16 LOCAL GOVERNMENT REVENUE

16.1 Approach

The Project’s use of, or effects on others use of, the land, services, and infrastructure could affect local government revenues and expenditures. Changes in local government revenues and expenditures are valued by local residents because they receive services from and pay property taxes to local governments. Federal and provincial governments would also receive revenues in the form of income taxes, consumption taxes, or royalties, as reported in Volume 1 Section 7 Project Benefits.

16.1.1 Regulatory and Policy Setting

The key statute governing local government revenues is the provincial Community Charter, Part 7, Municipal Revenue. The Charter sets out revenue sources and management guidelines for local governments, including the rules around borrowing funds and recovering costs through taxation associated with local services. The Local Government Act requires municipalities and regional districts to prepare a financial plan annually. The financial plan must be adopted annually by bylaw and it must cover a minimum five-year period (B.C. Ministry of Community, Sport and Cultural Development No Date a, No Date b).

Local governments generate revenue primarily through property taxes (property, parcel, and local service taxes), sale of services, and transfers received from the provincial and federal governments. There are clear rules around borrowing and repaying funds that often require consideration and direct input from voters.

The Local Government Grants Act establishes the statutory funding framework for provincial government support to local governments by providing authority to make conditional and unconditional grants to local governments and related organizations. The Fair Share Memorandum of Understanding (MOU) is an agreement between the provincial government, the Peace River Regional District (PRRD), and member municipalities. In the Peace River region, most of the industry infrastructure is located outside of municipal boundaries, which prevents municipalities from collecting tax on the properties. This agreement helps Peace River municipalities provide services despite not being able to access some of the industrial tax base (B.C. Ministry of Community, Sport and Cultural Development 2012). The current agreement began in 2005 and runs until 2020, and the funding has no conditions attached; however, the funding is renewed annually and can be terminated by the province at any time (PRRD, Chief Administrative Officer 2011, pers. comm.).

The Hydro and Power Authority Act authorizes BC Hydro to pay grants-in-lieu of general municipal, regional district and local improvement taxes. Order-In-Council 1218/65 and Order-In-Council 268/11 set out the formula used to calculate the grant payments. Annual grants paid include the following items:

- Grants equivalent to general, regional district, and local improvement taxes on the assessed value of all land owned by BC Hydro and on the assessed value of improvements such as office buildings, garages, warehouses, line stores, and
substation buildings; assessed values of generating plants, substation equipment, transmission lines, and distribution lines are excluded from this calculation

- Revenue grants equal to 1% of gross revenue from sales of electricity to BC Hydro customers within the province, excluding revenue from power sold to other distribution systems for resale
- Special grants-in-lieu of general taxes on dams, reservoirs, and powerhouses; these grants are based on installed capacity, or imputed nameplate-generating capacity, in the case of storage dams

16.1.2 Key Issues and Identification of Potential Effects

Issues, concerns, and interests identified during consultation with the public, local governments, and government agencies guided the scope of the local government revenue assessment (refer to Volume 1 Section 9 Information Distribution and Consultation). The key issues identified and the approaches used to address issues are outlined in Table 16.1.

There is the potential for adverse effects on local government revenue due to changes in the following as a result of the Project:

- Changes to population and demand for community infrastructure and services, increasing expenditures
- Change in expenditures for services demand by non-residents but no corresponding increase in revenues
- Change in revenues and expenditures and the difference in timing when revenues would begin to be received and when expenditures would need to take place
- Change to in-place infrastructure and the associated cost created by the Project
- Change in land use that would decrease the property tax paid to local government

Table 16.1 Key Issues: Local Government Revenue

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in population and demand for community infrastructure and services, increasing expenditures</td>
<td>• Issues were used to identify indicators such as property taxes, grants-in-lieu, sales of services, transfers, program expenditures, and service expenditures</td>
</tr>
<tr>
<td>Change in expenditures for services demand by non-residents but no corresponding increase in revenue</td>
<td>• Included direction in magnitude and timing of population change generated by BCIOM (Refer to Volume 3 Appendix A Economic Assessment, Part 2 Project Economic Impacts: B.C. Stats)</td>
</tr>
<tr>
<td>Change in revenues and expenditures and the difference in timing when revenues would begin to be received and when expenditures would need to take place</td>
<td>• Included consideration of the findings for local governments in the community infrastructure and services (Refer to Volume 4 Section 30 Community Infrastructure and Services)</td>
</tr>
<tr>
<td>Change to in-place infrastructure and the associated cost created by the Project</td>
<td>• Recognition of the policy and legal framework in which local government budgeting and finance is undertaken</td>
</tr>
<tr>
<td>Change in land use that would decrease the property tax paid to local government</td>
<td>• Assessment of local property tax loss due land use change prepared in cooperation with the PRRD and BC Hydro</td>
</tr>
<tr>
<td>Follow-up monitoring for methylmercury</td>
<td>•</td>
</tr>
</tbody>
</table>
Potential project interactions with local government revenue are summarized in Volume 2 Appendix A Project Interactions Matrix, Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a “2” ranking is assigned where an interaction may result in an adverse effect and where mitigation measures are not well understood to be effective. These interactions were taken forward through the effects assessment.

Project interactions with a ranking of “2” are set out in Table 16.2 below.

**Table 16.2  Interactions of the Project with Local Government Revenue**

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in Government Revenues and Expenditures</td>
<td>✓</td>
</tr>
</tbody>
</table>

**NOTE:**
Only Project interactions ranked as “2” in Volume 2 Appendix A Project Valued Component Interactions Matrix, Table 2 are carried forward to this table. A ✓ indicates that a project component or activity is likely to interact with local government revenue.

### 16.1.3 Standard Mitigation Measures and Effects Addressed

A “1” ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. A “0” ranking was given where there were no identified adverse effects identified arising from an interaction with the Project. These interactions were not carried forward through the effects assessment.

Potential effects on local government revenue and expenditures were assigned a “0” for Project operations, as there would be no or negligible change to local government expenditures on services or infrastructure during Project operations, as 1) the operations-phase workforce is very low relative to the existing and forecast population, and 2) there would be no Project demand that wouldn’t be addressed through normal fees (e.g., fees for landfill use).

There would be a beneficial effect on local government revenue during Project operations, as local governments would receive a reliable annual income from BC Hydro in the form of annual grants-in-lieu payments once the generating station begins operations. The amount payable and the recipient governments will be determined by the provincial government. Based on current rates, BC Hydro would make an estimated total annual payment of approximately $1.3 M (in 2012 dollars) beginning in the first year of operations to local governments (BC Hydro, Property Tax Specialist 2012a, pers. comm.). BC Hydro would also pay an estimated further $800,000 per year for school taxes for transmission assets to the provincial government. See Volume 1 Section 7 Project Benefits for further information.

As the grants-in-lieu approach is established under order-in-council by the provincial government, the operations phase is not considered further in this assessment.

### 16.1.4 Selection of Key Indicators

The key indicators for assessing Project effects on local government revenue are shown in Table 16.3 and include:

- Local government expenditures on specific programs and services
• Local government revenues from BC Hydro grants-in-lieu payments, property taxes, and transfers

Governments would be affected by changes in revenue streams, including property taxes and fees for service. They would also incur costs related to the provision of services and demand on infrastructure from the Project.

### Table 16.3  Key Indicators for Local Government Revenue

| Potential change in local and regional government expenditures and revenue | Key Indicators | Rationale for Selection of the Key Indicators
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local government expenditures</td>
<td>The indicators provide information on local government revenues and expenditures, how local governments raise revenues, and how revenues are applied against provision of local programs and services.</td>
</tr>
<tr>
<td></td>
<td>o programs, services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Local government revenues</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o property taxes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o grants-in-lieu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o sales of services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o transfers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o other (income, royalties, etc.)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**

* Includes input from consultation with regulators, First Nations, affected stakeholders, and the public, as well as regulatory guidelines, policies and/or programs

#### 16.1.5  Spatial and Temporal Boundaries

##### 16.1.5.1  Spatial Boundaries

The local assessment area (LAA) for local government revenues includes the City of Fort St. John, the District of Taylor, the District of Hudson’s Hope, the District of Chetwynd, the City of Dawson Creek, and the PRRD (Electoral Areas B, C, D, and E) (Table 16.4 and Figure 16.1). This is the area where physical and workforce effects would impact local government revenues and expenditures. First Nation communities are excluded from this analysis.

The RAA is the local municipal governments in the PRRD, including the City of Fort St. John, the District of Taylor, the District of Hudson’s Hope, the District of Chetwynd, the City of Dawson Creek, and the PRRD, but excluding First Nation communities. This is the regional government boundary within which both regional (i.e., PRRD) and local government revenues would be affected by other projects at the same time as the Project, potentially resulting in cumulative effects.
Table 16.4 Spatial Study Areas for Local Government Revenue

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Chetwynd</td>
<td>District of Chetwynd</td>
</tr>
<tr>
<td>City of Dawson Creek</td>
<td>City of Dawson Creek</td>
</tr>
<tr>
<td>City of Fort St. John</td>
<td>City of Fort St. John</td>
</tr>
<tr>
<td>District of Hudson’s Hope</td>
<td>District of Hudson’s Hope</td>
</tr>
<tr>
<td>District of Taylor</td>
<td>District of Taylor</td>
</tr>
<tr>
<td>PRRD</td>
<td>PRRD</td>
</tr>
</tbody>
</table>

16.1.5.2 Temporal Boundaries

The temporal boundary for the assessment is the Project construction phase as described in Volume 1 Section 4 Project Description and runs from year 0 to year 8.

As described in Section 16.1.3, the grants-in-lieu approach is established under order-in-council by the provincial government and would mitigate any potential effects during operations; thus, the operations phase is not considered further in this assessment.

16.2 Information Sources and Methodology

16.2.1 Literature Review

The baseline description of local government revenues used historical and current information including:

- Consolidated expenditure information (i.e., how expenditures were allocated among program and service areas) from 2004 to 2010 for the PRRD and local municipalities reported by B.C. Ministry of Community, Sport and Cultural Development
- Consolidated revenue information from 2004 to 2010 for the PRRD and local municipalities reported by the B.C. Ministry of Community, Sport and Cultural Development
- Direct grants-in-lieu payments by BC Hydro to local governments (BC Hydro)

Property tax information was available for incorporated communities and the PRRD. Literature and data sources used in the assessment are listed at the end of this section.

16.2.2 Interviews

Interviews were undertaken with municipal governments, PRRD, provincial government, and BC Hydro representatives concerning current services utilization and infrastructure demand. Plans for infrastructure and service expansion and for a review and interpretation of property taxation rates were also discussed. The PRRD assisted in calculating the local property tax that would be lost as a result of the Project. Personal contacts are listed at the end of this section. Volume 3 Appendix A Economic Assessment, Part 1 Economic Assessment Interview Methodology outlines details on the interview methodology.
16.3 Baseline Conditions

Local governments have both capital and operating budgets in their financial plan. This baseline description focuses on operating expenditures, as they are most directly linked to changes in service demand. Further detail on specific services that might be affected by the Project is provided in Volume 4 Section 30 Community Infrastructure and Services.

16.3.1 Revenues

Local government revenues are generated primarily through property taxes (including grants-in-lieu from Crown corporations such as BC Hydro) and sale of services. Communities in the LAA region also receive revenue from the provincial government through the Fair Share agreement. For the PRRD, electoral area requisitions, local government requisitions, and Municipal Finance Authority contributions are additional sources.

Table 16.5 shows total revenues for each PRRD community between 2004 and 2010. The annual Fair Share agreement funding from the province flows through the PRRD to the municipalities and rural areas in the LAA and is therefore reflected in the revenue of the PRRD and the municipalities. For example, in 2010, this resulted in a transfer of $31.2M from the PRRD to municipalities ($29.3 M) and Electoral Areas B, C, D, and E ($1.9 M) (Sander Rose Bone Grindle 2011). The communities experienced variation in revenue between 2004 and 2010. During this time, revenues have varied primarily as a result of capital project spending which includes those supported through lump sum funding from provincial and federal governments.

Table 16.5 Total Revenue for PRRD and Municipalities, 2004 to 2010 (\$000)

<table>
<thead>
<tr>
<th>Area</th>
<th>2004 ($)</th>
<th>2005 ($)</th>
<th>2006 ($)</th>
<th>2007 ($)</th>
<th>2008 ($)</th>
<th>2009 ($)</th>
<th>2010 ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Chetwynd</td>
<td>6,329.5</td>
<td>10,029.0</td>
<td>6,521.2</td>
<td>6,750.3</td>
<td>7,145.2</td>
<td>7,861.7</td>
<td>7,989.7</td>
</tr>
<tr>
<td>City of Dawson Creek</td>
<td>29,421.7</td>
<td>56,436.9</td>
<td>32,267.5</td>
<td>33,650.6</td>
<td>34,278.1</td>
<td>37,225.9</td>
<td>43,783.0</td>
</tr>
<tr>
<td>City of Fort St. John</td>
<td>30,720.1</td>
<td>47,977.8</td>
<td>47,772.1</td>
<td>40,372.9</td>
<td>44,419.8</td>
<td>51,044.2</td>
<td>68,646.2</td>
</tr>
<tr>
<td>District of Hudson's Hope</td>
<td>2,600.2</td>
<td>2,705.9</td>
<td>3,515.7</td>
<td>5,050.6</td>
<td>3,711.3</td>
<td>41,180.0</td>
<td>3,978.8</td>
</tr>
<tr>
<td>District of Taylor</td>
<td>5,780.9</td>
<td>9,068.2</td>
<td>6,617.7</td>
<td>7,006.2</td>
<td>6,609.0</td>
<td>8,744.9</td>
<td>8,536.0</td>
</tr>
<tr>
<td>PRRD</td>
<td>38,449.4</td>
<td>63,572.2</td>
<td>45,379.3</td>
<td>50,936.6</td>
<td>54,894.4</td>
<td>59,639.1</td>
<td>63,523.0</td>
</tr>
</tbody>
</table>

SOURCE:
B.C. Ministry of Community, Sport and Cultural Development (No Date a–g; h–o)

Table 16.6 shows the distribution of BC Hydro property taxes and grants-in-lieu payments for 2008 and 2011. The school tax is calculated based on the assessed property value in the municipality, but is paid to the provincial government. The grant portion and other taxes accrue to the local governments.
Table 16.6  BC Hydro Net Property Tax and Grants-In-Lieu Payments by Category, 2008 and 2011

<table>
<thead>
<tr>
<th>Area</th>
<th>Year</th>
<th>School Taxes ($</th>
<th>Grants ($</th>
<th>Other Taxes ($)</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Chetwynd</td>
<td>2011</td>
<td>51,840</td>
<td>134,021</td>
<td>10</td>
<td>185,871</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>40,168</td>
<td>246,459</td>
<td>11</td>
<td>286,638</td>
</tr>
<tr>
<td>City of Dawson Creek</td>
<td>2011</td>
<td>100,702</td>
<td>185,833</td>
<td>0</td>
<td>286,535</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>85,133</td>
<td>138,948</td>
<td>4,292</td>
<td>228,373</td>
</tr>
<tr>
<td>City of Fort St. John</td>
<td>2011</td>
<td>76,920</td>
<td>198,529</td>
<td>1,221</td>
<td>276,670</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>67,295</td>
<td>137,585</td>
<td>1,221</td>
<td>206,101</td>
</tr>
<tr>
<td>District of Hudson’s Hope</td>
<td>2011</td>
<td>1,577,560</td>
<td>1,250,342</td>
<td>9,963</td>
<td>2,837,865</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>1,501,432</td>
<td>1,067,196</td>
<td>7,226</td>
<td>2,575,854</td>
</tr>
<tr>
<td>District of Taylor</td>
<td>2011</td>
<td>24,604</td>
<td>281,860</td>
<td>0</td>
<td>306,464</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>23,075</td>
<td>218,874</td>
<td>0</td>
<td>241,949</td>
</tr>
<tr>
<td>PRRD</td>
<td>2011</td>
<td>0</td>
<td>1,014,869</td>
<td>0</td>
<td>1,014,869</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>0</td>
<td>838,716</td>
<td>0</td>
<td>838,716</td>
</tr>
</tbody>
</table>

NOTE:
School taxes accrue to the provincial government

SOURCE:
BC Hydro (No Date a, No Date b)

16.3.2 Expenditures

Local government expenditures increase in response to service expansion, population growth, and the acquisition of capital assets. Table 16.7 shows the total expenditures by community and the PRRD between 2004 and 2010. For all communities, expenditures fluctuated over the period, primarily due to the acquisition of capital assets. For example, in 2010, Fort St. John expenditures on capital assets represented $37.0 M of $70.9 M in total expenses, while in 2005 capital expenditures were $14.2 M of total expenses of $33.6 M.

Table 16.7  Consolidated Expenditures for PRRD and Municipalities, 2004 to 2010 ($000)

<table>
<thead>
<tr>
<th>Area</th>
<th>2004 ($)</th>
<th>2005 ($)</th>
<th>2006 ($)</th>
<th>2007 ($)</th>
<th>2008 ($)</th>
<th>2009 ($)</th>
<th>2010 ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Chetwynd</td>
<td>7,000.0</td>
<td>7,100.0</td>
<td>6,700.0</td>
<td>7,700.0</td>
<td>7,600.0</td>
<td>8,200.0</td>
<td>7,017.1</td>
</tr>
<tr>
<td>City of Dawson Creek</td>
<td>30,800.0</td>
<td>41,300.0</td>
<td>46,100.0</td>
<td>41,100.0</td>
<td>41,300.0</td>
<td>31,800.0</td>
<td>37,310.7</td>
</tr>
<tr>
<td>City of Fort St. John</td>
<td>28,000.0</td>
<td>33,600.0</td>
<td>48,100.0</td>
<td>55,800.0</td>
<td>55,100.0</td>
<td>57,400.0</td>
<td>70,896.1</td>
</tr>
<tr>
<td>District of Hudson's Hope</td>
<td>2,600.0</td>
<td>2,600.0</td>
<td>3,600.0</td>
<td>4,200.0</td>
<td>3,100.0</td>
<td>2,900.0</td>
<td>4,202.4</td>
</tr>
<tr>
<td>District of Taylor</td>
<td>6,100.0</td>
<td>10,500.0</td>
<td>5,400.0</td>
<td>6,600.0</td>
<td>6,400.0</td>
<td>8,800.0</td>
<td>8,845.7</td>
</tr>
<tr>
<td>PRRD</td>
<td>35,200.0</td>
<td>56,700.0</td>
<td>42,200.0</td>
<td>45,800.0</td>
<td>52,400.0</td>
<td>59,400.0</td>
<td>71,136.1</td>
</tr>
</tbody>
</table>

SOURCE:
B.C. Ministry of Community, Sport and Cultural Development (No Date o–ab)
16.3.3 Consolidated Revenues and Expenditures, 2010

Consolidated revenues and expenditures for the municipalities and PRRD for 2010 are shown in Table 16.8 and Table 16.9. In 2010, $29.3 M of the $35.4 M transferred to the PRRD from the Province was through the Fair Share agreement and was subsequently redistributed to the municipalities (Sander Rose Bone Grindle 2011). Grants-in-lieu paid by BC Hydro on power generation facilities are included in the “own purpose taxation and grants-in-lieu” line in Table 16.7. In 2010, Fort St. John collected 31.7% or $21.8 M of its total revenues from its own purposes taxation and grants-in-lieu, while Dawson Creek collected 33.1% or approximately $14.5 M.

Expenditures in Table 16.9 are itemized by major service area, including transportation, protective services, transit, parks, recreation, and culture. Protective services (e.g., fire, policing, bylaw services, and coordination of municipal emergency operations) made up over 16.0% of expenditures in Dawson Creek and 14.0% in Fort St. John in 2010. In the PRRD, solid waste management represented 11.3% of expenditures and was the single largest program expenditure. In addition, in all communities and the PRRD the acquisition of capital assets was a key expenditure area in 2010.
<table>
<thead>
<tr>
<th>Revenue</th>
<th>Chetwynd ($)</th>
<th>Dawson Creek ($)</th>
<th>Ft. St. John ($)</th>
<th>Hudson’s Hope ($)</th>
<th>Taylor ($)</th>
<th>PRRD ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total own purposes taxation &amp; grants-in-lieu (municipalities only)</td>
<td>2,745.3</td>
<td>14,475.5</td>
<td>21,776.3</td>
<td>2,481.1</td>
<td>3,412.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Grant-in-Lieu (PRRD only)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1,015.7</td>
</tr>
<tr>
<td>Sale of services</td>
<td>1,605.1</td>
<td>8,238.8</td>
<td>11,516.5</td>
<td>567.1</td>
<td>1,958.6</td>
<td>3,884.9</td>
</tr>
<tr>
<td>Transfers from federal government</td>
<td>156.1</td>
<td>208.9</td>
<td>11,897.7</td>
<td>0.0</td>
<td>1,385.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Transfers from provincial government</td>
<td>1,315.5</td>
<td>11,373.9</td>
<td>15,938.6</td>
<td>792.2</td>
<td>1,564.9</td>
<td>35,435.7</td>
</tr>
<tr>
<td>Transfers from regional &amp; other governments</td>
<td>2,308.8</td>
<td>1,340.1</td>
<td>683.0</td>
<td>90.8</td>
<td>105.8</td>
<td>367.5</td>
</tr>
<tr>
<td>Investment income</td>
<td>15.0</td>
<td>738.9</td>
<td>258.0</td>
<td>34.5</td>
<td>119.8</td>
<td>244.6</td>
</tr>
<tr>
<td>Developer contributions</td>
<td>12.5</td>
<td>4,159.1</td>
<td>6,613.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Disposition of assets</td>
<td>(168.7)</td>
<td>(79.6)</td>
<td>(36.9)</td>
<td>13.2</td>
<td>(10.9)</td>
<td>0.0</td>
</tr>
<tr>
<td>Other revenue</td>
<td>0.0</td>
<td>3,237.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>25.5</td>
</tr>
<tr>
<td>Actuarial adjustments</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Electoral area &amp; local government requisitions</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>15,877.2</td>
</tr>
<tr>
<td>Member Municipal Finance Authority debt payment</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>6,672.1</td>
</tr>
<tr>
<td>Total revenue</td>
<td>7,989.6</td>
<td>43,783.0</td>
<td>68,646.2</td>
<td>3,978.9</td>
<td>8,536.0</td>
<td>63,523.2</td>
</tr>
</tbody>
</table>

**NOTE:**
The $29.3 M in other adjustments in the PRRD expenditures is from the Fair Share funds received from the provincial government and is redistributed to municipalities and electoral area communities in the PRRD.

**SOURCES:**
B.C. Ministry of Community, Sport and Cultural Development (No Date a, p, ac, ad); District of Chetwynd (No Date); Sander Rose Bone Grindle (2011); City of Dawson Creek (2012); City of Fort St. John (2012)
# Table 16.9 Consolidated Expenditures for Local Municipalities and PRRD, December 31, 2010 ($000)

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Chetwynd ($)</th>
<th>Dawson Creek ($)</th>
<th>Ft. St. John ($)</th>
<th>Hudson's Hope ($)</th>
<th>Taylor ($)</th>
<th>PRRD ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General government</td>
<td>1,140.7</td>
<td>2,814.3</td>
<td>4,759.2</td>
<td>903.1</td>
<td>706.0</td>
<td>2,783.3</td>
</tr>
<tr>
<td>Protective services</td>
<td>424.2</td>
<td>6,093.7</td>
<td>9,945.9</td>
<td>231.3</td>
<td>326.9</td>
<td>2,717.1</td>
</tr>
<tr>
<td>Solid waste management &amp; recycling</td>
<td>341.0</td>
<td>480.7</td>
<td>972.8</td>
<td>104.6</td>
<td>33.2</td>
<td>8,033.9</td>
</tr>
<tr>
<td>Health, social services &amp; housing</td>
<td>119.5</td>
<td>89.6</td>
<td>0.0</td>
<td>4.1</td>
<td>129.4</td>
<td>536.5</td>
</tr>
<tr>
<td>Development services</td>
<td>571.6</td>
<td>998.6</td>
<td>1,775.4</td>
<td>106.3</td>
<td>72.9</td>
<td>1,035.9</td>
</tr>
<tr>
<td>Transportation &amp; transit</td>
<td>1,484.6</td>
<td>3,761.8</td>
<td>7,181.1</td>
<td>423.6</td>
<td>492.6</td>
<td>240.5</td>
</tr>
<tr>
<td>Parks, recreation &amp; culture</td>
<td>380.5</td>
<td>7,886.8</td>
<td>4,775.3</td>
<td>673.7</td>
<td>2,814.7</td>
<td>9,882.8</td>
</tr>
<tr>
<td>Water services</td>
<td>628.6</td>
<td>2,636.9</td>
<td>2,700.5</td>
<td>115.1</td>
<td>242.3</td>
<td>35.9</td>
</tr>
<tr>
<td>Sewer services</td>
<td>340.4</td>
<td>743.6</td>
<td>1,663.9</td>
<td>72.6</td>
<td>204.7</td>
<td>254.7</td>
</tr>
<tr>
<td>Other services</td>
<td>0.0</td>
<td>1,279.7</td>
<td>109.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Acquisition of tangible capital assets</td>
<td>1,586.0</td>
<td>10,525.0</td>
<td>37,013.0</td>
<td>1,568.0</td>
<td>3,823.0</td>
<td>9,643.0</td>
</tr>
<tr>
<td>Debt payment for member municipalities</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>6,672.1</td>
</tr>
<tr>
<td>Other adjustments</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>29,300.4</td>
</tr>
<tr>
<td>Total expenditures</td>
<td>7,017.1</td>
<td>37,310.7</td>
<td>70,896.1</td>
<td>4,202.4</td>
<td>8,845.7</td>
<td>71,136.1</td>
</tr>
</tbody>
</table>

**NOTE:**
The $29.3 M in other adjustments in the PRRD expenditures is from the Fair Share funds received from the provincial government and is redistributed to municipalities and electoral area communities in the PRRD.

**SOURCES:**
B.C. Ministry of Community, Sport and Cultural Development (No Date a, p, ac, ad); District of Chetwynd (No Date); Sander Rose Bone Grindle (2011); City of Dawson Creek (2012); City of Fort St. John (2012)
16.4 Effects Assessment

16.4.1 Effects Assessment Construction Change in Local Government Revenue and Expenditures

The potential effect on local government revenues and expenditures during Project construction is assessed by taking into account how local population increases, and therefore the incremental demand for local government services and infrastructure, would be influenced by the timing and magnitude of project-related activities (reported using the BCIOM Volume 3 Appendix A Economic Assessment) and the related factors for local governments to raise new revenue to address new population-based expenditures. In addition, the physical change to land use would affect existing property taxes collected and existing local infrastructure (see Volume 4 Section 30 Community Infrastructure and Services).

The BCIOM was used to produce the timing and magnitude of direct, indirect, and induced jobs associated with the Project, including estimates of regional employment. Potential local employment participation rates and the number of estimated new residents were used to estimate potential changes in population in the LAA, and specifically for Fort St. John. The potential population increases caused by the Project during construction inform potential changes to local government revenue and expenditures.

16.4.2 Timing and Magnitude of Local Population Growth Due to Project-Related Activities

During construction, direct workers would come to the area and, despite the availability of rooms in the construction camps, may choose to live in LAA communities, primarily Fort St. John and the surrounding area. In addition, other in-migrants would come to the area during construction to potentially fill indirect and induced positions and would settle in LAA communities. It is anticipated that workers settling in communities and those living in camp would place increased demand on local services, but in different ways.

Workers and their families living in the community would create demand typical of existing residents, while camp workers would have less need for many services, but this would still increase demand in areas where on-site services are not feasible. Aggregate demand would increase for local government services for policing, fire, recreation and leisure, municipal solid waste, sewer and water service delivery, and transportation (refer to Volume 4 Section 30 Community Infrastructure and Services and Volume 4 Section 31 Transportation).

Communities in the LAA are experiencing population growth; this growth is projected to continue. The net effect of the Project on local government revenues and expenditures would be to accelerate the expected increases in service and infrastructure needed to serve the growing population. Based on forecasting in Volume 4 Section 28 Population and Demographics, the population would be advanced by approximately two years for the LAA and three years for Fort St. John. As the construction workforce tapers off at the end of construction, natural population growth would be expected to replace the construction-induced population change; therefore, an overall population decline at the
end of construction would not be expected (see Volume 4 Section 28 Population and Demographics).

Local governments that receive new residents would experience increased property tax revenues. Increased taxes paid to local government by supplier and induced industries would also increase revenues. Collectively, own-source taxation to local governments would increase. Based on proximity to the Project, most of this new resident population and business activity would likely be in the Fort St. John area.

### 16.4.3 Legal and Policy Factors

The legal and policy framework that local governments operate within defines the way local governments manage their local finances and establish the budgeting process to follow. In particular, this limits the way in which local governments can deficit finance for capital projects and constrains the flexibility for operation variances. This could create challenges associated with the timing of when new revenues would accrue and when the expenditures would be required. Overall, local governments are bound by clear rules and procedures for budget planning and deficit financing.

### 16.4.4 Change in Land Use

Private land in the LAA that would be inundated by the Site C reservoir would result in a loss in the assessable property tax base at the time of reservoir filling. These lands would also no longer require municipal services.

In the PRRD, the estimated own-purpose property taxes lost permanently due to the Project reservoir filling would be $1,050 annually. An additional $1,640 annually in hospital taxes would be permanently lost. However, the PRRD would also be expected to receive grants-in-lieu payments that would more than offset this small loss of tax revenue.

Due to permanent loss of land due to reservoir filling, the District of Hudson’s Hope’s own-purpose property tax would decline by $14,105 annually and hospital taxes by $1,865 annually, or a total of approximately $16,000 per year.

The Project would affect local infrastructure, specifically water intake and sewer outfall infrastructure currently sited along the Peace River. These effects are addressed in Volume 4 Section 30 Community Infrastructure and Services and Volume 4 Section 31 Transportation. Services and infrastructure provided by local government that could, if not mitigated, increase local government expenditures due to Project effects are summarized in Table 16.10.
### Table 16.10 Summary of Potential Local Government Expenditure and Revenue Effects by Service Area

<table>
<thead>
<tr>
<th>Service</th>
<th>Jurisdiction &amp; Funder</th>
<th>Source of Incremental Expenditures</th>
<th>Typical Revenue Source</th>
<th>Potential Project Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Community Services</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation and Leisure</td>
<td>Fort. St. John and Taylor</td>
<td>Increased service capacity to meet demand from camp population using Fort. St. John’s and Taylor’s recreation and leisure services</td>
<td>Property taxes, User fees</td>
<td>Increased costs for programming and staff that exceed user fees (i.e., increase in local government subsidy)</td>
</tr>
<tr>
<td>Water &amp; Sewer Lines</td>
<td>Fort. St. John</td>
<td>Planning and hook-up costs for new homes and businesses</td>
<td>Developers – developer’s cost</td>
<td>None identified</td>
</tr>
<tr>
<td>Water &amp; Sewer Service Delivery</td>
<td>Fort. St. John, Taylor</td>
<td>Increased demand on sewer and water facilities by new residents</td>
<td>User fees</td>
<td>None identified</td>
</tr>
<tr>
<td>Water &amp; Sewer Intakes/Facilities</td>
<td>Fort. St. John, Taylor, Charlie Lake &amp; Hudson’s Hope</td>
<td>Costs for upgrading or moving facilities affected by project activities</td>
<td>None for unscheduled capital upgrades</td>
<td>Incremental capital expenditures</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>PRRD</td>
<td>Increased service capacity to meet demand of new residents, project waste management</td>
<td>User fees, tipping fees</td>
<td>None identified</td>
</tr>
<tr>
<td><strong>Emergency Services</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policing</td>
<td>Fort St. John</td>
<td>Increased service capacity to meet demand of new residents</td>
<td>Property taxes</td>
<td>None identified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased service capacity to meet demand of camp population, and road safety policing</td>
<td>None</td>
<td>Increased costs for staffing to maintain service levels and public safety</td>
</tr>
<tr>
<td>Fire and Rescue Services</td>
<td>Fort. St. John</td>
<td>Increased service capacity to meet demand of new residents</td>
<td>Property taxes</td>
<td>Emergency rescue service provided for motor vehicle accidents</td>
</tr>
<tr>
<td></td>
<td>Fort. St. John</td>
<td>Increased service capacity to meet demand of project facilities and work sites</td>
<td>Service fees</td>
<td>None identified – if services are provided there would be an agreed upon fee structure for services rendered</td>
</tr>
</tbody>
</table>
16.4.5 Mitigation Measure – Change in Local Government Revenue and Expenditure

Local governments may experience increased costs related to meeting the demands of new local residents and Project workforce camp populations, or may have infrastructure that, if affected and not mitigated, would increase local government expenditures. Volume 4 Section 30 Community Infrastructure and Services addresses these issues directly, and where adverse effects have been identified, mitigation and monitoring measures have been proposed.

In recognition of the potential impact on the District of Hudson Hope’s community development which would be caused by the Project’s permanent inundation of land BC Hydro agrees to provide a onetime contribution of $160,000 to the District payable within one year of when the Site C reservoir is filled. This payment will be without prejudice to any powers, rights, immunities or exemptions that BC Hydro may have under any statute or otherwise, and will not set a precedent for any other similar matter in the future.

16.5 Summary of Effects Assessment and Mitigation Measures

A summary of potential effects and mitigation measures is shown for local government revenues in Table 16.11.
### Table 16.11 Project Effects and Mitigation Measures on Local Government Revenue

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Change in local government revenue – increased costs to serve residents, damage to infrastructure</td>
<td>▪ Local governments may experience increased costs related to meeting the demands of new local residents and Project workforce camp populations, or may have infrastructure that, if affected and not mitigated, would increase local government expenditures. Volume 4 Section 30 Community Infrastructure and Services identifies adverse effects and mitigation and monitoring measures as appropriate</td>
<td>▪ Measures to manage demand for local services and infrastructure would address potential net increases in local government expenditures  ▪ Infrastructure damages and loss of taxable land base have been identified and compensation will be provided</td>
<td>BC Hydro</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Permanent inundation of land no longer available for development will be addressed by providing a one-time contribution of $160,000 to the District of Hudson’s Hope within one year of reservoir filling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Standard Mitigation: Once operational, BC Hydro will provide annual grants-in-lieu payments to local governments as directed by as per provincial funding obligations order-in-council.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 16.5.1 Other Mitigation Options Considered

There were no other mitigations measures considered by BC Hydro for effects on local government revenue.
16.6 Residual Effects
No residual effects on local government revenue are anticipated following mitigation.

16.7 Cumulative Effects Assessment
No cumulative effects on local government revenue are anticipated, because no residual effects following mitigation are anticipated.

16.8 Monitoring and Follow-up
Monitoring specific to local government revenue is not required.
References

Literature Cited

BC Hydro. No Date a. Northern Region Peace-Rocky Mountain Community Relations 2011 Annual Report. Vancouver, B.C.

BC Hydro. No Date b. 2007 Net Property Tax and Grant Payments as at June 30, 2007. Vancouver, B.C.

Internet Sites


16-18


Personal Communications


17 LABOUR MARKET

17.1 Approach

The labour market is the exchange of the supply of labour by workers for the demand of labour by employers. The potential labour supply for the Project is those workers with the required skills and occupational training. The labour supply may be drawn from residents living close by the Project, as well as persons throughout B.C., Canada, or internationally. Labour demand corresponds to the number of positions of the requisite skills at the required time to build and operate the Project, plus demand by supplier (i.e., indirect) and consumer (i.e., induced) industries supported by project expenditures.

Labour markets are dynamic, with fluctuations in both the numbers of persons in the labour force and the number of positions available from employers. The fluctuations can result in periods of labour surplus or labour scarcity. Forces inherent in the labour market, such as labour mobility and changing terms of employment, tend to restore balance between supply and demand. Provincial and federal initiatives also play a role in improving efficient labour market functioning.

The main factors that characterize the supply of labour are the number of people in the labour force by occupation and industry affiliation, unemployment rates, job search period, and contribution of non-resident workers. The indicators characterizing labour requirements are the estimated number of people to build the Project, derived from the 2010 cost estimate, and the number of jobs in the supplier and consumer industries as estimated by the British Columbia Input-Output Model (BCIOM).

17.1.1 Regulatory and Policy Setting

Full employment of the labour force is a primary objective of government labour policy. Programs and policies are aimed at improving the labour market efficiencies at the local, provincial, and national levels.

In northeast B.C. there are a number of current initiatives intended to better equip the unemployed, the underemployed, and persons entering the labour market. This includes partnerships funded under the Labour Market Development Agreement, and existing partnerships relevant to the Project’s labour force needs, including the Northern B.C. Resource Sector HR Strategy, Northern Opportunities, the Industrial Training Association, and the B.C. Construction Association. The North East Native Advancing Society (NENAS) holds an agreement with Human Resources and Skills Development Canada under its Aboriginal Skills and Employment Training Strategy. Programs aimed at enhancing employment opportunities are summarized in Table 17.1.
### Table 17.1 Summary of Northeast B.C. Labour Market Programs

<table>
<thead>
<tr>
<th>Area of Support</th>
<th>Description</th>
<th>Delivery Agencies in the LAA a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Support for the Unemployed</td>
<td>Assisting clients in successful job search</td>
<td>Employment Connections (FSJ b)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Catholic Social Services (Dawson Creek)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment Services (Fort Nelson)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obair Economic Society (FSJ, Dawson Creek, Chetwynd)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T.R.A.D.E.S. (FSJ)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North East Native Advancing Society (FSJ)</td>
</tr>
<tr>
<td>Skills Training for the Unemployed</td>
<td>Training programs prepare participants to take (often entry-level) employment in occupation/industry experiencing or expected to experience skill shortage</td>
<td>Northern Lights College</td>
</tr>
<tr>
<td></td>
<td></td>
<td>British Columbia Construction Association’s Skilled Trades Employment Program (STEP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North East Native Advancing Society (FSJ)</td>
</tr>
<tr>
<td>Job Training for the Low Skilled</td>
<td>Employment related training to low skilled employees working in targeted sectors</td>
<td>Employment Connections (FSJ)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Northern Lights College</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North East Native Advancing Society (FSJ)</td>
</tr>
</tbody>
</table>

**NOTES:**

a  LAA – Local Assessment Area (see Section 17.1.5.1)
b  FSJ – Fort St. John

**Sources:** NENAS (2011); NDIT (2012)

The Red Seal program allows qualified tradespeople to practice their trade in any province without having to write additional exams, thus improving labour mobility in Canada (HRDC 2012).

Canada provides for the hiring of foreign workers on a temporary basis to fill immediate skills and labour shortages when Canadians and permanent residents are not available through the Temporary Foreign Worker Program, which is administered jointly by Human Resources and Skills Development Canada with Citizenship and Immigration Canada. Temporary foreign labour can be accessed through the Labour Market Opinion process.

Foreign skilled and experienced workers who wish to settle in B.C. permanently can also apply under the British Columbia Provincial Nominee Program, which expedites the permanent resident application process. Workers can apply under either strategic occupations or business categories. Examples of strategic occupations are managers, technicians, and skilled trades. The program is administered on behalf of the Province of B.C. by the Ministry of Jobs under the authority of Citizenship and Immigration Canada (BCMJTI No date).

Under the federal *Canadian Human Rights Act* and the B.C. *Human Rights Code*, it is not a discriminatory practice for an employer to give preferential treatment to Aboriginal persons in hiring, promotion, or other aspects of employment, when the primary purpose of the employer is to serve the needs of Aboriginal people.

In 2006, BC Hydro’s Board of Directors adopted a 10-year Aboriginal Education and Employment Strategy. The corporation supports the recruitment, education, and job skills development of Aboriginal persons as an element of its ongoing provincially applicable initiatives in these areas; an example is its Trades Trainee Program. It also operates initiatives specifically targeted at the province’s Aboriginal population, such as its Aboriginal Scholarships program.
17.1.2 Key Issues and Identification of Potential Effects

Issues, concerns, and interests identified during consultation with the public, Aboriginal groups, and government agencies guided the scope of the labour market assessment (refer to Volume 1 Section 9 Information Distribution and Consultation). The key issues identified and the approaches used to address issues are outlined in Table 17.2.

**Table 17.2 Key Issues: Labour Market**

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>The loss of jobs and business opportunities in those industries negatively affected by the Project, such as tourism, forestry, and agriculture.</td>
<td>Potential changes in economic activity associated with changes in land and resource use is addressed in the relevant valued components in Volume 3.</td>
</tr>
<tr>
<td>Qualified residents and businesses want the opportunity to fully participate in construction and operating phases, as a community benefit.</td>
<td>Project labour and business requirements compared with local capacity is addressed in Labour Market and in the Regional Economic Development VCs.</td>
</tr>
<tr>
<td>Describe direct and associated employment with the Project by major category, full time/part time and seasonal, wage rates, and use of underutilized local human resources.</td>
<td>Section 17.4 provides employment estimates by major occupation category. Further details will be based on contractor scheduling and hiring decisions, and will be available at the construction phase.</td>
</tr>
<tr>
<td>Existing contractors and businesses are concerned that the Project will lure away their best employees.</td>
<td>Project labour and business requirements compared with local capacity is addressed in the Labour Market VC and the Regional Economic Development VCs.</td>
</tr>
<tr>
<td>First Nations’ concern with pressures on labour supply, as a result of in-migration (BRFN a, T8TA b).</td>
<td>Mitigation measures to address employment barriers of Aboriginal persons.</td>
</tr>
<tr>
<td>First Nations’ concern with brain drain (T8TA).</td>
<td>Mitigation measures to address conditions of labour shortages in the overall labour market and the Aboriginal labour market in the region.</td>
</tr>
<tr>
<td>First Nations’ concern that “boom and bust” cycle of a project creates difficulties in developing skills and sustaining lifestyles (SFN c, T8TA b).</td>
<td>Mitigation measures to address employment barriers of Aboriginal persons.</td>
</tr>
<tr>
<td>First Nations’ interest in benefits (employment, contracting opportunities, business development and capacity building) accruing to local residents (SFN).</td>
<td>Mitigation measures to address employment barriers of Aboriginal persons.</td>
</tr>
<tr>
<td>First Nations’ concern that the Project would result in a medium-term (5–10 years) growth cycle in the local economy; could contribute to inflation (T8TA).</td>
<td>Comparison of project labour requirements with local labour supply in Labour Market VC. Mitigation measures to address local labour shortages.</td>
</tr>
<tr>
<td>First Nations’ concern that low job satisfaction, racism, lack of advancement and training, long-distance commuting, destructive nature of work may influence retention rates of First Nations workers in Project construction (T8TA).</td>
<td>Mitigation measures to address employment barriers of Aboriginal persons.</td>
</tr>
<tr>
<td>First Nations concern regarding quality of work environment and job satisfaction levels (T8TA).</td>
<td>Mitigation measures to address employment barriers of Aboriginal persons.</td>
</tr>
</tbody>
</table>

**NOTES:**

a. BRFN – Blueberry River First Nations

b. T8TA – Treaty 8 Tribal Association

c. SFN – Saulteau First Nations

Potential project interactions with the Labour Market are summarized in Volume 2 Appendix A Project Interactions Matrix, Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a “2” ranking is assigned where an interaction may result in an adverse effect and mitigation measures are not well understood to be
effective. These interactions were taken forward through the effects assessment. Project interactions with a ranking of “2” are set out in Table 17.3 below.

Project effects are assessed at the phase level, not at the component level, because the interaction with labour supply is with respect to labour demand combined for the Project components. Project labour demand during the construction phase would be substantial relative to the size of the overall resident labour force and the Aboriginal labour force in the LAA; hence, there is the potential to adversely affect the labour market.

Table 17.3 Interactions of the Project with Labour Market

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>The indirect project employment calculated using the British Columbia Input-Output Model</td>
</tr>
<tr>
<td></td>
<td>Comparison of labour requirements against baseline and forecast local labour supply and demand by skill category</td>
</tr>
</tbody>
</table>

Construction  ✓  ✓  ✓

NOTES:
Only Project interactions ranked as “2” in Volume 2 Appendix A Project Interaction Matrix, Table 2 are carried forward to this table. A ✓ indicates that a project phase is likely to interact with Labour Market.

* LAA – Local Assessment Area (see Section 17.1.5.1)

17.1.3 Standard Mitigation Measures and Effects Addressed

A “1” ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. These interactions were not carried forward through the effects assessment.

A “1” ranking was assigned to Project operations because the expected labour demand is very low relative to the existing labour force in the region. Operations would involve an estimated 25 full-time positions annually, with about half of these in the region.

Incremental labour demand would also occur over the Project life in relation to capital expenditures to keep the Project operating. Over the first 100 years of operation, the capital expenditure for sustaining capital would total about $1.18 billion dollars with employment of 3,270 person-years (Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats). The first such sustaining capital expenditure is scheduled for approximately the 40th year of operation, with other expenditures distributed over the following 60 years. Annualized, the direct expenditure and labour requirements for any particular year would be a fraction of the total, which would be very low in relation to the total local labour market. If the historical trend projects into the future, then the size and skills of the local labour force will grow and change with economic conditions. Standard mitigation measures would also be expected to evolve and become more effective in avoiding or minimizing potential effects. Given these considerations, a “1” was assigned to this component of operations.

Labour market is not assessed for the operations phase, as the expected labour demand would be very low relative to the existing and projected labour force in the region.
Operations would involve an estimated 25 full-time positions annually, with about half of these in the region.

17.1.4 Selection of Key Indicators

Key Indicators for assessing the Project effects on the Labour Market are summarized in Table 17.4.

Table 17.4 Key Indicators for Labour Market VC

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Project’s labour needs relative to the expected availability and type of skills of persons in the LAA.</td>
<td>Number of persons by occupation and industry affiliation, and available skills in the local labour force and turnover rates.</td>
<td>Characterizes the Project’s main effects on the labour market.</td>
</tr>
<tr>
<td>The indirect project employment calculated using the British Columbia Input-Output Model.</td>
<td>Number of persons by occupation and industry affiliation.</td>
<td>Employment stimulated by the local Project expenditure will increase the demand on the local labour force.</td>
</tr>
<tr>
<td>Comparison of Project labour requirements against baseline and forecast local labour supply and demand by skill category.</td>
<td>• Project direct labour requirements • Contribution of non-resident workers in the North East Development Region’s labour force • Estimates of skill shortages and surpluses • Number of persons by occupation and industry affiliation, and available skills in the local labour force • Unemployment rates, demographics and characteristics, length of unemployment, job search period</td>
<td>Existing labour force characteristics indicate the extent to which Project requirements may be met from within the local assessment area (LAA). Unemployment rate is a reliable indicator of the status of the balance in a labour market.</td>
</tr>
</tbody>
</table>

NOTE: * Includes input from consultation with regulators, First Nations, affected stakeholders, and the public, as well as regulatory guidelines, policies, and programs.

17.1.5 Spatial and Temporal Boundaries

17.1.5.1 Spatial Boundaries

The spatial boundaries for the Labour Market VC assessment are reported in Table 17.5. The LAA and RAA for Labour Market are illustrated in Figure 17.1.

The local assessment area (LAA), or the area within which potential labour market effects could be experienced, is defined as the Peace River Regional District (PRRD) and the Northern Rockies Regional Municipality (NRRM), which, together, are known as the Northeast Development Region (NEDR). Baseline labour supply information, labour force trends, and forecast of labour market conditions to 2021 is presented for either the PRRD or for the NEDR as a whole, depending on availability of data. Where it is available, baseline labour force information is presented for communities such as Fort St. John, and for Aboriginal communities adjacent to the Project.
Baseline labour supply information is presented, where available, for First Nations communities and the Aboriginal population in the LAA. In the Census of Population, the Aboriginal population refers to those persons who reported identifying with at least one Aboriginal group, i.e. North American Indian, Métis, or Inuit, and/or those who reported they were members of an Indian band or First Nation, or reported being a Treaty Indian or a Registered Indian. This population includes Aboriginal residents of First Nations communities and non-First Nations communities such as municipalities.

The borders of the Northeast Development Region and First Nations traditional territories and Indian Reserve communities do not precisely overlap. The First Nations with communities situated within the boundaries of the LAA include the Doig River First Nation, Halfway River First Nation, Prophet River First Nation, West Moberly First Nations, Blueberry First Nation, Saulteau First Nations, and Fort Nelson First Nation. Duncan’s First Nation, Horse Lake First Nation, and McLeod Lake Indian Band are located outside the boundaries of both the LAA and RAA. Where Duncan’s First Nation, Horse Lake First Nation, McLeod Lake Indian Band, and other First Nations outside the LAA have identified interests in potential effects on regional economic development, these are discussed in Volume 5 Section 34 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Requirements. The baseline information for those communities is presented in Volume 3 Appendix B First Nations Community Baseline Reports, Part 3 Community Baseline Report and EIS Integration Summary Table for Duncan’s First Nation and in Part 4 Community Baseline Report and EIS Integration Summary Table for Horse Lake First Nation.

The Regional Assessment Area (RAA) for Labour Market is the LAA plus the Fraser Fort George Regional District (FFRD). The First Nations communities in the RAA include the First Nations communities in the LAA plus the McLeod Lake Indian Band. Projects in the FFRD that draw on the labour force in the LAA owing to relatively close proximity and movement of labour through the region might act cumulatively with Project effects if there is a temporal overlap.

The LAA and RAA for Labour Market are illustrated in Figure 17.1.

### Table 17.5 Spatial Assessment Areas for Labour Market

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peace River Regional District and Northern Rockies Regional</td>
<td>Peace River Regional District, Northern Rockies Regional</td>
</tr>
<tr>
<td>Municipality</td>
<td>Municipality and Fraser-Fort George Regional District</td>
</tr>
</tbody>
</table>

#### 17.1.5.2 Temporal Boundaries

The temporal boundary for the Labour Market VC is Year 1 through 8 of the Project construction phase.

Labour market is not assessed for the operations phase, as the expected labour demand would be very low relative to the existing and projected labour force in the region. Operations would involve an estimated 25 full-time positions annually, with about half of these in the region.
17.2 Information Sources and Methodology

17.2.1 Literature Review

Historic and current research literature informed the specification of baseline conditions and assisted with assessing potential effects. Key information sources included:

- Census information and labour market surveys from Statistics Canada
- Labour market research and forecasts from government agencies such as WorkBC and BC Stats, and from research-focused organizations such as Centre for the Study of Living Standards, Caledon Institute of Social Policy and Conference Board of Canada
- First Nations membership data from Aboriginal Affairs and Northern Development Canada (AANDC)
- First Nations community baseline profiles developed and supplied by: Treaty 8 First Nations of Doig River First Nation, Halfway River First Nation, Prophet River First Nation and West Moberly First Nations (detailed in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations)
- Other First Nations’ supplied information, such as profiles of First Nations-owned companies

The national Census of Population conducted by Statistics Canada every five years provides the most complete and reliable labour market data (e.g., labour force size, gender, age, employed and unemployed status, occupation, and industry). Statistics Canada also collects and publishes census labour force and demographic data by Aboriginal identity and First Nations communities. A complete data set for the 2006 Census is the most recent available at the time of writing. The Labour Force Survey, which is conducted monthly by Statistics Canada, and aggregated to annual levels, reports labour force and unemployment rate statistics at the development region level.

The effects assessment was assisted by regional forecasts of future labour market conditions completed by BC Stats and WorkBC. All literature and data sources used in the assessment are listed in References at the end of this section.

17.2.2 Interviews

Interviews were completed with labour organizations and employment offices to assist in interpretation and use of census data, and to assist in characterization of the size and role of the transient (non-resident) workforce not recorded in census statistics. Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 1 Economic Assessment Interview Methodology outlines details on the interview methodology.

17.2.3 Data Management, Mapping, and Modelling

The direct labour demand of the Project was provided by BC Hydro. The indirect and induced labour demand was estimated by BC Stats (Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats), based on an analysis of the project construction expenditure.
17.2.4 Aboriginal Community and Traditional Knowledge

Aboriginal community and traditional knowledge related to the Labour Market VC were gained through review of results of BC Hydro’s consultation with Aboriginal groups and reviews of First Nations community baseline studies prepared by the following First Nations in the LAA: Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations. While the communities and traditional territories of the Blueberry First Nations and Saulteau First Nations are within the boundaries of the RAA, BC Hydro had not received community baseline information from them at the time of writing.

Baseline information and data as well as First Nations concerns and interests relevant to the labour market are incorporated in the baseline and effects assessment. The First Nations community baseline reports are provided in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

BC Hydro’s approach to gathering community-based social and economic data with First Nations is described in Volume 3 Appendix B First Nations Community Baseline Reports, Part 1 Approach to Gathering and Integrating Community Baseline Information.

17.3 Baseline Conditions

The labour market baseline data collection focused on skills and occupations required by the Project, using the following key indicators:

- Number of persons, by occupation and industry affiliation, available skills in the local labour force, and turnover rates
- Unemployment rates, demographics and characteristics, length of unemployment, job search period
- Contribution of non-resident workers in the North East Development Region labour force
- Estimates of skill shortages and surpluses

A summary of the labour market baseline for the general population in the LAA is provided below. The detailed baseline is included in Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 3 Labour Market: Additional Baseline Information.

17.3.1 Labour Force by Occupation and Industry Affiliation

In 2006, approximately 1.5% of the province’s total population and 1.7% of the provincial labour force resided in the LAA. Key labour force characteristics for the LAA B.C. are summarized in Table 17.6.

Compared to B.C., the labour force in the LAA has a low unemployment rate and high participation rate. At the time of the 2006 Census, unemployment rates in the LAA indicated a balanced labour market, defined as unemployment above 5% and below 7%.
1 Table 17.6  Labour Market Statistics for the LAA and B.C.–2006

<table>
<thead>
<tr>
<th>Area</th>
<th>Labour Force (persons)</th>
<th>Employed (persons)</th>
<th>Participation Rate (%)</th>
<th>Unemployed (persons)</th>
<th>Unemployment Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAA</td>
<td>38,320</td>
<td>36,165</td>
<td>76.9</td>
<td>2,160</td>
<td>5.6</td>
</tr>
<tr>
<td>B.C.</td>
<td>2,226,380</td>
<td>2,092,770</td>
<td>65.5</td>
<td>133,615</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**NOTE:**

* The data in this table were accessed via BC Stats but is from the Census of Canada. In the census, the labour force refers to persons aged 15 and over who were either employed or unemployed during the week prior to Census Day (May 16, 2006).

b Calculated as the number of persons in the labour force divided by the total population over 15 years of age

**Source:** BC Stats (2010)

The available skills are characterized by the occupational profile of labour force in the LAA is summarized in Table 17.7.

Trades and occupations unique to primary industry comprise a larger percentage of the labour force in the LAA than in the province overall.

Changes in labour force in the LAA and in B.C. that occurred between 1995 and 2010 are presented in Figure 17.2. While the total labour force in the LAA increased by about 14% (5,000 persons) during this time, the construction labour force grew by 86%.

Table 17.7  Labour Force by Occupation in the LAA and in B.C. (2006)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>LAA (%)</th>
<th>B.C. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Business, finance, and administration</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>Natural and applied sciences, and related</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Health</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Social science, education, government service, and religion</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Art, culture, recreation, and sport</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sales and service</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Trades, transport and equipment operators, and related</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>Occupations unique to primary industry</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Occupations unique to processing, manufacturing, and utilities</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

**NOTES:**

**Source:** BC Stats (2010)

17.3.2  Job Search, Unemployment, Demographic Characteristics, and Turnover

In 2011, in an average month, approximately 300 to 500 people visited the Fort St. John office of Trades Referral Assessment, Direct Employment (T.R.A.D.E.S.) and approximately 1,000 people visited the Employment Connections office. About 75% of the visits were from local residents out of work or looking to change jobs, which provides insight into job turnover rates for residents within the LAA. The remainder of job seekers were non-residents (transients), most of whom resided in southern B.C. The majority (residents and non-residents) were male, with about 30% being 25 years of age or younger and about 70% being 40 years of age or younger. Workers with certification and training for in-demand positions typically found employment within a week, while persons...
with fewer skills or training who were seeking entry-level positions were unemployed for a longer period. Employment barriers such as personal issues and drug or alcohol abuse were identified as the main reasons for extended unemployment (Jones 2011 pers. comm.).

In addition to the rate of unemployment estimate at the census, labour force monitoring provides annual estimates. Figure 17.3 shows the annual average unemployment rate for B.C., in the LAA, and in the B.C. construction industry from 1995 to 2010, along with the natural rate of unemployment. Unemployment in the LAA shows considerable year-to-year variation but, in most years, it was less than the provincial rate. The average unemployment rate in the LAA over the 15-year period was 6.2%, compared to 7.3% in B.C. The unemployment rate in the LAA was below the natural rate of unemployment in 1998, 2005, and 2008, while the province was below that level from 2006 to 2008, and the construction industry was below that level from 2005 to 2008.

The unemployment rate is a reliable indicator of balance in the labour market. In recent research and modelling of B.C.’s labour market the natural rate of unemployment (termed the normal unemployment rate) was approximately 6% at the provincial level and approximately 5% for the northeast (BCMJTI, Director, Labour Market and Immigration 2012 pers. comm.). An unemployment rate below 5% indicates relative labour scarcity in the labour market. An unemployment rate in excess of 7% indicates relative lack of labour demand.

17.3.3 Labour Force and Skills, Shortages and Surpluses

Labour force participation by industry, for both Aboriginal and non-Aboriginal participants, is summarized in Table 17.10.

A survey of employers based in the LAA, conducted by Statistics Canada in April 2009, explored employment conditions for the major occupational categories (BC Stats and Statistics Canada 2009). The survey found that the highest hourly wage rates were in the trades occupations, that wage rates in the LAA for trades were higher than provincial rates, and that the average work week for people working in the LAA exceeded the provincial average.

The survey investigated the potential labour surplus or scarcity by occupation class by asking employers whether they were having difficulty filling positions and the length of time vacant positions were advertised prior to being filled. The results indicated that employers in the LAA experienced the greatest difficulty hiring persons in the sales and service occupations. Those employers hiring tradespersons indicated fewer difficulties than for the province as a whole. For a number of occupations, employers in the LAA had advertised vacant positions for longer than four months, which is an indication of limited labour supply.

A late 2007 survey of Fort St. John businesses and labour market participants found that Fort St. John was experiencing a labour shortage (Ipsos Reid Public Affairs 2007). The construction industry was second only to the services industry in experiencing labour scarcity, with 93% of respondents indicating that the construction industry was facing a shortage of suitably qualified workers. Also, construction firms had the most success recruiting from the Fort St. John area as well as from the rest of B.C., Alberta, and Atlantic Canada. Among the major employers in the LAA, construction firms also experienced the highest turnover rate.
Local labour scarcity eased somewhat in 2008 due to the worldwide economic
recession, and an increasing number of job seekers visited employment agencies.
Employment seekers included qualified tradespeople, but the majority had only
entry-level skills and training. These persons were the last hired when the economy was
growing strongly, and were among the first to be let go as business slowed down (Jones
2011 pers. comm.). For most tradespeople, the labour shortage in the Fort St. John area
persisted through the recession.

The scarcity of available tradespersons is illustrated by the status of members of the
union representing operating engineers, an important trade for project construction. This
union had a total of about 650 members working in the LAA in 2011, about 450 of whom
resided in the LAA (BC Building Trades, Members Representative, Local 115 2011 pers.
comm.). Another 50 members live in the LAA but work outside the LAA. About half of its
members work out of remote camps, such as Horne River. Mine construction and
operations is the single largest employer of members in the region. Other projects
include road building, pipeline construction, gas plant construction, wind projects, and
civil works.

Rising labour scarcity was evident in the LAA in 2011, primarily as a result of oil and gas
activity. Since reaching a peak unemployment rate of over 9% in the first two months of
2011, the rate declined to 4% by June 2011, and remained below 5% up to September

The wage and benefit packages and the frequency of overtime offered by the oil and gas
sector attract tradespersons. Other industries must compete for this skilled labour force.
For example, a large proportion of the 600 trades jobs required to retool the Canfor mill
were filled by non-residents of the LAA, mainly from southern B.C. Some positions were
also filled by people from Ontario and the Maritime provinces (T.R.A.D.E.S.,
Employment Councillor 2011 pers. comm.). Further, the oil and gas industry has drawn
persons away from the four-year apprenticeship programs required to acquire trade
credentials (T.R.A.D.E.S., Employment Councillor 2011 pers. comm.).

Some service industry employers in the LAA (i.e., accommodation and food services,
and retail trade industries) experienced labour scarcity and high turnover throughout
2011 and, in some cases, relied on temporary foreign workers to fill positions (Jones
2011 pers. comm.).

Census and labour force surveys report a worker’s normal place of residence.
Temporary residency, for example in hotels or work camps, is not captured in the
census. An anecdotal estimate indicates this non-permanent resident labour force could
be between 10,000 to 15,000 persons in the Fort St. John and Dawson Creek areas
(NPEDC, Economic Development Officers 2011 pers. comm.). This non-resident labour
force is an indication of local labour and skills shortages.

17.3.4 Labour Market Outlook

WorkBC projects 18,000 job openings in the LAA between 2010 and 2020, 60% of which
will be existing positions that become vacant and the remaining 40% will be new jobs
(BCMJTI 2011). Vacancies will be created mainly by retiring workers, while new jobs will
be created by major resource projects in mining, oil and gas, energy, and infrastructure.

Trades and administrative occupations are expected to experience the largest number of
job openings. The labour supply will expand as young people enter the market, but
non-resident workers are also anticipated to meet demand. This job outlook includes consideration of anticipated major project developments in the northeast, including the Project (BCMJTI, Director, Labour Market and Immigration 2012 pers. comm.).

17.3.5 Aboriginal Peoples

The labour market baseline for Aboriginal peoples in the LAA focused on its labour supply features, using the following key indicators (where data are publicly available):

- Labour force size, participation rate, unemployed numbers, and unemployment rate of the Aboriginal population and First Nations communities in the LAA
- Occupation and industry affiliation of the labour force of the Aboriginal population and First Nations communities in the LAA

Comparison between the Aboriginal and non-Aboriginal labour forces in the LAA are presented to determine similarities and differences in relation to these labour force characteristics.

17.3.5.1 Aboriginal Labour Force Indicators

The Aboriginal population accounted for 10.4% of the labour force in the LAA in 2006, with an unemployment rate of the Aboriginal labour force (14.6%) over three times more than the rate for the non-Aboriginal labour force in the LAA.

The monthly Labour Force Survey includes a question to determine if a respondent identifies as an Aboriginal person. The unemployment rate for Aboriginal persons living off-reserve in the LAA in 2011 was 8.8%, compared to 4.4% for non-Aboriginal persons. This survey does not include respondents living in First Nations communities.

Labour force indicators for the Aboriginal population and First Nations communities in the LAA are presented in Table 17.8.
Table 17.8  Labour Market Statistics for the Aboriginal Population in the LAA

<table>
<thead>
<tr>
<th>Population and First Nations Communities</th>
<th>Labour Force (persons)</th>
<th>Employed (persons)</th>
<th>Participation Rate (%)</th>
<th>Unemployed (persons)</th>
<th>Unemployment Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labour Force Survey data (2011)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Aboriginal Population (‘000)</td>
<td>35.7</td>
<td>34.1</td>
<td>76.8</td>
<td>1.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Aboriginal Population (off-reserve only) (‘000)</td>
<td>3.4</td>
<td>3.1</td>
<td>69.5</td>
<td>0.3</td>
<td>8.8</td>
</tr>
<tr>
<td><strong>Census of Population data (2006)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Aboriginal Population</td>
<td>34,350</td>
<td>32,775</td>
<td>76.9</td>
<td>1,580</td>
<td>4.6</td>
</tr>
<tr>
<td>Aboriginal Population (on-reserve &amp; off-reserve)</td>
<td>3,970</td>
<td>3,390</td>
<td>70.5</td>
<td>580</td>
<td>14.6</td>
</tr>
<tr>
<td>Doig River First Nations</td>
<td>35</td>
<td>30</td>
<td>53.3</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Halfway River First Nation</td>
<td>NA</td>
<td>NA</td>
<td>50.0</td>
<td>NA</td>
<td>50</td>
</tr>
<tr>
<td>Prophet River First Nation</td>
<td>NA</td>
<td>NA</td>
<td>64.3</td>
<td>NA</td>
<td>33</td>
</tr>
<tr>
<td>West Moberly First Nations</td>
<td>NA</td>
<td>NA</td>
<td>50.0</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

NOTE:  
\(^a\) The Labour Force Survey data reported in this table are an annual average, whereas the census data are for the week prior to Census Day (May 16, 2006). The Labour Force Survey provides the most up-to-date data on labour force characteristics, but the Census of Population provides a more accurate point-in-time estimate. The Labour Force Survey is conducted on a large sample of the Canadian population, approximately 100,000 persons and 54,000 households on a monthly basis. Responding to this survey is mandatory. The 2006 Census of Population also used a sampling procedure, but had a larger sample: one in five Canadian households. The larger sample of the Census of Population provides for a more accurate estimate of labour force characteristics.

NA – data not available

Sources: First Nations Community Baseline Reports (see Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations); Statistics Canada (2007, 2009); BC Stats (2012a)

Most First Nations communities in the LAA experience higher unemployment rates and lower participation rates than the Aboriginal population living off-reserve in the LAA. The higher unemployment rates in most First Nations communities in the LAA compared to the Aboriginal population residing in non-Aboriginal communities are likely due to the limited wage-based economic activity in the First Nations communities and the longer commuting distances to the centres with job opportunities. This differential between Aboriginal people living on Indian Reserves and Aboriginal people living off Indian Reserves is typical across the province; the unemployment rate for Aboriginal people living on-reserve in 2006 was 25.0\%, twice as much for Aboriginal people living off-reserve, 11.9\% (BC Stats 2012b).

The First Nations communities that are close to the main centres of economic activity in the LAA have lower levels of unemployment compared to those living further away. For example, the First Nations communities of the West Moberly First Nations are currently experiencing strong employment. The community is about 30 km from Chetwynd, 30 km from Hudson’s Hope and 90 km from Fort St. John, all of which are strong economic centres. There is an anecdotal reference in the Baseline Community Profile of Doig River First Nations, Halfway River First Nation, Prophet River First Nation and West Moberly First Nations that the current unemployment rate in the West Moberly First Nations community is low, “…everybody that wants to work is working and almost all of them have good jobs” (T8FNs Community Assessment Team and The Firelight Group).
Research Cooperative 2012a:124) and in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations).

The situation of high unemployment and low participation rates is more acute in First Nations communities that are more remote from the main nodes of economic activity, including Doig River First Nation, Halfway River First Nation and Prophet River First Nation. Several observations about challenges with transportation to work and training challenges for Aboriginal persons living in First Nations communities were reported, a couple were as follows, “…no job, no vehicle…no vehicle, no job”; people do not generally own vehicles…” (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012b: row 66) and in Appendix B; Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

In addition to historical, social, and systemic barriers, adult residents of these communities face weak on-reserve economic activity and commuting challenges, including higher transportation costs, to access off-reserve jobs. These challenges are reflected in their higher unemployment rates compared to the rate for Aboriginal persons living off-reserve in the LAA. For example, the Halfway River First Nation, located approximately 115 km and a one-and-a-half-hour drive from Fort St. John, has a high unemployment rate, 50% in the 2006 Census. Anecdotal reporting indicates most residents rely on social assistance and those who work rely on seasonal jobs (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012a:104) and in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations. The high unemployment and seasonal work situation is similar for the Prophet River First Nation community, which is located 90 km south of Fort Nelson and 350 km north of Fort St. John.

The earnings of well-qualified Aboriginal persons (age 35 to 54 with college credentials, working 40+ weeks per year, mostly full time) in the LAA are less than their comparable non-Aboriginal counterparts in the LAA. There is also a large difference in earnings in favour of Aboriginal persons living off-reserve (80.9% of the earnings of non-Aboriginal persons) compared to those living on-reserve (54.8% of the earnings of non-Aboriginal persons) (BC Stats No date).

17.3.5.2 Aboriginal Labour Force and Skills

The occupational profiles of the Aboriginal and non-Aboriginal labour forces in the LAA are summarized in Table 17.9. A high proportion of the Aboriginal labour force has skills in occupations associated with construction and resource-based primary industries, such as truck drivers, construction labourers, and tradespersons. The non-Aboriginal population has similar proportions of its labour force with these skills. By comparison, these occupation groups account for much lower shares of the province-wide labour force.
Table 17.9 Labour Force by Occupation, LAA (2006)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Aboriginal (%)</th>
<th>Non-Aboriginal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Business, finance, and administration</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Natural and applied sciences, and related</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Health</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Social science, education, government service, and religion</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Art, culture, recreation, and sport</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sales and service</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td>Trades, transport and equipment operators, and related</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>Occupations unique to primary industry</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Occupations unique to processing, manufacturing, and utilities</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**NOTES:**

**Source:** Statistics Canada (2007)

Aboriginal persons in the LAA were more likely to be employed as trades, transport and equipment operators, and in sales and service occupations, as well as occupations unique to the primary industry, than were non-Aboriginal persons in 2006. By comparison, non-Aboriginal residents in the LAA were more represented in management and natural and applied sciences occupations than Aboriginal residents.

An example of the trades orientation of First Nations employment is provided in the community profile for West Moberly First Nations, which reported that 16 to 18 of its members are self-employed, with seven member-operated businesses. The focus is on enterprises that serve the oil and gas, forestry, and construction industries (Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations).

Educational attainment is an important factor in the employment situation of the Aboriginal labour force and its occupational distribution. The gap in education levels between Aboriginal and non-Aboriginal persons in the LAA was similar to that of the province. High school non-completion rates for Aboriginal youth have been a major public policy concern for several years. A high school diploma is an important qualification across economic sectors. The unemployment rate in 2006 for Aboriginal persons aged 35 to 54 in the LAA without high school graduation was 20.0%; for those with a high school diploma, the unemployment rate was a much lower 8.1%. The high school completion rates in the LAA for Aboriginal and non-Aboriginal residents (aged 25 to 64) were low in both cases: 25% and 29% respectively, but similar to the provincial levels. There was a gap, however, between Aboriginal persons in the LAA living off-reserve and those who reside on-reserve; the latter’s high school completion rate is much lower, 15%, compared to 28% for the former group.

Although the high school graduation rates are similar between Aboriginal and non-Aboriginal persons in the LAA, the gap in their post-secondary qualifications rates is large, 34% versus 51%, respectively. The post-secondary qualifications rate for Aboriginal persons in the LAA is low within the provincial Aboriginal population; the current province-wide post-secondary qualifications rate is 48.9% for Aboriginal persons (BC Stats 2012b).
Although researchers have found that insufficient educational qualifications are the main barrier for Aboriginal persons when accessing employment opportunities (MNP 2012; Sharpe et al. 2009), they are not the only barriers. Sharpe et al. (2009) found that Aboriginal persons with the same level of educational qualifications as a non-Aboriginal person are likely to be unemployed, pointing to other barriers at play. In a survey-based study for Industry Training Authority, MNP (2012) cited these other barriers:

- Lack of readiness and awareness, e.g., at community level, relative to life skills
- Geographic barriers, e.g., access to transportation, ability to relocate
- Funding, e.g., for individuals, for programs
- Difficulty in securing employer sponsorship
- Lack of Aboriginal awareness within workplaces

The Baseline Community Profile of Doig River First Nations, Halfway River First Nation, Prophet River First Nation and West Moberly First Nations cited the following employment barriers: lack of child care, lack of education and training, isolated location and poor transportation options, emotional health issues, alcohol and drug problems, lack of life skills, higher-than-average health concerns and disabilities, racism/discrimination at work sites, destructive nature of resource extraction jobs, and greater exposure to economic downturns (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012a:231–232) and in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations).

The industries in the LAA in which Aboriginal and non-Aboriginal persons work are similar. Both segments had about one-fifth of their labour force working in resource-based industries, mainly oil and gas, and forestry. In 2006, Aboriginal persons in the LAA were more likely to be employed in public administration and construction than their non-Aboriginal counterparts. Non-Aboriginal persons were more represented in business services, in wholesale trade, and in professional, scientific, and technical services. The industry distribution for the Aboriginal and non-Aboriginal labour forces in the LAA are summarized in Table 17.10.

Table 17.10 Labour Force by Industry, LAA (2006)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Aboriginal (%)</th>
<th>Non-Aboriginal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and other resource-based industries</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>Construction</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Retail trade</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Finance and real estate</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Health care and social services</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Educational services</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Business services</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Other</td>
<td>20</td>
<td>17</td>
</tr>
</tbody>
</table>

NOTES:
Source: Statistics Canada (2007)
There are limited data on occupational and industry characteristics of residents of First Nations communities. The census data (Table 17.11) show that public administration forms a sizable share of employment in the Doig River First Nation community. Few First Nations communities in B.C. have large-scale employers within the boundaries of their Indian Reserves. The situation in the First Nations communities in the LAA is typical of most communities in the province; the band administration and First Nation health and education services are the main in-community employers. In addition, there are small construction, forestry service, and oil and gas service companies that are operated by a First Nation or by a First Nation member living in and basing their company in the Indian Reserve community. For example, the Community Profile report for Doig River First Nation stated that “Main economic activities in the community of Doig River include community administration, oil and gas work (seismic, facility construction, maintenance, first aid and safety, and reclamation), forestry, general labour, and agriculture. On-reserve labour also staffs the on again, off again convenience store, learning centre and daycare centre.” (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012a:92) and in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Public Administration</th>
<th>Services-Producing Industries</th>
<th>Goods-Producing Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doig River First Nation</td>
<td>30.8</td>
<td>23.1</td>
<td>46.2</td>
</tr>
<tr>
<td>B.C. Indian Reserve communities</td>
<td>21.3</td>
<td>48.6</td>
<td>30.0</td>
</tr>
</tbody>
</table>

NOTES:
Source: Statistics Canada (2007)

17.4 Effects Assessment
The potential for the Project to affect the labour market is assessed by taking into account the potential for the Project to result in changes to the following:
- The Project’s need for labour relative to the expected availability and types of skills of the persons in the LAA
- The indirect project employment calculated using the British Columbia Input-Output Model
- A comparison of the Project labour requirements against the baseline and forecast local labour supply and demand by skill category where the data are available

The first two changes address the labour demand associated with the Project’s construction expenditure and are addressed together. The availability and types of skills available in the local labour force are addressed in the context of the third aspect, in which labour demand is compared to baseline and forecast labour supply.

Mitigation addresses imbalance in the labour market and the three aspects collectively. These changes are assessed with respect to the construction phase only, as the Project’s changes during operations to the Labour Market are expected to be negligible.
17.4.1 Effects Assessment – Change in Demand for Direct and Indirect
Construction Phase Labour – General Population

Figure 17.4 presents person-months of direct labour by skill categories required by the
Project. Approximately 71% of total person-months would involve trades occupations.
Contractor supervisors would account for 18% of total person-months and BC Hydro
personnel and their advisors would account for 11%. Within the trades component,
operating engineers, labourers, and truck drivers would account for 60% of the
person-months. The greatest number of person-months would be needed for
construction of the powerhouse and related south bank structures. Construction of the
Site C dam and related works would account for the second-largest labour requirement.

The average monthly construction workforce for the three main occupational categories
is shown in Figure 17.5. The schedule has a seasonal profile, with higher labour
requirements between April and October than between November and March. For most
years, there would be, at a minimum, 500 persons working on-site during the off-peak
months. Between Years 1 and 5, the number of person-months would increase each
year, reaching a peak of 2,400 in September of Year 5 (This is the sum of the base
labour force of 2,134 persons, plus 222 persons hired and involved in various
“contingency” activities). The on-site labour force would decline after Year 6.

The person-month estimates include provision for contingency beginning in Year 4. The
2010 cost estimate contained an attribution for contingencies of $731 million to address
unforeseen expenditures related to a number of work packages. In order to estimate the
labour and economic effects associated with this expenditure, the contingency
expenditure was assumed to have the same labour and goods/service expenditure
profile as the Project. This was added to the construction schedule in equal increments
over the last five years. See Volume 3 Appendix A Economic Assessment Supporting
Documentation, Part 2 Project Economic Impacts: BC Stats.

Average person-months per year are also shown in Figure 17.5. The average annual
value is used to estimate the Project’s potential effect on the labour market addressed in
the subsection that follows.

The number of jobs supported in supply and other industries in the LAA and B.C.
associated with project expenditures based on 2010 Project Cost are reported in
Volume 1 Section 4 Project Overview. The model traces the project construction
expenditure through the economy and estimates total economic activity and
employment. Details of the BCIOM results are presented in Volume 3 Appendix A
Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC
Stats.

Table 17.12 presents the indirect and induced employment that would be generated
during construction within the LAA and the province. Employment effects in the LAA and
B.C. would be industries supplying goods and services to the Project (indirect) and
consumer industries receiving the re-spending of payroll (induced).
Table 17.12  Total Project Construction Phase Employment Effects

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Direct (\text{a} )</th>
<th>Indirect and Induced Employment(\text{b} )</th>
<th>Total Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAA</td>
<td>Total B.C.</td>
<td>LAA</td>
</tr>
<tr>
<td>Year 0</td>
<td>260</td>
<td>80</td>
<td>618</td>
</tr>
<tr>
<td>Year 1</td>
<td>818</td>
<td>210</td>
<td>1,59</td>
</tr>
<tr>
<td>Year 2</td>
<td>1,100</td>
<td>260</td>
<td>2,020</td>
</tr>
<tr>
<td>Year 3</td>
<td>1,078</td>
<td>280</td>
<td>2,29</td>
</tr>
<tr>
<td>Year 4</td>
<td>1,297</td>
<td>368</td>
<td>3,115</td>
</tr>
<tr>
<td>Year 5</td>
<td>2,066</td>
<td>398</td>
<td>2,908</td>
</tr>
<tr>
<td>Year 6</td>
<td>1,875</td>
<td>368</td>
<td>2,735</td>
</tr>
<tr>
<td>Year 7</td>
<td>1,284</td>
<td>268</td>
<td>1,864</td>
</tr>
<tr>
<td>Year 8</td>
<td>445</td>
<td>118</td>
<td>858</td>
</tr>
<tr>
<td>Total</td>
<td>10,223</td>
<td>2,350</td>
<td>18,005</td>
</tr>
</tbody>
</table>

NOTES:
\(\text{a}\)  BC Hydro (2012a), expressed in person-years of employment
\(\text{b}\)  Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats, Base Case Scenario

17.4.2  Comparison of Project Labour Requirements with Labour Supply

17.4.2.1  General Population

The proportion of the resident labour force taking up project employment could range from a low of 5% to a high of 20%. The lower end of the range corresponds to a strong regional demand for trades from other projects, where these projects would offer tradespeople living in the LAA better compensation and employment terms compared to the Project (T.R.A.D.E.S., Employment Councillor 2011 pers. comm.) The higher end of the range corresponds to the Project offering competitive compensation and employment terms relative to other projects.

The Project’s effect on the labour market would depend on the ability of the local capacity to meet construction labour demand while staying in balance. The local capacity is defined as the number of unemployed persons within the LAA with the required skills that are in excess of the natural rate of unemployment (i.e., 5%) (BCMJTI 2011). For example, if the baseline unemployment rate in the LAA is 7% for the occupations required by the Project, then the Project could hire those occupations from the local population until its number of unemployed is equal to 5%. Local hiring in excess of 5% unemployment would give rise to adverse labour market effects such as persistent labour shortages, reduction in service levels, and delay in completing work. If the baseline unemployment rate is at or below the natural rate of unemployment, there would be no capacity in the labour supply available in the LAA to meet the Project labour demand and an imbalance in the labour market would occur.

The historical unemployment rate is low in the LAA, but it has remained above the natural rate due to the in-migration of workers from other jurisdictions. Large construction projects in the last decade have consistently demonstrated the efficiencies of the market by using mobile workers to supplement what is available locally, and
maintenance of a low unemployment rate demonstrates that local hires are typically maximized.

As stated in the baseline description, the definition of labour market capacity does not include persons that are employed. Residents in the LAA that may leave a job to take a Project job create an employment vacancy. If that position is not eventually filled by an unemployed person, then a vacancy would persist in the labour market unless an in-migrating worker relieved the labour scarcity.

The unemployment rate in the LAA during the construction phase would depend on the state of the northeast B.C. economy. Baseline information indicated that, during periods of economic expansion, the unemployment rate in the LAA has fallen below 5% and the labour force expands (as workers migrate to the region). During economic slowdowns, the unemployment rate has increased to about 9% and the labour force growth declines. Labour market conditions are dynamic, and it is reasonable to expect that during the construction phase, both local labour shortages and excesses would occur at times for specific trades and occupations.

Given this dynamic, it is difficult to forecast labour market conditions during the construction phase with a high degree of accuracy. Table 17.13 shows construction demand for labour (for years requiring average, minimum, and maximum person-years of employment) compared to the labour supply available in the LAA for the trades and trades supervisors in 2011. The available labour force is an estimate of the number of persons that could be hired by the Project, at the average unemployment rate in the LAA, before pushing the unemployment rate below 5%. Table 17.13 indicates that Project labour demand would likely exceed the labour market capacity in the LAA for all years of the construction phase.

Table 17.13 Available Labour Force and Potential Project Requirements in the LAA

<table>
<thead>
<tr>
<th>Labour Force Characteristic</th>
<th>Crafts Supervisors</th>
<th>Crafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAA Labour Force (persons)</td>
<td>547 a</td>
<td>9,799 a</td>
</tr>
<tr>
<td>Available Labour Force</td>
<td>7 b</td>
<td>118 b</td>
</tr>
</tbody>
</table>

Project Requirements (person-years) c

<table>
<thead>
<tr>
<th></th>
<th>Crafts Supervisors</th>
<th>Crafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average year</td>
<td>189</td>
<td>710</td>
</tr>
<tr>
<td>Minimum year</td>
<td>29</td>
<td>149</td>
</tr>
<tr>
<td>Maximum Year</td>
<td>413</td>
<td>1,349</td>
</tr>
</tbody>
</table>

NOTES:

a Availability based on growth in crafts supervisors (excluding BC Hydro and Engineering, Procurement and Construction Management team) and crafts categories equalling LAA labour force growth between 2006 and 2011

b Available labour is estimated as the number of person in excess of the 5% threshold unemployment rate. The average unemployment rate in the LAA of 6.2% is assumed, where 1.2% of the labour force is estimated to be available without putting the unemployment rate below the threshold level.

c BC Hydro (2012a), includes contingency

17.4.2.2 Aboriginal Peoples

An Aboriginal labour market (or sub-market) exists within the LAA, which is based on Aboriginal labour force supply and LAA-based employer demand, including employment demand generated by the Project. There are also labour markets in the LAA based on community geographies, including First Nations communities.
In Section 17.4.1 there is an assessment of the labour demand change associated with the Project’s construction expenditure, including the amount (in person-years) and occupational characteristics of direct, indirect, and induced employment generated in the LAA and the province. The results of this assessment of Project-generated labour demand are directly applicable to the Aboriginal labour market, as the change in employment demand stemming from the Project potentially affects employment opportunities for members of the Aboriginal labour force.

The Project’s labour demand is compared to baseline and forecast Aboriginal labour supply to assess potential effects on the Aboriginal labour market in the LAA and on the labour markets of First Nations communities in the LAA. The Aboriginal labour force, although a segment of the labour force in the LAA, has its own distinct attributes, including size of the labour force, residential location of labour force members, number of unemployed, occupational skills, educational attainment, and social and historical circumstances, as described in Section 17.3.5.

Adverse effects would occur if members of the Aboriginal labour force in the LAA were unable to access, fairly and equitably, Project employment opportunities.

As outlined in Section 17.4.2, the local capacity to help fill Project employment demand is two-dimensional; one dimension is the number of unemployed persons that comprise the residual portion above the 5% natural unemployment rate, and the other is the occupational skills capabilities of unemployed persons within the LAA. This unemployed part of the labour force with crafts skills presents the local capacity to fill a minority, an estimated 5% to 20% of the Project’s crafts employment demand.

Although the Aboriginal labour force is a small proportion (approximately 10%) of the total labour force in the LAA, it has historically comprised a much higher portion, one-fifth to one-third, of the total unemployed in the LAA. From the point of view of the size of the pool of unemployed persons in the LAA, the Aboriginal labour force could fill a sizable minority of the local share of crafts employment. This contribution is subject to the Aboriginal unemployed having appropriate experience and abilities to fill these positions, including trainee positions, and having fair and equitable access to these Project employment opportunities.

The available data on the occupational skills of Aboriginal persons in the LAA (as described in Section 17.3.5.2) point to a portion of the Aboriginal labour force having certain qualifications to fill Project crafts positions. Almost 30% of the Aboriginal labour force has occupational skills that fall into the trades, transport, and equipment operators and related category. Data are not available on the occupational skills of the Aboriginal unemployed in the LAA, but if their occupational distribution is the same as for the whole Aboriginal labour force in the LAA, then, at this time, approximately 100 unemployed Aboriginal persons in the LAA may have suitable skills to fill crafts positions in the Project’s labour force. This amount or capacity will vary with the number of unemployed in the Aboriginal labour force and the composition of their capabilities.

Another potential source of capacity to help fill labour demand in the Aboriginal population is the group of adults who are not currently part of the Aboriginal labour force. The 2011 participation rate of the Aboriginal labour force was seven percentage points under the rate for non-Aboriginal persons (BC Stats 2012a). If the Aboriginal participation rate was the same as the rate for non-Aboriginal persons, then there would be approximately 350 more persons in the Aboriginal labour force in the LAA. The
occupational qualifications of these persons not in the current Aboriginal labour force are not known.

The Project employment demand also presents a potential opportunity for underemployed Aboriginal persons to secure more desirable work and wages or salary, possibly in apprenticeship or operator positions. A less-qualified unemployed person could potentially fill the position they left. Movement from employment in another entity to a Project-related position could result in drawing down unemployment if a local unemployed person moves into the paid workforce as a result. This movement also contributes to improved utilization of labour capacity in the LAA.

The full or even partial realization of this potential employment in the Project's construction phase will not occur in the absence of direct efforts to address the challenges and barriers to securing and maintaining suitable employment that are faced by many in the Aboriginal labour force. There has been strong demand for labour in the LAA, which is reflected in relatively low overall unemployment rates since 2003 and the extensive sourcing of labour from outside the LAA, yet the Aboriginal unemployment rate in the LAA remains high relative to the non-Aboriginal population over this period. This set of circumstances indicates that there are employment challenges and barriers for many members of the Aboriginal labour force in the LAA, even in a situation of strong employment demand.

The Treaty 8 First Nations’ Impact Pathways Report observed that “in general, there are also strong concerns by the T8FNs that even beneficial effects they do encounter are likely to be less beneficial for them than is likely for other, non-Aboriginal populations, due to a variety of built-in systemic hurdles to full engagement in the wage economy by the T8FNs and their members…There is a strong impression that outsiders and non-Aboriginal people are most likely to benefit from Site C” (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012b:24–25) and in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations). Several similar observations about barriers faced by the Aboriginal labour force in regard to securing employment associated with the Project were made in the Site C Initial Impact Pathways Report. Another example is “Variety of systemic hurdles to maximizing T8FNs engagement in employment during construction and operations of Site C, should it proceed; lack of training, low educational status, stigma of working on this project and psycho-social effects, lack of quality work environment in primarily non-Aboriginal companies; etc.; also, relatively short-term nature of construction; what incentive is there for T8FNs to engage?” (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012b) and in Appendix B, row 64; Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations).

An adverse effect would also occur if Project demand for labour during the construction phase results in staffing gaps in the organizations and enterprises located in First Nations communities (i.e., Indian Reserve communities) due to some of their employees leaving the community to take up Project construction employment.

There is an observation in the Treaty 8 First Nations’ Impact Pathways Report in regard to the Project that “…out-migration of those local people with highest business acumen
impacts on both the person leaving (loss of connection to home, subject to increased social isolation in a non-Aboriginal community) and the people left behind (family cohesion, “brain drain”, reduced capacity to run community infrastructure).” (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012, Appendix B, row 50 and in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations).

Since these small First Nations communities have high levels of unemployment and the on-reserve organizations and businesses have relatively small staffs, then many staffing gaps due to movement of persons from the employ of a First Nation community entity to an off-reserve entity associated with Project construction could be filled by unemployed on-reserve residents or by sourcing suitably qualified persons from outside the community. Employment demand in the LAA has been strong since 2003. Future employment growth in the LAA is projected to be similarly strong, as outlined in Section 17.3.4. The Project will add incrementally to this employment growth, and its contribution will vary in scale over the construction schedule. It will attract some persons from businesses and organizations based in First Nations communities, but this, in part, is the expected churn in employment when persons seek new opportunities and others fill their former positions. The Project will contribute to staffing pressures that these small communities face now and will likely face even in the absence of the project.

17.4.2.3 Summary

In summary, Project construction would require qualified persons to meet labour and scheduling requirements. The labour force in the LAA has the skills that suit the Project’s trade needs, but forecasts indicate the labour force will lack sufficient numbers of suitably qualified individuals. Without mitigation, this circumstance could result in effects to businesses in the LAA who lose workers to the Project, or who face increased competition for hiring or retaining workers. Labour shortages could also slow construction activity.

The positive change in demand for labour stemming from the Project’s construction phase opens up potential new employment opportunities for Aboriginal persons in the LAA, but targeted measures are needed to provide a fair and equitable pathway to accessing these opportunities.

17.4.3 Mitigation Measures – Change in Demand for Labour

With current forecasts of employment levels in the LAA continuing at or near the natural rate of unemployment, mitigation measures would focus on augmenting labour supply by:

- Recruitment, including accessing labour pools outside of the region, and attracting new entrants to the local labour force, including specific initiatives focused on Aboriginal persons
- Enhancing the local labour market participation rate and skill level of the population in the LAA, via training and skills development amongst other measures, including specific initiatives focused on Aboriginal persons in the LAA
The above initiatives should align with elements inherent in the labour market such as changing terms of employment and labour mobility, which tend toward equilibrating labour demand and supply.

17.4.3.1 Recruitment

Recruitment-focused mitigation measures would include:

- BC Hydro and its contractors would access labour markets beyond the LAA to supplement the local supply of labour
- Contractors would be encouraged to hire locally available workers with the requisite skills

The actual measures implemented will depend on the labour market conditions during construction, and will vary as conditions vary.

17.4.3.2 Local Labour Market Participation

17.4.3.2.1 General Population

Training would focus on strategies for increasing the labour force in the LAA by channelling new entrants (i.e., persons not presently in the LAA labour force and young persons just entering the labour force) to occupations expected to be in short supply, and by upgrading skills for underemployed and unemployed persons. Given the Project’s skill requirements, mitigation would focus on the construction skills and trades. Specific mitigation measures include:

- BC Hydro will provide $1 million to the Northern Lights College Foundation to fund student bursaries, focusing on trades and skills training to support the development of skilled workers in the LAA (BC Hydro 2012b). BC Hydro and Northern Lights College worked collaboratively to identify the skills and trades that would benefit most from the bursary funding. The initiative benefits non-Aboriginal and Aboriginal persons alike.
- BC Hydro will enter into a three-year (2011–2014) funding agreement with Northern Opportunities, a partnership of the school districts of Fort Nelson (School District #81), Peace River North (School District #60), and Peace River South (School District #59), Northern Lights College, local First Nations, industry, and local communities, with the objective of providing young people with a seamless learning pathway from secondary school to post-secondary training, which is open to Aboriginal and non-Aboriginal students
- BC Hydro will participate in regional workforce training initiatives, such as the Northeast Regional Workforce Table Task Force, to support alignment of training programs with the need for skilled workers to meet the needs of northeast B.C.
- BC Hydro may work with its contractors and labour organizations to identify apprenticeship opportunities during construction
- BC Hydro will provide additional daycare spaces in the Fort St. John area to increase spousal participation in the labour market
17.4.3.2.2 Aboriginal Peoples

Because the overall unemployment rate in the LAA is low and forecasted to continue in this relatively tight labour market condition, and the Aboriginal population’s unemployment rates are high and labour force participation rates are low in the LAA, certain mitigation measures would focus on the Aboriginal population to facilitate their participation in the Project’s employment opportunities, including targeted recruitment as well as training and skills development. Where identified by Aboriginal groups as an interest, BC Hydro will consider commitments respecting capacity building, education, and training associated with Aboriginal participation in Project labour market opportunities. Specific measures include:

- BC Hydro will support training, industry, and Aboriginal partnership opportunities in the region; for example, BC Hydro in partnership with the North East Native Advancing Society (NENAS) secured funding from Industry Training Authority (ITA) to support North East Aboriginal Trades Training (NEATT), an essential skills and pre-trades training program that began its first intake in the spring of 2012.
- BC Hydro will support the North East Native Advancing Society (NENAS) with $100,000 in funding over two years (2013–2014) to support trades training under its North East Aboriginal Trades Training program. The NEATT program emphasizes pre-college preparation, trade careers exploration, and personal development, as well as workplace essential literacy and numeracy skill building.
- BC Hydro will dedicate $500,000 of the $1 million provided to Northern Lights College to Aboriginal student bursaries.
- BC Hydro will develop a plan for inclusion of Aboriginal persons in its Project contracted workforce, including communication of employment opportunities, and evaluation criteria for hiring and training Aboriginal persons in contractor procurement packages.

17.5 Summary of Effects Assessment and Mitigation Measures

With the implementation of the above mitigation measures, the Project would maintain balance (or not exacerbate an imbalance) in the local labour market and would offer fair and equitable access to Project employment opportunities for interested members of the Aboriginal labour force in the LAA. Therefore, the Project would result in no residual adverse effect, where employment in the LAA is maximized while not putting the labour market in the LAA out of balance, and where remaining labour requirements would be sourced through non-local recruiting, and by enhancing local skills profiles and labour participation rates, including those of the Aboriginal population in the LAA.

A summary of potential effects and mitigation measures is shown for Labour Market in Table 17.14.
## Table 17.14 Project Effects and Mitigation Measures on Labour Market

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>• Change in demand for direct and indirect construction phase labour&lt;br&gt;• A comparison of the Project labour requirements against the baseline and forecast local labour supply and demand by skill category, where the data are available</td>
<td>• Recruitment, including accessing labour pools outside of the region, and attracting new entrants to the local labour force (including mobile workers)&lt;br&gt;• Local labour market participation: training and skill development, focused on increasing the local labour market participation rate and skill level of LAA population&lt;br&gt;• Local labour market participation: provision of daycare spaces in Fort St. John area to increase spousal participation in labour market&lt;br&gt;• Support to Aboriginal training initiatives and students&lt;br&gt;• Plan to provide for inclusion of Aboriginal persons in contracted workforce</td>
<td>• The application of mitigation measures will need to be responsive to Project needs and general labour market conditions to be most effective&lt;br&gt;• Residual adverse effects are not expected</td>
<td>• BC Hydro in cooperation with delivery agency or partner</td>
</tr>
</tbody>
</table>

### 17.5.1 Other Mitigation Options Considered

There were no other mitigation measures considered by BC Hydro for effects on the labour market.

### 17.6 Residual Effects

No residual effects are anticipated following the proposed mitigation measures.

### 17.7 Cumulative Effects Assessment

No cumulative effects are anticipated, because no residual effects are anticipated following mitigation.

### 17.8 Monitoring and Follow-Up

No monitoring or follow up is proposed.
References

Literature Cited


MNP. 2012. Barriers and Successful Approaches to Preparing and Employing Aboriginal Trades People. Prepared for Industry Training Authority. Richmond, B.C.


Internet Sites


Personal Communications


18 REGIONAL ECONOMIC DEVELOPMENT

18.1 Approach
Regional economic development is the change in areas of the economy such as business competitiveness that contribute to a region’s overall economy and standard of living. Expenditures made by the Project would accrue to individuals, businesses, and communities in the region, and thereby contribute to the development of the regional economy. Regional economic development is valued by communities because it represents opportunities for wealth creation and contributes to community stability and strength. Regional economic development key indicators include the regional business and contracting profile, capabilities, and capacity, including Aboriginal components.

18.1.1 Regulatory and Policy Setting
A key mandate of the B.C. Ministry of Jobs, Tourism and Skills Training is to provide economic development tools to rural communities. Programs and services focus on expanding business capabilities and capacity through business retention and expansion programs, small business financing, and support for provincial programs.
Domestic trade policy, such as the Agreement on Internal Trade and the New West Partnership Trade Agreement (NWPTA), aims to reduce barriers to the movement of persons, goods, services, and investments within Canada. The NWPTA obligates public entities to ensure:

- No obstacles: government standards and regulations cannot restrict or impair trade, investment, or labour mobility between British Columbia, Alberta, and Saskatchewan
- Non-discrimination: there will be no preferential treatment of a province's people, investments, and goods, except for justified actual cost-of-service differences and measures focused on Aboriginal peoples

BC Hydro’s Aboriginal Contract and Procurement Policy is consistent with the Agreement on Internal Trade and the New West Partnership Trade Agreement, as Article 1802 states that it does not apply to any measure adopted with respect to Aboriginal peoples. This policy provides for the use of several procurement practices to increase the involvement of First Nations in economic opportunities associated with the business of the organization. This policy includes:

- Capacity building initiatives, where BC Hydro provides funding or resources in order to provide training, improve skills, or increase business capacity in Aboriginal businesses
- Directed Aboriginal procurement, such as set/asides, restricted tendering, and single-source negotiations
- Aboriginal content evaluation criteria in procurement packages
- An Aboriginal Business Directory, which is web accessible to suppliers and contractors
18.1.2 **Key Issues and Identification of Potential Effects**

Regional contracting and procurement opportunities were identified by the public, Aboriginal groups, agencies, and other stakeholders as a potential beneficial effect of the Project (see Volume 1 Section 9 Information Distribution and Consultation).

A portion of the Project’s total capital spending for labour, equipment, goods, and services would accrue to local businesses and contractors. Procurement practices and economic conditions during the Project construction phase would affect the level of interest expressed by local supplier industries and, consequently, the extent to which the region can maximize its share of project-related benefits. Regional companies could expand (e.g., in size or in areas of service) to become more competitive, and new regional businesses could be created because of the Project. Regional companies could further benefit from the expanded capacity, new skills and innovations developed as a result of the Project, by increasing their share of the expenditures made by other sectors in the region (i.e., by displacing services from outside the region), or by exporting their services outside of the region.

The key issues for industry, as identified in Table 18.1, include a comparison of the value of contracts expected to be undertaken for the Project with the contractor capabilities in the region. The main concern of non-Aboriginal stakeholders was that local businesses have the opportunity to bid and secure contracts with the Project. A main concern of Aboriginal communities was that Aboriginal businesses and contractors in the region have a fair and equitable opportunity to obtain Project-associated contracts.

### Table 18.1 Key Issues: Regional Economic Development

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
</table>
| List of the major types of businesses and contractors, broken down at the local, provincial, and national level that will benefit from the overall project, including Aboriginal businesses | ▪ This assessment provides an inventory of businesses and contractors in the local study area. The British Columbia Input-Output Model in Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats identifies industries that would benefit from project expenditures in B.C. Aboriginal capabilities and capacity are also identified.  
▪ National-level businesses and contractors are not reported, due to the focus on regional effects and the British Columbia Input-Output Model’s limitation to B.C. effects |
| Value of supply of service contracts expected for both the construction and operation phases of the project | ▪ Volume 1 Appendix F Project Benefits Supporting Documentation, Project Cost Estimate identifies the value of major work packages and incorporated them into the British Columbia Input-Output Model.  
▪ Discussions were conducted with economic development offices and industry associations to identify potential capabilities and capacity |
| Information about a local purchasing strategy                              | ▪ Volume 1, Appendix F Project Benefits Supporting Documentation, Local Participation Strategies outlines the approach to purchasing and procurement, including Aboriginal strategies. These are recapped in the mitigation discussion of this assessment. |
18-3

Key Issues Approach to Addressing Key Issues

Inclusion of the Fort Nelson area in the local assessment area
- In this section, the local assessment area includes the Peace River Regional District as well as the Northern Rockies Regional Municipality, where Fort Nelson is located

Recognize regional economic development through the reduced agricultural opportunity due to the Project
- This issue is assessed as part of the Volume 3 Section 20 Agricultural assessment.

First Nations interest in benefits (e.g., employment, contracting opportunities, business development and capacity building) accruing to local residents, including Saulteau (SFN) members
- Strategy for the specific practices that BC Hydro will adopt to increase Aboriginal participation in providing contract services for the Project

First Nations interest in Project benefits – concern that there is an uneven playing field between First Nations and non-Aboriginal businesses (T8TA)
- Strategy for the specific practices that BC Hydro will adopt to increase Aboriginal participation in providing contract services for the Project

NOTES:

a SFN – Saulteau First Nations
b T8TA – Treaty 8 Tribal Association

Project interactions with VCs are ranked in Table 2 of Volume 2 Appendix A Project Interactions Matrix. A “2” ranking indicates where interactions may result in an adverse effect and the nature of the effect and/or the effectiveness of mitigation measures is uncertain. Therefore, they require analysis and evaluation in the environmental assessment.

Project expenditures would be concentrated in construction activities; consequently, that is when changes in business opportunities would be expected to occur, as noted in Table 18.2.

Table 18.2 Interactions of the Project with Regional Economic Development

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Change in Project contract opportunities as proposed by the Proponent</td>
</tr>
</tbody>
</table>

| Construction | ✓ | ✓ |

18.1.3 Standard Mitigation Measures and Effects Addressed

A “1” ranking in Table 2 of Volume 2 Appendix A Project Interactions Matrix means that an interaction with Regional Economic Development would occur; however, standard measures to avoid or minimize the potential effect are available and well understood to be effective, and any residual effects would be minimal. The effects during operations were assigned a ‘1’ because while an interaction would occur, the approximately $8.1 million in annual expenditures would be low relative to the regional economy, and would, therefore, generate negligible effects.

Additionally, incremental effects on business contracting opportunities would also occur in relation to periodic sustaining capital expenditures, an estimated total indirect and induced...
output in the region of $58.1 million. However, this effect would not begin to occur until the
40th year of operation, and it would gradually be distributed over the following 60 years
(Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project
Economic Impacts: BC Stats). Standard mitigation measures would evolve and become
more effective in avoiding and minimizing potential adverse effects.

18.1.4 Selection of Key Indicators

The key indicators for assessing Project effects on Regional Economic Development and
the rationale for their selection are shown in Table 18.3.

Table 18.3 Key Indicators for Regional Economic Development

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in project contract opportunities – as proposed by the Proponent</td>
<td>Regional business and contracting profile</td>
<td>A regional profile provides an understanding of the number of businesses in the region</td>
</tr>
<tr>
<td></td>
<td>Regional Aboriginal business and contracting profile</td>
<td></td>
</tr>
<tr>
<td>Comparison of the Project’s contracting requirements with the regional business and contracting profile, capabilities, and capacity</td>
<td>Regional business and contracting capabilities and capacity</td>
<td>Regional capabilities and capacity provide a context for identifying which procurements needs might be fulfilled from within the region</td>
</tr>
<tr>
<td></td>
<td>Regional Aboriginal business and contracting capabilities and capacity where information is available</td>
<td></td>
</tr>
</tbody>
</table>

18.1.5 Spatial and Temporal Boundaries

18.1.5.1 Spatial Boundaries

The Local Assessment Area (LAA) for Regional Economic Development is the Peace River
Regional District (PRRD) and the Northern Rockies Regional Municipality (NRRM), which
together comprise the boundaries of the B.C. Northeast Development Region (NEDR)
(Table 18.4 and Figure 18.1). The NEDR is a regional economic unit with business services
clustered in its southern communities of Fort St. John and Dawson Creek, and in the north
in Fort Nelson. This is the geographical area where project interactions with the regional
economic development VC will occur.

The borders of the Northeast Development Region and First Nations traditional territories
and Indian Reserve communities do not precisely overlap. The First Nations with
communities and businesses situated within the boundaries of the LAA include the Doig
River First Nation, Halfway River First Nation, Prophet River First Nation, West Moberly
Although the McLeod Lake Indian Band is located outside the boundaries of the LAA,
because their businesses, (i.e., the McLeod Lake Indian Band Development Corporation
and a band-owned construction business) are headquartered in Chetwynd, they are
included in the LAA. Duncan’s First Nation and Horse Lake First Nation are located outside
the boundaries of both the LAA and RAA. Where Duncan’s First Nation and Horse Lake
First Nation and other First Nations outside the LAA have identified interests in potential
effects on regional economic development, these are discussed in Volume 5 Section 34
Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and
Information Requirements. The baseline information for those communities is presented in
Volume 3 Appendix B First Nations Community Baseline Reports, Part 3 Community Baseline Report and EIS Integration Summary Table for Duncan’s First Nation and in Part 4 Community Baseline Report and EIS Integration Summary Table for Horse Lake First Nation.

The Regional Assessment Area (RAA) is the Peace River Regional District, the Northern Rockies Regional Municipality, and the Fraser-Fort George Regional District. The Fraser Fort George Regional District abuts the LAA to the west and south and includes the City of Prince George. For reasons of proximity, projects in the Fraser–Fort George Regional District could utilize the contracting and supply services in the LAA and thus create overlaps. Figure 18.1 illustrates the LAA and RAA for Regional Economic Development VC.

### Table 18.4 Spatial Assessment Areas for Regional Economic Development

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peace River Regional District</td>
<td>Peace River Regional District</td>
</tr>
<tr>
<td>Northern Rockies Regional Municipality</td>
<td>Northern Rockies Regional Municipality</td>
</tr>
<tr>
<td></td>
<td>Fraser–Fort George Regional District</td>
</tr>
</tbody>
</table>

18.1.5.2 Temporal Boundaries

The Project effects are presented for the construction phase. Construction activities, as described in Volume 1 Section 4 Project Description, would generate procurement activity. Annual construction expenditures and opportunities for business would gradually rise to a peak in Year 6 before declining and ceasing at the end of Year 8. Conditions would not return to the base case during operations, but as noted in Section 18.1.3, ongoing expenditures would be negligible in the context of the regional economy and thus are not evaluated further in this assessment.

18.2 Information Sources and Methodology

18.2.1 Literature Review

Baseline data was obtained from Statistics Canada, BC Stats, municipalities, economic development offices, and private sector studies. Government datasets included the business registry, inventory of major projects, business formations and failures, and lists of major employers. Municipalities contributed business licence data and economic development offices made research studies and strategic plans available for review.

Sources of baseline data for Aboriginal businesses and peoples and First Nations communities included the following:

- Statistics Canada’s Census of Population
- BC Hydro’s Aboriginal Business Directory
- Site C Business Directory
- Industry Canada’s Aboriginal Business Directory
- First Nations community baseline profiles supplied by: Treaty 8 First Nations of Doig River First Nation, Halfway River First Nation, Prophet River First Nation and West Moberly First Nations (detailed in Volume 3 Appendix B First Nations Community...
Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations).

- Other First Nations supplied information, such as profiles of First Nations owned companies

Literature reviewed and cited is shown under Literature Cited at the end of this section.

18.2.2 Interviews

Interviews were conducted with government officials, industry organizations, and economic development offices to obtain insights on baseline conditions, economic trends, and perspectives, as well as potential beneficial and adverse project effects. Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 1 Economic Assessment Interview Methodology outlines details on the interview methodology. Personal communications are listed at the end of this section.

18.2.3 Data Management, Mapping, and Modelling

Direct expenditures by the Project were provided by BC Hydro. The indirect and induced economic effects were estimated by BC Stats (Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats) based on an analysis of the Project construction expenditure.

18.2.4 Aboriginal Community and Traditional Knowledge

Aboriginal community and traditional knowledge related to regional economic development was gained through review of results of BC Hydro’s consultation with Aboriginal groups and review of First Nations community baseline studies prepared by the following First Nations in the LAA:

- Doig River First Nation
- Halfway River First Nation
- Prophet River First Nation
- West Moberly First Nations

While the communities of the Blueberry First Nations and Saulteau First Nations and traditional territory and certain offices associated with the McLeod Lake Indian Band are also within the boundaries of the LAA, BC Hydro had not received community baseline information from them at the time of writing.

Baseline information and data as well as First Nations concerns and interests relevant to regional economic development are incorporated in the baseline and effects assessment sections below. The First Nations community baseline reports are provided in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

BC Hydro’s approach to gathering community-based social and economic data with First Nations is described in Volume 3 Appendix B First Nations Community Baseline Reports, Part 1 Approach to Gathering and Integrating Community Baseline Information.
18.3 Baseline Conditions

The Northeast Development Region (NEDR) is the northwest extension of the Canadian prairie, with similar economies in agriculture, oil, and natural gas. The main economic activities in the region include energy, agriculture, forestry, mining, and tourism. Oil and gas industry activity is expanding. Three wind energy projects have recently been built or are under construction. Electricity transmission upgrades and expansions are underway. The Crown timber supply supports a diverse wood processing sector that includes lumber, panel, and pulp mills. The region has four operating coal mines, and more are in exploration or development phases. All of these activities are fuelling construction activity and population growth across the region.

18.3.1 Business Profile – General Population

18.3.1.1 Establishments and Locations

Statistics Canada compiles a monthly Business Register that identifies all businesses in Canada that produce goods and services. The Business Register lists companies by major industry as defined by Statistics Canada. The list of industries differ from the industries noted in the following economic dependency data, which only reference economic base activity (i.e., sectors that produce goods and services for export, tourism, and the public sector). All active businesses in Canada that have a corporate income tax (T2) account or a GST account with an annual gross business income of over $30,000 are tracked on a monthly basis. Note that the general or overall population includes non-Aboriginal and Aboriginal people.

As shown in Table 18.5, the growth in the number of business establishments in the PRRD from 2003 to 2011 was almost double that of the province. The NEDR was close behind, with a 16.3% increase in businesses. The rapid expansion of oil and gas activity, new investments in forest processing capacity, a growing coal industry, and related construction and support services contributed to increases. However, as is also evident from the table, the PRRD lost a higher percentage of businesses during the recession that began in 2008 than the NEDR or province as a whole.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PRRD</td>
<td>2,914</td>
<td>2,912</td>
<td>3,016</td>
<td>3,317</td>
<td>3,933</td>
<td>3,987</td>
<td>3,879</td>
<td>3,469</td>
<td>3,411</td>
<td>497</td>
</tr>
<tr>
<td>% change</td>
<td>N/A</td>
<td>-0.1</td>
<td>3.6</td>
<td>10.0</td>
<td>18.6</td>
<td>1.4</td>
<td>-2.7</td>
<td>-10.6</td>
<td>-1.7</td>
<td>17.1</td>
</tr>
<tr>
<td>NEDR</td>
<td>3,273</td>
<td>3,274</td>
<td>3,394</td>
<td>3,731</td>
<td>3,943</td>
<td>3,998</td>
<td>3,892</td>
<td>3,862</td>
<td>3,805</td>
<td>532</td>
</tr>
<tr>
<td>% change</td>
<td>N/A</td>
<td>0.0</td>
<td>3.7</td>
<td>9.9</td>
<td>5.7</td>
<td>1.4</td>
<td>-2.7</td>
<td>-0.8</td>
<td>-1.5</td>
<td>16.3</td>
</tr>
<tr>
<td>B.C. % change</td>
<td>N/A</td>
<td>-0.0</td>
<td>2.7</td>
<td>3.1</td>
<td>0.4</td>
<td>3.9</td>
<td>0.6</td>
<td>-0.1</td>
<td>-1.3</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Table 18.5 Number of Business Establishments by Location, 2003-2011

NOTE: Includes all industries with employees, but excludes establishments of indeterminate employee size

N/A – not applicable

Source: BC Stats (2012)
A profile of businesses by industry classification and employee size for the NEDR in 2011 is shown in Table 18.6. Of the 3,805 businesses with employees, 14.6% were in construction and the majority of these had fewer than 20 workers. Other services (12.1%), transportation and warehousing (10.0%), retail trade (9.0%), and mining and oil and gas (8.6%) were the next highest industries ranked by number of businesses.

The data also demonstrates the preponderance of small businesses in the regional and provincial economies. In the NEDR, firms with less than 50 employees made up 96.2% of all establishments, identical to the B.C. percentage. The PRRD economy had no large businesses (i.e., establishments with greater than 500 workers), while only 16 businesses had more than 200 employees. Nine of the 16 businesses involve publicly funded services, such as education and health, and retail trade operations.

The NEDR had a greater proportion, compared to the province as a whole, of total establishments in primary industries, notably oil and gas extraction, transportation and warehousing, utilities, construction and other services. All other industries in the region were represented as smaller proportions compared to B.C.

18.3.1.2 Business Licences

Figure 18.2 shows the total number of business licences issued in the City of Fort St. John between 2000 and 2010. As the service and business centre for northeast B.C., Fort St. John’s licence profile provides a benchmark for business capacity. The number of licences issued grew by 26% during this period. Business licences are not tracked in other communities in the PRRD.

The distribution of business licences by major industry in 2010 is shown in Figure 18.3. Trade and service businesses dominated, with 75% of total licences. The other 25% of businesses were engaged in goods production. Construction companies accounted for 252 licences, or 16% of the total licences in Fort St. John.
### Table 18.6 Count of Selected Business Establishments in the Northeast Development Region, 2011

<table>
<thead>
<tr>
<th>NAICS Code</th>
<th>Industry Sector based on NAICS Canada</th>
<th>Locations with No Employees</th>
<th>Firms with Employees in Northeast Development Region</th>
<th>B.C. Firms with Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total, All Industries</td>
<td>3,063</td>
<td>3,392 268 129 16 3,805 100.0 100.0 173,589</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Agriculture, Forestry, Fishing &amp; Hunting</td>
<td>636 241 8 0 0 249 6.5 4.0 6,932</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Mining &amp; Oil &amp; Gas Extraction</td>
<td>166 279 26 23 1 329 8.6 0.6 1,045</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Utilities</td>
<td>1 9 1 0 0 10 0.3 0.1 210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Construction</td>
<td>443 502 29 23 2 556 14.6 12.1 21,011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Manufacturing</td>
<td>39 53 5 5 1 64 1.7 4.1 7,146</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Wholesale Trade</td>
<td>50 132 15 3 0 150 3.9 5.4 9,305</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Retail Trade</td>
<td>119 291 30 18 3 342 9.0 11.9 20,657</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Transportation &amp; Warehousing</td>
<td>284 381 32 4 1 418 11.0 4.2 7,276</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Information &amp; Cultural Industries.</td>
<td>2 31 3 0 0 34 0.9 1.4 2,354</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Finance &amp; Insurance</td>
<td>80 51 11 4 1 67 1.8 3.8 6,667</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Real Estate &amp; Rental &amp; Leasing</td>
<td>374 137 6 3 0 146 3.8 4.9 8,433</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Professional, Scientific &amp; Technical Services</td>
<td>236 288 19 4 0 311 8.2 11.3 19,584</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Management of Companies &amp; Enterprises</td>
<td>107 16 0 2 0 18 0.5 1.5 2,537</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Administration &amp; Support, Waste Management</td>
<td>106 164 7 3 0 174 4.6 4.9 8,523</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Educational Services</td>
<td>19 30 3 1 3 37 1.0 1.3 2,289</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Health Care &amp; Social Assistance</td>
<td>43 165 11 10 3 189 5.0 9.1 15,793</td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Arts, Entertainment &amp; Recreation</td>
<td>30 47 4 0 0 51 1.3 1.6 2,810</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Accommodation. &amp; Food Services</td>
<td>58 130 39 13 1 183 4.8 6.8 11,831</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Other Services</td>
<td>268 443 16 2 0 461 12.1 10.5 18,288</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>Public Administration</td>
<td>2 2 3 11 0 16 0.4 0.5 898</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- NAICS – North American Industry Classification System
- Source: BC Stats (2012)
18.3.2 Business and Contractor Capabilities and Capacity

18.3.2.1 Community Economic Dependencies

The provincial government prepares local area dependencies for 63 rural areas of the province to quantify the sources of income that make up the economies of these areas. Local area dependencies were prepared for the four census periods from 1991 to 2006. The descriptive measures use the census and other economic data to describe each local area in terms of its dependence on various basic sectors, its diversity, and its vulnerability (Horne 2009). Table 18.7 highlights the local area dependencies for the Fort St. John local area, the Dawson Creek local area, and the Fort Nelson local area between 1991 and 2006. The data reflect the structure of the economic base and contributions made by businesses and contractors in major sectors.

The Fort St. John and Dawson Creek area economies are among the most dependent in the province on the mining and oil and gas sectors (data for mining and oil and gas have been aggregated into the mining category in Table 18.7). In the Fort St. John area, oil and gas has been the main economic driver, while in the Dawson Creek area, mining still predominates, although oil and gas activity has increased since 2006. The Fort Nelson area saw a major expansion of its oil and gas industry in 2001 and 2006. Overall, the data suggest that the key resource sectors constitute the majority of the economic base in the LAA, and that these sectors are cyclical.

Table 18.7 Percentage of Income by Economic Base Sector, 1991 to 2006

<table>
<thead>
<tr>
<th>% of total</th>
<th>FOR</th>
<th>MIN</th>
<th>F&amp;T</th>
<th>AGF</th>
<th>TOU</th>
<th>PUB</th>
<th>OTH</th>
<th>TRAN</th>
<th>ONEI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort St. John</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>6</td>
<td>37</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>14</td>
<td>19</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>2001</td>
<td>7</td>
<td>32</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>19</td>
<td>17</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>1996</td>
<td>11</td>
<td>26</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>19</td>
<td>18</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>1991</td>
<td>8</td>
<td>23</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>18</td>
<td>19</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Dawson Creek</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>12</td>
<td>20</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>21</td>
<td>18</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>2001</td>
<td>16</td>
<td>17</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>25</td>
<td>12</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>1996</td>
<td>14</td>
<td>25</td>
<td>0</td>
<td>5</td>
<td>6</td>
<td>21</td>
<td>10</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>1991</td>
<td>13</td>
<td>21</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>21</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Fort Nelson</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>27</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>17</td>
<td>16</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2001</td>
<td>31</td>
<td>19</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>17</td>
<td>14</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>1996</td>
<td>46</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>15</td>
<td>17</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>1991</td>
<td>29</td>
<td>14</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>19</td>
<td>15</td>
<td>13</td>
<td>6</td>
</tr>
</tbody>
</table>

NOTES:
FOR – Forestry and related manufacturing
MIN – Mining, oil and gas
F&T – Fishing and trapping
AGF – Agriculture and food processing
TOU – Tourism
PUB – Public sector including health and education
OTH – All other basic industries
TRAN – Transfer payments from government
ONEI – Other non-employment income

Source: Horne (2009)
for all 63 B.C. local areas. Construction accounts for between 10 and 11% of income in PRRD communities, versus a median value of seven for all 63 communities.

Table 18.8 Percentage of Income from the Construction Sector, 2006

<table>
<thead>
<tr>
<th>Community</th>
<th>% of total community income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort St. John</td>
<td>11</td>
</tr>
<tr>
<td>Dawson Creek</td>
<td>10</td>
</tr>
<tr>
<td>Fort Nelson</td>
<td>4</td>
</tr>
<tr>
<td>Provincial median (63 areas)</td>
<td>7</td>
</tr>
</tbody>
</table>

NOTE: a Median – the middle value of a list; in this case, the middle value of 63
Source: Horne (2009)

Table 18.9 shows the BC Stats diversity index for the three local areas in the LAA. The index values range from 0 if the area was entirely dependent on one sector to 100 if it was equally dependent on each of the 12 sectors. In general, the greater the diversity, the more stable the economic base and the less susceptible it is to economic shock. However, diversity is not equivalent to prosperity, as single-industry towns with very little diversification can be comparatively wealthy. Conversely, rural communities with low incomes and no strong economic leader can appear diversified. However, the diversity indices do indicate the extent to which a local area is exposed or susceptible to setbacks in its primary industry.

The index for Fort St. John has declined over time, meaning it has become less diverse as oil and gas activity expands. In Dawson Creek, the diversity index has remained strong, particularly in 2001 and 2006 when it ranked as one of the most diversified local area economies in the province. Fort Nelson has become more diversified since 1996 because oil and gas expansion has lessened dependence on the forest industry.

Table 18.9 Change in Local Area Diversity Indices and Provincial Rankings, 1991 to 2006

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort St. John: Diversity Index</td>
<td>74</td>
<td>75</td>
<td>70</td>
<td>66</td>
</tr>
<tr>
<td>Provincial Rank (1–63)</td>
<td>22</td>
<td>3</td>
<td>19</td>
<td>51</td>
</tr>
<tr>
<td>Dawson Creek: Diversity Index</td>
<td>74</td>
<td>72</td>
<td>74</td>
<td>76</td>
</tr>
<tr>
<td>Provincial Rank (1–63)</td>
<td>22</td>
<td>13</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Fort Nelson: Diversity Index</td>
<td>69</td>
<td>56</td>
<td>68</td>
<td>69</td>
</tr>
<tr>
<td>Provincial Rank (1–63)</td>
<td>45</td>
<td>58</td>
<td>31</td>
<td>41</td>
</tr>
</tbody>
</table>

NOTE: The Diversity Index is constructed using 11 dependency values – the higher the number, the more diversified the economic base, based on a scale from 0–100
Sources: Horne (2004, 2009)

18.3.2.2 Local participation in major projects

Active projects in the environmental assessment registries presented in Volume 1 Section 10 Effects Assessment Methodology, Figure 10.3 indicate that numerous
projects, predominantly in the mining and energy sectors, are in the planning stages with combined potential budgets of more than $10 billion. Other major projects, such as Rio Tinto’s Kitimat smelter expansion and the Mt. Milligan mine, are under construction and actively recruiting local businesses and contractors. There is no single source of data indicating the share of expenditures that are accruing to local businesses and contractors; however, it is believed most projects are relying on non-local suppliers for the majority of goods, services, and equipment. Examples include:

- An estimated 10% of the $1.3 billion expenditures for the construction of Mt. Milligan have accrued to businesses in the region (Initiatives Prince George, 2012 pers. comm.)

- The $600 million expansion of the Endako Mine completed in 2012 had only partial success attracting local suppliers, even though a supplier database was developed. A lack of qualified suppliers and a lack of outreach by the proponent were cited as contributing factors. (Initiatives Prince George, 2012 pers. comm.).

- Rio Tinto and Spectra Energy were also cited as having best practices in developing local supplier relationships (Initiatives Prince George, Business Retention and Expansion Consultant 2012 pers. comm.)

- There is a general lack of preparedness among local businesses and contractors for meeting the bidding and procurement requirements of major projects, which limits the potential for local benefits (NDIT, Director Business Development and Director Economic Development 2012 pers. comm.)

- The experience of the oil and gas sector indicates that major construction projects are dominated by non-local contractors, in part because local suppliers have challenges keeping skilled labour and developing relationships with non-local purchasing departments (Energy Services BC, Executive Director South 2012 pers. comm.)

- Capacity limitations among regional supplier industries, including limited contractor experience, expertise, or credentials for meeting industry bid or performance standards (NPEDC, Economic Development Officers 2011 pers. comm.)

18.3.2.3 Project Business Directory

In January 2009, BC Hydro launched the Site C Business Directory for companies interested in participating in the Project’s procurement process. As of March 12, 2012, 380 companies had registered. The services provided by registrants by location are shown in Table 18.10.
### Table 18.10  Location and Services Offered by Site C Business Directory Registrants, March 12, 2012

<table>
<thead>
<tr>
<th>Service</th>
<th>NEDR</th>
<th>Other B.C.</th>
<th>Canada</th>
<th>Internationally</th>
<th>Not Identified</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering – General Contractors</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Engineering – Logging</td>
<td>17</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Engineering – Other</td>
<td>66</td>
<td>45</td>
<td>17</td>
<td>4</td>
<td>0</td>
<td>132</td>
</tr>
<tr>
<td>Engineering – Subcontractors</td>
<td>15</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Engineering – Supplier</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Business Association</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Communications</td>
<td>7</td>
<td>10</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Environment</td>
<td>13</td>
<td>46</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>66</td>
</tr>
<tr>
<td>Hospitality</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Real Estate</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Safety, First Aid, Security</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Transportation</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>Other Services</td>
<td>11</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>175</strong></td>
<td><strong>141</strong></td>
<td><strong>43</strong></td>
<td><strong>9</strong></td>
<td><strong>12</strong></td>
<td><strong>380</strong></td>
</tr>
</tbody>
</table>

**NOTE:**

Source: BC Hydro (2012)

### 18.3.2.4  Services for Building Business Capabilities and Capacity

Communities in the NEDR have individually or collectively engaged in economic development planning and support business development. There are two development commissions and three community-based economic development offices in the PRRD:

- The North Peace Economic Development Commission (NPEDC) has an economic administrator based in Fort St. John and serves Fort St. John, Hudson’s Hope, Taylor, and the rural areas north of the Peace River in the PRRD.
- The South Peace Economic Development Commission (SPEDC) serves Tumbler Ridge, Chetwynd, Dawson Creek, Pouce Coupe, and the rural areas south of the Peace River in the PRRD. It is funded through an economic development bylaw, and maintains a staff relationship with Community Futures Peace Liard.
- The districts of Tumbler Ridge and Chetwynd and the Northern Rockies Regional Municipality each maintain a staffed economic development office.

All organizations are providing services to enhance business and contractor capabilities and capacity. For example:

- The NPEDC is delivering Small Business B.C. seminars, and promoting Site C Business Information Sessions (NPEDC 2011)
- The SPEDC has contributed funding to Energy Services BC – Business Development Initiative, to assist businesses in northern B.C. to benefit from contract opportunities with the oil and gas industry (SPEDC 2011)
Provincial and federal government-supported economic development service agencies include the Northern Development Initiative Trust (NDIT) and Community Futures Peace Liard (CFPL). NDIT has targeted programs aimed at improving the capability and competitiveness of local contractors wishing to participate in procurement opportunities offered by major projects. A more detailed account of economic development planning and programs is provided in Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 4 Economic Development Offices and Plans.

18.3.3 Outlook for Regional Economic Development

The Northeast’s strong economic performance over the last five years, including employment gains well above the provincial average, are expected to continue in the future as major development projects are constructed and come on stream. Resource extraction will provide the impetus for growth, but expansion of the trade, health, and professional service sectors will also occur.

Despite low natural gas prices, interest in the Montney Basin remains high, given the prospects of export to markets outside of North America. Proposed liquefied natural gas facilities on the west coast are expected to provide an outlet to Asian markets for the province’s natural gas at a higher price than the price received in North America. Without this new export capacity, slackening North American demand for northeast gas production may curtail industry growth going forward (Energy Services BC, Executive Director South 2012 pers. comm.). The wind energy and coal sectors are also expected to perform well in the years ahead, due to the province’s growing energy supply needs and buoyant demand among Asian coal markets. The lineup of large development projects seeking regulatory approval in northern B.C. and the expansion programs (see Volume 2 Section 10 Effects Assessment Methodology) at the Prince Rupert and Kitimat ports will spur economic growth in the north in the years ahead (Bennett 2012).

A constraint on growth is the availability and recruitment of the skilled and semi-skilled workforce. BC Stats Regional Employment Projection Model shows the Northeast having the highest annual growth in employment demand among all of B.C.’s eight development regions, leading up to 2011. The projected growth of 3.1% is more than 50% higher than the provincial rate of 2.0% (BC Stats No date). Temporary workers from other parts of B.C., Alberta, and the rest of Canada will continue to be an important component of the future regional labour market.

Central 1 Credit Union’s forecast of leading economic indicators for the Northeast for 2013 is presented in Table 18.11. Employment levels are forecast to rise by just under 2% this year, followed by a gain of 1.5% in 2013. Stronger employment prospects are expected to generate comparable gains in population and the labour force, maintaining regional unemployment rates below 5%. Building permits are expected to taper off, reflecting what is expected to be a temporary pull-back in oil and gas activity (Central 1 Credit Union 2012).

It is expected that the business and contractor profile, capabilities, and capacity would expand in line with overall economic growth for the region, but not increase its share of project expenditures, due to the following barriers:

- Limited expertise in finding and competing for procurement opportunities
- Difficulty in finding and hiring workers
1. Limited ability to do the scale of work often required by project proponents
2. Financial barriers, especially business costs and accessing capital (Ryser et al. 2012)

Table 18.11 Northeast Economic Development Forecast, 2009 to 2013

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour Force, thousands</td>
<td>38.4</td>
<td>39.7</td>
<td>39.1</td>
<td>39.7</td>
<td>40.3</td>
</tr>
<tr>
<td>% change</td>
<td>-3.0</td>
<td>3.4</td>
<td>-1.5</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Employment, thousands</td>
<td>35.8</td>
<td>37.0</td>
<td>37.2</td>
<td>37.9</td>
<td>38.5</td>
</tr>
<tr>
<td>% change</td>
<td>-5.0</td>
<td>3.4</td>
<td>0.5</td>
<td>1.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Unemployment Rate, %</td>
<td>7.0</td>
<td>6.8</td>
<td>4.9</td>
<td>4.6</td>
<td>4.7</td>
</tr>
<tr>
<td>Private Non-Residential Building Permits, $ millions</td>
<td>76.9</td>
<td>67.8</td>
<td>93.3</td>
<td>85.0</td>
<td>80.0</td>
</tr>
<tr>
<td>% change</td>
<td>-9.9</td>
<td>-11.9</td>
<td>37.6</td>
<td>-8.9</td>
<td>-5.9</td>
</tr>
<tr>
<td>Public Non-Residential Building Permits, $ millions</td>
<td>9.9</td>
<td>13.7</td>
<td>17.9</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>% change</td>
<td>56.5</td>
<td>38.3</td>
<td>30.7</td>
<td>-44.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Population, thousands</td>
<td>68.2</td>
<td>69.5</td>
<td>70.3</td>
<td>71.3</td>
<td>72.5</td>
</tr>
<tr>
<td>% change</td>
<td>0.8</td>
<td>1.9</td>
<td>1.2</td>
<td>1.4</td>
<td>1.7</td>
</tr>
</tbody>
</table>

NOTE:
Source: Central 1 Credit Union (2012)

18.3.4 Business Profile – Aboriginal Peoples

Businesses owned by Aboriginal persons and organizations are found in First Nations communities and non-Aboriginal communities (both incorporated and unincorporated) in the LAA. Information and data have been collected for this section from several sources to describe them.

The main source of data to assist with identifying the number, size, and industry of businesses for geographic areas in Canada is Statistics Canada’s Business Register. The Business Register data for the LAA cited in Section 18.3.1.1 includes businesses owned by Aboriginal persons and organizations, as well as non-Aboriginal persons and organizations. However, there is no ownership breakdown in this data, as Aboriginal identification of ownership is not collected for the Business Register initiative. Survey data to track the basic features of Aboriginal businesses is not regularly collected in B.C. or Canada.

The small business (defined herein as a business with 20 or less employees) per capita rate (for the total adult population 25–64 years) in the LAA is approximately 0.09 (calculated with 2011 Business Register data and 2006 Census of Population data). Applying this rate to the Aboriginal population (25–64 years) in the LAA gives an estimate of approximately 330 businesses owned by Aboriginal persons or organizations in the LAA. The proportion of small businesses in the LAA that are construction, transportation, or primary industry focused (forestry for example) is 42% (based on Table 20-6 in the Business Register data). These are the types of small businesses that are likely to be interested in seeking contracts connected with the construction of the
Site C Clean Energy Project Environmental Impact Statement  
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Section 18: Regional Economic Development

Project. Using this parameter, there could be an estimated 140 small businesses owned by either Aboriginal persons or organizations in the LAA that would be in a position to consider seeking construction, excavation, transportation, and related contracts associated with the project.

As described in Section 18.3.2.3, BC Hydro created a Site C Business Directory for businesses to state their characteristics and capabilities for undertaking contractual work associated with the Project. As of March 12, 2012, there were 380 registrants that listed their business address; 178 are based in B.C., 48 had self-identified Aboriginal ownership, and all but four of the latter were Aboriginal businesses based in the LAA. The Aboriginal business registrants based in the LAA accounted for 12% of the total registration and 14% of the B.C. registration.

Interest and activity in business is growing within First Nations communities in the LAA. West Moberly First Nations is an example as it seeks to “…move from a reactive labour-oriented resource extraction economy involved at the front end of development (e.g., cutting seismic lines) toward value-added, higher skill and long-term revenue-generating opportunities (e.g., equity shares in resource development companies)” (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012a:125). Sources included Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

Although interest and activity is growing, barriers and challenges for Aboriginal persons in Canada to start and grow businesses have been noted in several reports and studies (Federal–Provincial Ministers Working Group on Aboriginal Participation in the Economy 2001). It summarized the major documented barriers and challenges, including:

- Inadequate connections and linkages between Aboriginal communities and traditional economies with the mainstream economy
- Systemic barriers, misconceptions, and stereotypes about Aboriginal people
- Many Aboriginal businesses and communities lack business expertise in marketing, bookkeeping, manufacturing, and management skills
- Aboriginal businesses often lack equity and have difficulty acquiring adequate business financing
- Access to loan guarantees, and equity and debt financing are issues for both business and community development

More recent reports that surveyed Aboriginal business owners and representatives of First Nations economic development corporations noted similar barriers and challenges (CCAB 2011; CCAB and Environics Research Group 2011). The Site C Impact Pathways Report (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012b) itemized the barriers in the context of the LAA “…barriers identified by T8FNs include: the ‘old boys network’, lack of interest on the part of potential joint venture partners, lack of start-up funding, high housing costs, and lack of sufficient resources to purchase equipment; there is a lack of training in business development; First Nations lack experience in many sectors; lack of knowledge among members about how to start up and operate a business; failure to properly prepare for
the next contract; limited activity and industry partnership agreements in PRFN area” (Appendix B, row 51 in T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012b).

Table 18.2 summarizes the types and range of businesses in the First Nations communities of Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

**Table 18.12 Current Business Activity of First Nations in the LAA (2012)**

<table>
<thead>
<tr>
<th>First Nation</th>
<th>Business Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doig River First Nation</td>
<td>Economic development function in band administration First Nation-owned businesses, including Doig River Energy, an oil and gas industry service company 2011 directory of member-owned businesses listed 13 enterprises Road building, general contractors, forestry, oilfield (maintenance, facility construction, turnarounds), seismic, first aid and safety services, reclamation</td>
</tr>
<tr>
<td>Halfway River First Nation</td>
<td>First Nation-owned ranch 2011 estimate of five on-reserve members with businesses Gravel excavation and sales</td>
</tr>
<tr>
<td>Prophet River First Nation</td>
<td>First Nation-owned Prophet River Operations Ltd. Restaurant and commercial services, camps, and catering Four or five member-owned contracting companies</td>
</tr>
<tr>
<td>West Moberly First Nations</td>
<td>Several First Nation-owned businesses, including Dunne-za Ventures LP (contract services for mineral development and forestry sectors), joint venture in Dokie Wind Farm, Tsay-Keh-Ne-Cheleh Ranch, partnerships in two non-replaceable forest licences with Canfor, and Dunne-Za Lodge (on Moberly Lake) Gravel extraction and sales Estimate of seven member-owned businesses Logging and backhoe contracting business</td>
</tr>
</tbody>
</table>

**NOTE:**

*Source: Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations*)

Typically, each First Nation in the LAA has at least one First Nation-owned business that provides a range of contracting services, such as excavation, road building, vegetation clearing, and first aid, to primary resource industries in the region. Table 18.13 summarizes the sectoral focus, services, and clients of several First Nations-owned companies.
### Table 18.13 First Nations-Owned Contracting Businesses in the LAA

<table>
<thead>
<tr>
<th>Company</th>
<th>Business Activity</th>
</tr>
</thead>
</table>
| Dunne-za Ventures LP (West Moberly First Nations) | Sectoral focus – oil & gas, forestry and mining sectors  
Contracting services – right-of-way clearing, road building, reclamation, logging, trucking, bridge design, first aid, and project management  
Clients – such as Encana, Shell Canada Energy, Devon Canada, Canfor, West Fraser, Tembec, Pine Valley Coal, Peace River Coal, and Western Canadian Coal  
Operations base – Fort St. John, B.C. |
| Duz Cho Construction LP (McLeod Lake Indian Band) | Sectoral focus – oil & gas, wind energy, and mining sectors; a sister company, Duz Cho Logging Ltd., is a full-phase timber harvesting and forest road construction contractor  
Contracting services – right-of-way clearing, road building, reclamation, logging, trucking, excavation, camp and catering services, bulk fuel supply, and card lock systems  
Clients – such as Shell Canada, Walter Energy, Teck Resources, BC Hydro, Mortenson Canada, Arcis Corporation, and LXL Consulting  
Operations base – Chetwynd, B.C. |
| 4 Evergreen Resources LP (Saulteau First Nations) | Sectoral focus – oil & gas, forestry, and mining sectors  
Contracting services – right-of-way clearing, road building, reclamation, logging, trucking first aid, bridge design, and project management  
Clients – such as EnCana, Shell Canada Energy, Devon Canada, Canfor, West Fraser, Tembec, Pine Valley Coal, Peace River Coal, and Western Canadian Coal  
Operations base – Moberly Lake, B.C. |
| Blueberry River Enterprises GP Ltd. (Blueberry River First Nation) | Sectoral focus – oil & gas, forestry, and mining sectors  
Contracting services – Construction, alteration, repair, and development of earthworks, including right-of-way clearing, seismic clearing, road building, and site clearing; it also provides air curtain incineration services for vegetation clearing  
Clients – not named, but Blueberry River Enterprises GP Ltd. was nominated by Spectra Energy for a B.C. Aboriginal Business Award in 2011  
Operations base – Charlie Lake, B.C. |

**NOTE:** Sources: Dunne-za Ventures (2012); Duz Cho Construction LP (2012); 4 Evergreen Resources LP (No date); Blueberry River Enterprises GP Ltd. (No date)

Since 2010, and in accordance with BC Hydro’s Aboriginal Procurement Policy, Site C’s Engineering team provided direct award contracts to Blueberry River Enterprises (a Blueberry River First Nations company) and 4 Evergreen Resources (a Saulteau First Nations company) to carry out early season work in advance of the finalization of a competitive process for general construction services. In that process, two Aboriginal businesses were successful in receiving contracts: Renegade Construction Inc. (owned by a Doig River First Nation member) and Dunne-za Ventures (a West Moberly First Nations company). All four companies provided general contractor support for the engineering field investigation program throughout the project area.

Two regional organizations have specific mandates to support development of Aboriginal businesses: Treaty 8 Tribal Association and Northeast Aboriginal Business Centre. The latter provides small business planning and operations advisory services to Aboriginal persons and Aboriginal businesses in northeast B.C. from its office in Fort St. John (Northeast Aboriginal Business Centre No date). The former has a community and
economic planning function, which assists its First Nation members to create economic self-sufficiency (Treaty 8 Tribal Association No date). It has an economic development strategy project underway that will benefit the following Treaty 8 communities: Doig River First Nation, Halfway River First Nation, Prophet River First Nation, Saulteau First Nations, and West Moberly First Nations.

18.4 Effects Assessment

The potential to affect Regional Economic Development is assessed by taking into account the Project's potential to result in changes to the following key aspects:

- Project contract opportunities in the LAA during construction
- A comparison of Project contracting requirements with the regional and Aboriginal business and contracting profile, capabilities, and capacity

Project expenditures would occur along two separate pathways: direct expenditures by BC Hydro on major work packages that would be subject to company and project procurement practices, and spinoff business activity (i.e., indirect supplier and induced industries) that is not subject to or controlled by project procurement practices.

The Project’s general requirements for business contracting during construction are associated with each of the Project Component areas, as outlined in Volume 1 Section 4 Project Description:

- Dam, generating station, and spillways
- Reservoir
- Substation and transmission lines to Peace Canyon Dam
- Highway 29 realignment
- Quarried and excavated construction materials
- Worker accommodation
- Road and rail access

Effects are not assessed for contracting during operations, as the annual expenditures for this phase would be low relative to the regional economy and would, therefore, be negligible.

The direct, indirect, and induced expenditures flowing to non-Aboriginal-owned and Aboriginal-owned businesses located in the LAA would be determined by local supplier capabilities and capacity for meeting Project supply requirements. Capacity limitations among regional supplier industries include limited contractor experience, expertise, or credentials for meeting industry bid or performance standards (NPEDC, Economic Development Officers 2011 pers. comm.). Low unemployment rates and difficulties accessing skilled labour in the LAA are also constraining factors.

Adverse effects would occur if local and Aboriginal businesses and contractors were unable to fairly participate in the Project’s procurement and supply opportunities.
18.4.1 Effects Assessment – Construction – Change in Contract Opportunities in the LAA

Estimates of project expenditures that would accrue to the region are based on the results of the British Columbia Input-Output Model, which uses estimates of direct project expenditures and calculates outputs (the dollar amount of goods and services of the Project) for indirect (i.e., supplier) and induced (i.e., consumer) industries in B.C. and the LAA (see Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats).

The direct expenditures and indirect and induced output would represent opportunities for businesses in the LAA as shown in Table 18.14.

• Direct expenditures on goods, services, and wages would support local businesses that secure work with the Project. Most of the general contractors would likely be major companies based outside the region, with local services typically provided on a subcontract basis. Direct non-labour expenditures in B.C. are estimated to be $1.7 billion. The proportion of that spending that would accrue to companies in the LAA would be determined by their capacity, expertise, and willingness to participate in project construction, but it is expected to be in the range of 10%, or $170 million. This is based on observations made by regional economic development offices regarding participation of local suppliers in recent major projects in the region, including the Alcan Smelter upgrade, the Endako Mine expansion, and the Mt. Milligan Mine construction.

• The effects of spinoff activity would include increased output (i.e., value of industry production) as estimated in Table 18.4 for the LAA and for B.C. During construction, it is estimated that the LAA would receive $323.9 million in output, equivalent to 10.7% of the total B.C. output of approximately $3 billion.

An indication of the interest in the Project from local businesses and contractors is the composition of the Site C business directory – approximately 50% of all registrants are from the NEDR, and of those local registrants, 25% are businesses owned by either Aboriginal persons or organizations. In terms of communities, Fort St. John would be the major beneficiary of the direct expenditures and indirect and induced output because, as the service centre for the NEDR, its business base is best positioned to serve the Project. Project expenditures would encourage the expansion of existing businesses or the establishment of new ones, including branch and subsidiary operations of major suppliers not currently in the region.
Table 18.14 Estimated Direct, Indirect, and Induced Effects During Construction

<table>
<thead>
<tr>
<th>Expenditures</th>
<th>LAA</th>
<th>B.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Project expenditures a ($M)</td>
<td>NA</td>
<td>1736</td>
</tr>
<tr>
<td>Indirect and Induced Output (value of industry production)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Supply ($M)</td>
<td>99</td>
<td>1,429</td>
</tr>
<tr>
<td>Other Supply ($M)</td>
<td>127</td>
<td>774</td>
</tr>
<tr>
<td>Induced ($M)</td>
<td>99</td>
<td>813</td>
</tr>
<tr>
<td>Total Indirect and Induced Output ($M)</td>
<td>324</td>
<td>3,016</td>
</tr>
</tbody>
</table>

NOTE:
a Includes wages, benefits, unincorporated business income, operating surplus, and contingencies
NA – data not available
Source: Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats

Indirect and induced business opportunities would accrue to businesses in the LAA during construction, as shown in Figure 18.4. The Year 0 cumulative output of $11.8 million would increase annually before reaching a peak of $45.9 million in Year 4. Output in the final year of construction is $7.7 million.

According to the British Columbia Input-Output Model results, some industries would be more likely to experience increased opportunities because of direct Project expenditures. Table 18.15 shows the top five industries that would experience the greatest increased output in B.C. – all of which are represented by suppliers listed in the Site C Business Directory (refer to Table 18.10). Many companies receiving expenditures would not be contracting with BC Hydro, but would be indirectly involved in the supply chain.
### Table 18.15 Total Indirect and Induced Output Effects in Top Five Supplier Industries in B.C.

<table>
<thead>
<tr>
<th>Supplier industry</th>
<th>Total indirect and induced Output ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance, insurance, real estate, rental and leasing</td>
<td>636.2</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>192.6</td>
</tr>
<tr>
<td>Professional, scientific, and technical</td>
<td>318.6</td>
</tr>
<tr>
<td>Operating, office, cafeteria, and laboratory supplies</td>
<td>213.4</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>212.5</td>
</tr>
</tbody>
</table>

**NOTE:**
Source: Volume 3 Appendix A Economic Assessment Supporting Documentation, Part 2 Project Economic Impacts: BC Stats

#### 18.4.2 Mitigation Measures – Construction – Change in Contract Opportunities in the LAA

As the Project will result in new contract opportunities, benefits for Regional Economic Development are linked to access of information and avenues for communicating back to BC Hydro about capacity and capabilities. BC Hydro has a Project objective to create lasting economic and social benefits for communities, Aboriginal groups, and the province. This will include creating construction-related jobs and business opportunities; consulting with communities about regional benefits such as upgrades to infrastructure, including roads, bridges, and parks; and working with Aboriginal communities to identify opportunities for benefits, including skills training, jobs, and economic development.

BC Hydro will implement a Business Participation strategy as identified in Volume 1 Appendix F Project Benefits Supporting Documentation, which was initiated during the Pre-Panel Stage as described in Volume 1 Information Distribution and Consultation Section Business Liaison Program. Activities such as offering a Site C Business Directory and hosting Business Information Sessions have been and will continue to be provided. These initiatives keep the business community updated on the status of the Project, and inform and engage the B.C. business community on future Site C business opportunities. The Business Directory enables interested businesses to indicate their market interest and capacity, and to receive business-relevant updates. Business information sessions are offered publicly, and are focused on providing businesses, economic development organizations, and industry associations an opportunity to build awareness about Site C contracting opportunities.

#### 18.4.3 Effects Assessment – Construction – Comparison of the Project’s Contracting Requirements with Regional Economic Business and Contracting Profile, Capabilities and Capacity

**18.4.3.1 General Population**

The NEDR has more businesses per capita than any other development region in the province. The NEDR has a higher percentage of its labour force in construction-related occupations (see Section 17.3 Labour Market Effects Assessment Baseline Conditions), and higher ratio of construction to total businesses (see Table 18.6) as compared to the province. In addition, the Fort St. John and Dawson Creek local areas have above
average proportions of total community income coming from the construction sector (see Table 18.8).

More than 175 local companies, all of which are small businesses, have enrolled in the Site C Business Directory (43% of all companies listed) and attendance at Business Information Sessions held as part of the market engagement process (described in the Mitigation Measures section) indicates a growing level of local business interest in procurement opportunities. Economic development offices, including NDIT, Community Futures, and industry associations, provide investment attraction and development services that help businesses take advantage of emerging opportunities.

The capacity of local companies to respond to procurement opportunities is linked to the availability of inputs such as capital, labour, and infrastructure, size of the enterprise, entrepreneurship and managerial expertise, and the strength of relationships within the supply chain. Business development indicators (e.g., number of business establishments and locations, business licence activity) for the NEDR indicate that the business community is responsive to increases in local demand, especially in sectors where there is already good capacity, such as construction.

Direct expenditures by BC Hydro during construction would amount to $1.7 billion in B.C., with an estimated 10% of this accruing to regional businesses and contractors. Another $323 million in indirect and induced output is estimated to accrue to regional business. The leading beneficiaries would be expected to be suppliers in the following industries: construction, finance, insurance, real estate, rental and leasing services, manufacturing, professional, scientific and technical services, wholesale trade and operating, office, cafeteria, and laboratory supplies. Construction companies are assumed to benefit from the direct expenditures presented in Table 18.14. Business opportunities associated with direct labour costs are not estimated. Companies in other industries in the LAA economy would have the opportunity to participate in the Project.

In summary, the Project would have positive effects on Regional Economic Development during construction, as opportunities would be created for both companies and individuals directly involved in project construction, as well as for those companies and individuals involved in industries and activities that would benefit from indirect and induced output, as discussed in Volume 1 Section 7 Project Benefits.

### 18.4.3.2 Aboriginal Peoples

Section 18.4.3 assessed the change in contracting opportunities in the LAA as a result of the Project. An estimated $170 million in Project contracts or subcontracts is estimated to be awarded to contractors based in the LAA over the construction phase. This work is largely focused on construction of major project components, most requiring services such as vegetation clearing, road building, excavation, and general contracting, in which many Aboriginal businesses in the LAA have demonstrated expertise and experience, as noted and itemized in Section 18.3.4.

In addition, the input-output modelling carried out by BC Stats estimated that the Project would generate a total of $323 million of output (gross revenues) for business suppliers, filling indirect demand, and for consumer-focused businesses (such as grocery stores) in the LAA.

The results of the assessment in Section 18.4.3 of the change in contracting opportunities in the LAA due to Project-generated spending during the construction
phase are directly applicable to Aboriginal businesses and community economic development. The Aboriginal contracting and construction products supply sectors are a segment of the overall business sector in the LAA and they seek similar contracting and product (such as aggregates) sales opportunities as does the non-Aboriginal contracting sector in the construction, utilities, renewable energy, mining, oil and gas, and forestry sectors in the LAA.

In this section, the Project’s contracting demand is compared to baseline and forecast Aboriginal business sector capabilities to assess potential effects on businesses owned by Aboriginal persons and organizations that are located in either First Nations communities or in non-Aboriginal communities in the LAA.

The Aboriginal business sector, although a segment of the overall business sector in the LAA, has its own distinct attributes, including company size, access to capital, educational attainment of business owners, historical development, and social circumstances for owners and employees.

Adverse effects would occur if businesses owned by Aboriginal persons or organizations in the LAA were unable to fairly and equitably access Project contracting opportunities.

The available information and data on businesses owned by Aboriginal persons and organizations point to a significant portion offering the types of construction-related services and construction products (such as aggregates/gravel) that will be sought by the Project during its construction phase. Approximately one-quarter of the businesses from the LAA that have registered on BC Hydro’s Site C Business Directory are owned by either an Aboriginal person or organization. This result communicates the high level of interest of Aboriginal business owners and managers in the Project, as the Aboriginal population is approximately 10% of the total population in the LAA.

As noted in Section 18.3.4, however, Aboriginal businesses and First Nations economic development corporations face historical, social, and systemic barriers to starting and growing businesses.

The Site C Impact Pathways Report stated a few times that ‘lack of a level playing field’ will limit the benefits to Aboriginal businesses, “…size of project components & lack of ‘set aside’ for T8FNs raises strong concerns about ability to take advantage of capital and labour-intensive construction phase; not a level playing field to start with; large contracts, specialized technology, weaker starting point for T8FNs businesses due to existing hurdles make it possible T8FNs business "capture" will be limited….Lack of level playing field between First Nations and non-Aboriginal businesses means that unless there is dedicated pre-project planning to improve T8FNs business competitiveness, little benefits are likely” (Appendix B, row 50 and 51 in T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012b).

Although the Project’s construction phase will create substantial construction products supply and contracting activity and spending over an eight-year period in the LAA, businesses in the LAA owned by Aboriginal persons or organizations are unlikely to secure a commensurate portion of this activity and spending without measures to help address their specific challenges and barriers. To ensure equity in Project procurement and supply for Aboriginal businesses in the LAA, comprehensive planning is needed to identify and remove discrimination in procurement and award policies and practices. Effects of social and historical barriers and challenges need remediying through targeted
measures, and appropriate representation of Aboriginal suppliers should be planned for throughout the Project during its construction phase.

18.4.4 Mitigation Measures – Construction – Comparison of the Project’s Contracting Requirements with Regional Economic Business and Contracting Profile, Capabilities and Capacity

18.4.4.1 General Population

Mitigation proposed in Section 18.4.2, focused on implementing Business Participation strategies to increase awareness in the business community about Project procurement opportunities. These strategies will similarly promote new capabilities and capacity by having flexible procurement policies, enhancing local awareness and accessibility, and enabling partnerships among local businesses and outside suppliers.

Local economic development organizations already have the role of supporting businesses to be competitive for available market opportunities, so their participation in Project business information sessions is important in enabling them to support their constituents. BC Hydro will partner with local business organizations and with economic development offices and programs to deliver business information sessions and to communicate contracting opportunities.

Mitigation proposed in the Labour Market assessment (Volume 3 Section 17.4) will also contribute to expansion and diversification of the contractor profile, capabilities, and capacity. For example, BC Hydro’s contribution of $1 million to the Northern Lights College Foundation to fund trades and skills development will increase the skilled labour supply that contractors need to expand their capacity.

These mitigation measures would enhance Regional Economic Development by expanding and diversifying business opportunities, profile, capabilities, and capacity during construction of the Project.

18.4.4.2 Aboriginal Peoples

BC Hydro will continue its outreach initiatives to make Aboriginal businesses aware of Project contracting opportunities. Its targeted application to the Project of its Aboriginal Contract and Procurement Policy will facilitate the participation of Aboriginal businesses in the contracting opportunities presented by the Project. Where identified by Aboriginal groups as an interest, BC Hydro will consider commitments respecting capacity building, education, and training associated with Aboriginal participation in Project labour market opportunities.

- BC Hydro will implement a Business Participation Strategy (refer to Volume 1 Appendix F Project Benefits Supporting Documentation). BC Hydro will continue to notify Aboriginal groups of business information sessions, and about opportunities to register with BC Hydro’s Aboriginal Business Directory.
- BC Hydro will continue to engage directly with the Aboriginal business community in the LAA and elsewhere in the province, including providing opportunities to sponsor and participate in Aboriginal business events and conferences
- BC Hydro’s Aboriginal Contract and Procurement Policy includes a commitment to increasing Aboriginal participation in providing its goods and services. Activities to
achieve this objective include set-asides, direct awards, select tenders, and the inclusion of Aboriginal Content in bidding documents.

- BC Hydro will seek information from Aboriginal suppliers in the LAA, and from other Aboriginal groups with whom BC Hydro is engaged, about their business capacity and capabilities to provide goods and services for the Project.

### 18.5 Summary of Effects Assessment and Mitigation Measures

A summary of potential effects and mitigation measures are shown for Regional Economic Development in Table 18.16. As stated in Section 18.4, effects are restricted to the construction phase of the Project because effects are not assessed for operations, as the annual expenditures for this phase would be low relative to the regional economy and would, therefore, be negligible.

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Construction  | • Change in business opportunities  
• Change in LAA business and contracting profile, capabilities, and capacity | ▪ Implementation of business participation strategy  
▪ Work with local Economic Development Commissions and business organizations to deliver business information sessions and communicate contracting opportunities  
▪ BC Hydro Aboriginal procurement policy to increase Aboriginal participation in Project business opportunities  
▪ Seek information on Aboriginal businesses and capabilities | The Business participation strategy has proven effective in other BC Hydro capital projects, while regional and Aboriginal businesses have actively participated in ongoing business information sessions and the business directory  
No residual adverse effects on Regional Economic Development are anticipated. | BC Hydro  
BC Hydro  
BC Hydro |
18.5.1 Other Mitigation Measures Considered

Some stakeholders suggest that Project procurement and contracting policies should explicitly favour regional contractors and businesses (other than Aboriginal-owned ones). In consideration of this suggestion, this action was deemed infeasible for BC Hydro for the following reasons:

- As noted in Section 18.1.1, preferential contracting would conflict with domestic trade commitments that BC Hydro must meet under the New West Partnership Trade Agreement.
- Preferential contracting could lead to higher construction costs if there is a lack of competitive bidders.
- It is not common practice on major development projects in Canada.
- There is a general lack of research on targeted procurement programs and their effectiveness in Canada.

18.6 Residual Effects

The Project is anticipated to have positive effects on Regional Economic Development during construction, as opportunities would be created for businesses and contractors directly involved in Project construction, as well as for those involved in industries and activities that would benefit from indirect and induced expenditures, as discussed in Volume 1 Section 7 Project Benefits.

With mitigation, the Project would increase business procurement opportunities for local companies during construction and operations of the Project. Direct expenditures by BC Hydro during construction would amount to $1.7 billion in B.C., with an estimated $170 million accruing to regional contractors, including Aboriginal businesses in the LAA. Another $324 million in indirect and induced output would accrue to regional businesses.

The leading beneficiaries would be suppliers in the following industries: construction, transport, finance, insurance, real estate, rental and leasing services, manufacturing, professional, scientific and technical services, wholesale trade and operating, office, cafeteria, and laboratory supplies. However, companies in all industries in the local economy would be affected.

As the Project effects on Regional Economic Development are beneficial, these residual effects are not characterized further.

18.7 Cumulative Effects Assessment

No cumulative adverse effects are anticipated, because no residual adverse effects are anticipated.

18.8 Monitoring and Follow-Up

Monitoring and follow-up measures are not proposed for Regional Economic Development.
References

Literature Cited

1. 4 Evergreen Resources LP. No date. Accessing and Managing Contract Opportunities for Saulteau First Nation. Moberly Lake, B.C.


Internet Sites


Personal Communications


19 CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES

19.1 Approach

The Project has the potential to change the land, water, or resources, or access to lands, water or resources used by Aboriginal groups for traditional purposes. The key indicators for this valued component (VC) are as follows:

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

Aboriginal interests with respect to this VC are presented in the form of an issues tracking table, included in Volume 1 Appendix H Aboriginal Information Distribution and Consultation Supporting Documentation. Summaries of the consultation on the Project carried out by BC Hydro with each of the 29 Aboriginal groups identified in Table 9.2 in Volume 1 Section 9 Information Distribution and Consultation are included in Volume 5 Appendix A Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Requirements Supporting Documentation, Part 2. Drawing from those consultation summaries, a current use summary is included in Volume 3 Appendix F Current Use of Lands and Resources for Traditional Purposes Summary.

This VC is linked to the following VCs also considered in the assessment of the Project:

- Volume 2 Section 12 Fish and Fish Habitat
- Volume 2 Section 13 Vegetation and Ecological Communities
- Volume 2 Section 14 Wildlife Resources
- Volume 3 Section 24 Harvest of Fish and Wildlife Resources
- Volume 3 Section 25 Outdoor Recreation and Tourism
- Volume 3 Section 26 Navigation
- Volume 4 Section 33 Human Health

Volume 5 Section 34 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Requirements will examine the potential adverse impacts of the Project on the exercise of asserted or established Aboriginal rights and treaty rights.

19.1.1 Regulatory and Policy Setting

As specified in the EIS Guidelines, the Canadian Environmental Assessment Act (CEAA), 2012 informed the effects assessment for the current use of lands and resources for traditional purposes VC. Section 5(1) of the CEAA identifies that:
“for the purposes of this Act, the environmental effects that are to be taken into account in relation to an act or thing, a physical activity, a designated project or a project are… (c) with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on… (iii) the current use of lands and resources for traditional purposes.”

19.1.2 Key Issues and Identification of Potential Effects

Issues, concerns and interests identified during consultation with Aboriginal groups and government agencies guided the scope of the assessment of Current Use of Lands and Resources for Traditional Purposes (Volume 1 Section 9 Information Distribution and Consultation). The list of issues and the approaches used to address them are outlined in Table 19.1.

Table 19.1 Key Issues: Current Use of Lands and Resources for Traditional Purposes

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern about the potential effects of the Project on access to quality hunting areas, including areas that contain moose, elk, deer, bear, and birds. Concern about potential effects from Project-related activities, such as the Highway 29 realignment and the Peace Reach Pit, on hunting. Specific hunting areas of concern include: - The arc from the upper Halfway to Hudson’s Hope to Moberly Lake to Upper and Lower Pine watershed - Pine/Peace confluence - B.C./Alberta border to Smoky/Peace River confluence, to Caldotte/Peace River confluence, to Notikewin/Peace River confluence - Boucher Lake/Peace Moberly Tract area - Between Moberly Lake and Peace Rivers - Northwest of Hudson’s Hope - Upstream of Clear/Peace River confluence (Blueberry River First Nations, Duncan’s First Nation, Fort Nelson First Nation, McLeod Lake Indian Band, Salt River First Nation, Saulteau First Nations, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. Using the baseline information described in Section 19.2, and the assessment in Volume 2 Section 14 Wildlife Resources, the assessment considers the potential for change in access to areas used for hunting purposes, and to areas where specific wildlife resources may be located. The Local Assessment Area and the Regional Assessment Area are described in Section 19.1.5 in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. The first, second, fourth, fifth and possibly the sixth bullets listed in the left column are at least partly within the Local Assessment Area for the Current Use of Lands and Resources for Traditional Purposes VC, and are considered in the assessment where use of those areas has been identified by Aboriginal groups.</td>
</tr>
</tbody>
</table>
### Key Issues

Concerns about the potential effects of the Project on fishing, including access, water flow, water levels and habitat.

Concern that the reservoir will cause members to have reduced knowledge of fishing and success at fishing.

Specific fishing areas of concern include:
- B.C./Alberta border to Many Islands
- Many Islands to Dunvegan
- Dunvegan to Peace/Smoky River confluence and north to Notikewin Provincial Park
- Saddle Creek/Peace confluence to upstream of Peace River
- Peace River downstream of Farrell Creek
- Downstream of Hudson’s Hope
- Peace River above the dam
- North bank Peace upstream of Taylor Bridge
- Lower reaches of Pine River/at Beatton/Peace confluence up to Charlie Lake and upper Beatton River/on Peace River at B.C./Alberta border
- Pine/Peace confluence
- Clear/Peace confluence
- Many Islands and at Fourth Creek/Peace Confluence
- Many Islands to Dunvegan
- Dunvegan to Notikewin/Peace River confluence

Concern about the potential effects of the Project on trapping, including access, animal density, and reduction of habitat.

Concern that the Project will occupy approximately 204 ha of one trapline, comprising a loss of habitat for animals, medicinal plants, bear dens, licks, etc.

Concern about increased traffic and public access and the potential disturbance of traps.

Interest in BC Hydro avoiding the creation of new access points in trapline areas, such as 4X4 trails.

Concern that trapping activities will be eliminated within the Project inundation areas and may also be affected by migration and disturbance effects.

### Approach to Addressing Key Issues

An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. Using the baseline information described in Section 19.2, and the assessment in Volume 2 Section 12 Fish and Fish Habitat, the assessment considers the potential for change in access to areas used for fishing purposes, and to areas where specific fisheries resources may be located. The Local Assessment Area and Regional Assessment Area are described in Section 19.1.5. The areas identified in the first bullet and in fourth through ninth bullets, are least partly within the Local Assessment Area for the Current Use of Lands and Resources for Traditional Purposes VC, and are considered in the assessment where use of those areas has been identified by Aboriginal groups.

An assessment of the potential effects of the Project on reported registered trapline harvest volumes, trapline operations and revenue is included in Section 24.4 in Volume 3 Section 24 Harvest of Fish and Wildlife Resources.

(Additional text continues as required.)
### Key Issues

<table>
<thead>
<tr>
<th>Concern</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern about potential effects of the Project on trapping activity on the Peace by Duncan's First Nation that is not documented in current Traditional Land Use Studies, but is known to have taken place historically. (Duncan's First Nation)</td>
<td>An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. The baseline information, described in Section 19.2, has been developed considering traditional land use studies done for the Project, information provided by Aboriginal groups during the consultation process, and other publicly available information.</td>
</tr>
<tr>
<td>Meaningful assessment of reasonably anticipated future use of lands and resources for traditional purposes by the Treaty 8 First Nations (T8FNs) must consider future scenario without the existing flood reserve. (Treaty 8 Tribal Association: Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations)</td>
<td>The potential effects of the Project on the current and reasonably anticipated future use of lands and resources for traditional purposes have been assessed in Section 19 Effects Assessment on the basis that if the proposed Project does not proceed, the lands within the Flood Reserve will, for the reasonably anticipated future, remain in the same state as they are found in today, whether or not the Flood Reserve is removed.</td>
</tr>
<tr>
<td>Concern about the potential effects of the Project on berry harvesting and plant gathering. (Blueberry River First Nations, Duncan's First Nation, Kelly Lake Metis Settlement Society, Saulteau First Nations, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. Using the baseline information described in Section 19.2, and the assessment in Volume 2 Section 13 Vegetation and Ecological Communities, the assessment considers the potential for change in access to areas used for gathering purposes, and to areas where specific plant resources may be located.</td>
</tr>
<tr>
<td>Concern about the potential effects of the Project on ancestral gathering places used for camping and habitation, fishing and hunting, travel routes, ceremonial and sacred areas, burials, trails, freshwater springs, and associated oral history, specifically in the areas of Bear Flats, Cache Creek, Halfway River, Moberly River, the Peace Moberly Tract, and the Area of Critical Community Interest. (Blueberry River First Nations, Saulteau First Nations, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. Using the baseline information described in Section 19.2, the assessment considers the potential for change in specific areas used by Aboriginal groups for traditional purposes. The Local Assessment Area is described in Section 19.1.5, and includes portions of the areas identified here where uses have been identified by Aboriginal groups.</td>
</tr>
</tbody>
</table>
### Key Issues

<table>
<thead>
<tr>
<th>Concern</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern about increased access for recreational non-Aboriginal harvesters to the area, leading to increased pressure on wildlife and fish resources and increased competition for campsites. Interest in how BC Hydro is proposing to limit the hunting activities of the temporary workforce. (Blueberry River First Nations, Duncan’s First Nation, Kwadacha First Nation, Saulteau First Nations, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. Section 24.4 Effects Assessment in Volume 4 Section 24 Harvest of Fish and Wildlife Resources considers changes in access for harvesting. BC Hydro will manage safety on its work sites in a variety of ways, including the management of firearms. This will include prohibiting personal firearms on its work sites, and by prohibiting workers from engaging in hunting activities during working hours, or within active work sites. In general, there will be limited private vehicle access to the south bank site. The participation of the workforce in hunting activities on their own time would be done as members of the public, under provincially regulated licensing systems.</td>
</tr>
<tr>
<td>Interest in collecting baseline traditional knowledge. Interest in incorporating traditional knowledge into the environmental assessment. (Athabasca Chipewyan First Nation, Blueberry River First Nation, Deninu K’ue First Nation, Little Red River Cree Nation, Mikisew Cree First Nation, Smith’s Landing First Nation, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>Where information respecting traditional knowledge has been made available to BC Hydro by Aboriginal groups, it has been incorporated into the baseline for those VCs to which it applies.</td>
</tr>
<tr>
<td>Concern that off-site infrastructure (roads, transmission lines, quarries, hauling, etc.) will have direct effects during construction, and will open territory to new industrial activities. (Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. Using the baseline information described in Section 19.2, the assessment considers the potential for interaction between Project components and those identified uses of lands and resources. The assessment also considers the potential for change in specific areas used by Aboriginal groups for traditional purposes. The Local Assessment Area and the Regional Assessment Area are described in Section 19.1.5. An assessment of cumulative effects is presented in Section 19.5 for areas where any residual effects have been identified.</td>
</tr>
<tr>
<td>Concern that the Project will lead to a loss of access to certain sites that are associated with specific stories. If the sites are not accessible, the stories will not be told and may get lost over time. (Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>An assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes is presented in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. Using the baseline information described in Section 19.2, the assessment considers the potential for change in access to areas used for traditional purposes.</td>
</tr>
<tr>
<td>Key Issues</td>
<td>Approach to Addressing Key Issues</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Concern about potential impacts of the Project on cultural fragmentation, loss of cultural identity, and destruction of traditional way of life. (Blueberry River First Nations, Saulteau First Nations, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes provides an assessment of the potential effects of the Project on the current and reasonably anticipated future use of lands and resources for traditional purposes, including the potential effects on hunting, fishing, and trapping activities, and the use of lands and resources for activities other than hunting, fishing, and trapping by Aboriginal groups. Changes in the use of and access to culturally important places and valued landscapes is also considered in the assessment. An assessment on culture is not within the scope of the assessment on current use of lands and resources for traditional purposes.</td>
</tr>
<tr>
<td>Concern about the potential impacts of the Project on future generations and families, including: • The ability for youth to sustain themselves and practice traditional activities • Inter-generational respect and loss of time together for youth and elders • Loss of educational areas for transfer of knowledge to the young • Loss of land used for cultural camps to maintain the heritage of our relationship between elders and youth • Impacts on opportunities for the transmission of Aboriginal languages • Loss of opportunity for inter-band and family socialization and cultural exchange • Loss of capacity to pass on and receive traditional knowledge • Lack of control or voice in future land use (Athabasca Chipewyan First Nation, Blueberry River First Nations, Dene Tha’ First Nation, Fort Chipewyan Métis Association, Métis Nation British Columbia, Mikisew Cree First Nation Saulteau First Nations, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)</td>
<td>Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes provides an assessment of the potential effects of the Project on the current and reasonably anticipated future use of lands and resources for traditional purposes, including the potential effects on hunting, fishing, and trapping activities, and the use of lands and resources for activities other than hunting, fishing, and trapping by Aboriginal groups. Changes in the use of and access to culturally important places and valued landscapes is considered in the assessment, including teaching sites.</td>
</tr>
<tr>
<td>Key Issues</td>
<td>Approach to Addressing Key Issues</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Concern about reduced time on the land and sense of connectedness with the natural landscape. Reduced ability to travel on the land freely and in quiet enjoyment. Psycho-social dysfunction associated with loss of understanding of the land base, loss of connection to it, loss of faith in the health of traditional resources, and loss of control over changes occurring on the land. Concern that increased land alienation may lead to sedentary trend; lack of ability/desire to go out on land. (Saulteau First Nations, Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations) | Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes provides an assessment of the potential effects of the Project on the current and reasonably anticipated future use of lands and resources for traditional purposes, including the potential effects on hunting, fishing, and trapping activities, and the use of lands and resources for activities other than hunting, fishing, and trapping by Aboriginal groups. The assessment considers the changes in other cultural and traditional uses of the land, considering the following key aspects:  
- Use of and access to areas for other cultural and traditional uses of the land (e.g., collection of food and medicinal plants)  
- Availability of harvested species  
- Use of and access to culturally important places and valued landscapes. |
| Concern with the maintenance of, or impacts to, opportunities for the transmission of customary law. (Athabasca Chipewyan First Nation, Dene Tha’ First Nation, Mikisew Cree First Nation)                                                                 |                                                                                                                                                                                                                                                          |
| Concern about the loss of the Peace River islands, which have specific histories, some associated with particular dreamers and spiritual power. (Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)                                                                 | Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes provides an assessment of the potential effects of the Project on the current and reasonably anticipated future use of lands and resources for traditional purposes, including the potential effects on hunting, fishing, and trapping activities, and the use of lands and resources for activities other than hunting, fishing, and trapping by Aboriginal groups. Changes in the use of and access to culturally important places and valued landscapes is considered, including teaching sites. |
| Concern that the flooding associated with the Project would create a loss of identity, values, cultural connectedness (individually and collectively). (This issue, concern, or interest was expressed by participants attending BC Hydro-led First Nations Integrated Resource Plan Workshops held in Prince George or Fort St. John in 2011 and 2012. Comments were not attributed unless requested by the participant.) | Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes provides an assessment of the potential effects of the Project on the current and reasonably anticipated future use of lands and resources for traditional purposes, including the potential effects on hunting, fishing, and trapping activities, and the use of lands and resources for activities other than hunting, fishing, and trapping by Aboriginal groups. Changes in the use of and access to culturally important places and valued landscapes is considered in the assessment. An assessment on culture is not within the scope of the assessment on current use of lands and resources for traditional purposes. |
Concern with lack of respect for DunneZa/Danezaa culture as the first culture in the area.
(Treaty 8 Tribal Association: Doig River, Halfway River, Prophet River and West Moberly First Nations)

Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes provides an assessment of the potential effects of the Project on the current and reasonably anticipated future use of lands and resources for traditional purposes, including the potential effects on hunting, fishing, and trapping activities, and the use of lands and resources for activities other than hunting, fishing, and trapping by Aboriginal groups. Changes in the use of and access to culturally important places and valued landscapes is considered in the assessment.

Section 15.2.4 of the EIS Guidelines states that the potential to adversely affect current use of lands and resources by Aboriginal persons for traditional purposes will be assessed by taking into account the potential for the Project to result in changes to key aspects:

- Use of and access to lands used for traditional purposes
- Availability of harvested species based on the results of the assessment of the potential effects of the Project on fish and fish habitat, vegetation and ecological communities, and wildlife resources
- Other relevant considerations raised by Aboriginal groups

However, Section 19.4 Effects Assessment below presents the assessment of the potential to adversely affect current use of lands and resources for traditional purposes by taking into account the potential for the Project to result in changes to the following key aspects:

- Changes in fishing opportunities and practices
- Changes in hunting and trapping opportunities and practices
- Changes in other cultural and traditional uses of the land

The organization of key aspects differs from the EIS Guidelines in order to facilitate an analysis of specific current use of lands and resources for traditional purposes (e.g., fishing, hunting, and cultural and traditional uses) separately.

"Changes to cultural and traditional uses of the land" was added as a potential effect to take into account key aspects, including cabins and camp sites, drinking water, firewood, feather gathering, trails and water routes, cultural and spiritual places, collection of food and medicinal plants, and use of and access to culturally important places and valued landscapes. These key aspects were designed to respond to concerns raised by Aboriginal groups.

"Opportunities" refers to the circumstances--temporal, spatial, and ecological--that invite the exercise of current use practices.

"Practices" refers to the regular performance of a technical or cultural skill, typically in hunting, fishing, trapping, or craftsmanship. It mixes customary activity, on the one hand, with intentional maintenance of tradition, such as the exercise of rights, on the other.
Table 19.2  Interactions of the Project With Current Use of Lands and Resources for Traditional Purposes

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
<th>Changes in Fishing Opportunities and Practices</th>
<th>Changes in Hunting and Trapping Opportunities and Practices</th>
<th>Changes in Other Cultural and Traditional Uses of the Land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of Dam and Generating Station</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Construction of Reservoir</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Transmission System</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Quarried and Excavated Material Source</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Construction Access Roads</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker Accommodation</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam and Generating Station</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir Operations</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Line Operations</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Only Project interactions ranked as “2” Volume 2 Appendix A Project Interactions Matrix, Table 2 are carried forward to this table. A ✓ indicates that an activity is likely to contribute to the effect.

19.1.3 Standard Mitigation Measures and Effects Addressed

As shown in Volume 2 Appendix A Project Interaction Matrix, Table 2, a “1” ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. These interactions were not carried forward through the effects assessment.

A “1” ranking was not assigned to any project components, activities, and physical works associated with the construction of the Project.

All other project activities listed in Table 2 of Volume 2 Appendix A Project Interactions Matrix were ranked “0,” because no interaction is predicted between the Project and the current use of lands and resources for traditional purposes VC. Interactions with the following activities were ranked “0”:

- Hudson’s Hope shoreline protection maintenance
19.1.4 Selection of Key Indicators

Section 15.2.3 of the EIS Guidelines states that the key indicators for the current use of lands and resources for traditional purposes VC will include the following:

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

A list of key indicators, including a rationale for their selection, is provided in Table 19.3.

### Table 19.3 Key Indicators for Current Use of Lands and Resources for Traditional Purposes

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in fishing opportunities and practices</td>
<td>Current use of lands and resources for fishing</td>
<td>Reflects Aboriginal concerns CEAA 2012</td>
</tr>
<tr>
<td></td>
<td>Location of the activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Species targeted</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of the harvested species</td>
<td></td>
</tr>
<tr>
<td>Changes in hunting and trapping opportunities and practices</td>
<td>Current use of lands and resources for hunting and trapping</td>
<td>Reflects Aboriginal concerns CEAA 2012</td>
</tr>
<tr>
<td></td>
<td>Location of the activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Species targeted</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of the harvested species</td>
<td></td>
</tr>
<tr>
<td>Change in cultural and traditional uses of the land</td>
<td>Current use of areas for other cultural and traditional uses</td>
<td>Reflects Aboriginal concerns CEAA 2012</td>
</tr>
<tr>
<td></td>
<td>Use of the resource</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Location of the activity</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: * Includes input from consultation with government agencies and Aboriginal groups, as well as regulatory guidelines and policies

Location of current use activities is examined as an intrinsic part of current use of lands and resources, species targeted and use of the harvested species.

19.1.5 Spatial and Temporal Boundaries

19.1.5.1 Spatial Boundaries

The Local Assessment Area (LAA) and the Regional Assessment Area (RAA) for the current use of lands and resources for traditional purposes VC are depicted in Figures 19.1 and 19.2, and reported in Table 19.4. The LAA was defined in consideration of the expected maximum geographic extent of the potential for the Project...
to cause an adverse effect on the VC current use of lands and resources for traditional purposes.

Both the LAA and the RAA are based on the spatial boundaries set out in other sections of the EIS, as follows:

- **Fishing opportunities and practices:** the LAA and RAA are based on the LAA and RAA for the fish and fish habitat VC (Figure 12.1 in Volume 2 Section 12 Fish and Fish Habitat). These spatial boundaries were defined by reviewing information including information from Traditional Land Use Studies (TLUS).

- **Hunting and trapping opportunities:** the LAA and RAA are based on the wildlife resources VC (Figure 14.1 Volume 2 Section 14 Wildlife Resources).

- **Cultural and traditional uses of the land:** the LAA and RAA are based on the LAA and RAA for the vegetation and ecological communities VC (Figure 13.1 in Volume 2 Section 13 Vegetation and Ecological Communities).

### Table 19.4 Spatial Assessment Areas for Current Use of Lands and Resources for Traditional Purposes

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fish and Fish Habitat LAA</strong></td>
<td><strong>Fish and Fish Habitat RAA:</strong></td>
</tr>
<tr>
<td>▪ Peace River in the proposed reservoir area</td>
<td>Peace River from Peace Canyon Dam, B.C. to Vermilion Chutes, Alberta</td>
</tr>
<tr>
<td>▪ Tributaries entering the proposed reservoir</td>
<td></td>
</tr>
<tr>
<td>▪ Peace River downstream of the proposed Site C Dam to the Many Islands Area, Alberta (207 km)</td>
<td></td>
</tr>
<tr>
<td>▪ Watercourses and water bodies within the transmission line and roadway rights-of-way</td>
<td></td>
</tr>
<tr>
<td>▪ Watercourses and water bodies within the Project activity zone (construction materials)</td>
<td></td>
</tr>
<tr>
<td>▪ Riparian areas adjacent to identified watercourses and water bodies</td>
<td></td>
</tr>
<tr>
<td><strong>Vegetation and Ecological Communities, and Wildlife Resources LAA</strong></td>
<td><strong>Vegetation and Ecological Communities, and Wildlife Resources RAA:</strong></td>
</tr>
<tr>
<td>▪ Project activity zone buffered by 1,000 m, including a 1,000 m buffer around the erosion impact line</td>
<td>Five Wildlife Management Units – designated 7-31, 7-32, 7-33, 7-34, and 7-35.</td>
</tr>
<tr>
<td>▪ Peace River downstream of the proposed dam, buffered by 1,000 m from the south and north banks down to the Alberta border</td>
<td></td>
</tr>
</tbody>
</table>

### 19.1.5.2 Temporal Boundaries

The assessment has been conducted for the Project construction and operations phases, which are described in Volume 1 Section 4 Project Description.

The temporal description of the VC itself centres on the seasonality of the current use of lands and resources for traditional purposes – i.e., the “seasonal round” – and was based on Aboriginal traditional knowledge, as communicated in consultation and through Project-specific Traditional Land Use Studies, and ethnohistorical and other reports.
19.2 Information Sources and Methods

19.2.1 Literature Review

The following information was used to formulate the baseline and assist with assessment of potential effects on the current use of lands and resources for traditional purposes VC:

- Project description and other Project-related information
- Project-specific Traditional Land Use and knowledge studies or other Project-related information provided by First Nations that included information on past, current, and future use of resources. The following studies were received by First Nations at the time of writing (All but the MCFN and ACFN report are included in Volume 5 Appendix A Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Supporting Documentation):
  - Duncan’s First Nation (General 2012c)
  - Blueberry River First Nation Traditional Land Use Study (Kennedy 2011)
  - Duncan’s First Nation Ethnohistorical Review (Bouchard and Kennedy 2012b)
  - Horse Lake First Nation Ethnohistorical Overview (Bouchard and Kennedy 2012c)
  - Doig River First Nation, Prophet River First Nation, Halfway River First Nation, and West Moberly First Nation Traditional Land Use Study (Candler 2012b)
  - Saulteau First Nation Culture and Traditions Study (Nesoo Watchie Resource Management Ltd. 2011)
  - Kelly Late Métis Settlement Society Aboriginal Traditional Knowledge Assessment (Davison et al. 2012)
  - Dene Tha’ Traditional Land Use with Respect to BC Hydro’s Proposed Site C Dam (Stevenson and Dene Tha’ Lands and Environment Department 2012)
  - Fort Nelson First Nation Background and Rationale for Involvement in the Site C Project (Wolfenden 2012)
  - MCFN and ACFN Desktop Knowledge and Use Report for BC Hydro’s Proposed Site “C” Dam Project (Candler et al. 2012c)
  - Clarifications to BC Hydro’s Review and Response in regard to the Métis Nation BC’s “Site C Clean Energy Project” Report (MNBC 2012b)
  - Métis Nation BC “Site C Clean Energy Project” Report (MNBC 2012c)
- Readily available Traditional Land Use and knowledge studies for other projects
- Community Baseline Reports received from First Nations at the time of writing (Volume 3 Appendix B First Nations Community Baseline Reports):
  - Treaty 8 First Nations Treaty 8 First Nations (T8FNs) Community Assessment Team and The Firelight Group Research Cooperative. 2012. Telling a Story of

- Ethnohistorical, anthropological, and geographical literature
- Results of BC Hydro consultations with Aboriginal groups
- Results of the Fish and Fish Habitat, Vegetation and Ecological Communities, and Wildlife Resources Effects Assessments (Volume 2 Sections 12, 13, and 14, respectively)

19.2.2 Incorporation of Traditional Use information

As described in Section 9.2.3.3.2 in Volume 1 Section 9 Information Distribution and Consultation, BC Hydro entered into agreements with a total of nine Aboriginal groups to carry out Traditional Land Use Studies (TLUS) for the Project. Following submission of those reports, BC Hydro engaged Traditions Consulting Services to review the completed TLUS reports and related publicly available materials, and to consider where additional information would be beneficial. Traditions Consulting also completed summary reports for those Aboriginal groups that did not complete a TLUS for this Project but may, in some instances, have supplied information in other formats. With the exception of reports by MCFN and ACFN, the TLUS reports and the summary reports completed by Traditions Consulting are included in Volume 5 Appendix A Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Requirements Supporting Documentation.

Where First Nations submitted TLUS reports, these were used as the primary source of information for the baseline information presented in Section 19.2.2.

19.2.3 Data Management, Mapping and Modelling

A spatial analysis was undertaken to identify the overlap between the Project activity zone and areas that are currently used by Aboriginal groups for traditional purposes. Resource use was also depicted by Aboriginal groups in tabular form (see Tables 19.5 to 19.10).

Integration of the TLUS data posed a number of challenges. To begin with, the study areas defined in the Project-specific TLUS reports submitted to BC Hydro, and other reports reviewed, do not align precisely with the LAA or RAA. Interpretation of various TLUS and other maps was necessary in an attempt to discern the location of activities in relation to the LAA or RAA. Similarly, the spatial information supplied by Aboriginal groups was frequently buffered, or redacted, for purposes of confidentiality or sensitivity, making it difficult to identify specific locations in relation to the LAA for this VC. It is BC Hydro’s understanding that the results of the TLUS are representative of the appropriate land uses in the respective TLUS areas.

19.3 Baseline Conditions

The EIS guidelines identify 29 Aboriginal groups as potentially affected by the Project. This includes First Nations and Métis groups in B.C., Alberta, and the Northwest Territories. This section provides a general overview of current use of lands and resources for traditional purposes within and outside the LAA, based on the sources
considered in the assessment. Current and reasonably anticipated future use of lands
and resources for traditional purposes is then discussed in more detail by Aboriginal
group.

Hunting, fishing, trapping, gathering plant foods, and pursuing other traditional activities
remain culturally and economically important activities for the 29 Aboriginal groups listed
in the EIS guidelines. They are all reported to actively pursue hunting, fishing, trapping,
and other traditional activities on their traditional territories. Several of the Aboriginal
groups have identified a continued reliance on the Peace River for a range of
sustenance, cultural, socio-economic, and spiritual purposes. The Peace River valley
has been noted as a place of high cultural, historical, and ecological value. It is a place
to hunt, fish, trap; a place to gather, to quietly enjoy nature; and a place where traditions
and language are passed on to younger generations (General 2011; Candler et al.
2012b)

Actively engaging in traditional activities and maintaining a traditional way of life are
essential elements of Aboriginal people’s well-being and quality of life. Saulteau First
Nations, West Moberly First Nations 2006; Duncan’s First Nation 2012; Treaty 8 First
Nations and the Firelight Group 2012). The Treaty 8 First Nations Community Profile
Report describes country food harvesting as a practice that brings together multiple
generations; promotes a connection with the land and physical activity; contributes to a
healthier diet than store-bought foods; promotes the use of traditional language and the
transfer and retention of knowledge, traditions, and values; creates a sense of pride and
self-sufficiency among harvesters; and promotes community relations (Treaty 8 First

Aboriginal groups have indicated that their ability to utilize the lands and resources of the
Peace River basin for traditional purposes has been constrained by changes in the
overall health of the of the Peace River, and the availability and health of fish, wildlife,
and plant resources, which they attribute largely to development activities in the region
(e.g., oil and gas, energy, mining, forestry, agriculture, etc.) Other factors identified as
restricting Aboriginal people’s ability to hunt, fish, and trap include increased distance to
harvesting sites and related increased travel costs, increased competition from
non-Aboriginal hunters, fishers, and trappers, and a reduced feeling of safety and
security on the land (General 2012f; Candler et al. 2012a; Treaty 8 First Nations and the

Future Use

Aboriginal groups have expressed their future use intentions in various ways. Most
Aboriginal groups reported that they will continue to use their traditional territories for
hunting, fishing, and trapping in the future. Where this was not reported, other indicators
of future use were often identified, including the following:

- Expressions of interest in owning and protecting land from future development,
  including sacred sites (e.g., BRFN’s interest in protecting Dancing Grounds and Pink
  Mountain; Saulteau and West Moberly First Nation’s identification of Area of Critical
  Community Interest)
- Organization of hunting, trapping, and gathering camps, allowing for transfer of
  language, culture, and knowledge to youth
- Cultural programming (e.g., DRFN culture programs and events)
• Expressions of interest in engaging in watershed restoration and fisheries restoration for the Peace River Basin (e.g., Duncan’s First Nation)
• Expressions of concern regarding food security
• Identification of concerns regarding the Project’s potential effects on traditional use and the exercise of Aboriginal rights

Information was limited with respect to the intent to continue these activities specifically in the LAA.

Tables 19.5 to 19.10 provide a list of resources for harvested and traditional activities engaged in that have been reported for Aboriginal groups in the LAA.

The list was developed based on TLUS or other reports commissioned by BC Hydro for the Project and conducted by Aboriginal groups, and from the publicly available published and unpublished reports.

Tables 19.5 to 19.10 reflect the reported presence or absence of traditional or current use for those groups that have at least some identified current use, in the LAA, of each resource use or activity listed, regardless of the intensity or frequency of harvesting or activity. Generalized statements or references to traditional or current harvesting, use or activity (e.g., descriptions of hunting, trapping, fishing, or gathering throughout a traditional territory) are not reflected.

The Study Areas defined in the TLUS and other reports reviewed do not align precisely with the LAA, and therefore interpretation of various TLUS and other maps was required to discern whether harvesting or other activities should be deemed as included in the LAA.

The categories of resources and activities in the tables reflect the categories as reported in individual TLUS and other reports; no attempt has been made to standardize terminology.

The tables are subject to the limitations expressed in the TLUS and other reports on which it is based. More specifically, it should not be construed as comprehensive, since not all members of the First Nations or other groups listed were interviewed concerning traditional harvesting or activities, nor have all historic harvesting or activities in the LAA been reported or described.
1. **Table 19.5 Resource Use by Aboriginal Group – Wildlife**

<table>
<thead>
<tr>
<th>Resource: Wildlife</th>
<th>SFN</th>
<th>T8TA</th>
<th>BRFN</th>
<th>DTFN</th>
<th>DFN</th>
<th>HLFN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Mammals</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Elk</td>
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<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deer (unspecified)</td>
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<tr>
<td>Mule Deer</td>
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<td>✓</td>
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</tr>
<tr>
<td>Whitetail Deer</td>
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<td>✓</td>
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</tr>
<tr>
<td>Bear (unspecified)</td>
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<td>✓</td>
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<tr>
<td>Black Bear</td>
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<tr>
<td>Brown Bear</td>
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<tr>
<td>Bighorn Sheep</td>
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<tr>
<td>Buffalo</td>
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</tr>
<tr>
<td>Caribou</td>
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<td>Grizzly</td>
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<td>Mountain Goat</td>
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<td>Small Mammals</td>
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<td>Beaver</td>
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<td>Lynx</td>
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<td>Rabbit</td>
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<tr>
<td>Silver Fox</td>
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<tr>
<td>Squirrel</td>
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<td>Weasel</td>
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<td>Wolverine</td>
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**NOTE:**

* Previously hunted at specified locations

2. **Table 19.6 Resource Use by Aboriginal Group – Birds**

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<tr>
<th>Resource: Birds</th>
<th>SFN</th>
<th>T8TA</th>
<th>BRFN</th>
<th>DTFN</th>
<th>DFN</th>
<th>HLFN</th>
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</thead>
<tbody>
<tr>
<td>Bald Eagle</td>
<td>✓</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Birds (unspecified)</td>
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<td>✓</td>
<td></td>
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<tr>
<td>Black and White Duck</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Black Duck</td>
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<tr>
<td>Blue Grouse</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Duck (unspecified)</td>
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## Resource Use by Aboriginal Group – Birds

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<th>BRFN</th>
<th>DTFN</th>
<th>DFN</th>
<th>HLFN</th>
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</thead>
<tbody>
<tr>
<td>Golden Eagle</td>
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<tr>
<td>Geese</td>
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<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Grebe</td>
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<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Grouse (chicken)</td>
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<td>Mallard</td>
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<td>Ptarmigan</td>
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<td>Rough Grouse</td>
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<td>Spruce Grouse</td>
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<td>Waterfowl</td>
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### Table 19.7

## Resource Use by Aboriginal Group – Fish

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<td>Rainbow Trout</td>
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<td>✓</td>
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<tr>
<td>Small Trout</td>
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</tr>
<tr>
<td>Bull Trout</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td></td>
</tr>
<tr>
<td>Lake Trout</td>
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</tr>
<tr>
<td>Dolly Varden</td>
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<td>✓</td>
<td></td>
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<td>Grayling</td>
<td>✓</td>
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<tr>
<td>Jackfish</td>
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<td>Kokanee</td>
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<td>Sucker</td>
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<td>Whitefish</td>
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</table>

### Table 19.8

## Resource Use by Aboriginal Group – Plants

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<tr>
<th>Resource</th>
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<th>BRFN</th>
<th>DTFN</th>
<th>DFN</th>
<th>HLFN</th>
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<tr>
<td>Berries</td>
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<td></td>
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<tr>
<td>(unspecified)</td>
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<td>Berries or Wild</td>
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<tr>
<td>Fruit</td>
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<tr>
<td>Bearberry</td>
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<tr>
<td>(Kinnikinnick)</td>
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<td>Blackberries</td>
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<td>Cloudberries</td>
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### Table 19.9  Resource Use by Aboriginal Group – Other Resources

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<th>BRFN</th>
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<tbody>
<tr>
<td>Feathers</td>
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<td>Rocks</td>
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Table 19.10 Resource Use by Aboriginal Group – Cultural Sites

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<tr>
<td>Ceremonial Flags</td>
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<td>Cultural Sites</td>
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<tr>
<td>Day Camps</td>
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</table>

NOTES:
<sup>a</sup> Buffered sites include sacred sites, burial sites, spiritual areas, and medicinal plants
<sup>b</sup> Reported to be throughout a trapline, part of which is in LAA

19.3.1.1 Blueberry River First Nations

19.3.1.1.1 Background – Blueberry River First Nations

The Blueberry River First Nations (BRFN) has two reserves covering 1,508.8 ha (Kennedy 2011). As of December 2012, BRFN has a registered population of 469, nearly half of whom reside on Blueberry River Indian Reserve No. 205, located approximately 80 km northwest of Fort St. John (AANDC 2012c). The second reserve is the south half of the Beaton River No. 204 (Treaty 8 Tribal Association 2005-2013a). The North Half of Beaton River No. 204 belongs to the Doig River First Nation (AANDC 2012f).

The BRFN is a Treaty 8 signatory but is not a member of the Treaty 8 Tribal Association (Treaty 8 Tribal Association 2005-2013e).

BRFN members are culturally Beaver (Dane-zaa), part of the Northern Athapaskan language group.

19.3.1.1.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Blueberry River First Nations

Baseline information of current land use presented in this section is based largely on the BRFN Traditional Land Use Study, (BRFN 2011) authored by Bouchard and Kennedy Consultants, commissioned by BRFN, and funded by BC Hydro (Kennedy 2011).
Additional information on current use is derived from ongoing consultation with BC Hydro with respect to the Project.

BRFN traditional territory in British Columbia extends approximately from the area south of Tumbler Ridge in the south, to the area south of the Sikanni Chief River in the north, west to the height of land in the Rocky Mountains, and east to the Alberta border (see Volume 5 Appendix A03 Part 1, Map of Blueberry River First Nations Traditional Territory).

The spatial setting for the BRFN TLUS, called the Study Area, is located south of Blueberry River Indian Reserve No. 205 and represents only a portion of BRFN traditional territory.

The Study Area used in the BRFN TLUS was defined as a 16 km strip roughly centred on the Peace River upstream from Taylor (Kennedy 2011). The area depicted on the accompanying maps, however, is significantly larger, extending to Peace Reach on Williston Reservoir. Most of the Study Area is included within the wildlife resources LAA and fish and fish habitat LAA.

A majority of the 40 BRFN members interviewed for the BRFN TLUS indicated that the vicinity of the Project is a preferred area for pursuing traditional land use activities, due to its relative accessibility and year-round abundance of moose – a key food source for band members. BRFN members reported that they believe that oil and gas activity and industrial logging occurring around the BRFN Reserve negatively impacts the food resources there, forcing them to travel to other regions of their territory (Kennedy 2011).

In Section 8 of the BRFN TLUS Report, current site-specific resource harvesting information has been extracted from the TLUS interviews for 11 culturally significant areas. Ten of these areas are entirely or partly within the wildlife resources LAA, including: the Peace River and Beatton River; Taylor and Old Fort; the Pine River; Bear Flats and Cache Creek; Halfway River and Attachie; Farrell Creek; Hudson’s Hope; Moberly River and Del Rio.

These areas are described as having cultural significance to the BRFN (Kennedy 2011). However, many resource harvesting locations mentioned in these excerpts are not depicted on the theme maps or discussed in the Contemporary BRFN TLUS Activities and TEK section in the TLUS Report.

19.3.1.1.3 Current Hunting and Trapping – Blueberry River First Nations

BRFN assert that their ancestors hunted and trapped over a wide area of the Peace River region, both north and south of the Peace River, from the Rocky Mountain foothills in the west to the Clear Hills and Grande Prairie in Alberta in the east (Kennedy 2011).

The BRFN reportedly continue to hunt, fish, trap, camp, and gather resources over a wide area within their traditional territory as part of the continued exercise of their asserted Aboriginal and Treaty 8 rights. BRFN members are likely to pursue hunting, trapping, fishing, gathering, and related traditional activities in the future. The hunting areas identified by Brody (1981), being primarily lying north of Montney between the Blueberry and Beatton Rivers, continue to be used and comprise the most noteworthy hunting and trapping areas for BRFN members today (Weinstein 1979).
Ungulates and Large Animals

BRFN reports active hunting for moose, elk, and deer within both the LAA and outside the LAA (see Volume 5 Appendix A03 Part 5, Blueberry River First Nations Moose Harvesting Map, Elk Harvesting Map and Deer Harvesting Map).

BRFN members describe hunting moose, elk, deer, and bear on both sides of the Peace River. Moose, elk, mountain sheep, and caribou are harvested north of the eastern end of Williston Reservoir. Caribou are also said to be harvested on the east side of Cameron River.

Moose is described as the preferred species for meat. The hide is also tanned and used for making moccasins and other leather work. Approximately 31 moose harvesting areas are identified in the BRFN TLUS. The highest concentration of hunting activity for moose is depicted in the Cache Creek, Halfway River, and Farrell Creek watersheds, on the north side of the Peace River, and between the lower Pine and Moberly Rivers on the south side of the Peace River. There is also a moose harvesting area along the east side of Dunlevy Creek. Most of the moose harvesting areas described fall outside the wildlife resources LAA. Small areas fall within the wildlife resources LAA (see Volume 5, Appendix A03 Part 5, Blueberry River First Nations Moose Harvesting Map).

Approximately 23 elk harvesting areas are depicted in the BRFN TLUS. The highest concentration of elk hunting activity portrayed for elk is similar to that for moose: the Cache Creek, Halfway River, and Farrell Creek watersheds, and the lower Pine and Moberly River watersheds (Kennedy 2011). There is also an elk harvesting area depicted north of Dunlevy Creek. Some private landowners are said to allow BRFN members to hunt elk in their fields along the north side of the Peace River (Kennedy 2011). Most of the harvesting areas fall outside the wildlife resources LAA. Small areas fall within the wildlife resources LAA (see Volume 5 Appendix A03 Part 5, Blueberry River First Nations Elk Harvesting Map).

Deer harvesting is said to occur at fewer locations than moose and elk harvesting, and is concentrated in the Cache Creek and Wilder Creek watersheds. Six deer harvesting areas are depicted on the Deer Harvesting Map (Kennedy 2011) and are located mostly outside the wildlife resources LAA (see Volume 5 Appendix A03 Part 5).

Five mountain sheep harvesting areas are depicted on the Mountain Sheep Harvesting map. Two are located on the east side and north of Dunlevy Creek, two are located on the west side and north of Dunlevy Creek, and one is located west of the Halfway River Reserve. The two hunting areas to the east of Dunlevy Creek are outside the wildlife resources LAA. Three caribou harvesting areas are depicted on the Caribou Harvesting map. All are located outside the wildlife resources LAA (Kennedy 2011).

Three black bear harvesting areas were depicted in the BRFN TLUS: one in the LAA on the north side of the Peace River between Farrell Creek and Halfway River; and two outside the LAA on the south side of the Peace River in the mid-Moberly River and mid-Pine River areas (Kennedy 2011). Bear meat and hide are used, and the fat is highly regarded for its healing properties (see Volume 5, Appendix A03 Part 5, Blueberry River First Nations Bear Harvesting Map).
Wildfowl, Upland Birds, and Other Birds

BRFN members report that they hunt birds, but did not provide a harvesting map depicting the hunting areas. The mouth of Wilder Creek, located in the wildlife resources LAA, is mentioned as a good bird hunting area. Grouse are said to be hunted all over (Kennedy 2011). Bird hunting is described as opportunistic, often occurring while hunting the large ungulates. In Appendix 6 of the TLUS Methodology Report, three types of birds – duck, geese, and grebes – are indicated as being hunted for personal use in the Study Area. Grouse are also noted as “opportunistic harvesting” (Kennedy 2012).

Small Game

BRFN members say they currently hunt small game for food and pelts (Kennedy 2011). No harvesting map and little information is provided in the BRFN TLUS about small game hunting locations within our outside the wildlife resources LAA or outside the LAA. However, in Appendix 6 of the TLUS Methodology Report, it is noted in Schedule C: Categories of Traditional Knowledge, Use and Occupancy as to whether the reported site-specific uses are relevant to the TLUS Study Area. Rabbit (“opportunistic hunting”) and beaver (imprecise locations) are listed as being hunted for personal use within the Study Area (Kennedy 2012).

Location and Current Use of Traplines

The southern portion of one registered trapline held by a BRFN member is located within the wildlife resources LAA.

19.3.1.1.4 Current Fishing – Blueberry River First Nations

A variety of fish species are reported to be caught by BRFN members, including the following:

- Dolly varden/Bull trout
- Rainbow trout
- Kokanee
- Jackfish/pike
- Pickerel/walleye
- Suckers
- Whitefish
- Ling cod
- Grayling

Fishing is described as occurring along the Peace River from the Alberta border to eastern Williston Reservoir. The confluences of the tributary rivers and creeks with the Peace River including Beatton River, Halfway River, Cache Creek, and Farrell Creek are described as particularly important. The Peace River from the Peace Canyon Dam to the Alberta border, and the Halfway River to the Halfway River Reserve are within the fish and fish habitat LAA (see Volume 5 Appendix A03 Part 5, Blueberry River First Nations Fish Harvesting Map).
As a result of concerns regarding pollution from industrial and farming activities in other parts of BRFN territory, BRFN members say they rely more on the Halfway River and the mouths of streams flowing into the Peace River for their fish needs (Bouchard and Kennedy Research Consultants 2012a).

19.3.1.1.5 Current Use of Plants, Trees, and Additional Resources – Blueberry River First Nations

BRFN members describe harvesting plants and berries throughout the Peace River valley. Thirteen plant food harvesting areas, most located outside the wildlife resources LAA, with some portions inside the LAA, are depicted on the Plant Food map. Chokecherries, Saskatoon berries and blackberries are noted as being particularly abundant around Bear Flats, which is within the wildlife resources LAA (Kennedy 2011). The banks of the Halfway River are noted as important for harvesting mint and Labrador tea, the area north of Fort St. John and the lower Pine River Valley are described as important for harvesting blueberries, cranberries, Saskatoon berries, strawberries, and raspberries. Butler Ridge is reported as important for high-bush blueberries and huckleberries. Saskatoon berries and chokecherries are said to be abundant around Monias Lake. Plants are used for medicinal purposes, but are noted as “not specific to Study Area” (see Volume 5 Appendix A03 Part 5, Blueberry River First Nations Plant Food Map).

19.3.1.1.6 Trails, Places, and Other Cultural Features – Blueberry River First Nations

BRFN have reported six camp sites within the LAA. Five are reported on the north side of the Peace River: one at Bear Flats, one on the lower Halfway River, two between Halfway River and Farrell Creek, and one on lower Farrell Creek. The sixth camp site is reported on the south side of the Peace River, east of the confluence with the Moberly River. Five camps are depicted as located outside the wildlife resources LAA: one is located northeast of Moberly Lake, two are located on the east side of Dunlevy Creek, two are located south of the Halfway Reserve, and one is located south of the BRFN Reserve. BRFN members are reported to use the camps while hunting, fishing, and recreational camping. An elder/youth culture camp is held at Bear Flats (see Volume 5 Appendix A03 Part 5, Blueberry River First Nations Harvesting Maps).

Information on current spiritual sites is limited in the BRFN TLUS Report. There is a discussion of graves in the Aboriginal Dane-zaa section, in which some current information is included. The area around Attachie is identified as particularly important (Kennedy 2011). One BRFN member talked of the potential for burials throughout the Peace River valley because “that’s where the old-timer Beaver Indians used to be” (Kennedy 2011).

Through consultation with BC Hydro, BRFN representatives indicated that Dancing Grounds is a sacred site, and expressed interest in protecting the land from future development. BRFN also indicated that Red Creek was a common place for members who lived in the city to meet, and emphasized the importance of protecting the lands around Pink Mountain and Muskwa Kechika, both of which are outside the wildlife resources LAA (see Volume 5 Appendix A03, Part 2). Pink Mountain is noted as an important recreational and subsistence hunting area for BRFN. It is considered a prime hunting ground and a favorite area for moose and buffalo (Kennedy 2011: 88). BRFN are reported to fish in the headwaters of the Halfway River (Kennedy 2011: 115).
Pink Mountain is also used for berry picking, unity gatherings, and culture camps (Kennedy 2011: 117;119; see Volume 5 Appendix A03, Part 2).

19.3.1.2 Saulteau First Nations

Saulteau First Nations (SFN) has one reserve, East Moberly Lake No. 169, located approximately 25 km from the town of Chetwynd, B.C., and 100 km southwest of Fort St. John. The reserve covers 3,025.8 ha (Nesoo Watchie Resource Management Ltd. 2011). As of June 2010, SFN had nearly 1,000 members, with approximately half living on-reserve. Other members live in neighbouring communities, including Chetwynd, Prince George, and Fort St. John, as well as in larger cities, including Vancouver and Kamloops.

19.3.1.2.1 Current and Reasonably Anticipated Future Use of Lands and Resources – Saulteau First Nations

The main source for baseline information was the SFN’s Culture and Tradition Study (SFN CTS) undertaken for the Project environmental assessment, with support from BC Hydro (Nesoo Watchie Resource Management Ltd. 2011). SFN members report that they currently hunt, fish, trap, and harvest additional resources in portions of the wildlife resources LAA and outside the LAA as well. They also describe an extant network of trails, cabins, and other features and special sites with portions inside the wildlife resources LAA and in the CTS Project Area outside the LAA as well.

SFN’s Project-specific traditional use depicts most of this use as occurring south of the Peace River. SFN hunting grounds (Nesoo Watchie Resource Management Ltd. 2011, Saulteau First Nations Heat Map 83) are distributed throughout the wildlife resources LAA, with concentrations in the areas around the Boucher Lake, and in the areas around Monias Lake. References for hunting ground locations in the CTS Project Area and outside the LAA are generally distributed, with concentrations in the area around the upper Moberly River, around Monias Lake, around Boudreau Lake, in the vicinity of the road leading from Moberly Lake to Boucher Lake, and in the general area of Boucher Lake.

Traplines used by SFN members are shown as distributed through most of the wildlife resources LAA, with concentrations occurring in the areas around Boucher Lake, in the area to the southwest of Monias Lake, on the south side of the Peace River opposite Hudson’s Hope, and on the south side of the Peace River upriver from Attachie. The references to trapline locations are also distributed throughout the CTS Project Area outside the wildlife resources LAA, with most locations being portrayed to the south of the Peace River, with concentrations of activity occurring around Moberly Lake, around Big Lake, along the upper Pine River, along the Moberly River, around Boucher Lake, around Monias Lake, and around Boudreau Lake.

The SFN report making concerted efforts to maintain or re-establish their connections with traditional hunting lands. They place economic, social, and cultural importance on their seasonal round and establish hunting, trapping, and gathering camps on hunting lands. These camps are attended by SFN members who engage in traditional activities and are used as a place to teach SFN youth about SFN traditional life, activities, and language, with the aim of having these carried on into the future.
19.3.1.2.2 Current Hunting and Trapping – Saulteau First Nations

SFN members consider hunting and trapping to be the mainstays of traditional SFN community life, and of the traditional economy for local subsistence and commercial purposes (Nesoo Watchie Resource Management Ltd. 2011).

Ungulates and Large Animals

Ungulate species are reported to predominate amongst the large game animals hunted for food by SFN members. Moose is described as the most sought-after species for hunters, followed by elk and deer. Some bear hunting is also described. Most large game hunting is shown as occurring south of the Peace River, and towards the southwestern portions of the wildlife resources LAA and the central portion of the area outside the wildlife resources LAA included in the CTS Project Area.

Moose hunting is reported generally throughout the southwestern portions of the wildlife resources LAA and central portion of the areas outside the LAA included in the CTS Project Area south of the Peace River, with concentrations occurring along the middle and upper watershed of the Moberly River, and in the areas around Monias Lake and the Boucher Lake.

Elk hunting is mapped generally throughout the southwestern portions of the wildlife resources LAA and central portion of the areas outside the LAA included in the CTS Project Area south of the Peace River, with concentrations occurring along the middle and upper watershed of the Moberly River, in the area around Boucher Lake, and the area around Monias Lake, and southward towards Big Lake.

Deer (unspecified) hunting is shown generally throughout the southwestern portions of the wildlife resources LAA and central portion of the areas outside the LAA included in the CTS Project Area south of the Peace River, with concentrations occurring along the middle and upper watershed of the Moberly River, and in the areas around Monias Lake, Boudreau Lake, Boucher Lake, and north of Moberly Lake. Mule deer sites hunting are mapped in the same areas, the area between the lower stretches of the Moberly and Pine River, and the area south of the Taylor below the Peace River. Whitetail deer are depicted as being hunted along the Moberly River, in the area north of Moberly Lake, around Boudreau Lake and on the north side of the Peace River north of Hudson’s Hope.

Black bear hunting sites are mapped generally throughout the southwestern portions of the wildlife resources LAA and in the central portion of the areas outside the LAA included in the CTS Project Area south of the Peace River, with some concentrations of activity occurring around Boucher Lake, around Moberly Lake, and in the general area from the Peace River south to the Pine River around Monias Lake and Boudreau Lake.

Grizzly bear hunting is shown as occurring generally throughout much of the central and eastern portions of the wildlife resources LAA and in the central and southwestern portions of the areas outside the LAA included in the CTS Project Area south of the Peace River, with some concentration in an area to the north of Moberly Lake.

Brown bear hunting is shown at a number of sites distributed through the south central portions of the wildlife resources LAA and the areas outside the LAA included in the CTS Project Area. Two sites are located in the wildlife LAA to the south and west of Monias Lake, and another site is located along the central part of the Moberly River.
No mountain goat hunting sites are portrayed within the wildlife resources LAA; several locations are mapped in the CTS Project Area but outside the wildlife resources LAA to the north and west of the west end of Moberly Lake.

Caribou hunting locations are portrayed in the CTS Project Area to the east of Moberly Lake; a part of one location falls within the wildlife resources LAA.

**Wildfowl, Upland Birds, and Other Birds**

Waterfowl are depicted as being hunted generally, with a few exceptions, along rivers, streams, lakes, and other water bodies in the wildlife resources LAA and outside the wildlife resources LAA in the CTS Project Area south of the Peace River. Ducks (unspecified) are shown as hunted in the wildlife resources LAA in the area around Boucher Lake, along the Moberly River, and around Monias Lake.

Some concentrations of mallard hunting sites are mapped on a portion of the lower Moberly River, around Boucher Lake (within the wildlife resources LAA), at the west end of Moberly Lake, and in the vicinity of Big Lake.

Black and white duck are depicted as being hunted at various locations distributed in the south central portion of the CTS Project Area outside the wildlife resources LAA (Nesoo Watchie Resource Management Ltd. 2011).

Some goose hunting sites are shown as located in the wildlife resources LAA along the Peace River downstream from Hudson's Hope, and in the vicinity of Boucher Lake; other locations outside the wildlife resources LAA in the CTS Project Area occur in the area to the north of Moberly Lake, around Monias Lake, and on the north side of the Peace River around the lower portion of Farrell Creek.

Pointed-tail duck hunting sites are depicted in the wildlife resources LAA at the east end on the south side of the Peace River; other sites are mapped elsewhere outside the wildlife resources LAA in the CTS Project Area in the area to the south and east of the Pine River.

**Upland Birds and Other Birds**

Grouse (chicken) are hunted primarily in the southern and western portions of the wildlife resources LAA and elsewhere outside the wildlife resources LAA in the CTS Project Area south of the Peace River, with a concentration in the vicinity of Boucher Lake, and in the general vicinity of the portion of the Moberly River north of Monias Lake. Blue Grouse hunting sites are concentrated along the north shore of Moberly Lake. “Prairie chicken” hunting sites occur generally through the central portion of the CTS Project Area outside the wildlife resources LAA to the south of the Peace River, with some concentrations around the upper Moberly River, around the Boucher Lake, in the area between the lower Pine and Moberly Rivers, distributed in the general area around Boudreau Lake, and on the north side of the upper Pine River.

Ptarmigan hunting occurs generally in portions of the southwestern end of the CTS Project Area south of the Peace River, with some area falling inside the wildlife resources LAA, and with some hunting also occurring in the area around Monias Lake. Most rough Grouse hunting occurs in the south central and western portions of the CTS Project Area south of the Peace River, with some activity falling inside the wildlife resources LAA.
Spruce Grouse are hunted in the wildlife resources LAA in the area south of Monias Lake and generally in to the southwestern portions of the wildlife resources LAA.

Bald Eagles, or eagle feathers (Nesoo Watchie Resource Management Ltd. 2011), are harvested at three locations in the wildlife resources LAA. One Bald Eagle resource area is shown on the south side of the Peace River between the mouths of the Pine and Moberly Rivers; Golden Eagle resource sites in the LAA are shown to the southwest of Monias Lake, along Highway 29 to the south of the Peace River and distributed along the north shore of the Peace River. Elsewhere in the CTS Project Area, but outside the wildlife resources LAA, a Bald Eagle resource site is shown to the west of Highway 29 and south of the Peace River, and four Golden Eagle sites are distributed along Highway 29 between the Peace River and Moberly Lake; several more are shown along or near the Moberly River and Boucher Lake; several also occur in the vicinity of Monias Lake; and one site is shown to the northeast of Windy Creek.

**Small Game**

SFN members report hunting or trapping a wide variety of small game and fur-bearing animals in the wildlife resources LAA, including, in descending order of number references to sites recorded during SFN CTS interviews: rabbit, beaver, wolf, lynx, marten, squirrel, muskrat, weasel, coyote, fisher, mink, wolverine, and fox. Most harvesting of these animals in the wildlife resources LAA is shown as occurring south of the Peace River, and in the south central portion of the wildlife resources LAA, the south central portion of the CTS Project Area outside the wildlife resources LAA. See (Volume 5 Appendix A23 Part 5, Saulteau First Nations Heat Map 101) for a distribution of trapline sites. The quantities of trapping sites referenced suggest that trapping is a commercial activity for some SFN members.

Rabbit are shown as harvested generally in the western parts of the wildlife resources LAA, with concentrations of activity occurring in the vicinity of Monias Lake, and in the area to the south of Boucher Lake. They are reported to be harvested elsewhere in the CTS Project Area outside the Wildlife Resource LAA along the Moberly River in the vicinity of Boudreau Lake and Monias Lake, in the area around Boucher Lake, to the north of Moberly Lake, and in the area around Big Lake.

Beaver are shown as harvested throughout much of southwestern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with concentrations along the Moberly River, the southern Pine River, and around the Boucher Lake.

Marten are shown as harvested generally throughout of the southwestern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with most activity concentrated along the Moberly River, in the vicinity of Boucher Lake, and in the areas around Moberly Lake and Le Bleu Creek.

Wolf are shown as harvested generally throughout most of the south central parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with concentrations along the Moberly River, around Boucher Lake, and in the area around Boudreau Lake.

Lynx are shown as harvested generally throughout most of the south parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with concentrations along the Moberly River, the southern Pine River, around Boucher Lake, and along Medicine Woman Creek.
Squirrel are shown as harvested generally throughout the south and central parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with most activity concentrated along the eastern part of the Moberly River, the southern part of the Pine River, around Boucher Lake, and around Moberly Lake.

Muskrat are shown as harvested generally throughout the southwestern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with activity concentrated along the western part of the Moberly River, along the south Pine River, and around Moberly Lake, Boucher Lake, Jackfish Lake, and Big Lake.

Weasel are shown as harvested generally throughout the southwestern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with activity concentrated in the areas around Boucher Lake, Boudreau Lake, Monias Lake, and around Moberly Lake.

Coyote are shown as harvested generally throughout the southwestern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with most activity concentrated in the areas around Boucher Lake, Boudreau Lake, Monias Lake, and along the Moberly River.

Fisher are shown as harvested generally throughout the southwestern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with most activity concentrated along the Moberly River, in an area around Boucher Lake, and in the area north of Moberly Lake.

Mink are shown as harvested generally throughout most of the southern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with most activity concentrated along the Moberly River, in the areas around Boucher Lake, Boudreau Lake, and north of Moberly Lake.

Wolverine are shown as harvested generally throughout most of the central and southern parts of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA, with most activity concentrated along the upper Moberly River, in the areas around and north of Boucher Lake, north of Moberly Lake, and around Big Lake.

Fox harvesting activity in the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA is shown as concentrated in the areas around Boudreau Lake, Monias Lake, and Boucher Lake. One reference to a silver fox harvesting site is located in the western part of the wildlife resources LAA. They are shown as harvested elsewhere through the western and southern part of the CTS Project Area outside the wildlife resources LAA.

Location and Current Use of Traplines

A number of traplines were registered to SFN people, and several SFN members hold and operate trapline licenses today (BC Hydro 2012a; 2012b; Chatten et al. 2012). Portions of the wildlife resources LAA lie within the boundaries of six traplines held by SFN members (BC Hydro 2012a); all are located on the south side of the Peace River. Interviews conducted with 5 licence holders for these traplines provides complementary information to that provided in the SFN CTS concerning hunting and trapping in the wildlife resources LAA and outside the LAA (Chatten et al. 2012).

1) TR0731T007 is located to the southwest of Hudson’s Hope. The trapline is described as being used generally for hunting, trapping, and other purposes. Marten, fisher,
mink, and beaver (castor is used for medicine) are reported to be trapped, and
wolves and coyotes snared. Trapping is shown as occurring in the northeastern part
of the trapline in the wildlife resources LAA along the Peace River.

2) TR0732T002 is located to the north of Moberly Lake and includes the area around
Boucher Lake; the northwest end of the trapline extends to the Peace River and
includes part of the wildlife resources LAA. The proposed transmission line portion of
the wildlife resources LAA also traverses the trapline. The trapline is described as
being used two to three months of the year by all members of the trapline owner’s
family. They report hunting or trapping (with traps) all available fur-bearers and other
animals and birds, including beaver, otter, geese, ducks, marten, fisher, rabbits, lynx,
coyote, wolverine, squirrels, weasels, mink, and wolverine. Most activity is reported
to occur around lakes and wetland areas and in moose wintering areas.

3) TR0732T004 is located on the south side of the Peace River opposite the mouths of
Cache Creek and the Halfway River, and extends south towards the Moberly River,
and includes the area around Boudreau Lake. It includes a part of the wildlife
resources LAA on the south side of the Peace River. The trapline is reported to be
worked by one member of the family that owns the trapline; marten, otter, beaver,
fisher, coyote, wolf, and other fur-bearers are trapped, with wolves and marten being
the main target species.

4) TR0732T005 includes the general areas around lower Moberly River and Pine River.
The trapline includes portions of the wildlife resources LAA. The trapline is registered
and used by the owner, but it was stated that it will start to be used as a family
trapline. The key species described as being trapped are marten, fisher, and lynx;
but mink, squirrels, beaver, muskrat, and wolf are also reportedly trapped. The area
around Septimus to the Peace River is the described as the most successful area for
trapping.

5) TR0732T006 is located between the Pine and Moberly Rivers, from the vicinity of Big
Lake in the south, to the area of the mouth of Windy Creek to the northeast, with a
portion extending on the eastern side of the Pine River. The trapline is inside the
Wildlife RAA and is traversed by a portion of the wildlife resources LAA where there
are many beaver ponds. The trapline is described as being currently operated by one
individual, with marten, fisher, wolf, beaver, muskrat, and bears being the species
harvested with traps and snares; the entire trapline is generally trapped.

6) TR0732T007, located to the west of the Pine River and east of Halfmoon Lake, from
Big Lake in the north to East Pine in the south, includes a part of the wildlife
resources LAA. No interview was conducted with the trapline licence holder, a SFN
member.

Portions of traplines TR0731T010 and TR0722T005, with licences held by SFN
members, are included outside the wildlife resources LAA.

Project effects on tenured traplines are assessed in Volume 3 Section 24 Harvest of Fish
and Wildlife Resources.

19.3.1.2.3 Current Fishing – Saulteau First Nations

Fishing is described as having played an important role in the SFN traditional annual
round of economic and cultural pursuits, and continues to be pursued today
(Weinstein 1979).
Fishing is reported to occur in the fish and fish habitat LAA primarily in the Peace River and in the Moberly River, but also elsewhere in other streams and water bodies, most located south of the Peace River. SFN members report fishing for the following species in the fish and fish habitat LAA, in descending order of number of references to sites during interviews: rainbow trout, Dolly Varden, trout (unspecified), jackfish, grayling, bull trout, sucker and small trout.

At a meeting with BC Hydro on October 1, 2012, SFN representatives indicated that whitefish and walleye are also species of interest, as well as burbot and lake trout, the latter two being caught at Moberly Lake (see Volume 5 Appendix A23, Part 2).

SFN advised that Carbon Inlet was important to SFN. SFN indicated that access to key fishing sites was a concern and cautioned that certain mitigation measures, such as fish restocking, had not worked in Moberly Lake, where lake trout were lost.

Rainbow trout are described as being caught generally throughout of the southwestern parts of the fish and fish habitat LAA in the CTS Project Area, with concentrations of activity in the Peace River and Moberly River. Trout (unspecified) are said to be caught generally throughout of the southwestern parts of the fish and fish habitat LAA in the CTS Project Area, with some concentration of activity in the Moberly River. Bull trout are reported to be caught in the fish and fish habitat LAA in the Peace River in the CTS Project Area, and, to a lesser extent, along the Moberly River. Small trout are described as being caught in the in the western part of the fish and fish habitat LAA in the CTS Project Area.

The SFN CTS reports dolly varden being caught generally throughout the southwestern parts of the fish and fish habitat LAA in the CTS Project Area, with concentrations of activity in the Peace River and, to a lesser extent, in the Moberly River.

At a meeting on November 22, 2012, SFN advised BC Hydro that during bull trout runs, SFN members camp at the Halfway River, catch a substantial amount of fish, and eat them throughout the year.

Jackfish are reportedly caught generally throughout the southwestern parts of the fish and fish habitat LAA and the CTS Project Area outside the fish and fish habitat LAA, with most activity concentrated in Moberly River, Moberly Lake, Cameron Lakes, and Boucher Lake.

Grayling are described as being caught generally throughout the central and southern parts of the fish and fish habitat LAA and the CTS Project Area outside the fish and fish habitat RAA, with some concentration of activity in the Moberly River, and the area around and north of Moberly Lake.

Suckers are reportedly caught in the fish and fish habitat LAA in the Peace River, and, to a lesser extent, along the Moberly River; and in the CTS Project Area outside the fish and fish habitat RAA in Moberly Lake, the Moberly River and the Pine River.

19.3.1.2.4 Current Use of Plants, Trees, and Additional Resources – Saulteau First Nations

SFN members report harvesting several types of plant and tree resources in the wildlife resources LAA and in the CTS Project Area outside the wildlife resources LAA, mostly south of the Peace River. These include (in descending order of frequency): berries, trees (wood), plants (herb), Labrador tea, rat root, bulrush, wild onion, hay, and lumber.
There is little specific information presented in the CTS concerning the traditional uses of the resources harvested.

Berries are described as being collected generally in the wildlife resources LAA, with a concentration of activity in the area to the south of Boucher Lake. Berries are also said to be collected in the CTS Project Area outside the wildlife resources LAA, with concentrations of harvesting occurring along the shores of Moberly Lake, in the upper Moberly River watershed, in the area around Boucher Lake, and in the general area of Moberly Lake.

Trees are referenced as being harvested in the wildlife resources LAA along the north shore of the Peace River between Attachie and the Peace Canyon Dam, in the general area of Boucher Lake, and near Windy Creek. They are also reported as harvested elsewhere in the CTS Project Area outside the wildlife resources LAA in an area extending northward from Moberly Lake and including Boucher Lake, elsewhere around Moberly Lake, in the middle portion of the Moberly River watershed, and in the general vicinity of Big Lake.

Plants (herbs) are reported as harvested in the wildlife resources LAA in the area to the south of Boucher Lake and in the area around Monias Lake. They are also referenced as harvested in the CTS Project Area outside the wildlife resources LAA in the general area around Boucher Lake, around Monias Lake, along the shores of Moberly Lake, around Cameron Lakes, and around Big Lake.

Labrador tea is described as being harvested in the wildlife resources LAA along the Peace River (in the western part of the LAA) and in the areas around Boucher Lake, the Moberly River, Monias Lake, and Attachie. It is also reported as harvested in the CTS Project Area outside the wildlife resources LAA in the middle part of the Moberly River watershed, in a portion of the watershed of the Pine River, around Big Lake, around Moberly Lake, around Cameron Lakes, in an area that extends from the north shore of Moberly Lake to Boucher Lake, and in an area north and west of Attachie.

Rat root is shown as harvested in the wildlife resources LAA in the area around Boucher Lake, and in the CTS Project Area outside the wildlife resources LAA in the same general area. Rat root appears to be used by many SFN members (Chan et al. 2011).

Bullrush is mapped as harvested generally in the western parts of the wildlife resources LAA, and in the CTS Project Area outside the wildlife resources LAA, at locations at the east end of Moberly Lake, around Big Lake, and in the vicinity of the confluence of Farrell Creek and Alder Creek.

Wild onion is shown as harvested generally in the central portions of the wildlife resources LAA and the CTS Project Area outside the wildlife resources LAA with concentrations of activity in the vicinity of the confluence of Farrell Creek and Alder Creek, and at a location to the northeast of Moberly Lake.

Lumber is mapped as obtained in the wildlife resources LAA at one site around Monias Lake and another to the west of that location. It is also obtained north and west of Moberly Lake.

Hay is shown as harvested in the wildlife resources LAA at one location near Boucher Lake, and in the CTS Project Area outside the wildlife resources LAA on the north side of Moberly Lake.
19.3.1.2.5 Trails, Places, and Other Cultural Features – Saulteau First Nations

The SFN CTS interviews also obtained information about various “location types” that might be adversely impacted by the project within the LAA in the CTS Project Area outside the LAA. The location types include several that relate to traditional SFN activities, including those listed below (Nesoo Watchie Resource Management Ltd. 2011):

- **Cabins:** There are 11 references to cabins located in the LAA to the south and east of Boucher Lake. Elsewhere in the CTS Project Area outside the LAA, references to cabins are located in the area around or at Big Lake and Graveyard Creek, and on or near the Moberly River south of Boudreau Lake.

- **Camps:** There are 79 references in the SFN CTS to camps located within the LAA. Many references are to camps located along the south side of the Moberly River near the mouth, on the north side of the Pine River near the mouth, near Monias Lake, and through the eastern end of the proposed transmission line right-of-way. Other camp locations are shown on the north side of the Peace River to the southwest and northeast of Attachie, and on the south side of the Peace River opposite Attachie. In the CTS Project Area outside the LAA, references to camp locations are spread along the north side of the Peace River from Williston Reservoir to an area to the west of Attachie, near the north and south sides of the Moberly River, to the east of Boudreau Lake, to the area north of Monias Lake, and in the vicinity of Highway 97 near Foss and Groundbirch, and of 275 Road north of Groundbirch.

- **Day Camps:** There are six references to day camps in the LAA, located south of Boucher Lake, near Monias Lake, along both sides of the Peace River between Dinosaur Lake and Attachie, and at the east end of Williston Reservoir. In the CTS Project Area outside the LAA, there are references to other day camps located in the area around a bridge over the Moberly River, in the area around Boucher Lake, on the north shore of Moberly Lake, on the Moberly River northeast of Moberly Lake, and around Big Lake.

- **Trails:** There are 22 references to trails in the LAA, located in the area to the south of Boucher Lake, to the south and west of Monias Lake, near the mouth of the Moberly River, and at a pair of locations on the south side of the Peace River. In the CTS Project Area outside the wildlife resources LAA, concentrations of trail locations are shown along the north side of Moberly Lake, to the north of Cameron Lakes, and along a route leading from Boucher Lake to the vicinity of Boudreau Lake, and then proceeding to join the Moberly River. Other routes are shown extending as a network through much of the eastern portion of the RAA to the south of the Peace River.

- **Burial Grounds:** There is one reference to the location of a burial ground area, spread over a large area located in the LAA in the general vicinity of Hudson’s Hope. Other references to burial grounds are portrayed in the CTS Project Area outside the wildlife resources LAA in the area around Moberly Lake, in the vicinity of Graveyard Creek, along a route from Moberly Lake to Big Lake, and around a lake to the northwest of Monias Lake.

In general, the CTS describes that every summer SFN members establish hunting, trapping, and gathering camps where community members stay. It is also reported that while engaging in traditional activities, SFN youth learn about SFN language, culture,
19.3.1.3 Treaty 8 Tribal Association

19.3.1.3.1 Background – Treaty 8 Tribal Association

The Treaty 8 Tribal Association (T8TA) traditional use study represents Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

Doig River First Nation (DRFN) has two reserves, Doig River No. 206 and Beatton River No. 204 (North Half), with a combined area of 1358.1 ha (AANDC 2012f). The main community is located on Doig River No. 206, about 30 km northeast of Fort St. John (MARR 2012). Facilities in the community include a cultural and administrative centre, a learning centre, a convenience store, and a daycare (in progress) (Treaty 8 Tribal Association 2005-2013). The cultural and administrative centre is a large complex that, in addition to being used by DRFN members, offers public exhibitions, and programs and events so that adjoining communities and tourists can learn about and participate in DRFN culture (Ministry of Canadian Heritage 2012).

In December 2012, DRFN had a registered population of 293, with 126 members living on-reserve. DRFN has a Chief and two Councillors, and is a Section 11 Indian Act band (AANDC 2012f). According to DRFN:

“Today, our people are living in a hybrid world that integrates non-Aboriginal culture and economy with our Dane-zaa traditional knowledge and hunting culture. We are engaged in a range of business ventures and cultural activities that are focused on strengthening our economic base, improving the health of our community, and maintaining Dane-zaa traditions and language (Virtual Museum Canada 2012).”

DRFN is a member of the T8TA and the Council of BC Treaty 8 Chiefs (Treaty 8 Tribal Association 2005-2013).

Prophet River First Nation (PRFN), also known as Dene Tsaa First Nation, has one reserve, Prophet River No. 4, with an area of 373.9 ha. The reserve is located approximately 100 km south of Fort Nelson on Highway 97.

PRFN’s total registered population as of December 2012 is 260 with an on-reserve population of 103. PRFN has a Chief and two councilors, and uses a custom electoral system (AANDC 2012m). PRFN is a member of the T8TA and the Council of BC Treaty 8 Chiefs (Treaty 8 Tribal Association 2005-2013).

West Moberly First Nations (WMFN) has one reserve, situated on 2033.6 ha of land at the west end of Moberly Lake (West Moberly Lake No. 168A) (AANDC 2012s). The reserve is located roughly halfway between Hudson’s Hope and Chetwynd, B.C., about 90 km southwest of Fort St. John, B.C. (B.C. Court of Appeal 2011).

As of December 2012, WMFN has a registered population of 258, including 103 members living on-reserve. WMFN has a Chief and four Councillors and uses a custom electoral system (AANDC 2012s). WMFN is a member of the T8TA and the Council of BC Treaty 8 Chiefs (Treaty 8 Tribal Association 2005-2013).
Halfway River First Nation (HRFN) has one reserve, Halfway River No. 168, with an area of 3988.8 ha (AANDC 2012i). HRFN’s main community is located on the north bank of the Halfway River, about 100 km northwest of Fort St. John (MARR 2012).

As of December 2012, HRFN had a registered population of 256, with 145 members living on-reserve. HRFN has a Chief and two Councillors, and uses the Indian Act electoral system (AANDC 2012i). HRFN is a member of the T8TA and the Council of BC Treaty 8 Chiefs (Treaty 8 Tribal Association 2005-2013).

### 19.3.1.3.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Treaty 8 Tribal Association

Information on current T8TA use of lands and resources was derived primarily from the traditional land use study undertaken for BC Hydro by the T8TA, a letter from T8TA responding to questions regarding the TLUS (Candler et al. 2012b; Treaty 8 Tribal Association, Tribal Chief 2012 pers. comm.) and the Treaty 8 First Nations Community Profile Report, which encompasses DRFN, HRFN, PRFN and WMFN (Treaty 8 First Nations Community Assessment Team and the Firelight Group Research Cooperative 2012). In addition, a range of publicly available published and unpublished studies was reviewed for information on traditional land and resource use by T8TA members.

The TLUS Local Study Area (LSA), which was the area of focus in the interviews, covers a larger area than the wildlife resources LAA. The TLUS LSA encompasses the footprint of the Project with a 5 km buffer, whereas the wildlife resources LAA includes the footprint with a 1 km buffer. The TLUS LSA is totally within the Wildlife Resources and fish and fish habitat RAAs.

Subsistence use values or harvesting locations located outside of the TLUS LSA are depicted on the Comprehensive Study Results map (Candler et al. 2012, Treaty 8 Tribal Association Traditional Land Use Map 9). This map includes sections of the wildlife resources LAA not in the TLUS LSA and all of the area of the wildlife resources RAA.

Treaty 8 First Nations members describe the Peace River valley, especially the area between Hudson’s Hope and Taylor, as a “critical, essential and irreplaceable part of the cultural landscape”. Current T8TA use values recorded for the TLUS are concentrated along the north side of the Peace River at the confluences with tributaries. Many of the confluence areas are stated to be heavily used ancestral gathering places (Candler et al. 2012b).

WMFN has described the Peace River Sub-Basin as their preferred Treaty territory (WMFN Land Use Department 2012). Currently, WMFN report preferential harvesting areas west of Moberly Lake, up Johnson Creek Road and South Moberly Road, and has identified an area close to the West Moberly reserve, as an Area of Critical Community Interest (ACCI). It has also identified an area of particularly significant concern within the ACCI, known as the Peace-Moberly Tract. The Peace-Moberly Tract comprises approximately 1,090 km² of land lying between Moberly Lake and the Peace River. The northern boundary of the Peace-Moberly Tract follows the Peace River between Dinosaur Lake and Peace Boudreau Park, while the southern boundary follows the Moberly River watershed both upstream and downstream from Moberly Lake. Most of the WMFN reserve lands lie within the Peace-Moberly Tract (ILMB 2006).

In a 2010 report for the Halfway River First Nation, the north side of Peace Reach is noted as an area currently preferred by the Halfway River First Nation to exercise their...
treaty and Aboriginal rights, as extensive industrial activity in other areas within the Peace Region has constrained their ability to exercise their rights in those areas (HRFN Lands Department 2010).

HRFN members report areas of current highest use and value by include: around the Halfway Reserve down the Halfway River to Attachie, Crying Girl Prairie, Chowade River, Farrell Creek between Hudson’s Hope and the upper Halfway River, Christina Falls, and the Graham River watershed (Treaty 8 First Nations Community Assessment Team and the Firelight Group Research Cooperative 2012).

The PRFN primary traditional use area is reported as located north of the Sikanni Chief River and Pink Mountain. PRFN members say they have close connections to the people of Halfway River, and continue to travel to the Peace River valley for harvesting and annual gatherings held at Attachie and Bear Flats (Treaty 8 First Nations Community Assessment Team and the Firelight Group Research Cooperative 2012).

In the Treaty 8 First Nation Community Baseline Report (Treaty 8 First Nations Community Assessment Team and the Firelight Group Research Cooperative 2012), the preferred areas identified as currently used by DRFN members are north of the Reserve to Fontas River; near the Doig and Beatton Rivers, and toward and across the Alberta border, including Boundary Lake and Ole Lake. These areas are reportedly now used more than the Peace River region. Land alienation is stated as the primary factor for the loss of use of the Peace River area (Treaty 8 First Nations Community Assessment Team and the Firelight Group Research Cooperative 2012).

19.3.1.3.3 Current Hunting and Trapping – Treaty 8 Tribal Association

Subsistence use values or harvesting locations, including for hunting and fishing, in the TLUS LSA are depicted on the Subsistence Use Study Results Maps (Candler et al. 2012b, Maps W5, E5, 9). The confluences of tributary rivers/creeks with the Peace River along the north shore are described in the TLUS Report as the preferred fishing and/or hunting areas. Bear Flats and Cache Creek, Farrell Creek, Halfway River, Lynx Creek, and Hudson’s Hope are noted as being of particular importance (see Volume 5 Appendix A06 Part 5, Map W5).

In order of frequency, the species shown as harvested include: moose (16), white-tailed deer (7), mule deer (6), and elk (6). Small concentrations of ungulates are depicted at Bull Flats, Bear Flats, and east of Taylor. One bear was also depicted at Bear Flats.

Outside the wildlife resources LAA, but within the TLUS LSA, there are an additional 95 ungulates depicted on the Subsistence Use Study Results and Comprehensive Study Results maps.

Thirty-five subsistence use values for ungulates depicted on the Subsistence Use Study Results and Comprehensive Study Results Maps are located within the wildlife LAA.
(Candler et al. 2012b, Maps W5, E5, 9). In order of frequency, the species harvested are shown to include: moose (49), elk (28), white-tailed deer (12), mule deer (3), caribou (1), mountain sheep (1), and bison (1). Concentrations of ungulates are located between Bullhead and Portage mountains (mixed), at Farrell Creek (moose), near Carey Creek (elk), at the west end of Moberly Lake (mixed), and south of Taylor (mixed). There also two bear depicted outside the wildlife resources LAA, but within the TLUS LSA.

Subsistence areas and subsistence lines are another feature depicted on the Study Results and Comprehensive Study Results maps (Candler et al. 2012b, Maps W5, E5, 9). The terms are not defined. No information is provided as to what is being harvested at these locations. Many of the areas are depicted as linear. Six of the subsistence areas follow whole or in part a “limited use road” on the base map.

Fourteen subsistence areas depicted on the maps are located within the wildlife resources LAA. Thirteen of the subsistence areas/lines are located on the north side of the Peace River: three west of Fort St. John Park, two east of Wilder Creek, one at the confluence with the Halfway River, one on the lower Halfway River, two between Halfway River and Farrell Creek, two west of Farrell Creek, one at Coffee Pot, and one at Bull Flats. The other subsistence area is depicted on the south side of the Peace River west of Boucher Lake.

Outside the wildlife resources LAA, but within the TLUS LSA, 26 additional subsistence areas/lines are depicted on the Subsistence Use Study Results and Comprehensive Study Results maps: three south of Boucher Lake, one east of Boucher Lake, three south of Coffee Pot, one at Carbon Lake, four at West Moberly Lake, seven between the east end of Williston Reservoir and Portage Creek, one east of mid-Brenot Creek, one at the mouth of Dunlevy Creek, one at the Graham River, two in the area of Halfway River Reserve 168, and two northeast of the Halfway River Reserve.

Traditional Ecological Knowledge

Three environmental use values are depicted on the Environmental Maps: environmental areas, environmental features, and environmental corridors. The majority of these values are recorded along the north side of the Peace River in the LSA.

Environmental use values depicted and labelled include: moose, elk, deer, and bear habitats; eagle, duck, goose, beaver, and fish habitats; river crossings for moose, deer, elk, bear, and horses; and sightings of moose, elk, deer, and grizzly bear. There are also a number of calving areas labelled on the islands in the Peace River. Two natural water springs are identified southwest of Bear Flats. Three horse habitats are depicted around the lower Moberly River. A buffalo jump with buffalo remains is depicted east of Bear Flats (see Volume 5 Appendix A06 Part 5, Maps W5, E5).

Wildfowl, Upland Birds, and Other Birds

Four subsistence use values for birds, one Grouse, and three ‘chickens’ depicted on the Subsistence Use Study Results and Comprehensive Study Results maps are located within the wildlife resources LAA. The three “chicken” symbols are located at Bear Flats. A number of habitats for eagles, ducks, and geese are depicted along the Peace River on the Environmental Study Results maps.

Outside the wildlife resources LAA, but within the TLUS LSA, there are an additional 19 birds depicted on the Subsistence Use Study Results and Comprehensive Study Results maps. In order of frequency, the species shown include: 10 "chickens".
six Grouse, two geese, and one duck (see Volume 5 Appendix A06 Part 5, Maps W5, E5, 9).

**Small Game**

Four subsistence use values for small mammals, one marten and three beaver, depicted on the Subsistence Use Study Results and Comprehensive Study Results maps, are within the wildlife resources LAA (see Volume 5 Appendix A06 Part 5, Maps W5, E5, 9).

The marten symbol is located in the mid-Maurice Creek area, one beaver symbol is located north of Bear Flats, one is located on the Peace River west of Bear Flats, and one is located on the lower Pine River (see Volume 5 Appendix A06 Part 5, Maps W5, E5). Outside the wildlife resources LAA, but within the TLUS LSA, there are an additional 10 small mammals depicted on the Subsistence Use Study Results and Comprehensive Study Results maps. In order of frequency, the species shown include: three beavers, three coyotes, two rabbits, one marten, and one other fur-bearer.

**Location and Current Use of Traplines**

As there are few depictions of small fur-bearers, either commercial trapping figures were excluded from the TLUS or trapping is currently not being broadly pursued. No registered traplines held by T8TA members are located within the area of the wildlife resources LAA on the 1980 trapline map by Brody or the 2012 trapline map by BC Hydro (Brody 1981, Map 5; BC Hydro 2012a).

No DRFN traplines were identified within the wildlife resources LAA.

In 2000, the WMFN identified three traplines held by the community. However, none are within the wildlife resources LAA.

**19.3.1.3.4 Current Fishing – Treaty 8 Tribal Association**

Approximately 109 values depicted for fish on the Subsistence Use Study Results and Comprehensive Study Results maps are within the fish and fish habitat LAA: whitefish (10), jackfish (7), bull trout (6), lake trout (5), pickerel or walleye (3), sucker (1), and other fish (77) (see Volume 5 Appendix A06 Part 5, Maps W5, E5, 9). Fish symbols are concentrated at confluences along the Peace River at Portage Creek, Lynx Creek, Halfway River, east of Taylor, and at the mouth of the Beatton River. There is also a small concentration on the Halfway River near Halfway River Reserve 168 (see Volume 5 Appendix A06 Part 5, Map 9). Five fish habitat areas on the Peace River depicted on the Environmental Maps are located within the wildlife resources LAA (see Volume 5 Appendix A06 Part 5, Maps W3, E3).

**19.3.1.3.5 Current Use of Plants, Trees, and Additional Resources – Treaty 8 Tribal Association**

The south-facing slopes of the Peace River valley are identified with cultural use values for collecting sage and unidentified rare medicinal plants. Medicinal plants are buffered data on the Cultural Use Study Results maps and cannot be identified. There is, however, one medicinal plant habitat area depicted on the north shore of the Peace River opposite the confluence with the Moberly River on Environmental Study Results Map E3.

Thirteen berry or wild fruit use values depicted on the Subsistence Use Study Results and Comprehensive Study Results maps are located within the wildlife resources LAA.
Most are located along the Peace River. Two firewood locations are depicted at Bear Flats and another two locations between Farrell Creek and Halfway River. Outside the wildlife resources LAA, but within the TLUS LSA, there are an additional 13 berry or wild fruit use values depicted. There is a small concentration of berry or wild fruit symbols west of the Halfway River Reserve 168, and at the west end of Moberly Lake. The other berry or wild fruit use values are scattered over the TLUS LSA but outside the wildlife resources LAA.

Four firewood locations are depicted outside of the wildlife LAA.

Two natural water springs are identified southwest of Bear Flats. Four drinking water source locations are depicted on the Subsistence Use Study Results maps within the wildlife resources LAA, one at the south side of the Peace River at the mouth of Moberly Creek, one west of Bear Flats, and two at Hudson’s Hope (see Volume 5 Appendix A06 Part 5, Maps W5, E5).

19.3.1.3.6 Trails, Places, and Other Cultural Features – Treaty 8 Tribal Association

There are 136 habitation use values depicted on the Habitation Use Study Results and Comprehensive Study Results maps that are within the wildlife resources LAA: 59 gathering places, 53 temporary habitations, and 24 permanent habitations. There are concentrations of habitation use values shown along the north shore of the Peace River at Farrell Creek, Lynx Creek, Halfway River, Bear Flats and Cache Creek, and on both sides of the river at Hudson’s Hope. There are smaller concentrations shown on the north shore of the Peace River opposite Moberly River, at Fort St. John Historic Park, and at Taylor.

Outside the wildlife resources LAA, but within the TLUS LSA, there are an additional 57 habitation use values depicted on the Habitation Use Study Results and Comprehensive Study Results maps: 26 temporary, 26 permanent, four gathering places, and one habitation area. There are small concentrations of habitation symbols at the west end of the Moberly Lake, on Highway 29 north of West Moberly Reserve 168A, on the Beatton River west of the Doig River Reserve 206, and west of the Halfway River Reserve 168.

In the TLUS Report, the author stated that 30 transportation values were within the Project footprint and flood zone, including: portions of trails, horse crossings, raft or boat crossings, and water routes by canoe and motorboat (Candler et al. 2012b). Two transportation use values, transportation lines and water routes, are depicted on the Transportation Study Results maps (see Volume 5 Appendix A06 Part 5, Maps W6, E6). Outside the wildlife resources LAA, but within the TLUS LSA, there are at least four water routes extending along the Peace River from Hudson’s Hope eastwards to the confluence with the Beatton River. There are four transportation lines along the Halfway River, of which the lower sections are within the wildlife resources LAA; three roughly follow the river from the mouth to Halfway River Reserve 168, and one extends from the mouth of the river along the height of land on the west side to Halfway River Reserve 168. There are five shorter transportation lines depicted in the area of the Peace River including: two on the south side of the Peace River near the mouth of the Moberly River; one on the lower Pine River; one east of Bear Flats; and one along the west side of lower Farrell Creek.
Outside the wildlife resources LAA, but within the TLUS LSA, there are four additional transportation lines: two in the area south and west of Bull Flats, one west of mid-Maurice Creek; and one that extends down Dunlevy Creek across Williston Reservoir and south to West Moberly Lake (see Volume 5 Appendix A06 Part 5, Maps W6, 9).

T8TA describe the Peace River valley as a cultural landscape with many place names and associated histories reflecting Dunne-za (Beaver) ties to the land. Within the wildlife resources LAA, there are 76 cultural use values depicted on the Cultural Use Study Results map and the Comprehensive Results map: buffered data areas (44), place names (12), teaching areas (9), cultural areas (3), heritage resources (3), feathers (2), cultural lines (2), and cultural plants (1) (see Volume 5 Appendix A06 Part 5, Maps W2, E2, 9).

The cultural use areas are shown concentrated along the banks of the Peace River, with a higher concentration at stream confluences on the north shore. Bear Flats and Attachie at the mouth of the Halfway River are depicted as having the greatest concentration of cultural use values (Candler et al. 2012a; WMFN Traditional land Use and Occupancy Study Team 2000). One feathers location corresponds to the location of eagle nests depicted on Environmental Study Results map W-3 (Candler et al. 2012b).

Burials associated with the 1919 flu epidemic are reported to be in the Peace River valley at Attachie. The grave of Chief Attachie is reported to be on the south-facing slope at Attachie. The valley bottom downstream of Bear Flats is another area reported to be a burial location. Multiple burials are also reported to be at Halfway River (Candler et al. 2012b; WMFN Traditional land Use and Occupancy Study Team 2000).

Outside the wildlife resources LAA, but within the TLUS LSA, there are an additional 27 cultural use values depicted on the Cultural Use Study Results and Comprehensive Study Results maps: buffered data areas (9), place names (6), cultural lines (5), teaching areas (4), heritage resources (1), feathers (1), and cultural plants (1). The locations of the cultural use values are widely dispersed, including at Carbon Lake, East and West Moberly Lake, Rene Lake, Stewart Lake, Butler Ridge, upper Farrell Creek, and mid- and lower Kobes Creek (see Volume 5 Appendix A06 Part 5, Map 9).

19.3.1.4 McLeod Lake Indian Band

19.3.1.4.1 Background – McLeod Lake Indian Band

The McLeod Lake Indian Band (MLIB) has 21 reserves with a combined area of more than 20,000 ha. The main community is located on Indian Reserves No. 1 and No. 5, located on opposite banks at the north end of McLeod Lake, about 150 km of Prince George (BC Treaty Commission 2003, Statement of Intent, McLeod Lake Indian Band Territory Map).

In 2010, the band had 491 registered members (MARR 2012). MLIB has a Chief and six Councillors (two on-reserve, two off-reserve, an elder Councillor and a youth Councillor) (MLIB 2012).
19.3.1.4.2 Current and Reasonably Anticipated Future Use of Lands and Resources – McLeod Lake Indian Band

Information on MLIB current and future use of lands and resources was derived from a limited number of publicly available published and unpublished studies.

The traditional territory of the MLIB, as described on the MLIB website (see Volume 5, Appendix A15, Part 1, McLeod Lake Indian Band Traditional Territory Map), is an area of approximately 108,000 km² (MLIB 2012). A portion of the MLIB traditional territory depicted on the south side of the Peace River includes portions of the wildlife resources LAA that are on the south side of the Peace River as well.

The MLIB state they have used the lands and resources throughout their asserted traditional territory for traditional purposes including hunting, fishing, and gathering in the past and currently, and they anticipate doing so into the future.

19.3.1.4.3 Hunting and Trapping – McLeod Lake Indian Band

MLIB indicated to BC Hydro that the following species are of high importance to MLIB members: caribou, grizzly bear, wolverine, moose, elk, groundhogs or marmot, Grouse, deer, black bear, fisher, grayling, and bull trout (see Volume 5 Appendix A15, Part 2).

An Aboriginal Traditional Knowledge report prepared for the MLIB indicates that MLIB members currently hunt a range of species, including the following:

- Large mammals: moose, elk, deer, bear
- Small game: marmot, beaver, and rabbit
- Birds: Grouse, ptarmigan, geese, and ducks

Species reportedly trapped include beaver, squirrel, marten, mink, fisher, otter, lynx, wolves, coyote, and fox (FMA Heritage Inc. 2010).

No specific information was identified that described or documented current or reasonably anticipated future use by MLIB members of lands and resources within the Current Use of Lands and Resources LAA for hunting, fishing, or trapping activities. MLIB is undertaking a traditional use study for the Project. The results of the study will be considered and incorporated into the EIS, where appropriate, during the EIS review phase.

19.3.1.4.4 Current Use of Plants, Trees, and Additional Resources – McLeod Lake Indian Band

MLIB members are reported to pick blueberries, soapberries, huckleberries, low-bush and high-bush cranberries, Saskatoon berries, strawberries, raspberries, chokecherries, currants, and gooseberries. The berries are either put in jars or frozen (FMA Heritage Inc. 2010).

Plants, including Labrador tea, mint tea, devil’s club, strawberries, juniper, violet, fireweed, red willow, jack pine, balsam, pine bark, and pine sap, are described as harvested for medicinal purposes, primarily from wetlands (FMA Heritage Inc. 2010).

Other plants said to be of importance to MLIB are lodgepole pine, wild rhubarb, stinging nettle, fireweed, and cow parsnip (see Volume 5 Appendix A15, Part 2).
19.3.1.4.5 Trails, Places, and Other Cultural Features – McLeod Lake Indian Band

MLIB report that members have cabins and camping areas, located throughout their traditional territory, that are used when undertaking traditional activities, particularly trapping and hunting.

No specific information was identified that described or documented current use by MLIB members of lands and resources within the LAA for other traditional activities.

19.3.1.5 Duncan’s First Nation

19.3.1.5.1 Background – Duncan’s First Nation

The Duncan’s First Nation (DFN) main community is on Duncan’s Indian Reserve 151A, located on the north side of the Peace River near Brownvale, Alberta. DFN has a second Reserve, William McKenzie, located southeast of the town of Peace River. As of December 2012, DFN has a registered population of 269, with 142 members living off-reserve. DFN has a Chief and two Councillors, and uses a custom electoral system (AANDC 2012g).

19.3.1.5.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Duncan’s First Nation

The information on DFN current use of lands and resources presented here is drawn from the Traditional Land Use Study (TLUS) undertaken by DFN with respect to the Project (General 2011, 2012a, 2012b, 2012f). DFN traditional territory is defined as the TLUS Area (see Volume 5 Appendix A07 Part 1, Duncan’s First Nation Traditional Territory Map).

The DFN TLUS reports that members of the DFN have utilized in the past, and currently continue to utilize, the land and resources within northwestern Alberta and northeastern British Columbia for a range of traditional activities including sustenance, commercial, spiritual, and other cultural purposes.

DFN has expressed concern that industrial development in the Peace Region has limited and altered DFN members hunting, fishing, and gathering practices. Community members are reported to need to travel away from their usual places to engage in their traditional activities, and as far as 50 km to 300 km away from the community to hunt moose (General 2012f).

DFN will likely continue to pursue these activities in the future.

19.3.1.5.3 Current Hunting and Trapping – Duncan’s First Nation

Ungulates and Large Animals

The DFN TLUS reports that moose is the most heavily hunted mammal by DFN members. Seventeen moose kill sites are identified as follows:

- Two moose kill sites within the wildlife resources LAA: one near Hudson’s Hope and one near Taylor
- Moose kill sites outside the wildlife resources LAA including:
Three on the north side of the Peace River in the area of Farrell Creek and the lower Halfway River

Five northeast of Fort St. John

Three north of Moberly Lake

Two east of Dawson Creek

One in the area of the mid-Kiskatinaw River

One in the area of the mid-Pine River (General 2011)

The DFN TLUS identified deer kill sites outside the wildlife resources LAA, including one east of Fort St. John (see Volume 5 Appendix A07 Part 5, Duncan’s First Nation Deer Kills Category Map; General 2012b) and two elk kill sites in the area east of Moberly Lake (see Volume 5 Appendix A07 Part 5, Duncan’s First Nation Deer Kills Category Map; General 2012b). Other mammals noted as being hunted are bear (38 kill sites) and other ungulate (12 kill sites) (General 2012b). No information is presented in the TLUS on locations of harvest of the latter two categories.

In a meeting with BC Hydro on February 3, 2011, DFN members reported that they hunt less at the Peace River than in the past. DFN representatives indicated that members “could no longer hunt along the shores of the Peace River because of agricultural development and private property, and due to muddy conditions of the river banks” (see Volume 5 Appendix A07, Part 2).

Waterfowl, Upland Birds and Other Birds

The DFN TLUS did not identify bird kill sites within the wildlife resources LAA. The report identified bird kill sites outside the wildlife resources LAA, including two northeast of Fort St. John, and one on the south side of the Peace River near the Alberta border (see Volume 5 Appendix A07 Part 5, Duncan’s First Nation Bird Kills Hodgepodge Thematic Map).

Small Game

The DFN Community Baseline Report indicates that, from time to time, DFN members hunt, snare, and trap fur-bearers, including marten, wolverine, otter, beaver, and fox. Trapping locations were not identified (General 2012f).

Location and Current Use of Traplines

Based on the results of the Harvest of Fish and Wildlife Resources section (Volume 3 Section 24), there are no registered traplines held by DFN members in the wildlife resources LAA. The DFN is planning a trapping training program and intends to purchase one to three traplines to support the transfer of trapping skills in the community (General 2012f).

19.3.1.5.4 Current Fishing – Duncan’s First Nation

Of the 363 fish kill/catch sites identified in the DFN TLUS, ten are depicted in the fish and fish habitat LAA, as follows:

• One walleye on the Peace River east of Hudson’s Hope

• One bull trout on the south shore of the Peace River opposite Farrell Creek
• One walleye on the Peace River at the British Columbia-Alberta border
• Two jackfish at the Peace/Moberly confluence
• Two jackfish east of Taylor

353 fish kill/catch sites are depicted outside the fish and fish habitat LAA, including sites in the Peace River with a concentration in the area of the Peace River Wildlands (see Volume 5 Appendix A07 Part 5, Duncan’s First Nation Fish Kills Thematic Map).

DFN members reportedly fish less in the Peace River than in the past. In a meeting with BC Hydro on February 3, 2011, a DFN representative indicated that DFN members were “ceasing to fish in the Peace River or were fishing on a limited basis because the fish did not taste as good and some believed the flesh of the fish was dirty” (see Volume 5 Appendix A07, Part 2).

The DFN Community Baseline Report indicates that community members would fish more if there were more fish, and healthier fish, in the rivers. The DFN is interested in engaging in watershed restoration projects, fisheries management, and fisheries restoration for the Peace River Basin.

DFN representatives pointed out, in a meeting with BC Hydro on May 22, 2012, that the DFN TLUS indicated heavy use of the Peace River by DFN members, who also reported a lot of fishing in the Fort St. John area along the Peace River. DFN advised that fluctuation of water levels impacts fishing quality, ability to fish, and absence of wildlife in backwater areas (see Volume 5 Appendix A07, Part 2).

19.3.1.5.5 Current Use of Plants, Trees, and Additional Resources – Duncan’s First Nation

The DFN Harvest Study Report indicates that DFN members harvest the following berries: Saskatoon berries, wild raspberries, blueberries, wild strawberries, chokecherries, and high- and low-bush cranberries (General 2012b). The Harvest Study Report does not provide information on harvesting locations.

Two plant and earth gathering sites identified in the DFN TLUS are shown as located within the wildlife resources LAA, one east of Halfway River and one on the lower Pine River. Eleven plant and earth gathering areas are shown outside the wildlife resources LAA: eight are located on the lower Beatton River east of Fort St. John; three are located on the south side of the Peace River; one is in the area of Moberly Lake, one opposite Halfway River; and one is on the lower Kiskatinaw River.

19.3.1.5.6 Trails, Places, and Other Cultural Features – Duncan’s First Nation

The DFN TLUS map depicts 16 overnight sites that are likely connected with resource harvesting activities (see Volume 5 Appendix A07 Part 5, Duncan’s First Nation Overnight Sites Thematic Map). Five of these sites are located in the wildlife resources LAA as follows:

• One on the south shore of the Peace River opposite Farrell Creek
• Two in the area of Taylor
• Two opposite the mouth of Beatton River
Overnight sites are also depicted on the DFN TLUS map outside the wildlife resources LAA, including five east of Fort St. John and six on the south side of the Peace River.

Three cultural sites are depicted on the TLUS map. Two of these sites are located in the wildlife resources LAA: one near the mouth of Farrell Creek, and one on the Peace River south of Fort St. John. The third site is located outside the wildlife resources LAA and northeast of Fort St. John. The nature of the sites was not identified in the TLUS (see Volume 5 Appendix A07 Part 5, Duncan’s First Nation Cultural Sites Thematic Map).

### 19.3.1.6 Horse Lake First Nation

#### 19.3.1.6.1 Background – Horse Lake First Nation

The Horse Lake First Nation (HLFN) has two reserves with a total area of 3,099.1 ha. The Clear Hills IR 152C Reserve is located 56 km northwest of Fairview, Alberta (150 km north of Grande Prairie) and the Horse Lake IR 152B Reserve is located 60 km northwest of Grande Prairie, Alberta (AANDC 2012j).

As of December 2012, HLFN has a total registered population of 1,045 people, with 571 members living off-reserve. HLFN has a Chief and four Councillors, and uses a custom electoral system (AANDC 2012j).

HLFN is a member of the Western Cree Tribal Council along with DFN and Sturgeon Lake Cree Nation (Western Cree Tribal Council 2012). HLFN is also a member of the Treaty 8 First Nations of Alberta (Treaty 8 First Nations of Alberta 2012).

#### 19.3.1.6.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Horse Lake First Nation

The information on current HLFN use of lands and resources presented in this section is derived from the traditional land use survey undertaken for the HLFN by Matthew General and funded by BC Hydro (General 2012c, 2012d, 2012e).

The HLFN Traditional Land Use Study Area is the traditional territory of the HLFN (see Volume 5 Appendix A07 Part 5, Horse Lake First Nation Traditional Territory Map). The HLFN TLUS Methodology report confirms that community members have and continue to utilize lands and resources in northwestern Alberta, northeastern British Columbia, and the historic Treaty 8 area for a range of cultural, sustenance, socio-economic, spiritual, commercial, and other purposes (General 2012e).

The Upper Halfway River, Sikanni River, and Pink Mountain areas were not included in the Study, although the TLUS author states that a significant number of HLFN members reported ongoing use of these areas. HLFN Community members expressed concern over the potential effects of the Project on wildlife, specifically moose that calve on Peace River islands (see Volume 5 Appendix A11, Part 2).

HLFN community members have noted that it is increasingly difficult to successfully hunt, fish, trap, and gather earth and plant materials within northwestern Alberta and northeastern British Columbia, due to development in the region (General 2012e).

#### 19.3.1.6.3 Current Hunting and Trapping – Horse Lake First Nation

The TLUS maps depict limited hunting in the Peace River region of British Columbia. The HLFN TLUS indicates that moose is by far the most heavily hunted ungulate.
in the area of Highway 97/Kiskatinaw, outside the LAA (General 2012d; see Volume 5 Appendix A07 Part 5, Horse Lake First Nation Deer Kill Sites Thematic Map).

19.3.1.6.5 Current Use of Plants, Trees, and Additional Resources – Horse Lake First Nation

The HLFN Country Harvest Study indicates that HLFN members currently consume a variety of berries. From highest to lowest frequency of use, these are reported to include:

19.3.1.6.4 Fishing – Horse Lake First Nation

The TLUS maps depict limited fishing in the Peace River region of British Columbia.

Four of the 859 fish kill sites identified in the HLFN TLUS are located within the fish and fish habitat LAA in British Columbia including: one walleye and one jackfish on the Peace River at Hudson’s Hope, one jackfish on the lower Pine River, and one jackfish on the Peace River at the B.C/Alberta border (see Volume 5 Appendix A07 Part 5, Horse Lake First Nation Walleye Fish Kills Category Map, Jackfish/Northern Pike Category Map).

In the fish and fish habitat LAA, on the Peace River in Alberta, there is a concentration of fish kill sites at Many Islands and to the west. Outside the fish and fish habitat LAA, the concentration of fish kill sites continues along the Peace River east of Many Islands (see Volume 5 Appendix A07 Part 5, Horse Lake First Nation Fish Kills Thematic Map).
wild blueberry, Saskatoon berry, wild raspberry, huckleberry, wild strawberry, low- and high-bush cranberry, gooseberry, and loganberry (General 2012d).

19.3.1.6.6 Trails, Places, and Other Cultural Features – Horse Lake First Nation

Two HLFN cultural sites are depicted within the wildlife resources RAA, southeast of Dawson Creek near the Alberta border. No further information is provided on the two sites (General 2012e).

The Overnight Sites Thematic Map shows three sites located in the wildlife resources LAA in the area of Taylor/Fort St. John. Other overnight sites are depicted outside the wildlife resources LAA, some of these include:

- Two at the south end of Charlie Lake and 15 south of the Peace River
- Two north of Pine Le Moray Provincial Park
- One in the area of Carbon Lake, one south of the Peace River Canyon
- Eight in the area of Moberly Lake
- One in the area of the mid-Kiskatinaw River/Highway 97 crossing
- Two southeast of Dawson Creek (see Volume 5 Appendix A07 Part 5, Overnight Sites Thematic Map)

Thirty-three plant and earth gathering sites are depicted on the Plant & Earth Gathering Sites Thematic Map including:

- Five in the wildlife resources LAA, three around Taylor/ Fort St. John, and two along the Peace River near the Alberta border
- Other plant and earth gathering sites are shown outside of the wildlife resources LAA, including: four north of Pine Le Moray Provincial Park, two along the highway between Pine Le Moray Provincial Park and Chetwynd, one on Carbon Creek, three on the southeast side of Williston Reservoir, one at the east end of Williston Reservoir, two south of the Peace River canyon, two on the Moberly River east of Moberly Lake, five around Moberly Lake, two in the area of Boucher Lake, two west of Chetwynd, one in the area of the mid-Kiskatinaw River/Highway 97 crossing, and three southeast of Dawson Creek. (see Volume 5 Appendix A07 Part 5, Horse Lake First Nation Plan and Earth Gathering Sites Thematic Map)

No information was provided in the TLUS as to species or materials gathered at the above locations (General 2012e).

19.3.1.7 Dene Tha’ First Nation

19.3.1.7.1 Background – Dene Tha’ First Nation

The Dene Tha’ First Nation (DTFN) are divided into three Reserve communities in Northwest Alberta: Bushe River, Meander River, and Chateh (formerly Assumption) (Dene Tha’ 2012). DTFN has seven reserves near High Level and Bistcho Lake totalling 30,038 ha (AANDC 2012d).
As of December 2012, DTFN has a total registered population of 2,868, with 1,961 people living on-reserve (AANDC 2012d). DTFN is a member of the North Peace Tribal Council (NPTC), incorporated in 1987.

19.3.1.7.2 Current Use of Lands and Resources by Members of the Dene Tha’ First Nation

The primary source of information used to draw current traditional use baseline information was the Dene Tha’ Traditional Land Use with Respect to BC Hydro’s Proposed Site C Dam, Northeastern British Columbia (Stevenson and DTFN Lands and Environment Department 2012), which was undertaken with support from BC Hydro.

The Peace River forms the southern boundary of DTFN traditional territory, where it is within the current use of lands and resources for traditional purposes LAA.

The General Study Area for the DTFN TLUS is defined as the lower fifth of DTFN traditional territory, located south of the Notikiwen River and extending to the Peace River (DTFN, Acting Manager, DTFN Lands and Environment Department, 2012 pers. comm.). Within this area, the DTFN report hunting from Deadwood, Alberta, to Cecil Lake, British Columbia, including the region of the Clear Hills, Alberta. This area is referred to in the TLUS as the Sulphur Lake-Boundary Lake hunting corridor (Stevenson and DTFN Lands and Environment Department 2012).

The Specific Study Area for the TLUS is an area located on the north side of the Peace River that extends approximately 30 km north and then east from the Halfway River in B.C. to the Peace River in Alberta north of Silver Hills (see Volume 5 Appendix A04 Part 5, Study Area Map 1).

Peace River from Halfway River to the Alberta border is within the wildlife resources LAA.

The eastern portions of the LAA are on the western edge of the DTFN Sulphur Lake-Boundary Lake hunting corridor, and are reported to be actively used by DTFN members for hunting of ungulates, particularly moose. In the fall, geese and ducks are reportedly hunted west of Boundary Lake outside the wildlife resources LAA RAA. Berries are described as harvested in the summer along the Peace River in the LAA around Flatrock Creek and downstream.

The Sulphur Lake-Boundary Lake hunting corridor is described as an important resource harvesting area for a number of DTFN members and is likely to remain so in the future. Many of the people report making multiple trips during a year to this area to acquire their food. Some of the people interviewed in the DTFN TLUS say they have used the area for approximately 30 years.

19.3.1.7.3 Current Hunting and Trapping – Dene Tha’ First Nation

Ungulates and Large Animals

The DTFN TLUS reports that moose and other game are hunted by the DTFN year round throughout their traditional territory. Moose is the described as the most important animal and is used for food, and the hide for making moccasins (Stevenson, and DTFN Lands and Environment Department 2012). Other game is reported as taken often incidental to the moose hunt, including elk, deer, rabbits, “chickens” (Grouse), geese, and ducks.
DTFN report some moose hunting by boat along the Peace River both upstream and
downstream from Fort St. John, within the wildlife resources LAA. Moose hunting is also
depicted in the wildlife resources LAA on the south side of the Peace River east from the
mouth of the Moberly River to the Alberta border. There is also moose hunting in the
areas on either side of the Alaska Highway corridor; only the southern part of this
corridor is within the wildlife LAA (Stevenson and DTFN Lands and Environment
Department 2012).

**Wildfowl, Upland Birds, and Other Birds**

In the fall, DTFN members report they hunt geese and ducks in the area around and
west of Boundary Lake, British Columbia, which lies outside the wildlife resources LAA.
No bird hunting was reported in the LAA (Stevenson and DTFN Lands and Environment
Department 2012).

**Small Game**

In the spring, DTFN members report limited beaver hunting in the area around Boundary
Lake outside the wildlife resources LAA. No small game hunting was reported in the LAA
(Stevenson and DTFN Lands and Environment Department 2012).

**Location and Current Use of Traplines**

There are no tenured traplines held by DTFN members in the wildlife resources LAA.

**19.3.1.7.4 Current Fishing – Dene Tha’ First Nation**

The DTFN TLUS describes fishing on the Peace River east of Manning, Alberta, an area
outside the fish and fish habitat LAA (Stevenson, and DTFN Lands and Environment
Department 2012).

**19.3.1.7.5 Current Use of Plants, Trees, and Additional Resources – Dene Tha’
First Nation**

In the wildlife resources LAA, berries (huckleberries and Saskatoon berries) are
reportedly harvested in the summer along the Peace River, particularly around Flatrock
Creek and downstream (Stevenson, and DTFN Lands and Environment
Department 2012).

**19.3.1.7.6 Trails, Places, and Other Cultural Features – Dene Tha’ First Nation**

The DFN TLUS maps depict hunting camps around Boundary Lake in Alberta, outside of
the wildlife resources LAA (see Volume 5 Appendix A04 Part 5, Map 7).

**19.3.1.8 Fort Nelson First Nation**

**19.3.1.8.1 Background – Fort Nelson First Nation**

The Fort Nelson First Nation (FNFN) is a Dene/Cree community composed of 14 major
families from six main villages: Old Fort (Tthek’eneh Kue), Fontas, Kahntah, Snake River
(Nadudhi Deeze), Nelson Forks (Tlidli), and Francois (Tli Gohtche). The FNFN has four
reserves totalling 9,752.6 ha (AANDC 2012h). The main community is located on Fort
Nelson Indian Reserve #2, on the confluence of the Muskwa and Nelson rivers, and on
both banks of the Nelson River, 6 km southeast of Fort Nelson at mile 293–295 on the
Alaska Highway (FNFN 2012).
As of December 2012, FNFN has a registered population of 875 people, including 415 members living on-reserve. FNFN has a Chief and five Councillors, and uses the Indian Act electoral system (AANDC 2012h).

19.3.1.8.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Fort Nelson First Nation

Baseline information on FNFN current and reasonably anticipated future use of lands and resources was derived primarily from the letter sent from the FNFN Lands Department to BC Hydro in August 2012 (Wolfenden 2012). A limited number of publicly available published and unpublished reports were also consulted (Honigmann 1946; Asch 1981; Brody 1981; FNFN 2011, 2012a, 2012b; FNFN Lands Department 2012).

FNFN traditional territory encompasses the northeast corner of British Columbia (FNFN Lands and Resources Department 2012), an area that lies outside the boundaries of the wildlife resources LAA.

FNFN asserts that members have practiced their traditional lifestyle of hunting, trapping, harvesting, and fishing throughout their territory in the past, continue to do so today, and will do so into the future. FNFN reports that most FNFN families currently “make at least some part of their living off the land and harvesting in all seasons and across a wide cultural landscape” (Wolfenden 2012).

FNFN reports that members rely heavily on moose, caribou, elk, beaver, rabbit, fish, and other animals as a means of sustenance. They use lakes, creeks, and rivers as the main transportation to access hunting, trapping, and fishing sites within the Treaty 8 Territory (Wolfenden 2012). Goldeye was identified as a culturally important fish species (see Volume 5 Appendix A09, Part 2).

FNFN states that their members exercise their Aboriginal and Treaty 8 rights outside their traditional territory; however, no information was identified that described or documented FNFN current use of lands and resources for traditional purposes within the current use of lands and resources for traditional purposes LAA. Consultation is ongoing between BC Hydro and FNFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should FNFN provide information to BC Hydro, it will be considered and incorporated in the EIS during the EIS review phase.

19.3.1.9 Athabasca Chipewyan First Nation

19.3.1.9.1 Background – Athabasca Chipewyan First Nation

The Athabascan Chipewyan First Nation (ACFN) has eight reserves with a combined area of 34,767 ha (AANDC 2012a). The reserves are located near the southwestern tip of Lake Athabasca, across the lake from Fort Chipewyan, and on the Athabasca River (Athabasca Tribal Council 2009-2012a). Fort Chipewyan is ACFN’s administrative base. As of July 2012, ACFN has a registered population of 1,041, approximately one-third of which lives in the main community at Fort Chipewyan. The population is widely dispersed, with the majority of members living in Fort McMurray and other areas to the south of ACFN’s reserves (Candler and the Firelight Group Research Cooperative 2011).
ACFN has a Chief and four Councillors, and follows a custom electoral system. ACFN is a member of the Athabasca Tribal Council (with Mikisew Cree First Nation, Chipewyan Prairie First Nation, Fort McKay First Nation, and Fort McMurray No. 468 First Nation) (Athabasca Tribal Council 2012b).

19.3.1.9.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Athabasca Chipewyan First Nation

Baseline information on current, past, and future use of lands and resources by the ACFN was derived from publicly available published and unpublished studies. The ACFN and Mikisew Cree First Nation submitted a joint Desktop Knowledge and Use Report for BC Hydro’s Proposed Site “C” Dam Project (Candler et al. 2012c). The Study Area for the Desktop Report was the section of the Peace River from the western edge of Wood Buffalo National Park to the junction of the Peace and Slave rivers in the east. ACFN traditional lands are located in the northeast corner of Alberta and the northwest corner of Saskatchewan, centred around Lake Claire, the western end of Lake Athabasca and the lower Athabasca River (see Volume 5 Appendix A01 Part 3, TLUS Map 112). The core area where ACFN members currently exercise their treaty rights is located within identified ACFN traditional lands (see Volume 5 Appendix A01 Part 3, Core Area of ACFN Traditional Lands Map).

Traditional use and ethnohistorical studies undertaken for or by the ACFN indicate that the ACFN have used the lands and resources throughout their asserted traditional lands for traditional purposes including hunting, fishing, and gathering in the past, continue to do so today, and anticipate doing so into the future.

The ACFN reportedly hunt a range of animals, including the following:

- Large mammals including moose, caribou, bison, and black bear
- Small mammals, including snowshoe hare and porcupine
- Upland birds, including various species of Grouse and ptarmigan
- Waterfowl including various species of geese, and ducks.

ACFN members are reported to trap a variety of fur-bearers for pelts, and beaver and muskrat are also used for food (McCormack 2012).

ACFN members reportedly also harvest fish including lake whitefish, lake trout, northern pike (jackfish), goldeye, and walleye.

ACFN uses of the lower Peace River and the Peace-Athabasca Delta region in their traditional territory, including for water-based navigation, fishing, harvesting of aquatic and riparian plants, harvest of aquatic fur mammals, hunting of migratory birds, and hunting of other species such as moose that rely upon delta ecosystems, are described as relying upon the flow of the Peace River and seasonal high water, especially in spring (Candler et al. 2012c).

The traditional lands of the ACFN are distant from the current use of lands and resources for traditional purposes LAA. No information was identified that described or documented current use by the ACFN of lands and resources within wildlife resources and fish and fish habitat LAAs for hunting, fishing, trapping activities, or other traditional activities.
19.3.1.10 Beaver First Nation

19.3.1.10.1 Background – Beaver First Nation

In December 2012, the registered population of Beaver First Nation (BFN) was 995, of whom over 400 live on one of their two reserves. The two reserves, Boyer 164 and Child Lake 164A, are located northwest of Fort Vermillion in Alberta (Natural Resources Canada 2009, Map Depicting Beaver First Nation Indian Reserves). BFN has a Chief and four Councillors (Alberta MAR 2010b), and uses the Indian Act electoral system (AANDC 2012b). BFN is a member of the North Peace Tribal Council and a member of the Treaty 8 First Nations of Alberta (Treaty 8 First Nations of Alberta 2012). BFN is currently in Treaty Land Entitlement negotiations with Canada and Alberta (Alberta MAR 2010a).

19.3.1.10.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Beaver First Nation

Baseline information on past, current, and future use of lands and resources by the BFN was derived through online research. BC Hydro did not enter into a TLUS agreement with BFN, and no traditional land use information was made available by BFN for consideration in this review.

In a meeting with BC Hydro on June 9, 2011, BFN representatives advised that BFN members hunt (moose and deer), trap, and fish, including ice fishing. BFN did not identify the location of the activities or confirm whether they were within the wildlife resources or fish and fish habitat LAAs (see Volume 5 Appendix A02, Part 2).

The current use of lands and resources for traditional purposes LAA is distant from the traditional lands of the BFN. No specific information was identified that described or documented current or reasonably anticipated future use by the BFN of lands and resources within the LAA for hunting, fishing, trapping, or other traditional activities. Consultation is ongoing between BC Hydro and BFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should BFN provide information to BC Hydro, it will be considered and incorporated in the EIS during the EIS review phase.

19.3.1.11 Deninu K’ue First Nation

19.3.1.11.1 Background – Deninu K’ue First Nation

Deninu K’ue (DKFN), which means “moose island”, is a settlement corporation at Deninu K’ue (Fort Resolution), Northwest Territories, southwest of the Slave River Delta on the south shore of Great Slave Lake (Akaitcho Treaty 8 Tribal Corporation 2012).

As of December 2012, the DKFN had a total registered population of 878 people, with one member living on DKFN’s own reserve and 439 on their own Crown land. DKFN uses a custom electoral system (AANDC 2012e).

19.3.1.11.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Deninu K’ue First Nation

Baseline information on the past, current, and future use of lands and resources by DKFN was obtained from online research. At the time of writing, BC Hydro had not
entered into a TLUS agreement with DKFN, and no traditional land use information was made available by DKFN for consideration in this review. DKFN will be doing a desktop TLUS for submission to BC Hydro in 2013.

The traditional territory of the DKFN is located within the area of Treaty 8, largely south of Great Slave Lake in the southern part of the Northwest Territories. DKFN assert that their territory also extends to the north side of Great Slave Lake. The DKFN is a member of the Akaitcho First Nations (AFN) and the Akaitcho Treaty 8 Tribal Corporation. The asserted territory of the AFN encompasses 480,000 km² in southern Northwest Territories and a small area in northeastern Alberta (see Volume 5 Appendix A05 Part 1, Map of Asserted Territory of the Akaitcho Treaty 8 First Nations).

DKFN members are reported to fish, moose hunt, and trap ptarmigan and rabbit year-round within their traditional territory (Akaitcho Treaty 8 Tribal Corporation 2012). At a meeting between BC Hydro and DKFN Councillors on February 17, 2009, elders, staff, and community members, a DKFN staff member advised that Deninu K’ue use the Slave River and Great Slave Lake as a refrigerator, and that fish, moose, and berries come from the area (Volume 5 Appendix A05, Part 2).

The current use of lands and resources for traditional purposes LAA is distant from the traditional territory of the DKFN in southern Northwest Territories. No past or current use of lands and resources by DKFN members within the LAA has been identified, nor had any information been identified relating to reasonably anticipated future use of lands and resources within the LAA by DKFN members at the time of writing. When the DKFN submits its desktop study to BC Hydro, the results of the study will be considered and incorporated into the EIS, where appropriate.

19.3.1.12  Kelly Lake Métis Settlement Society

19.3.1.12.1  Background – Kelly Lake Métis Settlement Society

Kelly Lake Métis Settlement Society (KLMSS) is located at Kelly Lake, 120 km southwest of Dawson Creek. According to the KLMSS, approximately 160 people reside in Kelly Lake, and an additional 189 people remain connected with the community. Most people in Kelly Lake identify as Métis and have membership with KLMSS (Kelly Lake Métis Settlement Society 2012).

19.3.1.12.2  Current and Reasonably Anticipated Future Use of Lands and Resources – Kelly Lake Métis Settlement Society

Information on KLMSS current and future use of lands and resources presented in this section is derived primarily from the KLMSS Aboriginal Traditional Knowledge Assessment report (KLMSS ATKA) undertaken for the KLMSS by KSDavison & Associates (2012) and funded by BC Hydro (Davison et al. 2012). A limited range of publicly available and unpublished sources was also reviewed.

The KLMSS Traditional Territory (Volume 5, Appendix A12, Part 1) is portrayed as including the portions of the current use of lands and resources for traditional purposes LAA that lie to the south of the Peace River, and between Williston Reservoir and Peace River, Alberta. The spatial boundaries for the KLMSS ATKA Local Study Area is an approximately 30 km by 55 km rectangle centred on the Project area.
The KLMSS Traditional Territory is described as an area that has been used by the Métis people of Kelly Lake since the early 1800s for purposes such as guiding, trapping, hunting, fishing, and spiritual practices. The KLMSS traditional reliance on the “bush economy” is described as including hunting, trapping, and fishing.

### 19.3.1.12.3 Current Hunting and Trapping – Kelly Lake Métis Settlement Society

The KLMSS ATKA reports that KLMSS members hunt large mammals, including moose and bear, and trap small game, including beaver, muskrat, lynx, marten, squirrel, weasel, otter, wolf, fisher, coyote, mink, wolverine, and fox. One KLMSS member’s moose harvesting area was reported to be outside the LAA at Charlie Lake and to extend as far as Beatton River (Davison et al. 2012).

At a meeting with BC Hydro on April 12, 2012, a KLMSS representative confirmed that KLMSS members hunt at the edge of the Peace River, north of Fort St. John around Blueberry. KLMSS indicated that members found it challenging to hunt in the Project area since KLMSS members would need to ask farmers for permission. While members currently use the area, use has decreased over the past 60 years (see Volume 5 Appendix A12, Part 2).

#### Location and Current Use of Traplines

There are no registered traplines held by KLMSS members in the LAA.

### 19.3.1.12.4 Trails, Places, and Other Cultural Features – Kelly Lake Métis Settlement Society

Beyond their main settlement, Kelly Lake Métis are reported to have occupied camps and cabins related to trapping and berry picking activities within their traditional territory (see Volume 5 Appendix A12 Part 5, Figure 3).

Although not used as frequently as in the past, these locations are described as continuing to be important to the Kelly Lake Métis. Burials are reportedly associated with some of these sites (Davidson et al. 2012). The Belcourt Lake area (see Volume 5 Appendix A12 Part 5, Map 4) is highly valued by Kelly Lake Métis for its ecological productivity and purity, and as a cultural and ecological refuge that can support the traditional lifestyle and culture of Kelly Lake Métis now and in the future, should other harvesting areas decline.

The KLMSS ATKA presents information about KLMSS traditional use activities other than hunting, fishing, and trapping that include berry picking, medicinal plant harvesting, gathering areas, settlements, trails, and burials, but no specific reference to such activities currently occurring at locations within the current use of lands and resources LAA (Davison et al. 2012). Consultation is ongoing between BC Hydro and KLMSS, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should KLMSS share such information with BC Hydro, it will be considered and incorporated in the EIS during the EIS review phase.

### 19.3.1.13 Kwadacha First Nation

#### 19.3.1.13.1 Background – Kwadacha First Nation

The Kwadacha First Nation (KFN) are a Sekani (Tsek’ene) people who occupy the Rocky Mountain Trench area of northern British Columbia (Jenness 1937;
Denniston 1981). They are closely related by kinship and intermarriage to the Tsay Keh Dene First Nation and the Takla Lake First Nation. In 2007, the territory of the three First Nations was described as that part of the Rocky Mountain Trench that is drained by the Finlay and Parsonp Rivers. The territory extends north to the confluence of the Kechika and Gataga Rivers, and to the west of Takla Lake, Bear Lake, and Kitchener Lake (Littlefield et al. 2007, Figure 1). The three First Nations act as an alliance, the Tse Keh Nay First Nations, when dealing with issues in areas of common geographic interest (Littlefield et al. 2007; Tse Keh Nay First Nations and B.C. 2008). KFN is a member of the Kaska Dena Council.

KFN has three reserves situated in northeastern B.C. in the Rocky Mountain Trench, a valley formed by the eastern and central ranges of the Rocky Mountains. The largest reserve is Fort Ware No. 1 (388 ha) which is accessible by logging road from Mackenzie or by air from Prince George; the others are small fishing reserves on nearby lakes Sucker Lake No. 2, and Weissener Lake No. 3 (Littlefield et al. 2007).

**19.3.1.13.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Kwadacha First Nation**

A limited number of published and unpublished reports were consulted for information on KFN traditional land and resource uses. BC Hydro did not enter into a Traditional Land Use Study agreement with KFN, and no traditional land use information was made available by KFN for consideration in this review.

KFN territory is described together with Takla Lake First Nation and Tse Keh Dene First Nation (Littlefield et al. 2007, Figure 1) and is included as part of the territory of First Nations in the Kaska Dena Council on the treaty negotiations map (BC Treaty Commission and Map of the Traditional Territory of the First Nations of the Kaska Dene Council) (BC Treaty Commission 2001). The southern boundary of this territory abuts Tsay Keh Dene traditional territory.

The traditional territory of the KFN is located north and west of the current use of lands and resources for traditional purposes LAA.

KFN reportedly continue to recognize family hunting territories (keyoh) within their territory in the Rocky Mountain Trench (Vanden Berg & Associates 2000; Littlefield et al. 2007). Some KFN people also hold registered traplines in the same region. KFN are described as continuing to live a lifestyle largely based on hunting, fishing, and the gathering of plants for food and medicine within their traditional territory (see Volume 5 Appendix A13 Part 3, Figure 1). Country foods reportedly remain an important component of their economy (Vanden Berg & Associates 2000; Littlefield et al. 2007). It is reasonable to assume that KFN members will continue to use land and resources within their traditional territory for traditional purposes into the future. At a meeting with BC Hydro on September 13, 2012, KFN expressed concern over increased hunting and access in their region resulting from pressure from the Project and other projects in the Peace Region (see Volume 5 Appendix A13, Part 2).

No information was identified that described or documented past, current, or reasonably anticipated future KFN use of lands or resources for traditional purposes in the current use of lands and resources for traditional purposes LAA. Consultation is ongoing between BC Hydro and KFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should KFN
share such information with BC Hydro, it will be considered and incorporated in the EIS during the EIS review phase.

19.3.1.14 Little Red River Cree Nation

19.3.1.14.1 Background – Little Red River Cree Nation

The Little Red River Cree Nation (LRRCN) has three communities situated roughly 150 km east of High Level, Alberta: Fox Lake IR 162, John D’Or Prairie IL 215, and Garden Creek Indian Settlement (located within the Wood Buffalo National Park) (LRRCN 1999-2001). LRRCN’s reserves have a total area of 24,472.3 ha (AANDC 2012k). The majority of the population lives at Fox Lake, where there is no year-round road access, but the administrative centre is located at John D’Or Prairie (LRRCN 1999-2001).

As of December 2012, the LRRCN had a total population of 4,947 people, of whom 3,808 live on-reserve. LRRCN has a Chief and 10 Councillors, and uses a custom electoral system (AANDC 2012k).

The LRRCN is a member of the North Peace Tribal Council along with the BFN, DTFN and Tallcree First Nation (North Peace Tribal Council 2012). LRRCN is also a member of the Treaty 8 First Nations of Alberta (Treaty 8 First nations of Alberta 2012).

19.3.1.14.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Little Red River Cree Nation

Baseline information on the past, current, and future use of lands and resources by the LRRCN was obtained from online research. BC Hydro did not enter into a TLUS agreement with LRRCN, and no traditional land use information was made available by LRRCN for consideration in this review.

The traditional lands of the LRRCN are located in the Peace River Lowlands in the region of the Mikkwa and Wabasca Rivers and southwestern Caribou Mountains in Alberta (Schramm et al. 2002, Figure 1). These are outside of the current use of lands and resources for traditional purposes LAA.

Until the early 1960s, many LRRCN members are reported to have lived out on the land on their traplines. Today, many LRRCN members are described as still relying on the resources of the land for subsistence. Within their traditional territory, LRRCN members are reported to hunt, fish, trap, and harvest plants. Moose is described as the preferred species for hunting, but members also hunt waterfowl (ducks and geese), Grouse, rabbit, beaver, muskrat, and bear. Fish is also named as an important food source. Trapping reportedly continues, but on a limited scale. Members pick berries and gather medicinal plants (Schramm et al. 2002).

On October 22, 2008, at a meeting with LRRCN, the LRRCN advisor referred to the drying out of the Wabasca River wetlands near Vermilion Chutes, an area shared by LRRCN, BFN, and Tallcree. He suggested that BC Hydro support mitigation measures in the form of the removal of willow growth and the restoration of the area to meadow. At the same meeting, the LRRCN Chief asked about compensation for the loss of use of the ice bridge at Tompkins Landing that LRRCN members rely on.

At meetings with BC Hydro on April 24 and August 13, 2009, LRRCN indicated that it was interested in all areas of the Project, but especially in the hydrology of the river.
In particular, their concerns centred on the potential effect of the Project on the ice bridge at Tompkins Landing, which community members depend on during the winter (Volume 5 Appendix A14, Part 2).

The current use of lands and resources for traditional purposes LAA is distant from the traditional territory of the LRRCN. No specific information was identified that described or documented current or future use by the LRRCN of lands and resources within the LAA for hunting, fishing, trapping, or other traditional activities. Consultation is ongoing between BC Hydro and LRRCN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should LRRCN share such information with BC Hydro, it will be considered and incorporated in the EIS during the EIS review phase.

19.3.1.15 Mikisew Cree First Nation

19.3.1.15.1 Background – Mikisew Cree First Nation

As of December 2012, Mikisew Cree First Nation (MCFN) had a registered population of 2,841, with 155 members living on MCFN’s reserves and 510 on their own Crown land (AANDC 2012l). The nine MCFN reserves, created in 1986, are located in the region of the Peace-Athabasca Delta and northwest of Lake Athabasca (FMA Heritage Inc. 2010, Figure 3). While MCFN’s economic and administrative centre has been Fort Chipewyan for generations, their cultural heartlands are Wood Buffalo National Park and the Athabasca River (Candler et al. 2012a).

MCFN has a Chief and six Councillors, and follows a custom election system (AANDC 2012l). MCFN is a member of the Athabasca Tribal Council, together with ACFN, Chipewyan Prairie First Nation, Fort McKay First Nation, and Fort McMurray No. 468 First Nation (Athabasca Tribal Council 2009-2012).

19.3.1.15.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Mikisew Cree First Nation

Information on current use of lands and resources by the MCFN was derived from a limited number of publicly available published and unpublished studies, including a number of TLUS reports. The MCFN and ACFN also submitted a joint Desktop Knowledge and Use Report for BC Hydro’s Proposed Site “C” Dam Project. The Study Area for the Desktop Report was the section of the Peace River from the western edge of Wood Buffalo National Park to the junction of the Peace and Slave Rivers in the east (Candler et al. 2012c).

Within their traditional territory, MCFN are reported as continuing to use lands and resources for traditional purposes and expect to do so in the future. Big game animals are described as providing a large portion of MCFN diet (Elias 2010). In the past, moose, caribou, and bison were reported to be the major species hunted. Currently, moose is named as the most commonly hunted large mammal.

The following are also described as important food resources for MCFN members:

- Waterfowl – ducks and geese
- Fish – whitefish, pike, walleye, burbot, trout, suckers, and goldeye
- Small fur-bearers – beaver (Elias 2010)
When selecting lands for traditional activities within their traditional territory, MCFN members reportedly look for the following characteristics: prime resource habitat; proximity to places suitable for establishing habitations (cabins, camps); located on a well-travelled traditional trail or other land access route or with easy river access; and distant from industrial disturbance (Elias 2010).

One of the main concerns of the MCFN is the ability to continue to exercise their Aboriginal and treaty rights well into the future (Elias 2010; CIER 2011). The MCFN assert that the scale and number of resource developments in MCFN territory has already limited the ability of MCFN members to exercise these rights (Elias 2010; Elias 2011).

The MCFN traditional territory (See Volume 5 Appendix A18 Part 3, Figure 1) is distant from the current use of lands and resources for traditional purposes LAA. No specific information was identified that described or documented current use by the MCFN of lands and resources within the LAA for hunting, fishing, trapping activities, or other traditional activities.

### 19.3.1.16 Salt River First Nation

#### 19.3.1.16.1 Background – Salt River First Nation

In December 2012, the registered population of the Salt River First Nation (SRFN) was 923, of whom five were recorded as living on-reserve. The SRFN Treaty Settlement Agreement was signed in March 2002. The SRFN has three reserves: Salt Plains 195 and Salt River 195 in the Northwest Territories; and Fitzgerald 196 in Alberta, along with one settlement at Fort Smith in the Northwest Territories. SRFN also have four land parcels in Wood Buffalo National Park that are to become Indian Reserves (Salt River First Nation and Canada 2002). SRFN has a Chief and four Councillors and follows a custom electoral system (AANDC 2012n).

SRFN is a member of Akaitcho Territory Government (AANDC 2012n).

#### 19.3.1.16.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Salt River First Nation

Information on the SRFN and on past, current, and reasonably anticipated future use of lands and resources by SRFN was obtained through online research. BC Hydro did not enter into a Traditional Land Use Study agreement with SRFN, and no traditional land use information was made available by SRFN for consideration in this review.

The traditional territory of the SRFN is located in the region of northeastern Alberta and southern Northwest Territories.

The current use of lands and resources for traditional purposes LAA is distant from the traditional lands of the SRFN. No specific information was identified that described or documented SRFN current or reasonably anticipated future use of lands and resources for hunting, fishing, trapping, or other traditional activities within the LAA. Consultation is ongoing between BC Hydro and SRFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should SRFN share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.
19.3.1.17 Smith’s Landing First Nation

19.3.1.17.1 Background – Smith’s Landing First Nation

In 2000, Smith’s Landing First Nation (SLFN) signed a Treaty Entitlement Settlement Agreement with Canada and Alberta (Canada and Smith’s Landing First Nation 2000). The SLFN has 10 reserves located in and around the Wood Buffalo National Park along the Alberta/Northwest Territories border near Fort Smith totalling 10,049.7 ha (see Volum3 5 Appendix A24 Part 3 Map Depicting Location of Smith’s Landing First Nation Indian Reserves in Northeastern Alberta) (AANDC 2012o; Smith’s Landing First Nation 2012).

In December 2012, the SLFN had a registered population of 331. No community members are recorded as living on any of the Reserves (AANDC 2012o). Fort Smith, Northwest Territories, is the SLFN main community and where the SLFN offices are located.

The SLFN has a Chief and four Councillors and uses a custom electoral system (AANDC 2012o). The SLFN is an independent member of the Treaty 8 First Nations of Alberta (Treaty 8 First Nations of Alberta 2012).

19.3.1.17.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Smith’s Landing First Nation

Information on the SLFN and on past, current, and reasonably anticipated future use of lands and resources by SLFN was obtained through online research. BC Hydro did not enter into a Traditional Land Use Study agreement with SLFN, and no traditional land use information was made available by SLFN for consideration in this review.

The traditional territory of the SLFN is located in northeastern Alberta and the southern part of the Northwest Territories. The 10 SLFN Indian Reserves that were established by the Treaty Entitlement Settlement Agreement are all located in northeastern Alberta close to the Northwest Territories border, reflecting the importance of this region to the SLFN. This region is interpreted to be the major area where SLFN members exercise asserted Aboriginal or treaty rights.

At a meeting with BC Hydro on August 28, 2012, the SLFN Chief noted that his community was concerned about fish and wildlife and the impact of water levels in their local area. (Volume 5 Appendix A24, Part 2).

The current use of lands and resources for traditional purposes LAA is distant from the location of the SLFN. No specific information was identified that described or documented SLFN current or reasonably anticipated future use of lands and resources for hunting, fishing, trapping, or other traditional activities within the LAA. Consultation is ongoing between BC Hydro and SLFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should SLFN share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.
19.3.1.18 Sturgeon Lake Cree Nation

19.3.1.18.1 Background – Sturgeon Lake Cree Nation

The Sturgeon Lake Cree Nation (SLCN) has three reserves on 15,664.5 ha (AANDC 2012p). The main population is located 365 km northwest of Edmonton, 97 km east of Grand Prairie and 12 km west of Valley View (Sturgeon Lake Cree Nation 2012). As of December 2012, SLCN has a registered population of 3,003 people, with 1,396 members living on-reserve. SLCN has a Chief and six Councillors, and uses a custom electoral system (AANDC 2012p).

The SLCN is a member of the Treaty 8 First Nations of Alberta (Treaty 8 First Nations of Alberta 2012) and of the Western Cree Tribal Council, along with DFN and HLFN (Western Cree Tribal Council 2012).

19.3.1.18.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Sturgeon Lake Cree Nation

Information on SLCN’s current use of lands and resources was obtained from online research. BC Hydro did not enter into a TLUS agreement with SLCN, and no traditional land use information was made available by SLCN for consideration in this review. The current use of lands and resources for traditional purposes LAA is distant from the location of the SLCN. No specific information was identified that described or documented SLCN current or reasonably anticipated future use of lands and resources for hunting, fishing, trapping, or other traditional activities within the LAA. Consultation is ongoing between BC Hydro and SLCN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should SLCN share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.3.1.19 Tallcree First Nation

19.3.1.19.1 Background – Tallcree First Nation

Tallcree First Nation (TFN) has seven reserves totalling 8,160.3 ha near Fort Vermilion, Alberta. As of December 2012, TFN has a registered population of 1,232, with 467 members living on-reserve. TFN has a Chief and four Councillors, and uses a custom electoral system (AANDC 2012q).

TFN is a member of the North Peace Tribal Council along with the BFN, DTFN, LRRCN, and Lubicon First Nations (North Peace Tribal Council 2012). TFN is also a member of the Treaty 8 First Nations of Alberta. (Treaty 8 First Nations of Alberta 2012).

19.3.1.19.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Tallcree First Nation

Information on the TFN and on past, current, and future use of lands and resources by TFN was obtained from online research. BC Hydro did not enter into a TLUS agreement with TFN, and no traditional land use information was made available by TFN for consideration in this review.
The current use of lands and resources for traditional purposes LAA is distant from the location of the TFN. No specific information was identified that described or documented past, current, or future use by the TFN of lands and resources within the LAA for hunting, fishing, trapping, and other traditional activities. Consultation is ongoing between BC Hydro and TFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should TFN share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.3.1.20 Tsay Keh Dene First Nation

19.3.1.20.1 Background – Tsay Keh Dene First Nation

The Tsay Keh Dene First Nation (TKDFN) are a Tse Keh Ney (Sekani) people who occupy the Rocky Mountain Trench area of northern British Columbia (Denniston 1981; Jenness 1937). The TKDFN are closely related by kinship and intermarriage to the KFN and the Takla Lake First Nation. In 2007, the territory of the three First Nations was described as that part of the Rocky Mountain Trench that is drained by the Finlay and Parsnip Rivers. The territory extends north to the confluence of the Kechika and Gataga Rivers, and to the west of Takla Lake, Bear Lake, and Kitchener Lake (Tsay Keh Nay First Nations and Province of B.C. 2008; Littlefield et al. 2007). The three First Nations act as an alliance, the Tse Keh Nay First Nations, when dealing with issues in areas of common geographic interest.

The main TKDFN community is located at the north end of Williston Reservoir, approximately 430 km north of Prince George. The TKDFN has three Indian Reserves (Police Meadow IR No. 2, Tutu Creek IR No. 4, Parsnip IR No. 5), and two federal land parcels (Ingenika Settlement, Mesilinka) that are to be converted to Indian Reserves. As of December 2012, the band had a registered population of 447, with 66 members living on Tsay Keh Dene’s reserves and 166 members living on their own Crown land (AANDC 2012r).

19.3.1.20.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Tsay Keh Dene First Nation

TKDFN traditional territory, as described by the BC Treaty Commission and set out in the TKDFN Statement of Intent for the BC Treaty Commission, extends north to Mount Trace, west to South Pass Peak, south to Nation River, and east to Mount Laurier (BC Treaty Commission 1994). This depiction of TDKFN traditional territory is also the area in which BC Hydro and TKDFN reached a Settlement Agreement in 2006. The Agreement included provisions relating to the Project (Tsay Keh Nay First Nation, BC Hydro, Province of B.C. 2006).

TKDFN are described as continuing to live a lifestyle largely based on the lands and resources within their traditional territory (BC Treaty Commission 1994) (Tsay Keh Nay First Nations and Province of B.C. 2008).

No specific information was identified that described or documented current or reasonably anticipated future TKDFN use of lands and resources in the LAA for hunting, fishing, trapping, or other traditional activities. Consultation is ongoing between BC Hydro and TKDFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should TKDFN share such
19.3.1.21 Woodland Cree First Nation

19.3.1.21.1 Background – Woodland Cree First Nation

The Woodland Cree First Nation (WCFN) has three reserves on 16,106 ha northeast of Peace River, Alberta. As of December 2012, the WCFN has a registered population of 1,042, with 735 members living on WCFN’s reserves and seven members living on their own Crown land. WCFN has a Chief and four Councillors, and uses a custom electoral system (AANDC 2012t).

19.3.1.21.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Woodland Cree First Nation

Information on the WCFN and on past, current, and future use of lands and resources by TCFN was obtained from online research. BC Hydro did not enter into a Traditional Land Use Study agreement with WCFN, and no traditional land use information was made available by WCFN for consideration in this review.

The current use of lands and resources for traditional purposes LAA is distant from the location of the WCFN. No specific information was identified that described or documented past, current, or future use by the WCFN of lands and resources within the LAA for hunting, fishing, trapping, and other traditional activities. Consultation is ongoing between BC Hydro and WCFN, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA and RAA. Should WCFN share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.3.1.22 Fort Chipewyan Métis Nation Local 125

19.3.1.22.1 Background Fort Chipewyan Métis Local 125

The Fort Chipewyan Métis (FCM) are located in the community of Fort Chipewyan, Alberta. In August 2012, the population of the FCM Local 125 was 173 (Fort Chipewyan Métis, President 2012 pers. comm.).

Alberta’s June 2010 Métis Harvesting Policy acknowledges FCM as “both a historic and contemporary rights bearing community”. The Policy also creates a notional harvesting area of 160 km around its community, in the absence of a more definitive description of the community’s harvesting area (Alberta Sustainable Resource Development 2010).

FCM is a member of Métis Nation of Alberta, Region 1 (which covers an area from Highway 28 north to the Northwest Territories border and from Athabasca to the Saskatchewan border) (Métis Nation of Alberta Region 1 2012).

The FCM assert that they are vested with both Aboriginal and constitutionally protected rights:

- Whose origins predate Canadian confederation and the creation of Alberta, British Columbia, Saskatchewan and Northwest Territories
1. That are larger in scope and more robust than First Nations’ rights because of the adaptive Powley ‘effective control test’

19.3.1.22.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Fort Chipewyan Métis (Local 125)

Information on current and past use of lands and resources by the FCM was derived from a limited number of publicly available published and unpublished studies. BC Hydro did not enter into a TLUS agreement with FCM, and no traditional land use information was made available by FCM for consideration in this review. In 2008, the FCM established a Study Area for a TLUS that is the same as a proposed Fort Chipewyan Métis Harvesting Area (Fort Chipewyan Métis, President 2012 pers. comm.).

On September 12, 2011, FCM advised that community members use an ice bridge on the Peace River (Volume 5 Appendix A08, Part 2). No specific information was identified that described or documented current or reasonably anticipated future use by the FCM of lands and resources within the current use of lands and resources for traditional purposes LAA for hunting, trapping, fishing, or other traditional activities.

Consultation is ongoing between BC Hydro and FCM, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should FCM share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.3.1.23 Métis Nation of Alberta Region 6

19.3.1.23.1 Background Métis Nation of Alberta Region 6

The Métis Nation of Alberta is a political organization established in 1928 to advocate on behalf of Métis people in Alberta (Métis Nation of Alberta 2007-2012a). Region 6 of the Métis Nation of Alberta is located in northwest Alberta, with its office located in Peace River, Alberta (Métis Nation of Alberta 2007-2012b). The Peace River runs through much of Region 6. Métis communities within Region 6 include Fort Vermilion, Dunvegan and Peace River (MNAR6, Métis Liaison Officer 2012, pers. comm).

The office of the Métis Nation of Alberta Region 6 (MNAR-6) is located in Peace River, Alberta. Over 7,000 Métis live in the Region (MNAR6, Métis Liaison Officer 2012, pers. comm).

19.3.1.23.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Métis Nation of Alberta Region 6

Information on current and past use of lands and resources by the MNAR-6 was obtained from online research. BC Hydro did not enter into a Traditional Land Use Study agreement with the MNAR-6 and no traditional land use information was made available by the MNAR-6 for consideration in this review.

The MNAR-6 is located in northwestern Alberta (Alberta Intergovernmental and Aboriginal Relations 2012, Map of Métis Settlements and Métis Nation of Alberta Association Regional Zones), within the traditional territory historically occupied by the Métis. The Peace River is a central feature of Region 6.
At an MNAR-6 workshop regarding the Project, one family stated that they used the Peace River all year for their income and traditional activities, all participants stated that they used the Peace River for family gatherings and ceremonies, and many indicated that they felt exercise of their Aboriginal rights would be impacted by the Project (Volume 5 Appendix A16, Part 2). At a meeting with BC Hydro on November 30, 2012, MNAR-6 advised that they use bridges such as Shaftesbury for access to lands, and fish, hunt and trap along the Peace River.

The current use of lands and resources for traditional purposes LAA is distant from the location of the MNAR-6. No specific information was identified that described or documented current or reasonably anticipated future use by the MNAR-6 of lands and resources within LAA for hunting, fishing, trapping, or other traditional activities.

Consultation is ongoing between BC Hydro and the MNAR-6, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the LAA. Should the MNAR-6 share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.3.1.24 Métis Nation of British Columbia

19.3.1.24.1 Background – Métis Nation BC

The MNBC was created in 1996 to represent the Métis people of British Columbia and incorporated under the Métis Provincial Council of British Columbia (MNBC 2012a).

19.3.1.24.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Métis Nation BC

Information on the MNBC, and on current and past use of lands and resources by the MNBC, was obtained from online research and from a brief report and letter of clarification from MNBC to BC Hydro. The information provided in the MNBC report and clarification letter was obtained from the MNBC Traditional Harvesting Database and preliminary Métis Traditional Knowledge (MTK) research (MNBC 2012c). BC Hydro did not enter into a TLUS agreement with MNBC.

MNBC stated that the Métis currently harvest large quantities of game, birds, medicinal, and other plants and berries from the Project area, and that the most important harvesting areas are the Peace River and Pine River watersheds (MNBC 2012b, 2012c). The harvesting areas are likely to be, at least in part, within the current use of lands and resources for traditional purposes LAA.

In a meeting with BC Hydro in July 2012, representatives of MNBC discussed their traditional use and knowledge of the Peace region. One member advised that he has a cabin and traps on Monias Lake on the south bank of the Peace River, and traps north of Hudson’s Hope (Volume 5 Appendix A17, Part 2).

The MNBC identified concern regarding the potential effects of the Project on the ability of harvesters to continue to use the Project area for sustenance, social, and ceremonial purposes (MNBC 2012c).

Consultation is ongoing between BC Hydro and the MNBC, and may yet yield information on the current and reasonably anticipated future use of lands and resources within the current use of lands and resources for traditional purposes LAA. Should the
MNBC share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.3.1.25 Northwest Territory Métis Nation

19.3.1.25.1 Background – Northwest Territory Métis Nation

The Northwest Territory Métis Nation (NWTMN) also refer to themselves as the indigenous Métis of South Slave Lake. Members of the NWTMN reside mainly in the communities of Hay River, Fort Smith, Fort Resolution, and Yellowknife in the Northwest Territories (NWTMN 2007-2012). The NWTMN’s territory extends throughout the Northwest Territories and into northern Alberta (NWTMN 2011).


19.3.1.25.1 Current and Reasonably Anticipated Future Use of Lands and Resources – Northwest Territory Métis Nation

Information on the NWTMN and on current and past use of lands and resources by the NWTMN was obtained from online research. The NWTMN did not conduct a TLUS for the Project.

The current use of lands and resources for traditional purposes LAA is distant from the traditional lands of the NWTMN. On November 28, 2012, at a meeting with NWTMN, NWTMN informed BC Hydro that their members exercise Aboriginal rights in the South Slave Lake Region. At the same meeting, community members talked about fishing in Great Slave Lake and the Slave River, and expressed a strong interest in trapping and gathering as part of the continuing way of life. One member told BC Hydro that he built a winter road to access his trapline on the east side of the Peace River, but it suffered damage due to irregular flows in the Peace River (Volume 5 Appendix A19, Part 2).

No specific information was identified that described or documented current or reasonably anticipated future use by the NWTMN of lands and resources for hunting, fishing, trapping, or other traditional activities within the LAA.

Consultation is ongoing between BC Hydro and the NWTMN, and may yet yield information on the current and reasonably anticipated future use of lands and resources for hunting, fishing, trapping, and other activities within the LAA. Should the NWTMN share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.3.1.26 Paddle Prairie Métis Settlement Society

19.3.1.26.1 Background – Paddle Prairie Métis Settlement Society

Paddle Prairie Métis Settlement (PPMSS) is a rural settlement located south of High Level, Alberta. The eastern boundary of the Settlement is the Peace River (Alberta
Intergovernmental and Aboriginal Relations 2012, Map of Métis Settlements and Métis Nation of Alberta Association Regional Zones). Paddle Prairie was established in 1938. In 1990, the Paddle Prairie Métis were incorporated as a Métis Settlement and received a land base of 169,909 ha under letters patent from Alberta.

The Paddle Prairie Settlement consists of members who are Métis peoples whose traditional lands encompass most of northern Alberta.

PPMSS has a population of 1,464 members.

19.3.1.26.2 Current and Reasonably Anticipated Future Use of Lands and Resources – Paddle Prairie Métis Settlement Society

Information on Paddle Prairie Métis Settlement Society (PPMSS) and on current and past use of lands and resources by the PPMSS was obtained from online research. Paddle Prairie did not conduct a TLUS for the Project.

The current use of lands and resources for traditional purposes LAA is distant from the traditional lands of PPMSS. No specific information was identified that described or documented current or reasonably anticipated future use by PPMSS of lands and resources for hunting, fishing, trapping or other traditional activities within the LAA.

Consultation is ongoing between BC Hydro and the PPMSS, and may yet yield information on the current and reasonably anticipated future use of lands and resources for hunting, fishing, trapping, and other activities within the LAA. Should PPMSS share such information with BC Hydro, it will be considered and incorporated in the EIS, as appropriate, during the EIS review phase.

19.4 Effects Assessment

As indicated in Section 19.1.2, the organization of key aspects differs from the EIS Guideline in order to facilitate an analysis of specific current use of lands and resources for traditional purposes separately.

Section 15.2.4 of the EIS Guidelines states that the potential to adversely affect current use of lands and resources by Aboriginal persons for traditional purposes will be assessed by taking into account the potential for the Project to result in changes to key aspects:

- Use of and access to lands used for traditional purposes
- Availability of harvested species based on the results of the assessment of the potential effects of the Project on fish and fish habitat, vegetation and ecological communities, and wildlife resources
- Other relevant considerations raised by Aboriginal groups

However, this section presents the assessment of the potential to adversely affect current use of lands and resources for traditional purposes by taking into account the potential for the Project to result in changes to the following key aspects:

- Changes in fishing opportunities and practices
- Changes in hunting and trapping opportunities and practices
- Changes in other cultural and traditional uses of the land
The availability of and access to fishing, hunting and gathering resources and sites is based on the results of the assessment of the potential effects of the Project on fish and fish habitat, vegetation and ecological communities, and wildlife resources (Volume 2 Sections 12, 13 and 14, respectively).

Use of lands and resources for traditional purposes and the location of culturally important places are based on the results of TLUS reports prepared by Aboriginal groups for this Project or other projects, overlaid with the LAA, and on the results of consultation with BC Hydro.

Based on information received from Aboriginal groups and publicly available documents, BC Hydro’s understanding of current use of lands and resources for traditional purposes by Aboriginal groups is as follows:

- The following Aboriginal groups have reported current use of lands and resources for traditional purposes in the LAA defined for this VC:
  - BRFN
  - DTFN
  - DFN
  - HLFN
  - SFN
  - T8TA: DRFN, HRFN, PRFN and WMFN

Interactions are anticipated between the Project and current and reasonably anticipated future use in the LAA for the Aboriginal groups listed above and these groups are brought forward into the effects assessment.

- MLIB has no reported current use of lands and resources for traditional purposes in the LAA defined for this VC. The Project is not expected to have an effect on the current use of or access to lands and resources for traditional purposes for this First Nation and are, therefore not considered further in the effects assessment in this EIS. BC Hydro has provided funding for McLeod lake Indian Band to undertake a Traditional Land Use Study. When BC Hydro receives the TLUS, it will be considered and incorporated into the EIS, as appropriate.

- KLMSS and MNBC have indicated use of the Peace River valley in a general sense, but have not provided sufficient specific information on use within the LAA to enable an effects assessment. Should additional information regarding current and reasonably anticipated future use of lands and resources within the LAA be received from KLMSS or MNBC, BC Hydro will consider and incorporated it in the EIS, as appropriate, during the EIS review phase.

- The following 17 Aboriginal groups have no reported current use of lands and resources for traditional purposes within the LAA defined for this VC.
  - ACFN
  - BFN
  - DKFN
  - FCM
The Project is not expected to have an effect on the current use of or access to lands and resources for traditional purposes for these Aboriginal groups and they are therefore not considered further in the effects assessment in this EIS. Should additional information regarding current and reasonably anticipated future use of lands and resources within the LAA be received from the Aboriginal groups listed above, BC Hydro will consider and incorporated it in the EIS, as appropriate, during the EIS review phase.

19.4.1 Effects Assessment – Construction – Change in Fishing Opportunities and Practices

Potential Project effects during construction on fishing opportunities and practices are discussed at the Project component level, rather than the activity level, for this VC. An exception is made when information allows for an analysis of activity-level interactions. Construction of the dam and generating station, Highway 29 re-alignment, access roads, transmission system and temporary worker accommodation may reduce fishing opportunities and practices of Aboriginal people through changes to access to fishing sites (including access to fishing sites by both Aboriginal harvesters and non-Aboriginal harvesters), fish health, movement, and survival, and fish habitat. Potential effects, proposed mitigation, and residual effects are detailed in Volume 2 Section 12 Fish and Fish Habitat. Changes in use of and access to fishing areas during construction are described in Volume 3 Section 24 Harvest of Fish and Wildlife Resources, albeit with reference to public, rather than Aboriginal fishing.

Current Use of and Access to Fishing Areas—Overview

Dunne-za and Cree fishing is often described by observers as a supplementary or secondary activity to hunting. Bouchard and Kennedy, writing of the BRFN, note that, even in the minds of BRFN members, the relative importance of fish contrasts with their considerable reliance on game:

“Fortunately, it is no longer the threat of famine that motivates people to fish, as Dane-zaa mythology suggests was once the situation, and today fishing continues to be
a valued albeit sporadic activity, a pursuit that offers the bonus of a change to the predominantly meat diet, along with a good day’s diversion. (Kennedy 2011, 210).

Fishing is indicated to be an important feature of Aboriginal life in the area of the Project, as well as a right described in the text of Treaty 8.

In the LAA, fishing for cultural, recreational, and subsistence purposes is currently practiced by members of the BRFN, SFN, T8TA, DFN, and HLFN throughout the mainstem Peace River from the stretch of river downstream of Fort St. John to the Williston Reservoir. Harvesters, following the availability of targeted species, appear to heavily favour the confluences of rivers, streams, and creeks with the Peace—especially at Bear Flats, Farrell Creek, Halfway River, Lynx Creek, and Moberly River. This pattern of use is most pronounced among members of the T8TA, BRFN, and SFN.

In addition, fishing is also done in a number of small lakes, creeks, and streams outside of the LAA, as well as, to a lesser extent, in the Dinosaur and Williston Reservoirs.

SFN, T8TA, and BRFN may be fishing more in the Peace River in the area of the proposed Project today than they had, historically. In the case of BRFN, Bouchard and Kennedy indicate that the former residents of the old BRFN Reserve near Fort St John had become isolated from their former sites on the Peace between Fort St. John and Hudson’s Hope after their reserve had been resettled to its present location farther north in 1946. In recent decades, material prosperity, cars, and improved transport have facilitated the practice of traditional pursuits throughout a wider geographical area.

Ownership of pickup trucks is now common among BRFN members, making possible day-trips to hunting grounds and fisheries along the Peace River and elsewhere, including places not so easily accessible in the 1950s-1970s when vehicles were rare. (2012, 90)

An increased preference for the Peace may also reflect the diffusion of sport-fishing technologies and techniques for fishing. Bouchard and Kennedy make an observation that lends some credence to this, noting that Beaver traditional knowledge is limited on the subject of fish: “A few of the younger men who fish for sport with a rod and line have a broader knowledge of nomenclature and distinguish Dolly Varden (bull trout), rainbow trout, grayling, lake trout, grayling, lake trout, kokanee, and ling (burbot) from the less desirable jackfish, suckers, walleye and squawfish.”

Table 12.6 Summary of traditional knowledge provided in Traditional Land Use Studies reports in Volume 2 Section 12 Fish and Fish Habitat provides a tabular summary of species and areas where they are pursued by Aboriginal Groups.

Fish harvesting by SFN members suggest that their preference is, for the most part, for the coldwater fishes, with the exception of jackfish and sucker. In the fish and fish habitat LAA, they fish primarily in the Peace River and in the Moberly River, but also elsewhere in smaller streams and water bodies south of the Peace River. Rainbow trout are described as being caught generally throughout the southwestern parts of the fish and fish habitat LAA with concentrations of activity in the Peace River and Moberly River. Bull trout are reported to be caught in the fish and fish habitat LAA in the Peace River in, and, to a lesser extent, along the Moberly River. Dolly Varden are caught in the Peace River and to a lesser extent in the Moberly River, and jackfish and grayling in the Moberly River.
T8TA members indicate fishing along the north side of the Peace River at the confluences with tributaries. Fish symbols are concentrated at confluences along the Peace River at Portage Creek, Lynx Creek, Halfway River, east of Taylor, and at the mouth of the Beatton River. There is also a small concentration on the Halfway River near Halfway River Reserve 168 (Candler, et al. 2012b, Map 9). In addition, several instances to the Peace Canyon dam tailrace and the Williston reservoir are made.

A majority of the 40 BRFN members interviewed for the BRFN TLUS indicated that the vicinity of the Project is a preferred area for pursuing traditional land use activities, including 8-10 interview participants who discussed fishing in the mainstem Peace River in the area of the future reservoir.

Fishing is described as occurring along the Peace River from the Alberta border to eastern Williston Lake. The confluences of the tributary rivers and creeks with the Peace River including Beatton River, Halfway River, Cache Creek and Farrell Creek are described as particularly important. The Peace River from the Peace Canyon Dam to the Alberta border, and the Halfway River to the Halfway River Reserve are within the fish and fish habitat LAA (Kennedy 2011, Blueberry River First Nations Fish Harvesting Map).

As a result of concerns regarding pollution from industrial and farming activities in other parts of BRFN territory, BRFN members say they rely more on the Halfway River and the mouths of streams flowing into the Peace River for their fish needs (Bouchard and Kennedy Research Consultants 2012a).

The Peace River and its tributaries offer the most species. The Halfway and its confluences (Cameron River, Cust Creek, Dunlevy Creek, and Gravel Creek) are second to the Peace for availability of species. In that location, the pattern of current use targeting the confluences of the main stem (in this case, the Halfway) is evident.

Lake fishing does not make up a large portion of BRFN fishing effort. Several species are pursued in Moberly Lake, and other lakes and small streams are indicated as places where a single or two species are pursued, including Stuart Lake (whitefish), Jackfish Lake (jackfish), Charlie Lake (suckers), Chinaman Lake (trout), Gwillim Lake (walleye).

BRFN reports a little fishing in the Dunleavy and Upper reaches of Williston Reservoir, mostly through the ice in winter for catfish, Dolly Varden, lake trout, and ling cod. Beatton (BRFN has indicated some fishing in the Beatton for suckers) and the Pine for grayling.

Fishing is still conducted outside the LAA; however, several sources indicated a renewed preference for the Peace. There may be several reasons for this in addition to those noted above. As early as 1979, Weinstein observed that BRFN members were avoiding conflict in Moberly with sportsfishers on Moberly Lake. They have expressed concern about pollution in Moberly River (2012 133). Pollution and invasive species have impacted Charlie Lake and Fish Creek (2012 111-112). Bouchard and Kennedy note that pollution in other localities forces BRFN members to use the Peace more. “Due to pollution in streams local to the BRFN Reserve, individuals did report driving to the Peace River specifically for fishing. Use of the Study Area is predominantly on a day-basis, although precise quantification of this assumption has not been possible.” (BRFN Methodology Report 2012).

In the LAA, fishing as practised by members of the BRFN, SFN, and T8TA, appears—based on the information provided to BC Hydro—to favour the confluences of rivers,
streams, and creeks with the Peace—especially at Bear Flats, Farrell Creek, Halfway, Lynx Creek, Moberly River. Downstream confluences where fishing is currently conducted include the Pine and Beatton rivers. Fishing is also done in a number of small lakes, creeks, and streams outside of the LAA, as well as, to a lesser extent, in the Dinosaur and Williston reservoirs.

Changes in Use of and Access to Fishing Areas During Construction

Several changes in access and use are described in Volume 3 Section 24 that are pertinent to this indicator and VC:

- Access restrictions due to construction activities would reduce access to and use of fishing opportunities and areas during construction. Access restrictions include the following:
  - Boat passage within the dam site area will be permanently restricted at the beginning of Year 1 of construction
  - Boat access will be restricted above and below the Project construction zone through the entire construction period. The exclusion above the construction zone will include approximately 3 km
  - In Year 2, a debris collection boom to be installed in the vicinity of Wilder Creek, approximately 12 km from the dam site will restrict river travel
  - Although access to the Peace River upstream of Wilder Creek would be permitted through the final six years of construction, temporary restrictions would be imposed for occasional, specific project activities that take place
  - Both the Lynx Creek and Halfway River boat launches are proposed to remain open during construction through to reservoir filling (in Year 7), although temporary closures may occur
  - Site C reservoir may be closed during reservoir filling due to debris and slope stability hazards

Access restrictions on the mainstem Peace River may limit the current fishing practices of BRFN, DTFN, DFN, HLFN, SFN, and the T8TA (see Table 19.7 for the species harvested). Several other Aboriginal groups, including Métis Nation BC, Métis Nation Alberta, and the KLMSS, have indicated use of the Peace River in a general sense, but have not provided sufficient specific information on use within the Current Use of Lands and Resources for Traditional Purposes LAA to enable an effects assessment.

Access restrictions in the early years of the Project will begin to affect fishing at several confluences identified as important harvesting locations by T8TA, SFN First Nations, and BRFN. Restricting access to the confluence of the Moberly and Peace River at beginning of Year 1 of construction would affect fishing by SFN members. Access to the mouth of Wilder Creek, and the area downstream to Moberly River will be altered in Year 2.

However, road and river access to the mouth of the Halfway River, indicated as an important fishing location by T8TA, SFN, and BRFN, will not be restricted in the early years of the Project.

Reduced ability to access fishing areas due to project construction schedules and restrictions represents a potential effect on the current fishing practices of all the
Aboriginal groups who currently use fisheries resources within the Fish and Fish Habitat LAA. Use of the river will be fragmented, as travellers will be restricted from attempting to go either upstream or downstream of the proposed dam site from Year 1 of construction. Although the zone of exclusion begins in Year 1 at 3 km above the construction zone, river travel may be further impeded the following year by the boom to be installed at Wilder Creek, 12 km from the dam site. These restrictions may affect those Aboriginal groups who have reported current use of the area surrounding the proposed Project and immediate adjacent areas, especially SFN, T8TA, and BRFN.

Aboriginal fishers may adapt to Project-related restrictions on access by using other access points and fishing areas, such as the Peace River downstream of the Project dam site, the Pine River, Dinosaur Reservoir, or other areas in the region.

Increased competition between fish harvesters may occur during the construction period, as Aboriginal groups and the public are forced to share fewer access points, and reduced areas for fishing. Construction activities are anticipated to result in a net increase of approximately 416 anglers by the end of Year 5 (a yearly average of 69 licenses) This is anticipated to decline thereafter, resulting in a net increase of 112 anglers over the entire construction period (See Table 24.18 Volume 3 Section 24 Harvest of Fish and Fish Habitat). This potential adverse effect, noted as a concern by T8TA, BRFN, DFN, and SFN, may be offset during operation by enhanced fishing opportunities that may develop at the reservoir.

Changes in Availability of Targeted Species During Construction

According to the effects assessment on fish and fish habitat (Volume 2 Section 12), the construction of the Project may result in the following changes to fish and fish habitat, which are relevant to this VC:

- The construction of the dam and generating station, Highway 29 realignment and Hudson’s Hope shoreline protection would result in the loss of 198.50 ha of fish habitat, primarily in the Peace River, but also in the Moberly River, including the following:
  - Spawning and rearing habitats for whitefish, suckers and minnows in the Moberly
  - Feeding habitats for all adult species, in particular goldeye and pickerel in the Moberly
  - Spawning, rearing, feeding habitats along the south bank of the Peace for all adult species
  - High quality habitats within the dam generation zone, including the north bank of the Peace, providing habitat for Arctic grayling and mountain whitefish; and a channel along the north bank of the Peace providing habitat for Arctic grayling, bull trout, mountain whitefish, and rainbow trout will be destroyed by the North Bank haul road

- Highway 29 realignment will destroy 10.62 ha of fish habitat, mostly along the Peace River shoreline (.20 ha is along the Halfway River). Lost habitat includes feeding areas for bull trout along the Halfway River, and high quality spawning, rearing, or feeding habitats for mountain whitefish, Arctic grayling, bull trout, mountain whitefish, and rainbow trout.
• Construction of the Hudson’s Hope shoreline protection will destroy 6.12 ha of fish habitat along the Peace, including high-quality rearing, feeding, and/or spawning habitats for bull trout, rainbow trout, mountain whitefish, and rainbow trout. The Fish and Fish Habitat effects assessment notes that this section of the Peace River is used by lake trout for rearing, feeding, and/or spawning.

• Filling of the Reservoir will result in the loss of 28 km² of Peace River fish habitat and 1.63 km of habitat in tributary streams.

• Sediments introduced during construction activity associated with the Dam and Generating Station may affect fish health and survival.

• The construction of the headpond and filling of the reservoir may impact fish health and survival (12-70) through stranding of fish and fish entrainment.

• Sediments introduced during construction activity associated with the realignment of Highway 29 may affect fish health and survival.

• Increased Total Dissolved Gas (TDG) may impact the health and survival of fish during construction.

• Upstream fish movement may be impacted during the diversion stage of dam construction.

Volume 3 Section 24 Harvest of Fish and Wildlife Resources, notes that several Project effects on movement and aquatic productivity during construction may affect fishing by the public. These effects would also be felt by Aboriginal harvesters.

Effects on movement and aquatic productivity may reduce fishing success by way of a direct impact on availability of targeted fishes, or they may alter fishing effort by limiting the availability of desirable fishing locations due to increased turbidity or the perception of disturbance.

Although boat travel up and downstream of the dam site will be disrupted from Year 1 on, it is projected that fish will pass through the dam site with no effect during channelization (Years 1-4). It is anticipated that fishing opportunities and practices may remain unaffected downstream of the dam site during this period.

During river diversion (Years 5-7), opportunities to harvest fish from the cold/clear water group (including bull trout, Arctic grayling, and mountain whitefish) are anticipated to decline. In the same period, no effect is anticipated on opportunities to harvest fish from the cool/turbid water group (including walleye, burbot, and northern pike). Both fish groups are harvested in the LAA as part of the current fishing practices of First Nations who supplied information on land use to BC Hydro. The cold water group – including bull trout, “other” trout, and whitefish (undefined) – were indicated by British Columbia First Nations, while DFN and HLFN members reported more walleye and jackfish (See Table 19.7). It is anticipated that, during the river diversion years, fishing opportunities and practices for the cold water group will diminish—this effect will be felt most acutely upstream on the Peace River and its tributaries in British Columbia.

Also during river diversion, anticipated changes in water quality and turbidity may affect cold water species from Cache Creek to Pine River confluence, as they seek to avoid turbidity. Again, this effect is likely to be experienced most acutely among British Columbia First Nation fishers.
Inundation and the creation of the reservoir will reduce opportunities for fishing in the main stem Peace River and at its tributaries between Fort St. John and the Peace Canyon Dam by reducing access to fishing areas at a number of confluences with the Peace identified as important harvesting locations by First Nations, including Cache Creek (BRFN; T8TA); Farrell Creek (BRFN; DFN; T8TA), Halfway River (BRFN; T8TA); the Moberly River (Saulteau; DFN; T8TA). Consequently, inundation will adversely affect the current use of lands and resources for fishing for BRFN, DFN, SFN and T8TA. This effect will be caused by changes to access and destruction of riverine habitat (28 km² of Peace River fish habitat and 1.63 km of habitat in tributary streams). In total, 85 km (out of a possible 227 km) of main stem Peace River fishing area will be transformed into reservoir. Other confluences downstream of the proposed dam site will be unaffected, including the Pine and Beaton.

Similarly, other waterbodies within the LAA where fishing is currently conducted, including reservoirs and lakes, will be unaffected by the Project.

Changes in Use of Harvested Species During Construction

The TLUS reports received for the Project provides limited information on how Aboriginal groups use fish. However, it is reasonable to assume that the Aboriginal groups who currently fish for traditional purposes in the Project LAA use the resource for sustenance, recreational, and social purposes. Aboriginal groups have indicated that their ability to utilize the lands and resources of the Peace River basin for traditional purposes has been constrained by changes in the overall health of the of the Peace River and the availability and health of fish and wildlife which they attribute largely to development activities in the region. Aboriginal groups have indicated a reduced faith in country foods, including fish, as they perceive the quality of the resources to be compromised. This perception limits their desire both to go fishing in areas they believed to be less environmentally healthy, and to consume the fish.

Aboriginal groups have expressed concern that the Project would cause contamination of fish in the Peace River and its tributaries. This concern is noted several times in TLUS reports, and draws on experiences with earlier hydroelectric projects on the Peace. The Human Health Assessment (Volume 4 Section 33) which draws upon the results of the Human Health Risk Assessment of Methylmercury in Fish Technical Data Report (Volume 2, Appendix J, Part 2) indicates that commonly consumed species of fish upstream of the dam site (e.g. rainbow trout, bull trout), could be consumed by the most sensitive age groups (toddlers and children and women of childbearing age) one - two times a week without exceeding Health Canada’s Tolerable Daily Intake for methylmercury. Fish species downstream of the dam site (e.g. goldeye, walleye) could be consumed by the most sensitive age groups one time per week and bull trout downstream of the dam site could be consumed two times per week. Comparing these results to reported baseline consumption frequencies of fish caught in the LAA (which indicate a relatively low frequency), the assessment concludes that people will not be required to change the frequency of consumption of fish that are caught from the LAA. This finding took into account results of Aboriginal harvest and consumption studies.
19.4.2 Effects Assessment – Operations – Change in Fishing Opportunities and Practices

Changes in Use of and Access to Fishing Areas During Operations

It is anticipated that access within the Site C reservoir will be temporarily managed for safety and slope stability hazard in the first several years of operation. In the short term, this represents a net loss of access to fishing opportunities for First Nations. BC Hydro’s approach to providing reservoir and shoreline access is described in Volume 3 Section 25 Outdoor Recreation and Tourism. The reservoir and shoreline will create new areas for fishing when restrictions are lifted.

BC Hydro will provide three boat launches to provide reservoir access (Volume 3 Appendix E Outdoor Recreation Mitigation Plan). Volume 3 Section 26 Navigation indicates that the reservoir will provide good navigational opportunities to support fishing.

During the operations phase, access will be limited downstream of the dam to sections of the Peace and Pine rivers accessible from the boat launch at Peace Island Park.

Fishing opportunities in the reservoir will resemble opportunities in the Dinosaur Reservoir, with similar species. The reservoir will support more boats than the river does.

New access points to the reservoir and new seasonal opportunities represent both a benefit to Aboriginal groups and an adverse effect. New opportunities for fishing may be created for all fishers, non-Aboriginal and Aboriginal alike. However, those opportunities would take place in a modified landscape that would not resemble the Peace River as it existed before dam construction. In particular, the dam site will fragment the Peace River. The ability of Aboriginal fishers to exploit new seasonal opportunities depends upon the creation and transmission of local knowledge about fishing, a concern expressed directly by Aboriginal groups (See Table 19.1 Key Issues). Fishing requires local, place-responsive knowledge of habitat, species behaviour, gear and technique. It is anticipated that the fish community of the reservoir will undergo change in composition and membership for several decades. In addition, the variable depths of a lake give rise to a need for different fishing technologies, which may be costly. This may mark a change in the ability to access fishing areas and the practice of fishing.

There are indications in the Project-specific TLUS reports that at least some Aboriginal harvesters are fishing at the existing reservoirs, but the use appears to be less intense in comparison with use of the main stem Peace and tributaries. In addition, it is undermined by fears about methylmercury contamination and other perceptions about pollutants.

Where there is a benefit of greater opportunities for the public, this may be experienced by Aboriginal people as an adverse effect of the Project to the extent that they feel their enjoyment of the practice of fishing is reduced.

Changes in Availability of Targeted Species During Operation

According to the effects assessment on fish and fish habitat, the operation phase of the Project may adversely affect some species of fish while benefiting others. These anticipated changes in fish community composition may, in turn, result in a change in the availability of fish species targeted by Aboriginal fishers.
The fish and fish habitat VC states that the operation phase of the Project may result in the following changes to fish and fish habitat, which are relevant to this VC:

- At the end of the construction period the filling of the Site C reservoir would permanently change the aquatic ecosystem (and the areas available for fishing). A new aquatic ecosystem will be created upstream of the dam. The dam will impede upstream and downstream movement and affect fish survival. In particular, fishing use and access would change from a river setting to reservoir setting.

- Fish community modelling indicates an estimated three-fold increase in total biomass of harvestable fish in the reservoir relative to baseline conditions in the Peace River. Burbot, lake trout, rainbow trout, walleye, and northern pike are expected to increase, while Arctic grayling, mountain whitefish, and bulltrout are expected to decline.

  - In the short term (first 1-10 years), burbot, kokanee, lake whitefish, rainbow trout, and peamouth would enter the newly formed reservoir. Fish adapted to river environments would be impacted, especially Arctic grayling, mountain whitefish, sculpin, and bulltrout.

  - In the medium term (10-30 years), species belonging to the sucker and minnow group would dominate the system. Lake whitefish would become a dominant species while northern pike, present since inundation, may become an important predator in the medium term (its long term success would depend on habitat availability). It is uncertain whether walleye would reside in the reservoir. Lake whitefish and kokanee would compete directly for food sources but kokanee may, over time, become dominant. Lake trout and bull trout may increase over time.

  - In the long term (30 years+), species able to adapt to the reservoir system would settle into their respective roles, which would form the basis of a long-term fish community. Lake whitefish or kokanee will be the dominant group, while top predators will include northern pike, pikeminnow, and burbot. Rainbow trout may be present. (Volume 2 Section 12 Fish and Fish Habitat).

- For a distance downstream of the dam, the operation of the dam and generating station may modify the surface water regime and other characteristics of the river aquatic ecosystem and influence aquatic habitat conditions, ecological productivity and fish community composition.

- The species presently found downstream of the proposed Site C dam would continue to be found there following construction; however, their importance and place within the fish community may change.

- The water temperature and ice flow regime characteristic of the river below the Peace Canyon Dam will apply to the area below the Site C Dam. The fish community that will form downstream of the Site C Dam is predicted to reflect the community currently downstream of the Peace Canyon Dam. Kokanee and lake trout may establish population distributions immediately downstream of the Site C Dam, as they do with the Peace Canyon Dam.

- Arctic grayling, bull trout, mountain whitefish, and sculpin will be adversely affected, as downstream sediment concentrations during fall or winter will make unusable certain fish habitats characterized by clean rock bed material.
- Site C operations may result in ecological conditions that would allow Arctic grayling, bull trout, mountain whitefish, and rainbow trout populations to extend their distribution downstream into Alberta.

While the reservoir may create new opportunities for fishing, the ability of Aboriginal fishers to exploit those opportunities depends upon the creation and transmission of local knowledge about fishing. Fishing requires local, place-responsive knowledge of habitat, species behaviour, gear and technique. As indicated above with respect to the construction phase, it is anticipated that the fish community of the reservoir will undergo change in composition and membership for several decades. Therefore, fishing success would be adversely affected during this time.

Changes in species availability may affect Aboriginal communities at different times after the reservoir has been created. Only BRFN indicated harvesting burbot and kokanee in the LAA, although SFN and BRFN both indicated harvesting rainbow trout (whitefish are indicated by T8TA and BRFN, but it is not clear what kind of whitefish is being harvested). Since these species are predicted to increase in the first ten years of the reservoir, their presence would require adaptation of fishing practices by Aboriginal harvesters.

Changes to the fish community in the reservoir would continue to affect Aboriginal fishing into the medium term. Although jackfish and bull trout are both harvested by most Aboriginal groups, other species projected to increase are currently only harvested by three First Nations groups: lake trout (T8TA), kokanee (BRFN), and whitefish (T8TA and BRFN). In the long term, all harvesters using the reservoir could be expected to adjust to the predicted dominance of kokanee or whitefish, reported to be harvested by T8TA and BRFN, although the timing of such an adaptation is uncertain.

Changes in the fish community composition throughout the LAA, and the length of time the reservoir and downstream environs takes to reach a stable state supporting a fishery, would affect the success of Aboriginal fishers. Aboriginal fishers may avoid the reservoir and downstream areas until it becomes equally profitable to fish in those locations as it may in an alternate area. The adaptation of a new reservoir fishery may mirror the development of the fish community within the reservoir in terms of the time it takes to adapt.

These effects would be felt by all Aboriginal groups who currently use the LAA and, in particular, by T8TA, BRFN, SFN, and DFN as follows:

- A relative increase in kokanee and lake trout downstream of the dam poses an adaptive challenge to Aboriginal fishing practices, as neither appear to be target species, except where they are indicated by T8TA (lake trout) and BRFN (kokanee)
- A decrease in the availability of bull trout would affect T8TA, SFN, BRFN, and DFN, who indicated harvest of bull trout in TLUS reports
- The movement of a coldwater regime and fish species downstream may affect DFN and HLFN members, who currently favour cool water species such as walleye and jackfish, and may have to shift their harvesting to cold water species, requiring new fishing practices, knowledge, and gear

Changes in Use of Harvested Species During Operation

The changes in use of harvested species would carry over from construction.
19.4.3 Mitigation Measures – Change in Fishing Opportunities and Practices

Mitigation measures to address potential adverse Project effects on current fishing opportunities and practices will be achieved through the following commitments:

- Consult with Aboriginal groups respecting the development of fish habitat compensation projects that align with BC Hydro compensation programs
- Seek input from Aboriginal groups respecting mitigation strategies
- Continue to consult with Aboriginal groups on clearing plans and protocols
- Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect fishing opportunities or access
- Develop a communications program to inform harvesters of longer-term changes in fish community composition
- Implement all mitigation measures set out in Volume 2 Section 12 Fish and Fish Habitat.
- Implement measures supporting the development of 3 boat launches along the Site C reservoir accessible via Highway 29 to support navigability and navigable use, and the re-establishment of recreational sites on the Site C reservoir and downstream, and to re-establish and create new use patterns and access, as set out in Volume 3 Section 26 Navigation

19.4.4 Effects Assessment – Change in Hunting and Trapping Opportunities and Practices During Construction and Operations

The Project has the potential to affect a current use of lands and resources, traditional hunting, by reducing the hunting and trapping opportunities of Aboriginal groups. Aboriginal groups who submitted TLU studies have indicated that hunting is a primary activity.

The location of the hunting activity is identified in the discussion of use of and access to hunting rather than as a separate indicator. Potential project effects on hunting and non-tenured or subsistence trapping opportunities and practices are discussed at the Project component level, rather than the activity level, for this VC. An exception is made when more detailed information on either current use or biophysical effects allows for an analysis of activity-level interactions.

During the construction phase, the Project may affect hunting and non-tenured or subsistence trapping opportunities and practices through changes to access, wildlife habitat alteration and fragmentation, disturbance and/or displacement of wildlife resources, and direct or indirect mortality of animals.

Potential effects on wildlife are detailed in Volume 2 Section 14 Wildlife Resources, which assesses potential Project effects on wildlife resources within the wildlife resources Local Assessment Area (LAA). Key indicator groups for the wildlife assessment were selected based in part on “[A]boriginal concerns of effects to biodiversity, loss of habitat, changes in animal populations and their distribution, and effects to traditional land uses practices.” As a result, there is considerable overlap between the key indicator groups used in Volume 2 Section 14 (Table 14.3, Key
indicators for wildlife resources) and species reported as currently harvested species in Traditional Land Use studies (Tables 19.5 to 19.10). The following species are commonly referenced in TLUS and were also used as indicator groups in Volume 2 Section 14 Wildlife Resources:

- Bald Eagles (raptors)
- Sharp-tailed (non-migratory game birds)
- Ruffed Grouse (non-migratory game birds)
- Fisher (fur-bearers)
- Beaver (fur-bearers)
- Moose (ungulates)
- Elk (ungulates)
- Mule deer (ungulates)
- White-tailed deer (ungulates)

The following effects assessment of changes to hunting and non-tenured or subsistence trapping opportunities and practices focuses on these species.

**Changes in Use of and Access to Hunting Areas During Construction**

Assessment of potential Project effects on the ability of Aboriginal harvesters to access hunting areas during construction are brought into this VC from Volume 3 Section 26 Navigation, Volume 1 Section 4 Project Description, and Volume 3 Section 24 Harvest of Fish and Wildlife Resources. Although Volume 3 Section 24 addresses public hunting and tenured trapping (including Aboriginal tenured traplines), rather than Aboriginal hunting, its findings are relevant here.

Alterations in access that may affect Aboriginal harvesting would involve both changes to navigation on the Peace River and its tributaries as well as changes to access roads in the Project area. Access-related changes to hunting and non-tenured or subsistence trapping opportunities and practices include the following:

- restrictions due to construction activities would reduce access to and use of hunting opportunities and areas during construction.
  - Access would be restricted within the Project activity zone, including the Site C dam site and off-site construction materials locations.
  - As defined by existing regulations governing the use of firearms, hunting within Project work areas such as the Project access road, Highway 29 realignment corridors, and reservoir vegetation clearing areas will be restricted.
  - Restrictions on use for safety and slope stability reasons (described in Section 2.4.11) during reservoir construction and inundation will affect access and use of hunting areas along the Peace River during construction.

The Project will alter the existing access network utilized by Aboriginal and non-Aboriginal hunters to harvest wildlife resources. The Project would affect the ability of Aboriginal hunters to use existing access networks such as the Peace River in the
area of the Project (which is used as a transportation route as indicated by both T8TA and SFN).

Water-based navigation will be restricted in the area of the Project dam site at the beginning of the construction phase. Areas both up and downstream of this restricted area will remain navigable, and may be accessed from boat launches at Lynx Creek, Halfway River, and Hudson’s Hope in the beginning of the construction phase.

Opportunities to access the river will be temporarily reduced when construction activities close the Hudson’s Hope boat launch in Year 5. With inundation, all existing boat launches including Halfway River, Lynx Creek would become permanently unavailable. Until new boat launches are opened for use on the reservoir, there would be an adverse effect on access to water-based navigation.

Downstream of the dam, the Pine River would be unaffected.

Although provision of access and navigation downstream of the dam site will be unaffected during construction, harvesters who are accustomed to using the Peace River as a transportation corridor between the Peace Canyon Dam and stretches downstream of Fort St. John will have to transport their boats around the dam site.

Construction activities will create a new temporary road access network that may be used by all hunters, and poachers, to access wildlife. New temporary construction access will include the following linear features:

- Approximately 23 km of all-season clearing roads along the Site C reservoir and construction sites
- Approximately 113 km of winter clearing roads
- Temporary spans to access islands for clearing activities

Increased access during construction represents both a benefit and an adverse effect to Aboriginal hunters in the LAA. It opens up previously inaccessible areas to Aboriginal harvesting, but also to increased competition from other hunters, and poaching.

According to Volume 1 Section 4 Project Description, these roads will be reclaimed or inundated after clearing. In the consideration of public hunting, Volume 3, Section 24 indicates that these roads could be used by hunters to access formerly inaccessible areas within the LAA. However, this effect will only be temporary.

There is no predicted change in use of and access to hunting resulting from Wuthrich Quarry. The construction of Portage Quarry may affect T8TA’s hunting opportunities; they have identified subsistence values (moose and deer) and an environmental area near the site. The West Pine Quarry may affect the use of lands for hunting of HLFN, who identified two moose hunting sites in the area.

Changes in Use of and Access to Hunting Areas During Operation

Section 3 Volume 24 Harvest of Fish and Wildlife Resources notes that when the reservoir is open to public boat and recreational traffic – after the first several years of operation – areas that had been inaccessible to hunting (sport and Aboriginal) during the construction phase will become accessible again, although areas near the dam and the Moberly Reach may be restricted for longer periods due to slope stability concerns.

BC Hydro will provide three boat launches to provide reservoir access (Volume 3 Appendix E Outdoor Recreation Mitigation Plan). Volume 3 Section 26 Navigation...
indicates that the reservoir will provide good navigational opportunities to support harvesting and recreation.

Changes in Availability of Targeted Species During Construction and Operation

The assessment of changes in availability of targeted species draws on the relevant effects assessment in Section 2 Volume 14 Wildlife Resources and it follows Section 2 Volume 14 in treating construction and operation phases together. Section 2 Volume 14 Wildlife Resources describes the following potential effects on key indicators that are relevant to the current use of lands for hunting and non-tenured or subsistence trapping by Aboriginal persons.

- Habitat alteration—defined in Section 2 Volume 14 as the “permanent removal or loss of habitat or a reduction in habitat suitability for a species”
- Disturbance and displacement—defined as “activities that cause individuals to alter their behaviour or avoid habitats that are otherwise suitable.” These may include construction noise and close proximity of people and machinery to suitable habitats.
- Mortality—Associated with “the alteration of habitats due to construction activities, flooding—including construction headpond flooding, and the deleterious release of substances.” Mortality also includes animals hunted, poached, hit by vehicles, or lost during infilling of the reservoir.

Of these three key aspects, Section 2 Volume 14 Wildlife Resources predicts that habitat alteration would be the “primary effect on wildlife resources”. Consequently, habitat alteration is the most relevant to an assessment of potential Project effects on current use of lands and resources with respect to opportunities and practices for hunting and trapping. Construction phase activities have the potential to induce habitat alteration and fragmentation through site clearing and preparation and other activities that will be undertaken to construct the dam generating station and spillways, reservoir, transmission line, Highway 29 realignment, and construction of access roads. According to Volume 2 Section 14 Wildlife Resources, most of the effects of the Project on wildlife resources will occur during the construction phase.

Wildfowl, Upland Birds and Other Birds

Waterfowl (migratory birds) would be affected by construction activities through the loss of habitat due to alteration and fragmentation, disturbance and displacement, and mortality, mostly through transformation of the river into a reservoir. Ice formation patterns in the future reservoir will change staging areas for some species. The assemblages of waterfowl are predicted to change.

Waterfowl hunting is indicated within the LAA by SFN and, to a lesser extent, by BRFN (grebes included) and DTFN. One waterfowl site reported by BRFN members, at the mouth of Wilder Creek, is within the inundation zone and will be affected, first by access restrictions after Year 1, and afterward by reservoir creation. Waterfowl hunting by SFN members at Boucher Lake, Monias Lake, and around Boudreau Lakes would not be affected by the Project, as the adverse residual effects described for migratory waterfowl in 14.5.1.1.3 are specific to waterfowl in the reservoir. However, duck hunting by SFN members on the Lower Moberly will be affected by creation of the reservoir. Pintail duck hunting sites on the Peace River will be inundated, and goose hunting locations on the Peace River below Hudson’s Hope will be lost.
T8TA has indicated some wildfowl hunting in the LAA but has not supplied specific information to allow for an assessment of potential effects.

Sharp-tailed Grouse and Ruffed Grouse (non-migratory game birds) would be affected by loss of habitat, habitat fragmentation, disturbance and displacement via construction activities, direct and indirect mortality (construction activities, flooding, equipment and vehicle collisions), and potentially increased hunting. Noise and physical disturbance from construction and operation activities have the potential to disturb or displace Grouse. However, it is anticipated that residual effects on non-migratory game birds will dissipate with time.

Changes in the availability of the two indicator Grouse species may affect members of the SFN and T8TA at least during construction, who indicated harvesting them within the LAA. BRFN indicates that Grouse is harvested opportunistically, as part of larger ungulate hunting efforts, but no specific areas within the LAA are given.

Grouse hunting by SFN members may be affected within the LAA at Boucher Lake and Monias Lake by increased access and competition. Other areas on Moberly Lake, for instance, would not be affected. Grouse hunting by T8TA members at several sites within the LAA may also be affected, along the transmission route and near the dam site.

**Small Game and Furbearers**

Fisher will be affected by the construction of the Project. Construction will result in the removal of 14% of the suitable denning area for fishers within the LAA. Land clearing within the reservoir will displace animals out of their home ranges. Direct mortality may occur during vegetation clearing as fishers are cavity dwellers. However, Volume 2 Section 14 Wildlife Resources states that no significant residual effects to fisher are expected as a result of the Project. There will be no adverse effect on Aboriginal current use of lands and resources for hunting and trapping fisher.

Beaver will be displaced during reservoir clearing, flooding during Stage 1 and Stage 2 construction, and reservoir filling. More than 60 beaver lodges will be lost along the Peace and its tributaries during construction activities and filling of the reservoir. Removal of riparian vegetation may decrease food prior to inundation. It is anticipated that beavers will recolonize the reservoir area during the operation period.

Loss of furbearers and small game could affect Aboriginal harvesters who have indicated current use overlapping the LAA, including SFN and T8TA members. However, these effects would be confined to the construction period. In addition, other harvesting areas are identified outside the LAA.

SFN currently harvest a number of small game and furbearing animals contiguous with the LAA along the Moberly River, the Pine River, and around Boucher Lake which may be affected, including beaver, marten, wolves, squirrel, muskrat, weasel, coyote, jackfish, mink, wolverine, and fox. For these species, additional harvesting areas are identified outside the LAA.

Depending on their exact location, several small game sites indicated by T8TA members in the LAA would be affected by Highway 29 realignment or inundation of the reservoir, including two beaver harvesting sites and one marten harvesting site near Bear Flats.
Ungulates

Loss of habitat is predicted to affect ungulates in the LAA, principally through a projected loss of winter areas, or disturbance during winter. Ungulates includes moose, elk, mule and whitetail deer (caribou were excluded from the wildlife resources assessment; see Volume 2 Section 14 Table 14.2 Rationale for the Exclusion of Suggested Species).

Adult ungulates are highly mobile, and it is anticipated that the Project may induce some movement of ungulates away from the Project area. Construction activities may induce direct and indirect mortality. It is anticipated that new access roads will reduce suitable habitat and food sources for ungulates, fragment their habitat, and lead to direct mortalities through vehicular collisions. While these effects are anticipated to occur during construction, no significant residual effects to ungulates as a result of the Project are predicted (Volume 2 Section 14 Wildlife Resources).

Changes in ungulate availability could affect the current use of lands and resources for hunting by Aboriginal groups who report harvesting in the area. There will be no change in white-tail deer. Elk will continue to increase without a large change, mule deer numbers will vary based on winter severity but the Project won’t affect numbers. Moose may see a decline of 5% in population due to the Project.

Temporary reduction to moose availability in the LAA would affect reported harvesting in the area. Moose and elk are harvested by members of the SFN, T8TA, BRFN, DTFN, DFN, and HLFN. SFN and BRFN, and the T8TA members harvest deer. BRFN members reported that the vicinity of the Project is a preferred hunting area, and indicated several extensions of their hunting areas in the LAA that would be affected by reductions in moose, elk, and deer availability. However, the maps included in their Traditional Land Use study, depict the majority of their indicated hunting areas are north of the LAA in the watersheds of tributaries of the Peace.

SFN’s current use of hunting for moose, mule-deer, and elk in the southwestern portion of the LAA would be affected by changes in ungulate distribution, while their current use of hunting in the Monias and Boucher Lake areas may be affected by increased access and/or competition. Moose is the main ungulate species harvested.

T8TA members’ harvest of moose, deer, and elk may be affected at hunting locations within the LAA. Areas in the path of the future transmission line (moose) near the Peace Canyon Dam would be affected by increased access and competition from non-Aboriginal hunters. Areas on the north shore of the Peace River at Lynx Creek (white-tailed and mule deer), on opposite banks between Farrell Creek and the Halfway River (deer and moose), along the north bank near the mouth of the Red/Cache Creek (moose, elk, and deer) would be directly affected by inundation. Areas on the south side of the Peace River near Taylor (moose) are outside the inundation zone and could be affected by changes to downstream flows. Harvesting at other indicated ungulate locations between the south bank of the Peace River and the transmission line may be affected by increased access and competition by non-Aboriginal hunters. However, T8TA has identified in its TLUS additional moose hunting areas that lie outside the LAA.

The current use of lands and resources for hunting may be affected by reductions in moose populations in the LAA for DFN, HLFN, and DTFN. However, TLUS evidence provided by these First Nations indicates that their core moose hunting territories lie outside the LAA.
Large Carnivores

Volume 2 Section 14 Wildlife Resources anticipates that the Project will not affect large carnivores (grizzly bear and grey wolf) or hunting of these resources.

SFN members’ black bear hunting, which is indicated to occur in the southwestern portion of the LAA, and in and around Moberly, Boucher, and Monias lakes (Monias is also indicated for one brown bear harvesting site), will not be directly affected. However, the transmission line may permit easier access to the Boucher Lake area. T8TA has indicated one bear harvesting location at the mouth of the Red/Cache Creek, within the inundation zone. Grizzly bear are not harvested in the LAA.

19.4.5 Mitigation Measures – Change in Hunting and Trapping Opportunities and Practices During Construction and Operations

Mitigation measures to address potential adverse Project effects on current fishing opportunities and practices will be achieved through the following commitments:

• Consult with Aboriginal groups respecting the development of wildlife habitat compensation projects that align with BC Hydro compensation programs
• Seek input from Aboriginal groups respecting mitigation strategies, such as mitigation measures related to trap lines in the Project activity zone
• Continue to consult with Aboriginal groups on clearing plans and protocols
• Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect hunting opportunities or access
• Implement all mitigation measures set out in Volume 2 Section 14 Wildlife Resources
• Implement all mitigation measures set out in Volume 3 Section 24 Harvest of Fish and Wildlife Resources pertaining to trapping

19.4.6 Effects Assessment – Change in Cultural and Traditional Uses of the Land

Potential Project effects on other cultural and traditional uses of the land – including practices, features, and traditional values that have not been addressed within this VC under the indicators for hunting, trapping, and fishing – are discussed at the Project component level, rather than the activity level. As with the other indicators, an exception is made when information allows for an analysis of activity-level interactions.

SFN, T8TA, BRFN, DTFN, DFN and HLFN have reported other cultural and traditional uses of the land including place names, habitation sites (cabins and less permanent camps), gathering places, teaching areas, drinking water, feather-gathering sites, firewood, trails and water routes, berries and other food plants (see Tables 19.9 and 19.10).

Several other Aboriginal groups, including KLMSS, MNBC and MLIB have indicated use of the Peace River valley in a general sense, but have not provided sufficient specific information on use within the LAA to enable an effects assessment. MLIB is undertaking a traditional use study for the Project. The results of the study will be considered and
incorporated into the EIS, where appropriate, during the EIS review phase. Consultation
and engagement activities with other Aboriginal groups are also on-going.

Ceremonial and sacred areas, medicinal plant gathering sites, burial sites, and other
places reportedly of spiritual or cultural use importance were described to BC Hydro, but
not always with geographic precision. T8TA’s TLUS report, for example, combines these
features and values (medicinal plant gathering place, burial sites, cultural place, spiritual
places) into a single class of site for reasons of confidentiality on the accompanying
TLUS maps, such that the location or nature of the site is unidentified (see Volume 5
Appendix A06 Part 5, Maps W2 and E2 Cultural Use Study Results).

Many of the resources described in this section are used for food, medicine, water,
transient or longer-term shelter, warmth, and transportation. Although potential changes
in their use or availability that may be induced by the Project are assessed individually,
taken together they are all part of an infrastructure that supports the central current use
activities of fishing, hunting, and trapping, described in Section 19.3).

Aboriginal groups have conveyed to BC Hydro – in TLUS reports, other studies, and in
discussion – that there are certain places, or in a broader sense, landscapes, within the
Current Use of Lands and Resources for Traditional Purposes LAA (fish and fish habitat
and wildlife resources LAAs) that should be assessed paying particular attention to the
multiplicity of uses taking place there, the importance of those uses as described by
community members, and the depth of individual and community attachment to them.
Potential changes to culturally important places and valued landscapes are assessed
below for the construction and operation phases of the Project.

Changes in Other Cultural and Traditional Uses of the Land During Construction

Burial Sites

The locations of two burial sites reported by T8TA at Attachie and Bear Flats would likely
be affected by clearing activities during construction of the Highway 29 realignment, and
would eventually be submerged when the reservoir is filled. The burial sites are
associated in Treaty 8 oral history with the 1919 flu epidemic: the grave of Chief Attachie
is reported to be on the south facing slope at Attachie, while the valley bottom
downstream of Bear Flats is also reported to be a burial location. Multiple burials are
also reported to be at Halfway River, although no specific locations are given. No
physical indications of burial sites have been found at these locations (Volume 4
Section 32 Heritage Resources Effects Assessment); however, an oral tradition about
burial sites may be of cultural heritage value, and would be changed by the Project. It is
uncertain how Aboriginal community members will respond to the submergence of the
areas believed, traditionally, to hold graves belonging to their ancestors.

BRFN have also identified, in their TLUS, Attachie as an important burial ground. One
BRFN member talked of the potential for burials throughout the Peace River valley
because “that’s where the old-timer Beaver Indians used to be.” The information is
geographically broad and does not allow for an assessment of the Project’s effects.

SFN has indicated the location of a burial ground area in the general vicinity of Hudson’s
Hope, however, the information is geographically broad and does not allow for an
assessment of the Project’s effects.
Habitation Sites (Cabins and Campsites)

BRFN, SFN, and T8TA have identified cabins and campsites within the LAA. Locations of both permanent and transient habitations are indicated as strung along the north shore of the Peace River at Farrell Creek, Lynx Creek, Halfway River, Bear Flat and Cache Creek, and on both sides of the river at Hudson’s Hope. There are smaller concentrations on the north shore of the Peace River opposite Moberly River, at Fort St. John Historic Park and at Taylor.

Areas that include six camp sites within the LAA used for hunting, fishing, and recreational camping by BRFN members may be altered during construction by clearing activities, and then submerged during inundation. Five are reported on the north side of the Peace River – one at Bear Flats, one on the lower Halfway River; two between Halfway River and Farrell Creek; and one on lower Farrell Creek. The habitation values reported by BRFN are not permanent structures, but sites for transient camping.

SFN made 11 references to cabins located in the LAA to the south and east of Boucher Lake. It appears that these cabins will not be directly affected by the Project; however, temporary changes in availability of wildlife resources during construction may temporarily alter their utility and function for hunting, trapping, and fishing.

Seventy-nine campsite values were identified by SFN within the LAA; this does not refer to specific individual sites, and may refer to multiple references to the same or related sites:

- Campsites along the Peace River at the confluence with the Moberly, on the north side of the Peace River to the southwest and northeast of Attachie, and on the south side of the Peace River opposite Attachie, would be cleared during construction and covered by the rising reservoir during inundation.
- Campsites on the north side of the Pine River near its confluence with the Peace, near Monias Lake, and through the eastern end of the transmission line right-of-way, would not be affected.
- Two “day camps,” which is not defined, identified by SFN – one south of Boucher Lake near transmission line works, and another near Monias Lake – would not be adversely affected.
- Day camps identified along both sides of the Peace River between Dinosaur Lake and Attachie appear to be within the inundation zone of the reservoir.

Of the 136 habitation use values depicted by T8TA within the LAA—including 59 gathering places, 53 temporary habitations, and 24 permanent habitations—most appear to be within the area of the river valley that will be transformed into a reservoir, including those along the north shore of the Peace at Farrell Creek, Lynx Creek, Halfway River, Bear Flats and Cache Creek, and on both sides of the river at Hudson’s Hope.

Smaller concentrations on the north shore of the Peace opposite Moberly River, at Fort St. John Historic Park and at Taylor will be affected by access restrictions in the area of the proposed dam site, to be implemented in the first year of construction.

HLFN indicates 20 overnight sites within the LAA, including in the area of Taylor/Fort St. John. However, it is not possible to determine on the basis of the maps provided whether the sites will be adversely affected by the Project.
A Treaty 8 elder and youth culture camp is held at Bear Flats campground. This site and its importance are discussed below under “cultural and spiritual places”.

**Drinking water**

T8TA has described water as a sacred resource, and indicated the presence of several freshwater sources within the LAA. Two natural water springs identified southwest of Bear Flats and four drinking water sources—one at the mouth of Moberly Creek, one west of Bear Flats and two at Hudson’s Hope—sit in areas that will be submerged by the inundation of the reservoir.

**Firewood**

Clearing and subsequent inundation of the reservoir will flood an area that SFN members indicate they use for tree harvest, between Attachie and the Peace Canyon Dam on the north shore of the Peace River. One additional tree harvesting area near Boucher Lake, and one nearby hay harvesting site, appears to be on the route of the proposed transmission line.

Two firewood harvesting areas depicted by T8TA at Bear Flats and another two locations between Farrell Creek and Halfway River will be cleared and inundated.

**Eagle Feathers**

Saulteau and T8TA have indicated that they harvest eagle feathers. Of 59 bald eagle nests observed in field studies conducted for the assessment in Volume 2 Section 14 Wildlife Resources, 32 will be removed as a result of the Project. Bald Eagle gathering locations identified by SFN within the LAA on the Peace River between the Pine and Moberly rivers may be affected by clearing for the transmission line. Depending on their location, Golden Eagle sites to the north of the Peace River along Highway 29 and sites along the proposed transmission could be affected by clearing and construction activities. T8TA also identified two feather-gathering sites within the LAA that may be affected.

**Trails and Water Routes**

SFN identified 22 trails in the LAA. Trails located in the area to the south of Boucher Lake, and to the south and west of Monias Lake will not be affected by the Project and will continue to support transportation and access to land use features. Trails indicated near the mouth of the Moberly River and at two locations on the south side of the Peace River would be affected by construction clearing and inundation.

T8TA’s TLUS report identifies 30 transportation values within the Project footprint and flood zone including: portions of trails, horse crossings, raft or boat crossings and water routes by and for canoe and motorboat. Portions of these trails or routes that cross the river in its flood zone will be disrupted. Several other transportation and boat routes along the Peace will be flooded.

Transportation lines running along the Halfway River from its mouth to Halfway River Reserve 168 will not be adversely affected by the Project. Transportation lines depicted within the Peace River itself will be submerged and fragmented by the dam site.

**Cultural and Spiritual Places**

Ceremonial and sacred areas and other places, reportedly of spiritual or cultural use importance, including teaching and gathering sites, were described to BC Hydro by
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1 T8TA, but not always with geographic precision. T8TA’s TLUS, for example, combines
2 these features and values into a single class of site on the accompanying TLUS maps.
3 For reasons of confidentiality the location and nature of the site are unidentified. Map W2
4 and E2 Cultural Use Study maps, Volume 5 Appendix A06 Part 5). These sites are
5 discussed in greater detail in Section 19.4. Within the wildlife resources LAA, T8TA has
6 described 76 cultural use values, including 44 buffered, or redacted, data areas,
7 12 place names, and 9 teaching areas. These do not necessarily refer to different sites,
8 but may indicate multiple memories or references to the same site(s).
9 T8TA indicates gathering places and teaching areas at Coffee Pot, Lynx Creek, Dry
10 Creek, Farrell Creek, Attachie, Bear Flats, near the Moberly River confluence, and near
11 the Fort St. John Historical Site. They also identified sites of cultural and spiritual sites in
12 areas outside the LAA, including the Twin Sisters area.
13 BRFN identified a spiritual site at Attachie. In addition, through consultation with
14 BC Hydro, BRFN representatives indicated that Dancing Grounds is considered a
15 sacred site, and expressed interest in protecting the land from future development.
16 Dancing Grounds would not be affected by the Project as it is a far distance from the
17 boundaries of the LAA.
18 Other distant but highly valued cultural and spiritual sites include Pink Mountain,
19 Muskwa Kechika (BRFN and T8TA), K’ih tsaaʔdẓa Tribal Park (T8TA), the Crying Girl
20 Prairie, the Twin Sisters, and the Peace Moberly Tract (T8TA, SFN), among others.
21 SFN indicates that summer camping creates an opportunity to transfer traditional
22 knowledge from old to young. While engaging in traditional activities, SFN youth learn
23 about SFN language, culture, and how to process meat, berries and medicines. This
24 function will be affected by the Project insofar as camping opportunities will be reduced
25 by the construction and operation of the Project.
26 Bear Flats is reported to be an area used for gathering and teaching for T8TA. Elders
27 camps, Youth and Elders camps, and Treaty 8 meetings are held at the Bear Flats
28 campground, which is above the Site C maximum normal reservoir level, but within the
29 reservoir impact lines. A portion of the property would be directly affected by the highway
30 realignment at Cache Creek. The Nenan Dane-zaa Deh Zona Child and Family Services
31 Society (NENAN) holds an annual Youth and Elders gathering at the campground.
32 According to NENAN, the Bear Flats area was chosen due to its “profound significance
33 as Treaty 8 people have gathered, camped, hunted, and practiced ceremony here since
34 time immemorial”. The T8TA, BRFN and SFN also reported the importance of holding
35 the event at Bear Flats. (T8FNs Community Assessment Team and The Firelight Group
36 Research Cooperative 2012). The effects to the Bear Flats campground are further
37 discussed in Volume 3 Section 24 Harvest of Fish and Wildlife Resources.
38 The areas described above are spaces to transfer traditional knowledge, a key factor in
39 cultural retention.
40 **Berries, Herbs, and Medicinal Plants**
41 Effects on opportunities and practices to harvest resources for traditional purposes are
42 assessed based on information reported in Traditional Land Use studies provided to
43 BC Hydro and on the biophysical effects described in Volume 2 Section 13 Vegetation
44 and Ecological Communities. While Volume 2 Section 13 does not assess effects on
45 individual plant species or plants reported in TLUS reports to be used by Aboriginal
46 people for traditional purposes, it reports all terrestrial ecosystems within the Vegetation
and Ecological Communities LAA and assesses effects to those that are vulnerable to environmental effects of the Project, including rare plants and rare and sensitive communities. Sensitive communities encompass grasslands, wetlands, old-growth forest, marl fens and tufa seeps – some of which are known to have occurrences of plants harvested by Aboriginal people. By extension, the interactions and effects described in Volume 2 ecosystems can be used to inform this indicator.

Volume 2 Section 13 indicates that there is an increased potential for adverse effects on terrestrial ecosystems, and that rare plants would be adversely affected during the construction phase of the Project. Based on the effects described in Volume 2 Section 13, it is reasonable to expect that the following effect pathways would also apply to specific plants, berries, trees, bushes and water used by Aboriginal people within the LAA for this VC:

- Clearing of vegetation and grubbing during site preparation for the reservoir, dam site, new roads and transmission line would be the primary project activities resulting in habitat alteration during the early stages of construction.
- Water diversion associated with dam construction has the potential to change flow regimes on the Peace River (see Volume 2 Section 11.4 Surface Water Regime for more details), which may affect occurrences of plants along the river margins.
- In the final stages of construction, reservoir filling would affect terrestrial ecosystems and rare plants through inundation of existing habitats. Occurrences within the proposed reservoir would be inundated, while those near the new shoreline could experience changes to their supporting habitats.
- Clearing activities also have the potential to affect plants and habitat through a number of mechanisms, including contamination from herbicide, road salt, silt or accidental spills of industrial fluids; and changes to hydrologic regimes—drying of wetlands, flooding of uplands—due to vegetation clearing, road building, and ground disturbance.
- Nearly half of the 63.7 km of the construction of new permanent road is associated with access to the south along an extension of the Jackfish Lake Road. This new segment will be built adjacent to the existing corridor for the transmission line and railway. It passes through a variety of terrestrial habitats, including wetlands in the eastern portion of the transmission line corridor as it approaches the dam site.
- Tower placement and line stringing activities related to construction of the transmission line could affect existing rare plant occurrences and potential habitat both directly (trampling, hydrologic modification, etc.) and indirectly (increased invasive species potential, increased dust deposition, etc.). The level of effect depends on where the activities occur.

T8TA, BRFN, DFN, DTFN, and SFN reported harvesting berries in the LAA. Multiple harvesting locations were reported along the Peace River at the proposed dam site (T8TA), at the Lynx Creek confluence (T8TA), near Hudson’s Hope (T8TA) and at Bear Flats (BRFN, T8TA) and Attachie (T8TA), where hunting, trapping and fishing are also practiced. These sites would be inundated. DTFN has reported harvesting berries at the junction of Flatrock Creek and the Peace River, downstream from the dam site. Project construction is not likely to have effects on berries downstream of the dam site.
There is a concentration of berry harvesting activity in the area south of Boucher Lake (SFN, T8TA). This area, depending on the exact location, may be altered or lost during clearing of the transmission line Right of Way or tower placement.

DFN indicated that there are plant and earth gathering sites east of Halfway River, however, there is not enough detail to determine whether the Project would overlap spatially with the harvesting sites (see Volume 5 Appendix A07, Plant and Earth Gathering Sites).

Multiple locations for harvesting herbs and medicinal plants were reported by First Nations. BRFN reported that the banks of the Halfway River are important for harvesting mint and Labrador tea. However, there is not enough detail in the TLUS maps to determine whether the Project would overlap spatially with the harvesting sites.

Similarly, T8TA indicated medicinal plant use throughout the Peace River between Fort St. John and Hudson’s Hope; however, the location of the areas has not been provided in sufficient detail to allow for an assessment of likely Project interactions. One medicinal plant habitat area is depicted on the north shore of the Peace River opposite the confluence with the Moberly River. Part of this harvesting area would be inundated.

SFN reported that Boucher Lake is an area of importance with multiple plant species harvested, including Labrador tea and rat root. This area, depending on the exact location, may be altered or lost during clearing of the transmission line Right of Way or tower placement.

Changes in Other Cultural and Traditional Uses of the Land During Operations

It is anticipated that the effects on other cultural and traditional uses of the land induced during construction would continue during the Operations Phase.

As is the case for the rare plants assessed in Section 2 Volume 13 Vegetation and Ecological Communities, berries, trees, medicinal plants and other resources identified above may survive clearing and potentially re-establish themselves.

The Project will affect the opportunities for T8TA, SFN, BRFN and DFN to continue to harvest plants and berries in the LAA. While in some cases, it may be possible for members of these First Nations to find alternate harvesting areas, these may be farther afield relative to their current travel distance, more costly to access, or less abundant. As a result, harvesting success may be reduced.

The operation of the dam is also expected to result in changes to the downstream hydrologic regime along the Peace River from the Project tailrace to the Pine River confluence. However, Volume 2 Section 13 Vegetation and Ecological Communities reports that it is not clear how these changes would affect rare plants and, by extension it is difficult to predict effects on the plants used by Aboriginal people.

The Project is expected to remove or alter ecosystems where food and medicinal plants, and berries and other resources used by Aboriginal groups grow. As is the case for the rare plants assessed in Section 2 Volume 13 Vegetation and Ecological Communities, berries, trees, medicinal plants and other resources identified above may survive clearing and re-establish themselves in the new environment. There is some uncertainty surrounding the fate of the resources discussed in this section outside of those areas that will be lost to the filling of the reservoir.
In areas where clearing has occurred, but plants and berries remain, perceived or real effects on the quality and safety of the foods may limit the availability of desirable harvesting locations and the desire to gather and consume the resources.

Clearing of the Right of Way for the transmission line may destroy resources that are currently used by Aboriginal people at Boucher Lake. As there is already access to Boucher Lake, Right of Way clearing is not expected to induce a noticeable increase in harvesters in the area.

**Changes in Use of and Access to Culturally Important Places and Valued Landscapes During Construction**

Aboriginal groups have encouraged BC Hydro to look beyond the Project’s interactions with individual land uses in isolation from one another in order to examine the Project’s effects on highly valued, multi-use, culturally and historically important places or areas.

As noted in Subsection 19.3, Aboriginal communities have indicated that they place a high value on certain places or landscapes within the LAA. These observations are quantified in Table 19.11, which describes the places identified by Aboriginal groups, and the multiplicity of uses and users that they host. While there are individual sites and small concentrations of sites strung along the length of the Peace River within the LAA, the cultural use areas demonstrating the most density of use and purpose, as evidenced in TLUS studies and consultation, are patterned along the River with a higher concentration at stream confluences on the north shore. Many of these places have an Aboriginal place name, indicative of a high historical and cultural association. Based on this information and on the reported high value Aboriginal groups attach to them, the following places suggest that they have the highest special importance:

- Attachie (atachii) (T8TA 2012)
- Bear Flats (sas tluuge?) (T8TA 2012)
- Farrell Creek

The following places are also reported to have a high cultural value, and multiple current uses are indicated for each:

- Bull Flats
- Coffee Pot
- Hudson’s Hope (near Maurice Creek)
- Lynx Creek
- Dry Creek
- Between Farrell Creek and the Site of Farrell
- Moberly River to Fort St. John Historical site
- Fort St. John Historical Site

The above noted places are along the Peace River would be inundated by the reservoir. The sites are generally a mixture of fee simple land, parcels owned by BC Hydro and Crown land. In the Attachie, Bear Flats, and Farrell Creek areas, the locations that appear to have the highest special importance, on average more than 80% of the lands are either owned in fee simple or by BC Hydro. However, the general nature of the site
descriptions from Aboriginal groups makes precise calculations difficult. It is possible 
that, following inundation and the establishment of new access within the reservoir, that 
old patterns of Aboriginal use may be reconstituted at new confluences of the Halfway 
River (Attachie) and the Peace River and Cache Creek (Bear Flats) with the reservoir, 
which will occur farther upstream from their present confluences with the Peace. 
However, the success of such an adaptation would require the return of conditions 
supporting both current use activities and conditions supporting broader cultural aims 
(teaching, ceremony, and other cultural uses).

There are several other places indicated as high value, multi-use places within the LAA 
that will not be affected by inundation, including the Taylor confluence below the Site C 
dam (indicated for use by DFN, SFN, and HLFN).

Multiple uses are also reported at Monias Lake, Boudreau Lake and Boucher Lake.
However, these sites are outside the flood zone, and the multiplicity of uses they host 
tend toward current use activities—hunting, fishing, trapping—without the emphasis on 
cultural and/or spiritual uses coupled with oral historical traditions that are attached to 
highly valued places along the Peace River.

**Changes in Use of and Access to Culturally Important Places and Valued 
Landscapes During Operations**

It is anticipated that the effects during construction on use of and access to culturally 
important places and valued landscapes would continue during the operations phase, as 
all the places indicated on banks of the Peace River will be inundated. It is possible that 
other gathering places may be reconstituted at the confluences of the old creeks and the 
new lake. It is also possible that Aboriginal harvesters will shift their attention outside the 
area of the Project to other special places within their territories.

**Table 19.11 Culturally Important Places and Valued Landscapes**

<table>
<thead>
<tr>
<th>Place Name</th>
<th>Landscape Feature</th>
<th>Current Uses</th>
<th>First Nations</th>
<th>Reported Cultural Values</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull Flats</td>
<td>Bull Run Creek, north and south of dam</td>
<td>Fishing, hunting, feather gathering, temporary habitation</td>
<td>Blueberry River First Nations, Dene Tha' First Nation, Duncan's First Nation, Horse Lake First Nation, Saulteau First Nations, Treaty 8 Tribal Association</td>
<td>Cultural areas, Place name, Feather gathering</td>
<td>Inundation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fishing</td>
<td>Blueberry River First Nation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harvesting</td>
<td>Saulteau First Nation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffee Pot</td>
<td>Peace River, The Coffee Pot, large island</td>
<td>Fishing, Plant gathering, Teaching area, Cabin</td>
<td>Treaty 8 Tribal Association</td>
<td>Teaching areas</td>
<td>Inundation</td>
</tr>
<tr>
<td>Place Name</td>
<td>Landscape Feature</td>
<td>Current Uses</td>
<td>First Nations</td>
<td>Reported Cultural Values</td>
<td>Interaction</td>
</tr>
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</tr>
<tr>
<td>Hudson’s Hope</td>
<td>Peace River, Maurice Creek</td>
<td>Temporary habitation, cabin, gathering place, water route, fresh water, Fishing</td>
<td>Treaty 8 Tribal Association</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trapping, trails</td>
<td>Saulteau</td>
<td>Trapline, trails</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hunting, fishing</td>
<td>Duncan’s First Nation</td>
<td>Moose, walleye</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hunting, fishing</td>
<td>Horse Lake First Nation</td>
<td>Moose, deer, walleye, jackfish</td>
<td></td>
</tr>
<tr>
<td>Lynx Creek</td>
<td>Creek confluence with Peace River</td>
<td>Plant gathering place, fishing, hunting, Place name, temporary habitation, gathering place</td>
<td>Treaty 8 Tribal Association</td>
<td>Place name</td>
<td></td>
</tr>
<tr>
<td>Dry Creek area</td>
<td>Dry creek confluence with Peace, and islands</td>
<td>Teaching area, cultural area, fishing, hunting, earth material, temporary habitations, cabin</td>
<td>Treaty 8 Tribal Association</td>
<td></td>
<td>Inundation, Highway 29 realignment</td>
</tr>
<tr>
<td>Farrell Creek</td>
<td>Creek confluence with Peace</td>
<td>Teaching area, cultural area, temporary habitations, fishing</td>
<td>Treaty 8 Tribal Association</td>
<td></td>
<td>Inundation, Highway 29 realignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hunting area, camp site</td>
<td>Blueberry River</td>
<td>Moose, Elk, camp site</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Gathering</td>
<td>Saulteau</td>
<td>Wild onion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fishing</td>
<td>Duncan’s First Nation</td>
<td>Bull trout</td>
<td></td>
</tr>
<tr>
<td>Between Farrell Creek and the site of Farrell Creek</td>
<td>Island</td>
<td>Fishing, firewood, cabins, temporary habitation</td>
<td>Treaty 8 Tribal Association</td>
<td></td>
<td>Inundation</td>
</tr>
<tr>
<td></td>
<td>Between Farrell Creek and Halfway River</td>
<td>Hunting, fishing, camp sites</td>
<td>Blueberry</td>
<td>Black bear, camp sites</td>
<td></td>
</tr>
<tr>
<td>Attachie</td>
<td>Halfway River confluence with Peace River, islands</td>
<td>Teaching area, place names, cultural area, plant gathering, feather gathering, fishing, temporary habitation, gathering place</td>
<td>Treaty 8 Tribal Association</td>
<td>Traditional burial site</td>
<td>Inundation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hunting, fishing, gathering, camp site, spiritual site</td>
<td>Blueberry River</td>
<td>Moose, elk, berries, camp site, spiritual sites</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trapping, harvesting, camps, day camps</td>
<td>Saulteau</td>
<td>Trapline, tree harvest, herbs, camps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gathering</td>
<td>Duncan’s First Nation</td>
<td>Plants and earth gathering sites</td>
<td></td>
</tr>
<tr>
<td>Place Name</td>
<td>Landscape Feature</td>
<td>Current Uses</td>
<td>First Nations</td>
<td>Reported Cultural Values</td>
<td>Interaction</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------------</td>
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<td>----------------------------------</td>
</tr>
<tr>
<td>Bear Flats</td>
<td>Cache Creek confluence with Peace River, Bear Flats</td>
<td>Temporary habitation, cabin, gathering place, hunting, teaching areas, place names, plant gathering, fresh water, firewood, earth material</td>
<td>Treaty 8 Tribal Association</td>
<td>Traditional burial site</td>
<td>Inundation; Highway 29 realignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hunting, fishing, gathering, camp site</td>
<td>Blueberry River</td>
<td></td>
<td>Moose, elk, deer, berries, camp</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moberly River to Fort St. John Historical Site</td>
<td>Confluence with Peace River, islands, north and south banks</td>
<td>Gathering place, temporary habitation, cabins, plant gathering, fresh water, fishing, hunting, heritage resource</td>
<td>Treaty 8 Tribal Association</td>
<td>Heritage resource</td>
<td>Inundation</td>
</tr>
<tr>
<td>Wilder Creek</td>
<td>Hunting, camp site</td>
<td>Blueberry River</td>
<td>Moose, Deer, camp site</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hunting, camps</td>
<td>Saulteau</td>
<td>Moose, elk, deer, brown bear, waterfowl</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fishing</td>
<td>Duncan’s First Nation</td>
<td>jackfish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fort St. John Historical Site</td>
<td>Islands, Peace River, islands, cultural area</td>
<td>Gathering place, cultural area</td>
<td>Treaty 8 Tribal Association</td>
<td></td>
<td>No interaction</td>
</tr>
<tr>
<td></td>
<td>Overnight sites</td>
<td>Horse Lake First Nation</td>
<td>Overnight sites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boucher Lake</td>
<td>Lake</td>
<td>Hunting, Fishing, Plant gathering, Place name, cabins, temporary habitations</td>
<td>Treaty 8 Tribal Association</td>
<td></td>
<td>Clearing for Transmission line Right of Way</td>
</tr>
<tr>
<td>Boudreau Lake</td>
<td>Lake</td>
<td>Hunting, trapping, fishing, gathering, cabins, day camps</td>
<td>Treaty 8 Tribal Association</td>
<td>Trapping, moose, elk, deer, black bear, water fowl, birds, rabbit, beaver, martin, wolf, lynx, muskrat, weasel, coyote, fisher, mink, wolverine, fox, jackfish, berries, trees, herbs, roots, hay, cabins, day camps, trails</td>
<td>Clearing for Transmission line Right of Way</td>
</tr>
<tr>
<td></td>
<td>Hunting, trapping, cabins</td>
<td>Saulteau</td>
<td>Deer, black bear, birds, wolf, weasel, coyote, mink, fox, trapping, cabins</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Section 19: Current Use of Lands and Resources for Traditional Purposes

<table>
<thead>
<tr>
<th>Place Name</th>
<th>Landscape Feature</th>
<th>Current Uses</th>
<th>First Nations</th>
<th>Reported Cultural Values</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monias Lake</td>
<td>Lake</td>
<td>Trapping, hunting, gathering, harvesting, camps, day camps</td>
<td>Saulteau</td>
<td>Tralines, moose, elk, deer, black bear, brown bear, waterfowl, Ptarmigan, Grouse, eagles, rabbit, weasel, coyote, fox, herbs, lumber, camps, day camps, trails</td>
<td>Clearing for Transmission line Right of Way</td>
</tr>
<tr>
<td>Taylor and the Lower Pine</td>
<td>Confluence of at the Peace River near Taylor</td>
<td>Hunting, fishing, gathering, overnight sites</td>
<td>Duncan's First Nation</td>
<td>Moose, jackfish, plants and earth gathering sites, overnight sites,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hunting, fishing, overnight sites</td>
<td>Horse Lake First Nation</td>
<td>Moose, elk, jackfish, overnight sites, gathering sites</td>
<td></td>
</tr>
</tbody>
</table>

### 19.4.7 Mitigation Measures – Change in Cultural and Traditional Uses of the Land

Mitigation measures to address potential adverse Project effects on current cultural and traditional use of lands will be achieved through the following commitments:

- Work with Aboriginal groups to ground truth traditional land use information for specific areas within the Project activity zone prior to commencing construction.
- Continue to consult with Aboriginal groups regarding clearing plans and protocols.
- Develop a communications program to inform harvesters of planned or unplanned events that may affect opportunities to harvest plants, berries, and other resources.
- Consult with Aboriginal groups respecting the development of habitat compensation projects that align with BC Hydro compensation programs.
- Work with Aboriginal groups to identify permanent habitation structures used in the current use of lands and resources for traditional purposes that may be lost to inundation. Effects on cabins associated with tenured trap lines will be addressed as set out in the Harvest of Fish and Wildlife Resources VC. Where untenured cabins may be impacted by the Project, BC Hydro will work with Aboriginal individuals to determine appropriate measures that could be implemented.
- Work with Aboriginal groups to identify potential sites for re-location of medicinal and food plants to compensate for areas that will be inundated.
- Use only indigenous and/or non-invasive plants and grasses in re-vegetation programs associated with the Project.
- Engage with Aboriginal groups around any reclamation phase that may present opportunities to restore ecological communities that support species of high traditional use value.
• Provide support for the indigenous plant nursery owned by West Moberly and Saulteau First Nations located at Moberly Lake. The First Nations have a business plan to support propagation of a wide range of indigenous plant species for use in reclamation work.

• Establish a Culture and Heritage Resources Committee to provide advice and guidance on the mitigation of specific effects of the Project on culture and heritage resources. The Committee would consist of BC Hydro officials and Aboriginal members whose communities are in the immediate vicinity of the Project.

• Consider implementing, in consultation with Aboriginal groups and British Columbia where appropriate, the following potential initiatives:
  o The identification and naming of key cultural sites and the potential to integrate Aboriginal names into Project operations and sites;
  o Recording of stories and history associated with key cultural sites that may be affected by the Project;
  o The protection and documentation, including mapping, of important Aboriginal trails and sites;
  o Contribute funding to support a youth culture camp that includes transfer of knowledge around medicinal and food plants;
  o Engage with Aboriginal groups to commemorate the lost and submerged places;
  o Engage with Aboriginal groups around potential plans to undertake ceremonies prior to the commencement of construction on key elements of the Project; and
  o Develop and implement an education program respecting Aboriginal culture, history and use of lands and resources in the Project Area to be offered to all workers on the Project.

• Implement all mitigation measures set out in Volume 2 Section 13 Vegetation and Ecological Communities

• Implement all mitigation measures set out in Volume 4 Section 32 Heritage Resources

• Implement those measures supporting the development of new shoreline recreation sites in Volume 3 Section 25 Outdoor Recreation and Tourism

• Implement measures supporting the development of 3 boat launches along the Site C reservoir accessible via Highway 29 to support navigability and navigable use, and the re-establishment of recreational sites on the Site C reservoir and downstream, and to re-establish and create new use patterns and access, as set out in Volume 3 Section 26 Navigation

19.4.8 Summary of Effects Assessment and Mitigation Measures

A summary of potential effects and mitigation measures is shown for current use of lands and resources for traditional purposes in Table 19.12.
### Table 19.12  Project Effects and Mitigation Measures – Current Use of Lands and Resources for Traditional Purposes

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and</td>
<td>Changes in fishing opportunities and practices</td>
<td>Consult with Aboriginal groups respecting the development of fish habitat compensation projects that align with BC Hydro compensation programs. Seek input from Aboriginal groups respecting mitigation strategies. Continue to consult with Aboriginal groups on clearing plans and protocols. Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect fishing opportunities or access. Implement all mitigation measures set out in Volume 2 Section 12 Fish and Fish Habitat. Develop a communications program to inform harvesters of longer term changes in fish community composition. Implement measures supporting the development of 3 boat launches along the Site C reservoir accessible via Highway 29 to support navigability and navigable use, and the re-establishment of recreational sites on the Site C reservoir and downstream, and to re-establish and create new use patterns and access, as set out in Volume 3 Section 26 Navigation.</td>
<td>The effectiveness of mitigation measures that address effects on Aboriginal fishing opportunities and practice is not well understood. The effectiveness of mitigation measures for fish and fish habitat is included in Volume 2 Section 12 Fish and Fish Habitat. The effectiveness of mitigation measures for effects on navigation is included in Volume 3 Section 26 Navigation.</td>
<td>BC Hydro</td>
</tr>
<tr>
<td>operations</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Construction and</td>
<td>Changes in hunting and trapping opportunities and practices</td>
<td>Consult with Aboriginal groups respecting the development of wildlife habitat compensation projects that align with BC Hydro compensation programs. Seek input from Aboriginal groups respecting mitigation strategies, such as mitigation measures related to trap lines in the Project activity zone. Continue to consult with Aboriginal groups on clearing plans and protocols. Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect hunting opportunities or access. Implement all mitigation measures set out in Volume 2 Section 14 Wildlife Resources. Implement all mitigation measures set out in Volume 3 Section 24 Harvest of Fish and Wildlife Resources pertaining to trapping.</td>
<td>The effectiveness of mitigation measures that address effects on Aboriginal hunting and trapping opportunities and practices is not well understood. The effectiveness of mitigation measures for wildlife resources is included in Volume 2 Section 14 Wildlife Resources. The effectiveness of mitigation measures for the harvest of fish and wildlife resources pertaining to trapping is included in Volume 3 Section 24 Harvest of Fish and Wildlife Resources.</td>
<td>BC Hydro</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Project Phase</td>
<td>Potential Effect</td>
<td>Mitigation Measures</td>
<td>Mitigation Effectiveness</td>
<td>Responsibility</td>
</tr>
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<td>-------------------------</td>
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<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| Construction and operations | Changes in cultural and traditional uses of the land                              | Work with Aboriginal groups to ground truth traditional land use information for specific areas within the Project activity zone prior to commencing construction, e.g. when determining the exact location of an access road.  
Continue to consult with Aboriginal groups regarding clearing plans and protocols.  
Develop a communications program to inform harvesters of planned or unplanned events that may affect opportunities to harvest plants, berries, and other resources.  
Consult with Aboriginal groups respecting the development of habitat compensation projects that align with BC Hydro compensation programs.  
Work with Aboriginal groups to identify permanent habitation structures used in the current use of lands and resources for traditional purposes that may be lost to inundation. Effects on cabins associated with tenured trap lines will be addressed as set out in Volume 3, Section 24.4.9.1, Harvest of Fish and Wildlife Resources. Where untenured cabins may be impacted by the Project, BC Hydro will work with Aboriginal individuals to determine appropriate measures that could be implemented.  
Work with Aboriginal groups to identify potential sites for re-location of medicinal and food plants to compensate for areas that will be inundated.  
Use only indigenous and/or non-invasive plants and grasses in re-vegetation programs associated with the Project.  
Engage with Aboriginal groups around any reclamation phase that may present opportunities to restore ecological communities that support species of high traditional use value.  
Provide support for the indigenous plant nursery owned by West Moberly and Saulteau First Nations located at Moberly Lake. The First Nations have a business plan to support propagation of a wide range of indigenous plant species for use in reclamation work.  
Establish a Culture and Heritage Resources Committee to provide advice and guidance on the mitigation of specific effects of the Project on culture and heritage resources. The Committee would... | The effectiveness of mitigation measures that address effects on Aboriginal cultural and traditional uses of the land is not well understood.  
The effectiveness of mitigation measures for effects on vegetation and ecological community is included in Volume 2 Section 13 Vegetation and Ecological Communities.  
The effectiveness of mitigation measures for effects on heritage resources is included in Volume 4 Section 32 Heritage Resources.  
The effectiveness of mitigation measures for effects on outdoor recreation and tourism is included in Volume 3 Section 25 Outdoor Recreation and Tourism.  
The effectiveness of mitigation measures for effects on navigation is included in Volume 3 Section 26 Navigation. | BC Hydro |
<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>consist of BC Hydro officials and Aboriginal members whose communities are in the immediate vicinity of the Project. Consider implementing, in consultation with Aboriginal groups and British Columbia where appropriate, the following potential initiatives:</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>▪ the identification and naming of key cultural sites and the potential to integrate Aboriginal names into Project operations and sites;</td>
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<tr>
<td></td>
<td></td>
<td>▪ recording of stories and history associated with key cultural sites that may be affected by the Project;</td>
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<tr>
<td></td>
<td></td>
<td>▪ the protection and documentation, including mapping of important Aboriginal trails and sites;</td>
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<td></td>
<td>▪ contribute funding to support a youth culture camp that includes transfer of knowledge around medicinal and food plants;</td>
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<tr>
<td></td>
<td></td>
<td>▪ engage with Aboriginal groups to commemorate the lost and submerged places;</td>
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<tr>
<td></td>
<td></td>
<td>▪ engage with Aboriginal groups around potential plans to undertake ceremonies prior to the commencement of construction on key elements of the Project; and</td>
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<tr>
<td></td>
<td></td>
<td>▪ develop and implement an education program respecting Aboriginal culture, history and use of lands and resources in the Project Area offered to all workers on the Project.</td>
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<tr>
<td></td>
<td></td>
<td>Implement all mitigation measures set out in Volume 2 Section 13 Vegetation and Ecological Communities.</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>Implement all mitigation measures set out in Volume 4 Section 32 Heritage Resources.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Implement those measures supporting the development of new shoreline recreation sites in Volume 3 Section 25 Outdoor Recreation and Tourism.</td>
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<tr>
<td></td>
<td></td>
<td>Implement measures supporting the development of 3 boat launches along the Site C reservoir accessible via Highway 29 to support navigability and navigable use, and the re-establishment of recreational sites on the Site C reservoir and downstream, and to re-establish and create new use patterns and access, as set out in Volume 3 Section 26 Navigation.</td>
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</tbody>
</table>
19.4.9 Other Mitigation Options Considered

BC Hydro did not consider any other mitigation measures for effects on current use of lands and resources for traditional purposes.

19.5 Residual Effects

19.5.1 Current Use of Lands and Resources for Traditional Purposes - Fishing

After proposed mitigation, Project construction would have a residual adverse effect on the current use of lands and resources for fishing. Fishing opportunities and practices of BRFN, SFN, T8TA, DFN and HLFN would be adversely affected due to reduced access to fishing areas (including potentially increased competition with non-Aboriginal anglers), and potentially reduced success in harvest of targeted species.

During operations, the Project would have a residual adverse effect on the current use of lands and resources for fishing. Fishing opportunities and practices of BRFN, SFN, T8TA, DFN, and HLFN would be adversely affected due to reduced access to fishing areas. Over time, as the reservoir develops into a stable fishery and local knowledge develops about how to practice fishing there, the Project may have a beneficial effect on fishing opportunities. However, it is not certain when these conditions may occur.

19.5.2 Current Use of Lands and Resources for Traditional Purposes – Hunting and Trapping

After proposed mitigation, the Project would have a residual adverse effect on hunting and trapping (non-tenured). Hunting and trapping opportunities and practices of BRFN, SFN, T8TA, DFN, HLFN, and DTFN would be adversely affected due to temporary reductions in availability of targeted species and temporarily reduced access to hunting areas during construction.

Current use of lands and resources for traditional purposes – other cultural and traditional uses

After proposed mitigation, the Project would have a residual adverse effect on other cultural and traditional uses of the land. Due to permanent loss of use of and access to certain culturally important places and valued landscapes within the LAA, the use of those areas by T8TA, BRFN, SFN, DFN, and HLFN will be permanently impaired.

19.5.3 Characterization of Residual Effects

Criteria used to characterize residual effects, presented in Table 19.13 were defined based on experience and results of consultation with Aboriginal groups.
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
<th>Quantitative Measure or Definition of Qualitative Categories</th>
</tr>
</thead>
</table>
| Direction | The ultimate long-term trend of the effect | **Adverse:** nature of the VC is negatively altered in comparison to baseline conditions and trends  
**Positive:** nature of the VC is enhanced in comparison to baseline conditions and trends  
**Neutral:** condition of the VC is unchanged in comparison to baseline conditions and trends |
| Magnitude | The amount of change in a measurable parameter or variable relative to baseline case | **Low:** current use of lands and resources for traditional purposes is adaptable and may be readily transferred elsewhere without undermining the traditional purpose  
**Moderate:** current use of lands and resources for traditional purposes is adaptable and may be readily transferred, however, the traditional purpose is undermined  
**High:** current use of lands and resources for traditional purposes is highly impaired and is not adaptable or readily transferrable elsewhere |
| Geographical Extent | The geographic area in which the effect of a defined magnitude occurs | **Site-specific:** changes to one site or one restricted area  
**Local:** changes to multiple sites or a large area within the LAA |
| Frequency | The number of times during a project or a specific project phase that effect may occur | **Once:** occurs once  
**Continuous:** occurs on a regular basis and at regular intervals |
| Duration | The period of time required until the VC returns to its baseline condition, or the effect can no longer be measured or otherwise perceived | **Short-term:** effect is limited to <1 year  
**Medium-term:** effect occurs >1 year and less than or equal to 8 years (construction phase)  
**Long-term:** effect lasts beyond construction and up to 10 years of the operation phase of the Project  
**Permanent:** effect extends >10 years |
| Reversibility | The likelihood that a measurable parameter will recover from an effect | Effect **reversible** with reclamation and/or over time  
Effect **is not reversible** |
| Context | The general characteristics of the area in which the project is located | **Disturbed:** Area has been substantially previously disturbed by human development or human development is still present  
**Undisturbed:** Area relatively pristine or not adversely affected by human activity |
| Disturbance | | |
| Importance of use | | **High:** current use of area or resource is indicated to be of high importance for traditional purposes  
**Low:** current use of area or resource is indicated to be of low importance for traditional purposes |
| Multiplicity of use | | **Multiple:** area or resource is indicated to have multiple uses for traditional purposes  
**Single/few:** area or resource is indicated as having single or few uses for traditional purposes |
| Importance of area | | **High:** area indicated to be of high importance for traditional uses  
**Low:** area indicated to be of low importance for traditional uses |
Current use of Lands and Resources for Traditional Purposes - Fishing

The current use of lands and resources for fishing by T8TA, SFN, BRFN, DFN and HLFN would be adversely affected by the Project. The effect on fishing opportunities and practices is adverse, as the nature of the indicator is negatively altered in comparison to baseline trends. Fishing opportunities and practices will be negatively altered within the LAA by the construction of the Project.

Boat and shore-based river fishing along an 85-km stretch of the main stem Peace River and practices will be negatively altered within the LAA by the construction of the Project.

Boat and shore-based river fishing along an 85-km stretch of the main stem Peace River between the dam site and the Canyon dam will be inundated. This loss encompasses the inundation of several river and stream mouths valued for their fishing. The effect would be of moderate magnitude for T8TA, SFN, and BRFN. Although some aspects of the traditional purpose of the activity may be altered by transferring them to another location, fishing practices of Aboriginal people are adaptable, spatially and temporally. Fishing currently undertaken in the area of the proposed reservoir may be done, and in some cases is being done, downstream at the confluences of the Pine and Beatton rivers. Additional confluences are farther downstream at the Kiskatinaw, Pouce Coupe, and Clear River.

The effect would be of low magnitude for DFN, and HLFN, as the Peace River section within the LAA is at the periphery of their use of fish resources. Fishing practices of Aboriginal people are adaptable, spatially and temporally, and the traditional purpose of the activity would not be undermined for members of DFN and HLFN, although an increase in cold water species downstream of the dam would pose an adaptive challenge and opportunity for harvesters.

The geographic extent of the effect would be local, as it is confined within the LAA. The effect would be continuous, at least until the reservoir stabilizes and Aboriginal fishing practices adapt to the post-project environment, and not reversible, although fishing practices are adaptable to it. The effect is long term and there is uncertainty around the time sufficient to re-establish a stable fishery resource, coupled with a body of knowledge and a set of practices about its exploitation.

The geographical and environmental setting for fishing can be described as disturbed, although some elements of the setting remain undisturbed or resilient. The confidence level in the assessment is low, because the assessment is restricted by limited TLUS.
data, uncertainty regarding the biophysical effects of the Project, uncertainty regarding reactions of the environment and responses to change by Aboriginal harvesters. If the Project proceeds, there would be a high probability that an adverse effect would occur because the physical changes in the Project activity zone, particularly Site C reservoir filling, would alter fishing areas.

**Current Use of Lands and Resources for Traditional Purposes – Hunting and Trapping**

The current use of lands and resources for hunting and trapping by T8TA, SFN, BRFN, DFN, HLFN, and DTFN will be adversely affected by the Project. Hunting and trapping opportunities and practices will be negatively altered in comparison to baseline trends within the LAA during the construction of the Project. The effect would be of low magnitude for DFN, HLFN, and DTFN, as hunting practices of Aboriginal people are adaptable, spatially and temporally, and the affected areas are at the periphery of their current use hunting areas, as indicated in traditional use studies. The effect would be of low to moderate for BRFN, and moderate magnitude for SFN and T8TA, as the affected areas are within their core current use hunting areas. The geographic extent of the effect would be local, as it is confined within the LAA. The effect would be temporary, at least until access restrictions are lifted within the reservoir and animals and Aboriginal hunting and non-tenured trapping practices adapt to the post-project environment. The effects are reversible, and are short-term. The geographical and environmental setting for the indicator can be described as disturbed, although some elements of the setting remain undisturbed or resilient. SFN and T8TA indicate that the area is of high importance and is used for multiple species harvesting purposes. The confidence level in the assessment is low, as the assessment is restricted by limited TLUS data, uncertainty regarding the relationship between biophysical effects of the Project, reactions of the environment, and responses to change by Aboriginal people. If the Project proceeds, there would be a high probability that an adverse effect would occur because the physical changes in the Project activity zone, particularly Site C reservoir filling and habitat loss and fragmentation, and changes to access, would alter hunting opportunities at least in the short term.

**Current Use of Lands and Resources for Traditional Purposes – Other Cultural and Traditional Uses**

The Project would have a residual adverse effect on other cultural and traditional uses of the land for T8TA, BRFN, SFN, DFN, and HLFN.

The effect on other cultural and traditional uses of the land is adverse, as the nature of the indicator is negatively altered in comparison to baseline trends. Opportunities to use special high-value places and landscapes along the Peace River for the conduct of multiple current use and cultural activities will be negatively altered within the LAA. The effect would be permanent and the magnitude would be high for T8TA, SFN, and BRFN, moderate-low for DFN, and low for HLFN. The geographic extent of the effect is local, as it will affect Attachie, Bear Flats, Farrell Creek as well as seven other sites reported to have high cultural value within the LAA. The effect will occur once (inundation) and will be permanent. The geographical and environmental context for the effect is disturbed. Aboriginal groups report that other cultural and traditional uses for traditional purposes are of high importance, and that the area is of high importance. The confidence level in the assessment is moderate as there is reliable body of data for this analysis. However, adaptive response to change by Aboriginal persons is...
unknown. If the Project proceeds, there would be a high probability that an adverse effect would occur because changes in the Project activity zone would inundate or alter the areas.
### Table 19.14  Characterization of Residual Effects: Current Use of Lands and Resources for Traditional Purposes

<table>
<thead>
<tr>
<th>Effect</th>
<th>Phase</th>
<th>Direction</th>
<th>Magnitude</th>
<th>Geographic Extent</th>
<th>Duration and Frequency</th>
<th>Reversibility</th>
<th>Context</th>
<th>Level of Confidence</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in fishing opportunities and practices</td>
<td>Construction And operation</td>
<td>Adverse</td>
<td>Moderate – T8TA, SFN, BRFN</td>
<td>Local</td>
<td>Long-term and continuous</td>
<td>Not reversible</td>
<td>Disturbed; Area and use of high importance; Multiple uses</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Changes in hunting and trapping opportunities and practices</td>
<td>Construction And operation</td>
<td>Adverse</td>
<td>Low – DFN, DTFN, HLFN, Moderate – SFN Moderate-low – BRFN</td>
<td>Local</td>
<td>Long-term and continuous</td>
<td>Not reversible</td>
<td>Disturbed; Area and use of high importance; Multiple uses</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Changes to other cultural and traditional uses of the land</td>
<td>Construction And operation</td>
<td>Adverse</td>
<td>High – T8TA, SFN, BRFN Moderate-Low: Duncan’s Low: HLFN</td>
<td>Local</td>
<td>Long-term and continuous</td>
<td>Not reversible</td>
<td>Disturbed; Area and use of high importance; Multiple uses</td>
<td>Moderate</td>
<td>High</td>
</tr>
</tbody>
</table>
19.5.4 Standards or Thresholds for Determining Significance

The significance of each residual effect is evaluated taking into consideration the criteria provided in Table 19.13, existing knowledge about current use of lands and resources for traditional purposes, and the likely effectiveness of mitigation. A determination of significance will be made where:

- A current use of lands for traditional purposes would be permanently undermined and its practice cannot be readily reproduced elsewhere; and

- the current use and area is indicated to be of high value or importance among Aboriginal groups for traditional purposes.

19.5.5 Determination of Significance of Residual Effects

The measures identified to mitigate potential effects on Current Use of Lands and Resources for Traditional Purposes may not be fully effective. Consequently, the Project is likely to result in a residual adverse effect on the Current Use of Lands and Resources for Traditional Purposes.

Therefore, the significance of the potential residual adverse effects of the Project on this VC has been assessed as follows:

Current Use of Lands and Resources for Traditional Purposes – Fishing

The effect on current use of lands and resources for fishing would be adversely altered by the Project. Although some aspects of the traditional purpose of the activity may be altered by transferring them to another location, fishing practices of Aboriginal people are adaptable, spatially and temporally. The effect on current use of lands and resources for fishing is not significant.

Current Use of Lands and Resources for Traditional Purposes – Hunting and Trapping

The effect on hunting and trapping opportunities and practices would be adverse, however, the traditional purpose of the activity would not be undermined. The Project effect on current use of lands and resources for hunting and trapping (non-tenured) is not significant.

Current Use of Lands and Resources for Traditional Purposes – Other Cultural and Traditional Uses

The effect on other cultural and traditional uses would be significant for T8TA, SFN and BRFN at particular high value places along the Peace River in the LAA, most notably at Bear Flats, Farrell Creek and Attachie. These spaces, indicated to be of high value by Aboriginal groups, will be inundated and access to them will be permanently impaired. Consequently, the effect of the project on current use of lands and resources for other cultural and traditional uses by those three Aboriginal groups is significant.

In summary, the Project may result in a significant residual adverse effect on certain current uses of lands and resources for traditional purposes for certain Aboriginal groups. As discussed in Section 34.7.1, Volume 5 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests and Information Requirements, the Project may impact the exercise of treaty rights to hunt, fish and trap. BC Hydro is prepared to address and accommodate the potential for the Project to do so by entering into arrangements set out in Impact Benefit Agreements. Those agreements may provide for
lump sum cash payments, payment streams over time, the transfer of Crown lands to
the affected Aboriginal groups in fee simple, potential land protection measures or the
establishment of special management zone designations. BC Hydro has offered to enter
into initial discussions with Aboriginal groups that are likely to be impacted by the Project
and to date, three Aboriginal groups have accepted BC Hydro’s offer to enter into
discussions. Those arrangements, if entered into, could, in addition to accommodating
the potential impact on the exercise of treaty rights, further avoid, reduce, or compensate
for, the potential residual adverse effects of the Project on the current use of lands and
resources for traditional purposes.

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Adverse Effect</th>
<th>Key Mitigation Measures</th>
<th>Significance Analysis of Residual Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Use of Lands and Resources for Traditional Purposes</td>
<td>Construction and Operation</td>
<td>Changes in fishing opportunities and practices</td>
<td>Implement of all mitigation measures set out in the Fish and Fish Habitat VC and those set out in the Navigation VC for specific measures respecting navigation. Consult with Aboriginal groups respecting the development of fish habitat compensation projects that align with BC Hydro compensation programs. Seek input from Aboriginal groups respecting mitigation strategies. Continue to consult with Aboriginal groups on clearing plans and protocols. Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect fishing opportunities or access. Develop a communications program to inform harvesters of longer term changes in fish community composition.</td>
<td>Not significant</td>
</tr>
<tr>
<td>Construction and operation</td>
<td>Changes in hunting and trapping opportunities and practices</td>
<td>Implement of all mitigation measures set out in the Wildlife Resources VC and those set out in Harvest of Fish and Wildlife Resources VC, pertaining to trapping. Consult with Aboriginal groups respecting the development of wildlife habitat compensation projects that align with BC Hydro compensation programs. Seek input from Aboriginal groups respecting mitigation strategies, such as mitigation measures related to trap lines in the Project activity zone. Continue to consult with Aboriginal groups on clearing plans and protocols. Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect hunting opportunities or access.</td>
<td>Not significant</td>
<td></td>
</tr>
<tr>
<td>Valued Component</td>
<td>Project Phase</td>
<td>Potential Adverse Effect</td>
<td>Key Mitigation Measures</td>
<td>Significance Analysis of Residual Effects</td>
</tr>
<tr>
<td>------------------</td>
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<td>----------------------------------------</td>
</tr>
<tr>
<td>Construction and operation</td>
<td>Changes in other cultural and traditional uses</td>
<td>Implement of all mitigation measures set out in the Vegetation and Ecological Communities VC, and the Heritage Resources VC, and those measures supporting the development of new shoreline recreation sites in the Outdoor Recreation and Tourism. Work with Aboriginal groups to ground truth traditional land use information for specific areas within the Project activity zone prior to commencing construction, e.g. when determining the exact location of an access road. Continue to consult with Aboriginal groups regarding clearing plans and protocols. Develop a communications program to inform harvesters of planned or unplanned events that may affect opportunities to harvest plants, berries, and other resources. Consult with Aboriginal groups respecting the development of habitat compensation projects that align with BC Hydro compensation programs. Work with Aboriginal groups to identify permanent habitation structures used in the current use of lands and resources for traditional purposes that may be lost to inundation. Effects on cabins associated with tenured trap lines will be addressed as set out in Volume 3, Section 24.4.9.1, Harvest of Fish and Wildlife Resources. Where untenured cabins may be impacted by the Project, BC Hydro will work with Aboriginal individuals to determine appropriate measures that could be implemented. Work with Aboriginal groups to identify potential sites for re-location of medicinal and food plants to compensate for areas that will be inundated. Use only indigenous and/or non-invasive plants and grasses in re-vegetation programs associated with the Project. Engage with Aboriginal groups around any reclamation phase that may present opportunities to restore ecological communities that support species of high traditional use value. Provide support for the indigenous plant nursery owned by West Moberly and Saulteau First Nations located at Moberly Lake. The First Nations have a business plan to support propagation of a wide range</td>
<td>Significant</td>
<td></td>
</tr>
</tbody>
</table>
### Valued Component | Project Phase | Potential Adverse Effect | Key Mitigation Measures |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Phase</td>
<td>Potential Adverse Effect</td>
<td>Key Mitigation Measures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of indigenous plant species for use in reclamation work. Establish a Culture and Heritage Resources Committee to provide advice and guidance on the mitigation of specific effects of the Project on culture and heritage resources. The Committee would consist of BC Hydro officials and Aboriginal members whose communities are in the immediate vicinity of the Project. Consider implementing, in consultation with Aboriginal groups and British Columbia where appropriate, the following potential initiatives: the identification and naming of key cultural sites and the potential to integrate Aboriginal names into Project operations and sites; recording of stories and history associated with key cultural sites that may be affected by the Project; the protection and documentation, including mapping, of important Aboriginal trails and sites; sponsorship of a youth culture camp that includes transfer of knowledge around medicinal and food plants; engagement with Aboriginal groups around a plan to commemorate the lost and submerged places and stories; engagement with Aboriginal groups around potential plans to undertake ceremonies prior to the commencement of construction on key elements of the Project; and development and implementation of an education program respecting Aboriginal culture, history and use of lands and resources in the Project Area to be offered to all workers on the Project.</td>
<td></td>
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</tr>
</tbody>
</table>

### 19.6 Cumulative Effects Assessment

The assessment of the cumulative effects of the Project on the current use of lands and resources for traditional purposes VC has been conducted subject to limitations in the information relied upon. Information about the potential effects of other projects and activities often did not include a comprehensive analysis of potential residual effects on Aboriginal current use of lands and resources for traditional purposes. As described in Section 19.2.1, the spatial information supplied by Aboriginal groups was frequently limited to areas adjacent to the Project activity zone, buffered, or redacted for purposes of confidentiality or sensitivity, making it difficult to identify specific locations or to determine the geographic extent and range of current uses.
19.6.1 Screening of Cumulative Effects

The Project is likely to result in residual adverse effects on current use of lands and resources for traditional purposes by SFN, T8TA, BRFN, DTFN, DFN, and HLFN for fishing, hunting and trapping, and other cultural and traditional uses. Consequently, the potential cumulative effects of the Project on current use of lands and resources for traditional purposes have been assessed.

The cumulative effects screening follows methods explained in Volume 2 Section 10 Effects Assessment Methodology and includes a review of projects and activities, the residual effects of which may interact cumulatively with potential residual effects to current use of lands and resources for traditional purposes as a result of the Project.

19.6.1.1 Cultural and traditional uses of the land

The projects and activities are generally well removed from the LAA and are unlikely to have any residual effect on the use for cultural and traditional purposes of the lands and resources that may be adversely affected by the Project. Consequently, the residual effects of the Project are unlikely to overlap with the effects of those projects and activities. Further, the adverse effect of the Project results from inundation of particular high value sites. Consequently, even if there were some overlap, the effects would not accumulate. For these reasons, the Project is unlikely to result in a cumulative effect on the use of lands and resources for other cultural and traditional purposes.

Fishing for Traditional Purposes

Two projects, the Dunvegan Hydroelectric Project and the Montney Gas Play, were considered in the assessment of the potential cumulative effects of the Project on fish and fish habitat VC (Volume 2 Section 12 Fish and Fish Habitat). Neither has been assessed as likely to have effects that would combine with those of the Project to produce a cumulative effect on fish and fish habitat. For the full cumulative effects assessment, see Volume 2 Section 12. Given these results, the Project is unlikely to result in cumulative effects on fishing for traditional purposes.

Hunting and Trapping for Traditional Purposes

The Project is likely to result in residual adverse effects on hunting and trapping for traditional purposes by SFN, T8TA, BRFN, DTFN, DFN, and HLFN. Information about the potential residual adverse effects on current use of lands and resources for traditional purposes is available for some of the other projects considered in the cumulative effects assessment. Where this information is available, consideration has been given to whether the potential effects of the Project on hunting and trapping for traditional purposes would overlap in time and space with the effects of those projects and combine to produce a cumulative effect. Projects that provide some analysis of effects on current use of lands and resources for traditional purposes are Alliance Pipeline Sunrise Meter Station Relocation, Dokie Wind Energy Project, Groundbirch Mainline, Provident Beatton River Replacement Project, Wildmare Wind Energy Project, and Wartenbe Wind Energy Project. These are discussed below.

For each of the remaining projects or activities that may have adverse residual effects on wildlife or wildlife habitat, the prospect that those effects will combine with the residual adverse effects of the Project on wildlife resources is raised. This, in turn, raises the prospect that the combined effect will reduce the availability of species to a level that would impair hunting for traditional purposes.
The conversion of habitats due to multiple projects and activities within the RAA will put increased pressure on wildlife populations, particularly to those species that are habitat specialists - strongly associated with mature and old forest, or wetlands. Species generalists, or those more tolerant of habitat edges and early seral vegetation communities, may also be affected, but could also respond positively to the change.

Most projects and activities will result in a further reduction of habitats within the RAA; however not all projects would lead to measureable changes to intact mature and old forest communities and wetlands. The detail of specific residual effects of many of the projects and activities that were reviewed is limited, but based on information that is readily available, the following projects and activities are expected to result in a measureable reduction of habitats associated with ungulates, fur-bearers, and non-migratory game birds (grouse) and migratory waterfowl: Provident Beatton River Replacement, Project, Dokie Wind Energy Project, Carbon Creek Coal mine, General Oil and Gas Activities, and General Forestry Activities. These are discussed below.

19.6.2 Description of Cumulative Effects

19.6.2.1 Alliance Pipeline Sunrise Meter Station Relocation

The project has been in operation since 2010, and involved the relocation of an existing meter station to a new 50 m by 50 m site closer to Huron Energy’s Sunrise Compressor Station (TERA Environmental Consultants Ltd. 2010b), approximately 27 km northwest of Dawson Creek. The relocated meter station was constructed to accommodate the receipt of natural gas originating in the Sunrise producing area of northeastern B.C. The goal was to minimize natural gas liquids dropping out from the rich incoming natural gas stream before reaching the desired location.

The project’s Environmental and Socio-Economic Assessment report concludes that given that the project is conducted entirely on privately owned agricultural lands, no effect on traditional use of lands is expected (TERA Environmental Consultants Ltd. 2010b).

Consequently, a cumulative effect on hunting and trapping for trapping for is unlikely.

19.6.2.2 Carbon Creek Coal Mine

This project involves the development of an open-pit surface and underground metallurgical coal mine. The mine will be designed to achieve a production rate of 2.9 million tonnes of clean coal per year, with an estimated mine life of 30 years (Rescan Environmental Services Ltd. 2012). Currently the project is in the Environmental Assessment stage, with construction of project tentatively planned to begin in 2014 and surface mine coal production beginning in same year.

The Project Description is available but no potential effects on current use of lands and resources for traditional purposes have yet been identified. The proponent has identified that the project is near the communities of MLIB, SFN, WMFN and BRFN (Rescan Environmental Services Ltd. 2012).

With a planned open-pit surface and underground coal mine, reductions in forests and possibly wetlands are anticipated. However, measureable reductions in the regional populations of ungulates, waterfowl, non-migratory game birds, and fur-bearers are not expected.
Consequently, a cumulative effect on hunting and trapping for traditional purposes is unlikely.

**19.6.2.3  Dokie Wind Energy Project**

Preliminary modelled layout comprises 200 turbines of 1.5 MW each. Phase 1 of the project (144 MW) has been operational since 2011. Phase 2 would include the construction of the remaining towers to produce 156 MW.

It is not clear from the Dokie Wind Energy Project Environmental Assessment Certificate Application whether the project is expected to have effects to current use activities undertaken by Aboriginal groups. The Application considers traditional land use of Halfway River First Nations, McLeod Lake Indian Band, Saulteau First Nations and West Moberly First Nations, but does not provide a residual effects statement (Hélimax et al. 2006a).

The project was described as reducing black huckleberry habitat, and would affect old forest, riparian habitats and wetlands (Hélimax et al. 2006a). Measureable reductions to regional populations of any of these species groups are not anticipated.

Consequently, a cumulative effect on hunting and trapping for traditional purposes is unlikely.

**19.6.2.4  Groundbirch Mainline**

NOVA Gas Transmission Ltd. operates a 24 km pipeline, of which 5 km parallels existing rights-of-way and roads; the remaining 19 km was newly cut (TERA Environmental Consultants Ltd. 2010a). A construction right-of-way of 39 m was required for the project, with 20 m being a permanent right-of-way and 19 m being temporary workspace.

The pipeline is located 40 km northwest of Dawson Creek and 33 km southwest of Fort St. John. Construction of the project was completed in 2012.

The Groundbirch Mainline project has the potential to have residual effects on current use of hunting, trapping, or other cultural and traditional uses by SFN, WMFN, BRFN, DTFN, DFN and HLFN (these are First Nations that were included in a Traditional Ecological Knowledge survey conducted for that project).

The wildlife resources VC (Volume 2 Section 14) concluded that residual effects on wildlife habitat and resources are not expected to combine with those of the Project and that a cumulative effect is not expected.

Consequently, a cumulative effect on hunting and trapping for traditional purposes is unlikely.

**19.6.2.5  Provident Beatton River Replacement Project**

This project involved the replacement of portions of the approximately 53 km long Taylor to Boundary Lake Pipeline, which carries sweet high vapour pressure hydrocarbon products from the city of Taylor to Boundary Lake, Alberta. A 36 km long section of the pipeline required replacement to ensure safe and reliable operation. The majority of the replacement work occurred within the existing right-of-way under operations and maintenance activities; however, a new right-of-way (approximately 16 km long) was required for the construction of a more suitable crossing of the Beatton River (National Energy Board 2011).
The project may affect Sharp-tailed Grouse leks, will remove habitats within an ungulate winter range, and crosses two wetlands that are recognized as migratory waterfowl habitat (National Energy Board 2011). The project is not expected to have a measurable effect to regional populations of any of these species groups.

The proponent identified ten Aboriginal groups with a potential interest in the Beatton River Replacement Project. The National Energy Board’s Reasons for Decision statement indicates that the project is not expected to have adverse environmental effects on current traditional land use.

Consequently, a cumulative effect on hunting and trapping for traditional purposes is unlikely.

19.6.2.6 Wildmare Wind Energy Project

This project involves Finavera’s construction of a 74 MW wind park, connector roads and electrical connections, access roads, substation and operations centre, and an overhead transmission line (Finavera Wind Energy Inc. 2011). It will be located 5 km west of Chetwynd. The project is currently under review.

Residual effects on First Nations traditional land use were assessed as follows:

- Potential loss of Traditional/Cultural Use Sites where Traditional/Cultural Activities: low magnitude, low probability, within the project footprint and low significance
- Potential decrease in value of hunting, trapping and fishing: low magnitude, high probability, within the project local study area, and low significance
- Potential decrease in value of plant gathering resources: low magnitude, within the project footprint, high probability and low significance (Finavera Wind Energy Inc. 2011)

Consequently, a cumulative effect on hunting and trapping for traditional purposes is unlikely.

19.6.2.7 Wartenbe Wind Energy Project

The project site is located in the south of the Peace River region of B.C. on Mount Wartenbe, southeast of Chetwynd. The project originally received its environmental Assessment Certificate in 2006, but subsequently changed ownership. An application to extend the deadline of the certificate was submitted in 2011, as construction had not commenced and the certificate was set to expire. In 2012, the name of the holder of the Environmental Assessment Certificate was again changed. The preliminary modelled layout includes 47 turbines of 1.5 MW each (AXYS Environmental Consulting Ltd 2006).

The proponent undertook a TLUS with MLIB, SFN, HRFN, and WMFN. Traditional Land Use sites were identified and mitigation measures were described. First Nations raised concerns regarding effects to habitat and water sources, and effects of access roads. In the Environmental Assessment Certificate Application indicated confidence “that the impact of the DWE Wartenbe Wind Energy Project has been significantly reduced” (Hélimax et al. 2006b).

Consequently, a cumulative effect on hunting and trapping for traditional purposes is unlikely.
19.6.2.8 General Oil and Gas and Forestry Activities

Oil and Gas

There are many oil and gas related activities found throughout the northeast portion of the province; collectively, there are a number of environmental effects that result from the exploratory stage, as well as from the drilling and development stage. As new extraction technologies become available, additional sites will be more attractive for exploration and development. The timing and level of development will likely be set by market prices, but recent plans for liquefied natural gas should continue interests in the region’s gas sector.

According to information available, a total of 32 oil and gas facilities are approved or under review within the RAA. Facilities are point features that indicate any grouping of equipment where water, hydrocarbon liquids, or natural gas are processed, measured, upgraded, or stored (Ministry of Labour – Citizens’ Services and Open Government 2012).

A total of 344 pipeline projects (from 2004 to present) are approved within the RAA, with another 23 under review. Linear length of pipeline was estimated from available spatial information and totals 377 km within the RAA.

Petroleum Access Roads are applications for roads over any Crown land. A total of 1,422 approved or proposed access road applications are within the RAA, with a total length of 823 km. In addition, there are 37 approved or proposed Petroleum Development Road applications, totalling 163 km within the RAA. Petroleum Development Roads applications are for construction or to existing non-status tenured roads over any Crown land and/or use of non-status, unencumbered existing access roads on Crown land.

The development of pipelines, seismic lines, drill sites, and access roads leads to habitat fragmentation and a reduction of interior habitats removed from unnatural (anthropogenic) edges. In addition to habitat loss, species that are less tolerant of human disturbance may be displaced. Collectively, oil and gas activities are expected to have measurable reductions to the total population of furbearers in the region. Depending on the location of the activity waterfowl, game birds, and ungulates may also be affected.

General Forestry

Volume 3 Section 21 Forestry provides a detailed review of forestry activities. Information provided in that section has been summarized below.

The same pressures associated with oil and gas activities would occur with forestry as well; however, typically this industry specifically targets mature and old forest stands. Therefore some furbearers (pine marten and fisher) will see measurable decreases in suitable habitats, and reductions in the regional populations are anticipated. Wetlands are generally avoided unless access is limited and there is no other feasible option.

Together with oil and gas these two industries result in the greatest number of access roads within the RAA. While this does allow for greater access for hunting and trapping into previously inaccessible areas it also allows for greater industrial and recreational use which may put further pressure on harvestable species. Therefore, the potential for measurable reductions to ungulate populations within the RAA are also anticipated.

Oil and gas, as well as, forestry are considered the more prevalent activities occurring within the RAA. However, these activities are generally more scattered on the
landscape, occurring as smaller developments across a wider area. The Project, which
is mostly confined to the Peace River valley, is the single largest foreseeable future
development within the RAA.

Oil and gas, forestry, and the Project combined will likely result in a decrease in the
regional populations of furbearers and ungulates (notably moose and mule deer). Taking
into account the changes to habitat that would result from these projects and activities,
the populations of furbearers and ungulates, while reduced, are likely to continue to
persist on the landscape to the point where hunting and trapping is still permissible. The
regional populations of waterfowl and game birds should remain relatively unchanged.

19.1.1 Potential Cumulative Effects of the Project on Current Use of Lands and
Resources

The Project is unlikely to result in a cumulative adverse effect on the current use of lands
and resources for traditional purposes.

19.1.2 Cumulative Effects Mitigation Measures

As the Project is unlikely to result in a cumulative adverse effect on the current use of
lands and resources for traditional purposes, regional approaches to mitigation are not
proposed.

19.7 Monitoring and Follow-up

Monitoring related to the effect of the Project on the current use of lands and resources
for fishing is as follows:

- BC Hydro will consider community-based monitoring programs, which may involve
  incorporation of local, community or traditional knowledge, where potential effects
  and the effectiveness of mitigation measures on fishing opportunities are uncertain,
  provided a sound methodology with clear indicators and outcomes is delineated.
- BC Hydro is prepared to engage with Aboriginal groups to discuss potential
  community-based monitoring programs, such as programs intended to monitor the
  productivity and abundance of fish species.

Monitoring related to the effect of the Project on the current use of lands and resources
for hunting is as follows:

- BC Hydro will consider community-based monitoring programs, which may involve
  incorporation of local, community or traditional knowledge, where potential effects
  and the effectiveness of mitigation measures on hunting opportunities are uncertain,
  provided a sound methodology with clear indicators and outcomes is delineated.
- BC Hydro is prepared to engage with Aboriginal groups to discuss potential
  community-based monitoring programs, such as programs intended to monitor the
  productivity and abundance of wildlife species.

Monitoring and follow-up programs dealing specifically with fish and fish habitat are
described in Volume 2 Section 12 Fish and Fish Habitat. Monitoring and follow-up
programs dealing specifically with vegetation and ecological communities are described
in Volume 2 Section 13 Vegetation and Ecological Communities. Monitoring and
follow-up dealing specifically with wildlife resources are described in Volume 2
Section 14 Wildlife Resources.
References

1. Literature Cited


Candler, C., S. DeRoy and the Firelight Research Cooperative with Mikisew Cree First Nation and Athabasca Chipewyan First Nation. 2012c. MCFN and ACFN Desktop Knowledge and Use Report for BC Hydro’s Proposed Site “C” Dam Project. Victoria, BC.


Section 19: Current Use of Lands and Resources for Traditional Purposes


Rescan Environmental Services Ltd. 2012. Carbon Creek Project: Project Description. Cardero Coal Ltd, Vancouver, B.C.


West Moberly First Nations (WMFN) Land Use Department. 2012. We Used to Come Here All the Time: A Review of the Proposed Dawson Creek to Chetwynd Transmission Line in Western Treaty No. 8. Moberly Lake, BC.


Internet Sites


Section 19: Current Use of Lands and Resources for Traditional Purposes


Personal Communications


Section 19: Current Use of Lands and Resources for Traditional Purposes


20 AGRICULTURE

20.1 Approach

Agriculture is an important component of the economy in the Peace region. The effect of the Project on the valued component (VC) of agriculture is assessed considering the interactions between the Project and the four key aspects of agricultural land base, farm operations, the agricultural economy, and food production and consumption.

20.1.1 Regulatory and Policy Setting

Some of the land that would be temporarily or permanently occupied by the Project is in the province’s Agricultural Land Reserve (ALR), and would need to be approved as either “non-farm use” or the lands would need to be excluded from the ALR. The ALR is managed in B.C. under the Agricultural Land Commission Act (S.B.C., 2002).


20.1.2 Key Issues and Identification of Potential Effects

Issues, concerns, and interests identified during consultation with the public, Aboriginal groups, and government agencies guided the scope of the agriculture assessment (see Volume 1 Section 9 Information Distribution and Consultation).

Project interactions with agriculture could potentially cause the following effects:

- Temporary and permanent loss of agricultural land
- Changes in individual farm operations, including potential changes to local microclimate that could affect agriculture
- Changes in agricultural economic activity
- Changes in local and regional food production and consumption

The key issues identified and the approaches used to address issues are outlined in Table 20.1.
Table 20.1 Key Issues: Agriculture

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>The potential for the Project to result in the loss of agricultural land</td>
<td>The agriculture assessment considers the temporary and permanent use of agricultural land for the Project</td>
</tr>
<tr>
<td>Agricultural capability of land in the Peace River valley, taking into consideration climate, soil, and the suitability of land for food crops</td>
<td>The agriculture assessment baseline conditions describe land capability for agriculture, which has been updated with current fieldwork and technical analysis of soil conditions, climate conditions, and crop suitability</td>
</tr>
<tr>
<td>The need for the assessment to include all Project activities and areas</td>
<td>The agriculture assessment is undertaken for the complete Project activity zone and consideration of areas within the impact lines</td>
</tr>
<tr>
<td>The impact of the flood reserve on current use of land for agricultural purposes. Assessment should consider potential use, as current use is minimal due to non-farmer ownership, not due to land potential or suitability.</td>
<td>The agriculture assessment takes into count lands both currently developed and undeveloped for agricultural uses, by considering land capability (irrespective of current use)</td>
</tr>
<tr>
<td>Local, regional, and provincial food production and food security</td>
<td>The agriculture assessment takes into account how the Project would affect the food self-reliance in the region for crops suitable to the region</td>
</tr>
<tr>
<td>Effects on farmers, farm operations, and farm access, including project benefits for increased agricultural use</td>
<td>The agriculture assessment takes into account effects on farm operations. Volume 2 Section 11.3 Land Status, Tenure, and Project requirements addresses the Project approach to land requirements.</td>
</tr>
<tr>
<td>Consider climate capability and irrigation potential. Consider future land capability considering climate change as it relates to agricultural use. Consider irrigation potential.</td>
<td>The local climate was considered in the determination of current baseline conditions for land capability for agriculture ratings. Irrigation potential is considered in the improved land capability ratings as the key improvement that would overcome the natural climatic moisture deficit. Consideration of possible future changes to climatic ratings is based on regional climate change scenarios for 2050 and 2080.</td>
</tr>
<tr>
<td>Potential for increased wildlife crop damages</td>
<td>The agriculture assessment considers the potential for increased wildlife damage to crops</td>
</tr>
</tbody>
</table>

Potential project interactions with agriculture are summarized in Volume 2 Appendix A Project Interaction Matrix, Table 2. A “2” ranking in Table 2 indicates where interactions may result in an adverse effect, and the nature of the effect or the effectiveness of mitigation measures are uncertain. Therefore, they require analysis and evaluation in the environmental assessment. Project interactions with a ranking of “2” are summarized in Table 20.2 below.
Table 20.2 Interactions of the Project With Agriculture

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
<th>Loss of agricultural land</th>
<th>Effects on individual farm operations</th>
<th>Change to the agricultural economy</th>
<th>Changes to regional food production and consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam and Generating Station Construction</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Reservoir preparation and filling</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Transmission system</td>
<td></td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Quarried and Excavated Material Source Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Wuthrich quarry</td>
<td></td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>- Del Rio granular borrow</td>
<td></td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>- Other Sources</td>
<td>Granular borrow (within inundation zone, along Highway 29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other Sources</td>
<td>Area E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 85th Avenue Industrial Lands till source conveyor belt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highway 29 realignment</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Construction Access Road Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Transmission line access roads</td>
<td></td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>- Jackfish Lake Road works</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>- Old Fort Road realignment, extension of 240 and 269 Roads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Septimus Rail Siding construction</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Worker Accommodation Construction and Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Temporary Accommodation – Northern Regional Site(^a) (Halfway-Farrell)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Temporary Accommodation – Southern Regional Site(^a) (Jackfish Lake Road)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Line Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Right-of-way vegetation maintenance</td>
<td>N/A</td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>- Maintenance of access roads</td>
<td>N/A</td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

NOTES:
\(^a\) Location of temporary northern and southern region worker camps not yet determined

Only Project interactions ranked as “2” in Volume 2 Appendix A Project Interaction Matrix, Table 2 are carried forward to this table. A ✓ indicates that a project component or activity is likely to interact with the VC

N/A – not applicable
20.1.3 Standard Mitigation Measures and Effects Addressed

A “1” ranking in Table 1 in Volume 2 Appendix A Project Interaction Matrix, Table 2 means that an interaction with agriculture will occur; however, the effects of such interactions are well understood and can be avoided or mitigated through the application of standard mitigation measures. Therefore, no further analysis and evaluation is required in the environmental assessment. A “1” ranking was assigned to the transportation of construction materials and supplies at the dam site, transportation of merchantable timber away from the reservoir, supply and transportation of goods and services for dam site camps, and West Pine quarry access because interactions with agriculture would occur but would be managed through the Traffic Management Plan.

As described in Volume 5 Section 35 Summary of Environmental Management Plans, BC Hydro will prepare a Traffic Management Plan for the Project’s construction phase that will include applicable access restrictions to, and traffic control of, land, roads and railway corridors. Project-induced increases in operation costs associated with access, traffic and mitigation options would be discussed with affected landowners and, where appropriate, agreements would be entered into, as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

Excluding those project activities and works described above as having been given a ranking of “1” or “2”; all other project activities and works listed in Table 2 of Volume 2 Appendix A scored a “0” or were not applicable, meaning that there is no potential interaction. As noted in Table 2 of Volume 2 Appendix A, these activities are minor works and activities that do not interact with agriculture, or are evaluated at the Project or component level.

20.1.4 Selection of Key Indicators

The key indicators for assessing Project effects on agriculture and the rationale for their selection are shown in Table 20.3.
### Table 20.3 Key Indicators for Agriculture

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of agricultural land</td>
<td>• Land capability ratings (soil and climatic capability)</td>
<td>The key indicators will be used to estimate the effects of temporary and permanent loss of agricultural land. The change in agricultural land use and Crown land tenures will provide amounts of agricultural land lost. Land capability, which is the commonly accepted measure of the relative agricultural productive value of land, crop suitability, and agricultural utility, provides measures of the agricultural productive value of the lost land. Land capability ratings are described by the Agricultural Land Commission.</td>
</tr>
<tr>
<td></td>
<td>• Crop suitability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Agricultural land use and Crown land tenures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Agricultural utility (reflects relative likelihood of cultivation)</td>
<td></td>
</tr>
<tr>
<td>Effects on individual farm operations</td>
<td>• Direct loss of land</td>
<td>The key indicators together describe potential effects on individual farm operations</td>
</tr>
<tr>
<td></td>
<td>• Changes to access routes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Loss of farm infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Soil disturbance and compaction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Changes to livestock movement patterns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Changes to irrigation and livestock watering facilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Changes to local hydrology and groundwater</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Changes to drainage patterns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Introduction and proliferation of invasive plant species</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Increased biosecurity risks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Farm worker safety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Reservoir-induced changes to microclimate on adjacent agricultural operations</td>
<td></td>
</tr>
<tr>
<td>Change to the agricultural economy</td>
<td>• Agricultural costs and revenues at the individual farm level</td>
<td>The key indicators can be used to quantify projected effects to local, regional, and provincial agricultural economies</td>
</tr>
<tr>
<td></td>
<td>• Primary agricultural economic activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Opportunities for potential new agricultural economic activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Secondary agricultural economic activity</td>
<td></td>
</tr>
<tr>
<td>Changes to regional food production and</td>
<td>• Regional food production</td>
<td>The key indicators will identify potential changes to regional food self-reliance by estimating changes to food production compared to food consumption of regionally suited crops</td>
</tr>
<tr>
<td>consumption</td>
<td>• Regional food consumption</td>
<td></td>
</tr>
</tbody>
</table>

20.1.5 Spatial and Temporal Boundaries

20.1.5.1 Spatial Boundaries

The Local Assessment Area (LAA) in the EIS Guidelines for the assessment of the VC of Agriculture is the Project activity zone and the Peace River valley between the Peace
Canyon Dam and the Alberta border. The Regional Assessment Area (RAA) in the EIS Guidelines is the Peace River Regional District Peace River Census Division (Census Division 55, Agricultural Region 8).

The areas used for reporting in this assessment were updated from the originally proposed spatial boundaries in the EIS Guidelines. The agricultural land LAA used in this agriculture assessment for reporting on changes to the agricultural land base and changes to individual farm operations is the Project activity zone and the remainder of any farm operations that are within the Peace River valley and that overlap the Project activity zone. The agricultural economy LAA for changes to agricultural economic activity and changes to food production and consumption was expanded to include the Peace River Regional District and the Northern Rockies Regional Municipality, which comprise the Peace River Agricultural Region (Statistics Canada Agricultural Region 8, Statistics Canada 2012a). This wider area coincides with the reporting areas on agricultural economic activity.

The RAA for all components of this assessment is the Peace River Regional District and the Northern Rockies Regional Municipality, which comprise the Peace River Agricultural Region, Statistics Canada Agricultural Region 8 (Statistics Canada 2012a).

Figure 20.1 shows the boundaries of the agricultural LAAs and the RAA.

20.1.5.2 Temporal Boundaries
Project components and activities that could affect agriculture would occur during the construction and operation phases of the Project. Agricultural resources located within the agricultural land and economy LAA would be affected in Years 1 through 8 of the Project. Effects related to the operations phase would begin in Year 8 and may continue through the operating life of the Project.

20.2 Methodology and Baseline Conditions
In accordance with the EIS Guidelines, the agricultural assessment baseline data collection included information on the following:

- Agricultural land capability ratings, using updated field observations or existing provincial mapping, and updated climatic capability using current climate data
- Agricultural suitability of lands within the Project activity zone for growing different crops, determined using updated or available capability ratings and rated as well suited, suited, or not suited for various crops
- Agricultural utility ratings, to reflect the likelihood of each area being used for agricultural production in the future, based on land capability ratings, as well as constraints on agricultural use (such as location, access, parcel size, landownership or tenure, and land use plans or designations)
- Agricultural land use, determined from recent air photos of the Project area, Crown land tenures, field observations, and interviews with landowners and operators
- Agricultural tenure on Crown lands, including range tenures and grazing licences, determined from provincial data sources, within and near the Project activity zone
- Current and expected future agricultural operations and practices, determined through interviews with owners and operators of potentially affected agricultural...
operations, as well as through review of agricultural census information for the agricultural economy

- Local and regional agricultural economic activity, determined through interviews with owners and operators, relevant agricultural associations, representatives of agriculturally related industries, and representatives of government agencies
- Local and regional food production and consumption estimates, determined through interviews with owners and operators of potentially affected agricultural operations, relevant agricultural associations, representatives of agriculturally related industries, and representatives of government agencies

The key sources resulting from a literature review are discussed below, followed by a summary of fieldwork and analysis used and a description of the baseline conditions. Details on the methodology are described in Volume 3 Appendix D Agricultural Assessment Supporting Documentation.

20.2.1 Literature Review

A complete list of information sources used in this assessment is provided in the References at the end of this section. Key information sources used to define baseline conditions for agriculture in the study area are listed below.

The key information sources on soils were as follows:

- Soils of the Fort St. John–Dawson Creek area, British Columbia (Lord and Green 1986)
- 1:40,000 digital orthophotograph base (2007)
- 1:5,000 scale orthophotographs (2010)
- LiDAR Digital Elevation Model

The key information sources on land capability for agriculture in the Project activity zone were as follows:

- Peace River Site C Hydroelectric Development Agriculture Assessment (CBRC 1979)
- Determination of the Aerial Extent of Lands with Agricultural Capability Class 1 to 5 within the Proposed Site C Reservoir Area (Pottinger 1982a)
- Manuscript Maps Used for Determination of the Aerial Extent of Lands With Agricultural Capability Class 1 to 5 Within the Proposed Site C Reservoir Area (Pottinger 1982b)
- Land Capability Classification for Agriculture in British Columbia (Kenk and Cotic 1983)
- Site C Agricultural Resources Inventory: Status of Information and Recommendations for Further Study (Norecol 1991)
- Site C Project Environmental Resource Atlas (Hugh Hamilton Ltd. 1991)
- Soils of the Fort St. John–Dawson Creek Area, British Columbia (Lord and Green 1986)
Sources of information and land use planning within the Project activity zone, used to develop agricultural utility ratings, included the following:

- Peace River Regional District Zoning By-laws and Maps (Peace River Regional District 1996, 2001)
- The City of Fort St. John Zoning By-law Map (City of Fort St. John 2008)
- The District of Hudson’s Hope Zoning Bylaw and Maps (District of Hudson’s Hope 2009)

Relevant information related to agricultural economic activity, and to food production and consumption, was obtained from the following sources:

- Agricultural Land Commission
- Alberta Agriculture and Rural Development
- B.C. Ministry of Agriculture (B.C. Ministry of Agriculture and Food; B.C. Ministry of Agriculture and Lands)
- B.C. Ministry of Health
- BC Stats
- Canadian Grain Commission
- Farm Credit Corporation
- Saskatchewan Agriculture
- Statistics Canada
- U.S. Department of Agriculture Foreign Agriculture Service
- WorkBC

20.2.2 Land Capability for Agriculture

20.2.2.1 Land Capability Method

20.2.2.1.1 Land Capability Definition and Classification

Land capability for agriculture is derived from both soil and climate conditions, and refers to the potential for agricultural crop production. Capability is rated as Class 1 through 7. A description of each Class is provided below:

- Class 1 land is capable of producing the widest range of crops. Soil and climate conditions are optimum, resulting in easy management.
20.2.2.1.2 Mapping Update

The existing maps covering the proposed reservoir area consisted of a series of draft 1:10,000 scale digital maps based on LiDAR and air photograph base imagery. GIS "layers" were also included, which showed slope classes, polygons (map areas) showing preliminary land capability for agriculture ratings in the reservoir from previous studies, Agricultural Land Reserve boundaries, Crown land, lands owned and leased by BC Hydro, and private lands.

These maps and other existing land capability information for the Project activity zone were reviewed, and in general were found to be out of date, or were not verifiable with current mapping, soil, and climate documentation. It was concluded that the land capability for agriculture needed to be updated in order to have accurate mapping, with supporting documentation and analysis for use in the assessment.

The update was based on the following:

- A mapping update, including a review of recent air photographs, detailed topographic mapping (derived from LiDAR)
- A field program to verify and refine soil capability
- Review and analysis of climate data
- Consideration of possible future changes to climatic ratings based on regional climate change scenarios

Based on this updated information, the preliminary land capability for the proposed reservoir area was revised as appropriate.

The land capability for agriculture mapping in non-reservoir areas of the Project activity zone and for other lands within the Peace River valley between the Peace Canyon Dam and the Alberta border was also reviewed. For these areas, recent air photography, topographic mapping, and existing 1:50,000 scale soil and land capability mapping were reviewed, and capability polygon boundaries were adjusted as appropriate. The results
of the soils field program and climate data review, as described below, were also taken into account.

The refined capability polygons, and the results of the soils field evaluation program and climatic capability analysis discussed below, were combined to create updated land capability maps for the Peace River valley between the Peace Canyon Dam and the Alberta border. This updated mapping is shown in Figure 20.2, Maps 1 through 25.

20.2.2.1.3 Soils Field Program

As indicated above, a soils field program was conducted for agricultural lands within the Project activity zone for the purpose of deriving updated agricultural land capability ratings.

The field evaluation was carried out for agriculturally capable areas within the Project activity zone where permanent or temporary loss of land may occur, including the reservoir, dam site, Highway 29 realignments, construction access roads, the transmission line, and quarried and excavated construction material source areas.

The program included field observations and data collection to determine soil characteristics required to classify soils according to the Land Capability Classification for Agriculture in British Columbia (Kenk and Cotic 1983). The key soil characteristics required to determine land capability for agriculture in the Project activity zone are as follows:

- Topography
- Soil texture
- Surface stoniness
- Depth to bedrock

Topography was determined using available topographic mapping and agricultural capability slope class mapping derived from LiDAR imagery. Field investigations determined and recorded micro-topography and evidence of erosion.

Soil texture, to determine proportions of sand, silt, and clay, was estimated in the field by hand, and coarse fragment content (the percentage of gravel, cobbles, and stones) was determined based on visual inspection. Samples were collected and analyzed for particle size in the laboratory to confirm field estimates. Soil texture provided the basis for available water storage capacity estimates and a general indication of soil fertility.

Additional soil characteristics that were noted during the field program, which influence capability, are listed below:

- Internal soil drainage
- Risk of flooding
- Impervious horizons
- Calcareous surface horizons

Key observations of the soils field program were that soils generally had a higher water holding capacity than was estimated in previous capability assessments. This higher soil
water holding capacity results in a greater extent of Class 1 soils than was previously estimated. These findings are incorporated into the capability assessment.

The agricultural soils field program and classification of land capability is described in more detail in Volume 3 Appendix D Agricultural Assessment Supporting Documentation.

**20.2.2.1.4 Review and Analysis of Climate Data: Climatic Capability for Agriculture Ratings**

Climatic capability for agriculture is another input into land capability ratings and, as described above, climate data was also reviewed and analyzed to derive the updated land capability ratings for the Project activity zone.

Climatic capability for agriculture is based on thermal parameters defined as growing degree-days and frost-free periods, derived from long-term (generally 30 years) average climatological values. Climatic capability is also based on a moisture parameter defined as climatic moisture deficit, or surplus. These parameters are discussed below.

The most recent regional climatic capability for agriculture mapping for the general area was published in 1983. These climatic ratings were based on the 30-year period of 1951 through 1980. To assess if there have been changes in climate that would warrant updating climatic capability for agriculture mapping, data collected at the North Peace Regional airport for the 1951 through 1980 period was compared to the data collected during the 1971 through 2000 period. The Canada Atmospheric Environment Station at the North Peace Regional airport was the only climate station with the length of record that permitted this comparison.

Thermal parameters compared for the two 30-year periods were as follows:

- The frost-free period, defined as the period between the last spring average frost date and the average first fall frost date
- Growing degree-days, defined as the accumulated difference between the mean daily temperature and 5°C on days when the mean daily temperature is above 5°C, starting on the first day of a consecutive five-day period when the mean daily temperature is equal to or greater than 5°C, and ending on the last day of the five-day period when the mean daily temperature is equal to or greater than 5°C

The results of the analysis of thermal parameters show that there has been an increase of approximately 65 growing degree-days, or approximately 0.5%, and an increase in the length of the frost-free period of 10 days. The last spring frost has occurred, on average, seven days earlier, and the first fall frost has occurred, on average, three days later.

These changes were not large enough, relative to the accuracy of climatic capability polygon mapping, to justify amending the climatic capability for agriculture mapping.

Climatic moisture deficit was calculated for the period from May through September based on potential evapotranspiration minus precipitation. Estimates of long-term annual climatic moisture deficit at the North Peace Regional airport and at the BC Hydro climate stations ranged from 123 mm/year through 235 mm/year as shown in Figure 20.3. The median of the climatic moisture deficit values was 148 mm/year. This is consistent with the 1983 climatic capability mapping.

For lands inside the Project activity zone, the existing land capability for agriculture mapping assumed a climatic moisture deficit that was not large enough to influence land
capability for agriculture ratings. This previous capability mapping therefore showed no improvement in capability with irrigation. Compared to this previous land capability mapping, current analysis revealed an increased climatic moisture deficit that results in a reduced capability for unimproved conditions. Improved ratings are not influenced, as improved ratings assume that irrigation would compensate for the moisture deficit.

For lands outside the Project activity zone, the unimproved ratings reflect published agricultural capability mapping from the 1970s (Canada Land Inventory 1973) that were based on an assumed low climatic moisture deficit of 34 mm. However, the climate analysis conducted as part of this assessment estimated higher climatic moisture deficits. The higher climatic moisture deficits would result in reduced unimproved ratings in some locations. As discussed in Section 20.2.2.1, the soils field program revealed that soils within the Project activity zone generally had higher soil water holding capacities than previously estimated. Assuming that soils outside the Project activity zone also have higher soil water holding capacities than previously estimated, it is reasonably expected that the higher water holding capacity would partially offset the higher climatic moisture deficit when evaluating unimproved ratings. Therefore, the use of the unimproved ratings is reasonably considered to be representative of land capability for agriculture for areas outside the Project activity zone.

A detailed description of the method of determining climatic capability for agriculture is contained in Volume 3 Appendix D Agricultural Assessment Supporting Documentation.

20.2.2.1.5  Regional Climate Change

The impact of potential global climate change on future climatic capability for agriculture was assessed using temperature and precipitation anomalies for the 2050s and 2080s as calculated by the Pacific Climate Impacts Consortium (PCIC) at the University of Victoria (see Volume 2 Appendix T Climate Change Summary Report) for B1 and A2 emission scenarios. The Intergovernmental Panel on Climate Change (IPCC) B1 emission scenario assumes that greenhouse gas emissions will eventually decrease, while the IPCC A2 emission scenario assumes emissions continuously increase (Volume 2 Appendix T Climate Change Summary Report).

The PCIC model predicts warmer conditions in 2050 and 2080 in all seasons of the years for each emission scenario, and similarly wetter conditions except during the summer months for the A2 scenario.

Growing degree days and frost-free period were calculated for each of the BC Hydro climate station locations by applying the monthly temperature anomaly data as a linear correction.

Applying the PCIC climate change model temperature anomaly projections, statistically significant changes to growing degree-days and frost-free periods are expected, and as a result, a significant improvement in climatic capability for agriculture is predicted. Improved climatic capability in the vicinity of the reservoir would generally improve from Class 2 and 3 to Class 1. The effect would be an increase in the area of land with a land capability rating of Class 1.

Climate change predictions also indicate that climate capability within the region as a whole will improve, increasing the land capability for agriculture throughout the region. It is expected that the proportion of high capability land within the Project activity zone
relative to the total within the region will not increase with climate change, and may
decrease.

### 20.2.2 Land Capability: Baseline Description

The updated land capability for agriculture mapping is shown in Figure 20.2, Maps 1 through 25.

To provide context, Table 20.4 shows areas by capability class for the Peace River valley in B.C., both upstream of Site C to the Peace Canyon dam and downstream of Site C to the Alberta border, the Peace River Agricultural Region, and the province.

Agricultural land capability statistics for the region and the province were obtained from B.C. Environment and Land Use Committee Secretariat (1976).

#### Table 20.4 Land Areas by Unimproved Agricultural Capability Class (ha)

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6 &amp; 7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peace River valley in B.C. – upstream of the Site C dam site</td>
<td>0</td>
<td>6,419</td>
<td>3,765</td>
<td>1,019</td>
<td>401</td>
<td>18,280</td>
<td>29,884</td>
</tr>
<tr>
<td>Peace River valley in B.C. – downstream of Site C to Alberta border</td>
<td>926</td>
<td>3,132</td>
<td>2,385</td>
<td>930</td>
<td>1,079</td>
<td>16,751</td>
<td>25,203</td>
</tr>
<tr>
<td>Peace River valley in B.C. – Total</td>
<td>926</td>
<td>9,551</td>
<td>6,150</td>
<td>1,949</td>
<td>1,480</td>
<td>35,031</td>
<td>55,087</td>
</tr>
<tr>
<td>Peace River Agricultural Region</td>
<td>3,833</td>
<td>121,013</td>
<td>365,043</td>
<td>501,036</td>
<td>1,683,351</td>
<td>2,091,078</td>
<td>4,765,354</td>
</tr>
<tr>
<td>Province</td>
<td>21,057</td>
<td>235,480</td>
<td>692,041</td>
<td>1,701,715</td>
<td>6,671,820</td>
<td>20,674,336</td>
<td>29,996,449</td>
</tr>
</tbody>
</table>

**Note:**

* Peace River valley in B.C. – upstream of the Site C dam site includes lands both within and outside the Project activity zone

#### 20.2.3 Agricultural Suitability of Lands

Crop suitability refers to the suitability of different crops, or groups of crops, potentially grown in different land classes and is a function of the climate, soil capability, and crop needs. Crop suitability does not consider the economic viability of producing crops.

The suitability of agricultural lands within the Project activity zone for growing different crops was estimated using the updated land capability for agriculture mapping developed and a methodology similar to that described in the Soil Management Handbook for the Okanagan and Similkameen valleys (Gough et al. 1994). Agriculturally capable lands were rated as well suited, suited, or not suited for a variety of crops (Table 20.5).
Table 20.5  Rating of Agriculturally Capable Lands

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Suited</td>
<td>• Management inputs can be made by an individual producer&lt;br&gt;• Technological inputs are low to moderate&lt;br&gt;• Irrigation is provided if required</td>
</tr>
<tr>
<td>Suited</td>
<td>• Moderate to high level of expertise and management&lt;br&gt;• Technological inputs are moderate to high (e.g., drainage, organic matter additions)&lt;br&gt;• Economic inputs may be high (e.g., land levelling)&lt;br&gt;• Risk of crop failure may be moderate to high&lt;br&gt;• Irrigation is provided if required</td>
</tr>
<tr>
<td>Not Suited</td>
<td>• Risk of crop failure is high</td>
</tr>
</tbody>
</table>

For areas within and near the reservoir, soil characteristics generally do not limit the suitability of most crops, and crop suitability is primarily dependent on climate. Crops that are considered well suited or suited for different improved land capability classes within or adjacent to the proposed reservoir area are listed in Table 20.6. This table provides examples of crops that would be well suited or suited, but is not an exhaustive list of all potential crops that would be well suited or suited. Table 20.6 also provides an indication of the range of crops that can be grown in areas of different land capability classes. A determination of the range of crops that could be grown successfully at a specific location would require a site-specific evaluation of soils and climate.
Table 20.6  Crop Suitability by Improved Land Capability Class

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains and oilseeds</td>
<td>Barley, millet</td>
<td>Barley, millet</td>
<td>Barley, millet</td>
<td>Barley, millet</td>
</tr>
<tr>
<td>Oats, rye, wheat</td>
<td>Oats, rye, wheat</td>
<td>Oats, rye, wheat</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Canola, flax</td>
<td>Canola, flax</td>
<td>Canola, flax</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Corn – silage</td>
<td>Corn – silage</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Legumes and grasses</td>
<td>Native grazing</td>
<td>Native grazing</td>
<td>Native grazing</td>
<td>Native grazing</td>
</tr>
<tr>
<td>Unimproved pasture</td>
<td>Unimproved pasture</td>
<td>Unimproved pasture</td>
<td>Unimproved pasture</td>
<td>Unimproved pasture</td>
</tr>
<tr>
<td>Hay, improved pasture</td>
<td>Hay, improved pasture</td>
<td>Hay, improved pasture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Alfalfa, forage seed</td>
<td>Alfalfa, forage seed</td>
<td>Alfalfa, forage Seed</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Peas</td>
<td>Peas</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Beans</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Annual vegetables</td>
<td>Cabbage, lettuce</td>
<td>Cabbage, lettuce</td>
<td>Cabbage, lettuce</td>
<td>Cabbage, lettuce</td>
</tr>
<tr>
<td>Potatoes, turnips, Carrots</td>
<td>Potatoes, turnips, Carrots</td>
<td>Potatoes, turnips, carrots</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Broccoli</td>
<td>Broccoli</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cantaloupe, corn, cucumber, peppers, tomatoes</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Berries and fruits</td>
<td>Raspberries, strawberries, Saskatoon berries</td>
<td>Raspberries, strawberries, Saskatoon berries</td>
<td>Raspberries, strawberries, Saskatoon berries</td>
<td>N/A</td>
</tr>
<tr>
<td>Blueberries</td>
<td>Blueberries</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Hardy apples</td>
<td>Hardy apples</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Nanking cherries</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Plums</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

NOTE: N/A – not applicable

20.2.4 Agricultural Utility

20.2.4.1 Agricultural Utility: Method

Areas within the Project activity zone were assigned an agricultural utility rating to reflect the likelihood of future agricultural use. In accordance with the EIS Guidelines, agricultural utility was classified based on the physical capability (soil and climate) and on potential constraints to agricultural use, using the following definitions developed by the agricultural assessment team:

- High utility: Class 1 through 3 lands with a high likelihood of being used for cultivated agriculture in the future
- Moderate utility: Class 4 and 5 lands with a high likelihood of being used for cultivated agriculture in the future
• Low to nil utility: Class 6 and 7 lands, and lands with a low to nil likelihood of being used for cultivated agriculture in the future

The following factors were considered in assigning an agricultural utility rating:

• Land capability for agriculture
• Land use plans and potential protected areas
• Tenure
• Location and access
• Parcel size and configuration
• Environmental constraints such as wildlife habitat

Areas with improved capability ratings of Class 1 through 3 were initially assigned a high utility, Class 4 and 5 were assigned a moderate utility, and other areas were assigned a low to nil utility. Initial utility ratings were then adjusted to reflect the potential constraints to the land being used for cultivated agricultural production in the future, in absence of the Project, as described below.

The Province completed land use plans for Fort St. John and Dawson Creek areas through the Fort St. John and Dawson Creek Land and Resource Management Plans (B.C. Ministry of Forests, Lands and Natural Resource Operations 1997, 1999). Both plans recommended the creation of the Peace River Boudreau Lake Protected Area. If created, this protected area would include land within the Project activity zone, including the majority of the south bank lands and islands that are within the proposed reservoir area. If the protected area is established, agricultural land use would be expected to be limited to existing grazing tenures or some expanded grazing use. It is unlikely that any cultivated agriculture would occur within the protected area. For these reasons, lands within the proposed protected area were assigned a low to nil utility rating.

Without the protected area designation, agricultural utility of portions of the proposed protected area would be limited by access, particularly land on the islands. Agricultural land use within the remainder of the Project activity zone is generally not restricted by existing zoning, nor is it expected to be restricted by the implementation of recommendations in the two Land and Resource Management Plans.

Apart from the recommendations of the Land and Resource Management Plans, likely future agricultural use was assumed not to be restricted by tenure. Therefore, the agricultural utility ratings were not considered to be constrained by ownership, or by status as Crown, private, or ALR.

Agricultural utility also considered location, access, parcel size, parcel configuration, and potential environmental constraints. Areas with no existing access and for which creating access would be difficult and expensive, as well as areas that are relatively small and isolated were assigned a low to nil utility rating. Examples would be parcels along the tributaries that are contained by steep banks.

Agricultural utility ratings outside of the recommended protected area were not reduced to address potential environmental constraints, such as competing land uses (e.g., wildlife habitat), though environmental issues may constrain agricultural development in some areas.
20.2.4.2 Agricultural Utility: Baseline Description

The agricultural utility ratings assigned to areas with agricultural capability within the Project activity zone are shown in Figure 20.4, Maps 1 through 16.

To provide a comparison of agricultural utility within the Project activity zone to utility in remaining areas of the Peace River valley, a utility rating was also assigned to areas within the Peace River valley but outside the Project activity zone. Islands and tributaries were assigned a low to nil rating on the basis of limited access.

Utility outside the Project activity zone was defined as follows:

- Upstream of the dam site:
  - High utility includes Class 1 through 3 land on the north bank, excluding tributaries
  - Moderate utility includes Class 4 and 5 land on the north bank, excluding tributaries

- Downstream of the dam site:
  - High utility includes Class 1 through 3 land on the north and south banks, excluding islands and tributaries
  - Moderate utility includes Class 4 and 5 land on the north and south banks, excluding islands and tributaries

20.2.5 Agricultural Land Use

Agricultural land use within the Project activity zone was mapped using land use information collected during interviews with agricultural property owners and operators, from field observations, and from recent air photographs. Agricultural land use as of 2011, when the majority of the agricultural operator interviews were completed, is shown in Figure 20.5, Maps 1 through 11.

20.2.6 Agricultural Tenures on Crown Land

Information on agricultural tenures on Crown lands within the Project activity zone, including associated management plans and livestock carrying capacity, available from the B.C. Ministry of Forests, Lands and Natural Resource Operations, was collected from their Dawson Creek office, mapped, and summarized.

The B.C. Ministry of Forests, Lands and Natural Resource Operations indicated that carrying capacity in the area ranges from 3.2 through 6.1 ha per animal unit month (AUM). Information in range use plans for licences that would be affected were provided by the B.C. Ministry of Forests, Lands and Natural Resource Operations, and showed carrying capacities ranging from 2.3 through 20.7 ha per AUM.

A total of 19 grazing tenures including 4 leases and 15 licences were identified that would be affected by the Project. The tenure boundaries are noted in Figure 20.5, Maps 1 through 10.
20.2.7 Agricultural Operations

As stated in the EIS Guidelines, current and expected future agricultural operations and practices were determined through interviews with owners and operators of potentially affected agricultural operations, as well as through review of agricultural census information for the agricultural land LAA.

20.2.7.1 Interviews

Interviews were conducted in 2011 and 2012 with the owners and operators of agricultural operations located in the agricultural land LAA. These interviews were focused on the collection of information related to current and future agricultural activities and information required to define and evaluate on-farm effects. Additional information on the interview process is contained in Volume 3 Appendix D Agricultural Assessment Supporting Documentation.

Information sought during the interviews with owners and operators included the following:

- Current and future land use
- Soil and crop management practices, including crop rotation practices
- Crop yields and farm gate prices
- Livestock use, movements, and production
- Farm infrastructure and improvements and other investments that have been made or might be considered
- Historical and potential trends in agricultural land use
- Motivating factors in land use decision-making
- Non-farm infrastructure used by farm operations
- Projected changes to land use if the Project proceeds
- Marketing and distribution channels used, including access and transportation needs
- Agricultural input acquisition channels
- Short-term and long-term concerns related to potential effects of the Project on agricultural operations
- Avoidance and mitigation options
- Regional compensation and enhancement opportunities

All producers with a portion of their operation within the Project activity zone were sought for interview.

Table 20.7 lists 34 farm operations where a portion of the operation is within the Project activity zone.
### Table 20.7  Land Use by Farm Operation

<table>
<thead>
<tr>
<th>Operation</th>
<th>Crops</th>
<th>Livestock</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forage, grain</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>2</td>
<td>Forage</td>
<td>Horses</td>
</tr>
<tr>
<td>3</td>
<td>Forage</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>4</td>
<td>Forage</td>
<td>No livestock</td>
</tr>
<tr>
<td>5</td>
<td>No cropland</td>
<td>Bees</td>
</tr>
<tr>
<td>6</td>
<td>Unknown(^b)</td>
<td>Unknown(^b)</td>
</tr>
<tr>
<td>7</td>
<td>Forage</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>8</td>
<td>Forage</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>9</td>
<td>Forage</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>10</td>
<td>Forage (cropland is rented out)</td>
<td>No livestock</td>
</tr>
<tr>
<td>11</td>
<td>No farming activities</td>
<td>No livestock</td>
</tr>
<tr>
<td>12</td>
<td>Canola (cropland is rented out)</td>
<td>No livestock</td>
</tr>
<tr>
<td>13</td>
<td>Forage</td>
<td>Small numbers of livestock</td>
</tr>
<tr>
<td>14</td>
<td>Unknown(^b)</td>
<td>Unknown(^b)</td>
</tr>
<tr>
<td>15</td>
<td>Forage (cropland is rented out) (forage)</td>
<td>No livestock</td>
</tr>
<tr>
<td>16</td>
<td>Unknown(^b)</td>
<td>Unknown(^b)</td>
</tr>
<tr>
<td>17</td>
<td>Unknown(^b)</td>
<td>Unknown(^b)</td>
</tr>
<tr>
<td>18</td>
<td>Forage, canola</td>
<td>Beef (cow/calf), horses</td>
</tr>
<tr>
<td>19</td>
<td>Forage, grain, canola</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>20</td>
<td>Forage</td>
<td>No livestock</td>
</tr>
<tr>
<td>21</td>
<td>Forage</td>
<td>No livestock</td>
</tr>
<tr>
<td>22</td>
<td>Forage</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>23</td>
<td>Canola</td>
<td>No livestock</td>
</tr>
<tr>
<td>24</td>
<td>Forage, some land leased out for canola</td>
<td>Horses</td>
</tr>
<tr>
<td>25</td>
<td>Forage</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
<tr>
<td>26</td>
<td>Forage (cropland is rented out)</td>
<td>No livestock</td>
</tr>
<tr>
<td>27</td>
<td>Pasture (cropland is rented out)</td>
<td>No livestock</td>
</tr>
<tr>
<td>28</td>
<td>Unknown(^b)</td>
<td>Unknown(^b)</td>
</tr>
<tr>
<td>29</td>
<td>Forage (cropland is rented out)</td>
<td>No livestock</td>
</tr>
<tr>
<td>30</td>
<td>Forage</td>
<td>Beef (cow/calf/yearling)(^a)</td>
</tr>
<tr>
<td>31</td>
<td>Forage</td>
<td>No livestock</td>
</tr>
<tr>
<td>32</td>
<td>Canola (cropland rented out)</td>
<td>Horses</td>
</tr>
<tr>
<td>33</td>
<td>Forage, grain, canola</td>
<td>Horses</td>
</tr>
<tr>
<td>34</td>
<td>Pasture</td>
<td>Beef (cow/calf)(^a)</td>
</tr>
</tbody>
</table>

**NOTES:**

\(^a\) Farm has horses, but does not raise horses for sale

\(^b\) Information is not available, as operator either declined or failed to respond to interview request

### 20.2.7.2  Statistics Canada Data

The following sections describe local and regional agricultural land use and agricultural sector characteristics.

#### 20.2.7.2.1  Land Use

The Peace Agricultural Region is represented by Peace River Census Division 55 and the Northern Rockies Census Division 59. Census Division 55 and Census Division 59
correspond to the Peace River Regional District and the Northern Rockies Regional Municipality, respectively. The area of farms in Census Division 55 represented 99.03% of the total area of farms in the Peace Agricultural Region in 2011.

The Peace Agricultural Region comprises about 22% of B.C.’s land area and contains 32% of the province’s ALR land or 1,522,145 ha (Agricultural Land Commission 2010).

About 7.4% of the Peace Agricultural Region is in the ALR. Farms in the Peace Agricultural Region comprise 32% (831,566 ha) of the total land on Census farms in B.C. (2,611,383 ha), according to the 2011 Census of Agriculture (Statistics Canada 2012a).

The following is a breakdown of the use of land on Census farms in the B.C. Peace Agricultural Region (Statistics Canada 2012a):

- Natural land for pasture: 41.1%
- Crops: 32.5%
- Tame and seeded pasture: 12.1%
- Woodlands and wetlands: 9.8%
- All other lands: 2.6%
- Summer fallow: 1.9%

Peace Agricultural Region farms comprise 8% of the farms in the province. Overall, the number of farms decreased 12% in the Peace Agricultural Region between 2001 and 2011, compared to a decline of about 3% in B.C. as a whole. The average farm size in the Peace Agricultural Region is 533 ha, which is four times larger than the provincial average of 132 ha.

The proportion of cultivated land in crop, tame, and seeded pasture and summer fallow in the Peace Agricultural Region is 46% of the total area on Census farms in the province. The total cultivated area has declined in both the Peace Agricultural Region and the province since 2001 (Statistics Canada 2012a, 2012b).

### 20.2.7.2.2 Agricultural Sector Characteristics

The agricultural sector of the Peace Agricultural Region is predominantly mixed farming, including cow/calf operations, other livestock and grain, forage, and seed production for own use or for sale of surplus. Cash crops such as wheat, barley, oats, canola, fescue seed, and field peas have provided opportunities to augment farm incomes in response to increased run-ups in global market prices.

In the Peace Agricultural Region, 77% of the farms specialize in hay (43%), beef (16%), horses (12%), or livestock combinations (6%). The Peace Agricultural Region alone represents 20% of B.C.’s hay farms and 10% of its beef farms. About 11% of Peace Agricultural Region farms are oilseed (5%), wheat (1%), and other grain farm types (5%). Other types of farms include sheep, apiculture, fruit, berries and nuts, poultry and eggs, vegetables, and potatoes, with each representing less than 1% of the total farms in the region (Statistics Canada 2012a).

While all types of livestock are raised in the Peace Agricultural Region, the area has larger concentrations of B.C.’s beef cattle and bison than other livestock.
From 2001 to 2011, animal inventories of meat chickens, hogs, and bison increased in the Peace Agricultural Region, while all other livestock categories declined. A summary of the main livestock sectors is provided below (Statistics Canada 2012a, 2012b):

- **Beef cows:** The Peace Agricultural Region contained 51,506 head of cows and replacement heifers in 2011, representing 23% of the population in the province. From 2001 to 2011, the population declined by 30% in the region. Many farmers have left the sector or substantially downsized herds due to declines in the market.

- **Bison:** About 84% of B.C.’s farmed bison, numbering 7,765 head in 2011, are raised in the Peace Agricultural Region. Low prices resulted in a drop in herd numbers between 2001 and 2006, followed by modest recovery in 2011 and an overall increase of 14%.

- **Other livestock:** Other livestock categories in the Peace Agricultural Region include sheep (ewes) at 17% of the livestock inventory, hogs (sows and gilts) at 8%, and goats at 7%. With the exception of the hog category, which has increased by 14%, all other livestock categories have declined in the Peace Agricultural Region over the last decade.

- **Honeybees:** In 2011, Peace Agricultural Region honey hives represented 5% of the provincial total. The number of hives dropped 59% in the Peace Agricultural Region since 2001, but has increased across the province by 17%. Honey production in the Peace Agricultural Region is largely a byproduct of extensive crop pollination operations.

- **Horses:** In 2011, horses in the Peace Agricultural Region represented 18% of the total number in the province. Since 2001, the equine population decreased 17% in the Peace Agricultural Region and 14% provincially.

- **Poultry and dairy:** The dairy and poultry sector livestock inventory is less than 1% of the provincial total. While the sectors are very small, poultry inventory showed growth of 130% during the 2001 to 2011 period; however, the dairy presence in the Peace Agricultural Region declined by 48%.

The bulk of Peace Agricultural Region agriculture is oriented to the export of harvested field crops and livestock. The agricultural support industry and infrastructure is set up for bringing inputs in and transporting harvested products to the U.S., Asia, and other provinces (e.g., Alberta).

A very small proportion of Peace Agricultural Region produce is oriented for domestic consumption, local retailers, and local farmers’ markets. Several livestock operations sell livestock for local slaughter to meet domestic needs and for specialty processing of bison, sheep, and deer.

According to the 2011 Agriculture Census (Statistics Canada 2012a), the Peace Agricultural Region contains the majority of the provincial area in canola (94%), dry field peas (94%), wheat (87%), forage seed (86%), oats (84%), and barley (60%).

The following is an overview of the dominant crops in the Peace Agricultural Region (Statistics Canada 2012a, 2012b):

- **Forages:** Alfalfa and alfalfa mixtures (35%) and other tame hay and fodder crops (17%) dominated the land reported in crops in 2011. In B.C. as a whole, these types of crops represent 64% of the cropped area. Between 2001 and 2011, the area of
alfalfa production increased 23% in the Peace Agricultural Region, while the area of other tame hay decreased 35%. The total area in hay and fodder production decreased 3.5%.

- Grains and oilseeds: Canola (12%), wheat (11%), oats (11%), and barley (6%) represented 40.5% of the cropped area in the Peace Agricultural Region in 2011. In B.C. as a whole, these types of crops represented only 22% of the cropped area. Among these major field crops, between 2001 and 2011, the canola area increased 49%, the wheat and oats area rose 16% and 20%, and the barley area dropped 25%.

- Forage seeds: Forage seed production area, represented predominantly by creeping red fescue seed, but also by some alfalfa seed, comprised about 5.5% of the land in crops in the Peace Agricultural Region in 2011. Forage seed crops have declined in area greatly over the last decade.

- Dry field peas: Dry field peas are a relatively new cash crop in the Peace Agricultural Region and accounted for 1.4% of the land in crops in 2011. Field peas are sold into export and regional feed markets. The area planted increased by 32% between 2001 and 2011.

In 2011, 22 farm operators produced organic products in the Peace Agricultural Region. The main organic products are hay crops and organic animals or animal products (Statistics Canada 2012a).

20.2.8 Agricultural Economies

20.2.8.1 Marketing

Consolidation in the input supply sector of the agricultural industry has intensified over the last few decades. The grains and oilseeds sector of the Peace Agricultural Region is now largely served by suppliers such as Viterra, Agro Source Ltd., and Cargill in Dawson Creek and Fort St. John. There are also two farmer-owned seed cleaning plants in the Peace Agricultural Region.

The main granular urea and ammonia fertilizer storage and distribution facility in the region is Canadian Fertilizers Ltd., which has a terminal and fertilizer plant in Alberta. Cash grain sales are marketed to a number of regional grain dealers, primarily for export to Asian markets. Some feed grains are sold directly to feed lots and livestock yards out of province.

Forage seeds are marketed to dealers in B.C. and Alberta. The bulk of common forage seed makes its way to the U.S. export market, with about 10% sold inter provincially. Farmers also tend to produce a slight surplus of hay in case of weather-related yield declines. This often leads to the sale of surplus hay into local and regional markets.

Most of the produce and meat food products sold in the Peace Agricultural Region are marketed by large retail chains with branches throughout B.C. and Canada. Small local butcher facilities slaughter local livestock and process meat for the local market. While some retailers may buy some produce in the Peace Agricultural Region, the large retail chains buy wholesale through centralized distribution centres across Canada and the U.S. (USDA Foreign Agriculture Service 2012).
A few farmers’ markets selling local honey, fruits, and vegetables are in operation in the region, and some vendors also sell processed food products such as baking and preserves.

Livestock sales occur regionally at auction, at points in Alberta, and through Internet bidding. Livestock such as bison, deer, hogs, and sheep raised in the Peace Agricultural Region tend to be butchered locally and packed or processed into livestock products that are sold locally or exported regionally.

Meat sales in the region are dominated by the large retail food chains, which procure from major suppliers outside of the Peace Agricultural Region. The Peace Agricultural Region is also served by several provincially licensed abattoirs in the area (BCMOH 2012). With changes to B.C.’s Food Safety Act, more stringent meat processing regulations have limited slaughter and processing of meats for sale to provincially and federally licensed abattoirs, and have required pre-existing processing facilities to meet new provincial standards. In 2010, amendments to B.C.’s Meat Inspection Regulation were made to allow Class D and Class E licences that now permit limited on-farm slaughter for producers who cannot access a licensed facility to meet their slaughter needs. However, financial costs are often beyond the reach of small-scale processors.

### 20.2.8.2 Agricultural Population and Employment

In 2011 agriculture in the Peace Agricultural Region comprised 1,560 farms operated by 2,325 farm operators (Statistics Canada 2012a). About 65% of farms had two or more farm operators, often family members.

Two Hutterite colonies own and farm large tracts of land in the Peace Agricultural Region near Farmington (approximately 25 km north of Dawson Creek), and a German Mennonite settlement at Prespatou (approximately 80 km north of Fort St. John) continues to farm in the area.

Agriculture employed about 3% of the region’s workforce (WorkBC No date), or about 1,200 person-years, in 2010. Only about 20% of the farms pay formal wages and salaries. In 2010, agricultural operators paid about $8.596 million in total agriculture-related wages and salaries (the 2011 Census of Agriculture asked farmers to respond to questions about wages and salaries based on the 2010 or the last complete fiscal period, as appropriate). Of the farms using paid labour, 73% utilize seasonal or temporary labour and 46% employ farm workers full-time. The total weeks of annual paid employment represent about 312 person-years of employment, based on an estimate of 49 weeks of employment per year per full-time worker. The number of farms using paid labour and the number of weeks of employment have dropped 28% and 30%, respectively, since 2005.

About 57% (894 farms) of Peace Agricultural Region farms were sole proprietorships, 30% (470) were formal or informal partnerships, and 10% (162 farms) were family corporations in 2011.

About 55% of the land in farms in the Peace Agricultural Region was privately owned in 2011, with a further 29% leased from governments, and 16% farmed through private rental and lease arrangements.
20.2.8.3 Economic Returns from Farming

Key measures of economic returns from farming include the following:

- Gross farm receipts: In 2010, Peace Agricultural Region farmers generated about $145 million, or 4.9% of the gross farm receipts generated in B.C. Total gross farm receipts have increased slightly more rapidly in B.C. as a whole than in the Peace Agricultural Region over the last decade.

- Contribution margin (gross farm receipts less operating expenses as reported in the Census): In 2010, the average contribution margin across all farm types in the Peace Agricultural Region was 5.4%.

- Total farm capital: Total farm capital value increased 64% in the Peace Agricultural Region, compared to an increase of 119% in B.C. as a whole.

- Livestock and poultry: Between 2001 and 2011, livestock and poultry inventory value declined by 51% in the Peace Agricultural Region, compared to a decrease of 41% in the province.

- Land and Buildings: About 83% of the farm capital of Peace Agricultural Region farm operations is composed of land and building value, compared to 93% in B.C. as a whole. Between 2001 and 2011, land and building value increased farm capital value by more than 100% in the Peace Agricultural Region and by almost 150% in B.C. (Statistics Canada 2012a, 2012b).

Characteristics of farms in the Peace Agricultural Region include the following:

- Gross receipts: In 2010, over half (56%) of farming operations in the Peace Agricultural Region grossed less than $25,000 and only about 18% grossed more than $100,000 annually.

- Farm size: In 2011, approximately 31% of the Census farms were a quarter section (160 acres or 65 ha) or less.

- Area in crops or summer fallow: In 2011, 23% of farms had less than 60 acres (26 ha) in crops or summer fallow.

There is a wide variation in net returns to farming in the Peace Agricultural Region. Higher gross margins are being achieved by larger farms, and low or negative gross margins by smaller farms. Many farm operators rely on off-farm income in addition to revenues produced from farming (Statistics Canada 2012a).

Additional information on the regional agricultural economy is contained in Volume 3 Appendix D Agricultural Assessment Supporting Documentation.

20.2.9 Food Production and Consumption

Food production and consumption in B.C. and the Peace Agricultural Region are outlined in the following sections.

20.2.9.1 Historical Food Self-Reliance in British Columbia

With globalization and increased trade, B.C. and Canada have substantially increased their levels of both food exports and imports. This shift to sourcing increased levels of food from outside the province and the country reflects the federal government’s food...
security strategy (Government of Canada 1998). This strategy is a global commitment that includes enhancing trade in the food and agri-food sectors as a way of reducing vulnerability to food shortages. Canada supports fair trade rules and environmentally sustainable trade practices as the means toward increasing food security, rather than agricultural protectionism and promotion of food self-sufficiency. In B.C., as elsewhere in the country, this shift has led to decreasing levels of food self-reliance. Table 20.8 shows that B.C.’s overall food self-reliance has decreased from the close to 100% self-reliance noted in 1946 to levels close to 50% today.

Table 20.8  British Columbia’s Historical Reliance on Food Imports

<table>
<thead>
<tr>
<th>Period</th>
<th>Import Contribution to Food Consumption (%)</th>
<th>Self-Reliance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1946(^a)</td>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>1955(^a)</td>
<td>29</td>
<td>71</td>
</tr>
<tr>
<td>1970s(^b)</td>
<td>44–49</td>
<td>51–56</td>
</tr>
<tr>
<td>1970s(^d)</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>1982(^c)</td>
<td>53</td>
<td>47</td>
</tr>
<tr>
<td>1980s(^d)</td>
<td>27–31</td>
<td>69–73</td>
</tr>
<tr>
<td>1990s(^e)</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>2000s(^f)</td>
<td>52</td>
<td>48</td>
</tr>
</tbody>
</table>

NOTES:
\(^a\) Furuseth and Pierce (1982)
\(^b\) Markham (1982)
\(^e\) Provincial Health Services Authority (2010)
\(^f\) BCMAL (2006)

20.2.9.2  Food Self-Reliance in the Peace Agricultural Region

The total per capita availability of food in Canada in 2010 is estimated at 580 kg/year (Statistics Canada 2010), not including alcoholic beverages. Approximately 52% of food consumption is of fruits and vegetables. Cereal products are also substantial, at 13% of total consumption.

As outlined earlier, food self-reliance is a comparison of total production (regardless of whether it is consumed in the area being considered or exported) and consumption. Current regional self-reliance in the Peace Agricultural Region may be characterized as follows:

- In grains (cereals), the region is in surplus self-reliance, exceeding 100% by a multiple of six. In oils and fats, the region is in surplus self-reliance, exceeding 100% by a multiple of four.
- In sugars, there is surplus self-reliance exceeding 100%
- In vegetables, the region has low self-reliance for crops that are climatically adapted to the region, producing 5% of the regional consumption of these crops
• In fruits and berries, the region has moderate self-reliance for crops that are climatically adapted to the region, producing 45% of the regional consumption of these crops.

• In dairy and poultry, the region has low self-reliance, about 5%, mostly because it is not currently economically feasible to base these enterprises in the region.

• In red meats, the region has high self-reliance, somewhere between 50% and 100%, but could be substantially higher if animals were finished in the region. Estimates are that 90% of the calves are currently exported to Alberta for finishing.

• In fish, the region has nil self-reliance, since fish are not harvested commercially in the Peace Agricultural Region.

Overall, regional food self-reliance has not been examined in detail. Nonetheless, it is estimated that about 30% of the fresh-equivalent weight of vegetables consumed cannot be grown in the region. For fruits and berries, slightly over 96% of the products consumed cannot be grown in the Peace Agricultural Region. At a maximum, this means that the Peace Agricultural Region is capable of producing 41% of the total fruits and vegetables consumed.

Additional information on food self-reliance is contained in Volume 3 Appendix D Agricultural Assessment Supporting Documentation.

20.3 Effects Assessment

This section considers the effects of the Project on agriculture in relation to the changes to the following four key aspects:

• Agricultural land

• Farm operations

• Agricultural economies

• Food production and consumption

For each aspect, the effects assessment discusses the effects of Project construction and operation and applicable mitigation measures. Residual effects are evaluated in Section 20.5.

The evaluation of changes to the agricultural land base included an estimation of the loss of land with potential agricultural value, an evaluation of the percentage of that land loss within a local, regional, and provincial context, and an evaluation of the potential effects of reservoir-induced changes to local microclimate on the agricultural land base.

The evaluation of changes to farm operations considered the loss of land and agricultural production and access, farm infrastructure, livestock management, water management, the introduction and proliferation of invasive plant species, biosecurity risks, and farm worker safety.

The evaluation of changes to agricultural economies included an estimation of the potential changes to primary and secondary economic activity within the agricultural economy LAA.

The evaluation of potential changes to regional food production and consumption considered changes in food production capacity in relation to regional food consumption.
20.3.1 Effects Assessment – Construction – Agricultural Land Base

This section summarizes effects on the agricultural land base that would occur during construction. As discussed above in Section 20.1.2, these effects would occur through the following project activities:

- Site clearing and preparation
- Dam, generating station, and spillway construction activities
- Reservoir preparation and filling
- Transmission line construction
- Highway 29 realignment
- Construction access road development
- Quarried and excavated material source development
- Worker accommodation construction

The effects of each of these activities are discussed below.

20.3.1.1 Primary Construction Activities

Land clearing and access road construction associated with reservoir preparation will disturb some agricultural lands.

Where individual farms may be affected, road locations will be discussed with farm operators and where appropriate agreements will be entered into as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

20.3.1.2 Dam, Generating Station, and Spillways

Construction activities within the dam site would result in both temporary and permanent loss of agricultural land. Permanent losses would result from permanent roads (Old Fort Road realignment, 269 Road extension, south bank Project access road, Septimus Siding) and permanent offices and warehouses, as shown in Figure 20.6 in Map 6. These losses are summarized in Table 20.9 by capability class. Areas of improved land capability for agriculture ratings are shown in brackets. The areas exclude locations within the reservoir full supply level, which are presented in the summary in Section 20.3.1.3, but include other project components such as construction access roads, material source sites, and worker accommodation area within the dam site.

Table 20.9 Loss of Agricultural Land – Dam Site (ha)

<table>
<thead>
<tr>
<th>Type of Land Loss</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6 &amp; 7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary</td>
<td>24 (33)</td>
<td>285 (290)</td>
<td>77 (63)</td>
<td>7 (7)</td>
<td>77 (77)</td>
<td>37 (37)</td>
<td>506 (507)</td>
</tr>
<tr>
<td>Permanent</td>
<td>0 (14)</td>
<td>75 (61)</td>
<td>29 (29)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>61 (61)</td>
<td>165 (165)</td>
</tr>
</tbody>
</table>

NOTES:
Unimproved capability and, in brackets, improved capability
All temporary construction areas, including laydown areas, worker accommodation areas, conveyor, and temporary access roads, will be reclaimed in accordance with the Project Soil Management, Site Restoration and Revegetation Plans as described in Volume 5 Section 35 Summary of Environmental Management Plans. Areas of current or potential agricultural use will be reclaimed to pre-disturbance capability or better.

20.3.1.3 Reservoir

All of the agricultural land within the full supply level of the reservoir would be permanently lost. Permanent loss of agricultural land due to inundation would occur during the reservoir filling stage of construction. Islands that would be created during reservoir filling have not been included in the estimates of land that would be permanently lost.

Estimated areas of permanent losses are summarized in Table 20.10, based on both improved and unimproved capability ratings (improved capability ratings are shown in brackets). The reservoir area includes current land and river channel areas. The reservoir surface area of 9,330 ha would comprise 4,523 ha of current land area and 4,807 ha of current river channel and recent alluvium.

### Table 20.10 Land Within the Reservoir (ha), by Capability

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6 &amp; 7</th>
<th>Total Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Land</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peace – North Bank</td>
<td>0 (525)</td>
<td>697 (291)</td>
<td>137 (20)</td>
<td>45 (43)</td>
<td>43 (43)</td>
<td>567 (567)</td>
<td>1,489 (1,489)</td>
</tr>
<tr>
<td>Peace – South Bank</td>
<td>0 (379)</td>
<td>432 (106)</td>
<td>160 (107)</td>
<td>16 (16)</td>
<td>6 (6)</td>
<td>483 (483)</td>
<td>1,097 (1,097)</td>
</tr>
<tr>
<td>Peace – Islands</td>
<td>0 (373)</td>
<td>687 (471)</td>
<td>162 (68)</td>
<td>68 (5)</td>
<td>19 (19)</td>
<td>58 (58)</td>
<td>994 (994)</td>
</tr>
<tr>
<td>Tributaries</td>
<td>0 (135)</td>
<td>474 (432)</td>
<td>226 (133)</td>
<td>53 (53)</td>
<td>0 (0)</td>
<td>190 (190)</td>
<td>943 (943)</td>
</tr>
<tr>
<td>Current Land Subtotal</td>
<td>2,290 (1,300)</td>
<td>685 (328)</td>
<td>182 (117)</td>
<td>68 (68)</td>
<td>1,298 (1,298)</td>
<td>4,523 (4,523)</td>
<td></td>
</tr>
<tr>
<td>Current River channel and recent alluvium</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>4,807</td>
</tr>
<tr>
<td>Total Reservoir Area</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>9,330</td>
</tr>
</tbody>
</table>

**NOTES:**

- N/A – not applicable
- Unimproved capability and, in brackets, improved capability

Two historical assessments of land capability within the reservoir area were previously completed (CBRC 1979; Pottinger 1982a, 1982b). A description of each of these historical assessments is provided in Volume 3 Appendix D Agricultural Assessment Supporting Documentation. The results of these historical assessments are summarized in Table 20.11 and compared to the most recent updated capability summaries.

Due to differences in delineating capability polygons and in classifying Class 5, 6, and 7 lands between the studies, it was only possible to compare Class 1 to 4 lands.
Table 20.11  Comparison of Land Capability for Agriculture Within the Proposed Site C Reservoir: Historical and Current Studies (ha)

<table>
<thead>
<tr>
<th>Capability Assessment</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Subtotal</th>
<th>Class 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical, unimproved&lt;sup&gt;a&lt;/sup&gt;</td>
<td>100</td>
<td>2,300</td>
<td>520</td>
<td>2,920</td>
<td>240</td>
<td>3,160</td>
</tr>
<tr>
<td>Historical, unimproved&lt;sup&gt;b&lt;/sup&gt;</td>
<td>106</td>
<td>2,215</td>
<td>607</td>
<td>2,928</td>
<td>162</td>
<td>3,090</td>
</tr>
<tr>
<td>Golder, unimproved – 2012</td>
<td>0</td>
<td>2,290</td>
<td>685</td>
<td>2,975</td>
<td>182</td>
<td>3,157</td>
</tr>
<tr>
<td>Golder, improved – 2012 (1,412)</td>
<td>(1,412)</td>
<td>(1,300)</td>
<td>(328)</td>
<td>(3,040)</td>
<td>(117)</td>
<td>(3,157)</td>
</tr>
</tbody>
</table>

NOTES:
<sup>a</sup> CBRBC 1979
<sup>b</sup> Pottinger 1982a

The different assessments yielded similar results, particularly when the previous results were compared with the current unimproved ratings. The differences between the current assessment’s unimproved and improved ratings are discussed in the agricultural land base baseline section (Section 20.2.2). The current assessment indicates that, with irrigation to achieve the improved ratings, the Class 1 area is greater than previously estimated, based on the improved soil quality revealed during the soils field program. All of the estimates indicated similar amounts of Class 1 through 3 lands.

20.3.1.4  Transmission Line to Peace Canyon

The upgraded transmission line would be approximately 77 km long, running from the switchyard at the proposed Site C Dam to the substation at the Peace Canyon Dam, as shown in Figure 20.6 Maps 6 through 10. The transmission line would pass through approximately 38 km of areas with agricultural activities, including one private agricultural operation (7 km), one grazing lease (10 km), and four grazing licences (21 km).

Within the transmission line corridor, land capability for agriculture is mostly Class 3 through 5, with some Class 7 lands.

Land disturbance associated with construction of the upgraded transmission line would include disturbances due to clearing, access road construction, tower foundation construction, tower erection, and conductor stringing.

The only areas where there would be permanent loss of agricultural land would be at the tower foundations. New access roads, tower construction pads, and temporary laydown and staging areas would be restored and revegetated once construction of the transmission line is completed, and therefore will not result in permanent loss of agricultural land.

It is expected that land clearing and ongoing vegetation management within the widened transmission right-of-way and the revegetation of disturbed areas would increase forage production to an extent that this increased forage production would compensate for the permanently lost land.

20.3.1.5  Highway 29 Realignment

Highway 29 realignment locations, shown in Figure 20.6 Maps 1 through 4, include:

- Cache Creek
The highway realignments would potentially affect agricultural lands, some of which are currently cultivated or used for pasture.

Estimated losses of agricultural land associated with the highway realignments include lands within proposed new right-of-way or, where a new right-of-way has not yet been defined, an area equal to the land within the currently defined highway corridor.

Proposed new rights-of-way have been defined for the Farrell Creek, Halfway River, and Lynx Creek realignments and for a portion of the Cache Creek realignment. For those locations where only a corridor has been defined, including Dry Creek and a portion of the Cache Creek realignment, it has been assumed that the new right-of-way would occupy the entire width of the corridor. This provides a conservative estimate of permanent loss of land, as the area within the highway right-of-way alignment will be less than that within the corridor.

Highway realignment construction would also result in temporary disturbances in areas outside of the new right-of-way, such as for construction laydown, equipment staging, and detours. These temporarily disturbed areas will be reclaimed in accordance with the Project Soil Management, Site Reclamation, and Revegetation Plan as described in Volume 5 Section 35 Summary of Environmental Management Plans. Abandoned sections of the highway located outside of the reservoir would either be converted to local access roads or decommissioned and restored to natural conditions.

Estimated areas of land loss resulting from Highway 29 realignments are summarized in Table 20.12. Improved capability ratings are shown in brackets. An estimated 330 ha would be permanently lost due to Highway 29 realignments. Of this total, 149 ha have an unimproved capability of Class 2 and 32 ha an unimproved capability of Class 3.

<table>
<thead>
<tr>
<th>Type of Land Loss</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6&amp;7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent</td>
<td>0 (121)</td>
<td>149 (54)</td>
<td>32 (57)</td>
<td>66 (15)</td>
<td>1 (1)</td>
<td>82 (82)</td>
<td>330 (330)</td>
</tr>
<tr>
<td>Temporary</td>
<td>0 (26)</td>
<td>47 (30)</td>
<td>10 (8)</td>
<td>20 (13)</td>
<td>0 (0)</td>
<td>32 (32)</td>
<td>109 (109)</td>
</tr>
</tbody>
</table>

**NOTE:**

Unimproved capability and, in brackets, improved capability

### 20.3.1.6 Construction Access

Construction access outside of the dam site that would permanently affect agricultural land includes the south bank Project access. Permanent loss of agricultural land associated with the Old Fort Road realignment, the 269 Road extension, and the
Septimus siding are included in the dam site land loss estimates. The section of south bank Project access road where there would be a permanent loss of land is shown in Figure 20.6 Maps 1 through 10. This area totals 78 hectares, including 52 hectares of Class 3 lands and 7 hectares of Class 4 lands.

Upgrades of the existing Jackfish Lake Road will be discussed with B.C. Ministry of Transportation and may include widening; however, all works will be within the existing road right-of-way with no permanent loss of agricultural land.

All other construction roads, including clearing roads and the conveyor leading to the dam site area, would result in temporary loss of agricultural land as shown in Figure 20.6 Maps 1 through 10. Disturbed areas with agricultural potential will be reclaimed in accordance with the Project Soil Management, Site Reclamation, and Revegetation Plan as described in Volume 5 Section 35 Summary of Environmental Management Plans. The estimated area disturbed by construction access outside of the reservoir and dam site is summarized in Table 20.13. Areas of improved capability are shown in brackets.

### Table 20.13  Loss of Agricultural Land by Capability – Construction Access (ha)

<table>
<thead>
<tr>
<th>Type of Land Loss</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6&amp;7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary</td>
<td>0 (1)</td>
<td>10 (9)</td>
<td>9 (9)</td>
<td>2 (2)</td>
<td>2 (2)</td>
<td>14 (14)</td>
<td>37</td>
</tr>
<tr>
<td>Permanent</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>52 (52)</td>
<td>7 (7)</td>
<td>19 (19)</td>
<td>0 (0)</td>
<td>78</td>
</tr>
</tbody>
</table>

**NOTE:**
Unimproved capability and, in brackets, improved capability

### 20.3.1.7  Quarried and Excavated Materials

Potential quarried and excavated materials sources that would affect agricultural lands are shown in Figure 20.6 Maps 1 through 9. Table 20.14 lists the potential sources and shows ALR status, Crown land agricultural tenure, capability for where there is potential agricultural use, and current cultivation.
Table 20.14 Off-site Materials Site Characteristics

<table>
<thead>
<tr>
<th>Site</th>
<th>ALR</th>
<th>Tenure</th>
<th>Grazing Lease or Licence</th>
<th>Land Capability (Class)</th>
<th>Current Cultivation</th>
<th>Temporarily Disturbed Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wuthrich Quarry</td>
<td>Yes</td>
<td>Private</td>
<td>No</td>
<td>Class 3 &amp; 4, partially disturbed</td>
<td>Partial</td>
<td>18</td>
</tr>
<tr>
<td>West Pine Quarry</td>
<td>No</td>
<td>Crown</td>
<td>No</td>
<td>n/a</td>
<td>No</td>
<td>104</td>
</tr>
<tr>
<td>Portage Mountain</td>
<td>No</td>
<td>Crown</td>
<td>No</td>
<td>n/a</td>
<td>No</td>
<td>148</td>
</tr>
<tr>
<td>Del Rio Pit</td>
<td>No</td>
<td>Crown</td>
<td>Yes</td>
<td>Class 5 &amp; 7</td>
<td>No</td>
<td>162</td>
</tr>
<tr>
<td>85th Avenue</td>
<td>No</td>
<td>Private</td>
<td>No</td>
<td>n/a</td>
<td>No</td>
<td>100</td>
</tr>
<tr>
<td>Industrial Lands</td>
<td>No</td>
<td>Private &amp;</td>
<td>Partial</td>
<td>Class 3, 6 &amp; 7</td>
<td>No</td>
<td>80</td>
</tr>
<tr>
<td>Area E</td>
<td>Yes</td>
<td>Crown</td>
<td>No</td>
<td>Class 3 &amp; 5</td>
<td>No</td>
<td>27</td>
</tr>
<tr>
<td>Borrow Source 1</td>
<td>Partial</td>
<td>Crown</td>
<td>No</td>
<td>Class 4, 6 &amp; 7</td>
<td>No</td>
<td>17</td>
</tr>
<tr>
<td>Borrow Source 2</td>
<td>Yes</td>
<td>Private</td>
<td>No</td>
<td>Class 4</td>
<td>No</td>
<td>3</td>
</tr>
<tr>
<td>Borrow Source 3</td>
<td>Yes</td>
<td>Private (BC Hydro)</td>
<td>No</td>
<td>Class 4</td>
<td>No</td>
<td>3</td>
</tr>
</tbody>
</table>

**NOTE:**
ALR – Agricultural Land Reserve

On-site material sources (Area A, Area C, and the Howe Pit) are within the dam site area, with disturbed areas associated with these sites included in the assessment of dam site disturbed areas (refer to Section 20.3.1.2).

Wuthrich Quarry and the Del Rio Pit are existing B.C. Ministry of Transportation and Infrastructure sources. These sites would be operated under the existing authorizations. These areas do not represent a loss of land due to the Project.

Off-site borrow Sources 1 through 3 are potential sources outside of the reservoir inundation area along Highway 29. The preference would be for use of material source areas within the reservoir inundation area. Material from the off-site areas would be used only if there was not enough material available from sites within the inundation area.

All new material source sites that are outside of the reservoir and within the ALR or an agricultural Crown land tenure will be reclaimed in accordance with the Project Soil Management, Site Reclamation, and Revegetation Plan as described in Volume 5 Section 35 Summary of Environmental Management Plans.

Activities at aggregate material sources will not result in permanent loss of agricultural land. Estimates of the temporary loss of land that would be associated with the material source sites are included in Table 20.15.

### 20.3.1.8 Worker Accommodation

One planned temporary worker accommodation location would be within the dam site. Land disturbances associated with this location are included the dam site disturbed areas (refer to Section 20.3.1.2).

Locations for other temporary worker accommodations have not been identified. Worker accommodations that would be located within ALR areas, or areas with agricultural capability of Class 4 or better, would be reclaimed in accordance with the Project Soil Management, Site Reclamation, and Revegetation Plan as described in Volume 5 Section 35 Summary of Environmental Management Plans.
20.3.2 Effects Assessment – Operations – Agricultural Land Base

Effects on the agricultural land base that would occur during operations include effects within reservoir impact lines, effects due to changes in groundwater elevations, and effects from transmission line maintenance and vegetation management.

20.3.2.1 Reservoir

Several preliminary impact lines have been defined to delineate areas beyond the full supply level of the reservoir that may be affected by the reservoir.

These impact lines are listed below:

- Erosion Impact Line
- Flood Impact Line
- Stability Impact Line
- Landslide-Generated Wave Impact Line

A detailed discussion of preliminary reservoir impact lines is provided in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports Part 2 Preliminary Reservoir Impact Lines.

Areas within the Flood, Erosion, and Stability Impact Lines are summarized in Table 20.15. Areas noted for the Flood Impact Line are areas that are beyond the Erosion Impact Line, and areas noted for the Stability Impact Line are areas that are beyond the erosion and flood impact lines. Areas noted for the Landslide-Generated Wave Impact Line are areas which are beyond the Erosion, Flood and Stability Impact Lines.

Table 20.15 Land Within Impact Lines (ha), by Capability

<table>
<thead>
<tr>
<th>Impact Line Class</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6 &amp; 7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land predicted to be altered by erosion over 100 years (assessed as likely permanently lost to agricultural use)</td>
<td>0 (10)</td>
<td>87 (56)</td>
<td>34 (46)</td>
<td>25 (34)</td>
<td>15 (15)</td>
<td>1212 (1,212)</td>
<td>1,373</td>
</tr>
<tr>
<td>Flooda,b</td>
<td>0</td>
<td>111</td>
<td>40</td>
<td>0</td>
<td>13</td>
<td>39</td>
<td>203</td>
</tr>
<tr>
<td>Stabilitya,b</td>
<td>0</td>
<td>84</td>
<td>39</td>
<td>12</td>
<td>5</td>
<td>5,773</td>
<td>5,913</td>
</tr>
<tr>
<td>Landslide-generated wavea</td>
<td>0 (135)</td>
<td>148 (25)</td>
<td>12 (2)</td>
<td>2 (0)</td>
<td>5 (5)</td>
<td>7 (7)</td>
<td>174 (174)</td>
</tr>
</tbody>
</table>

NOTE:

- Areas outside the erosion area (not assessed as permanently lost to agricultural use)
- Capability ratings are based on previous Canada Land Inventory mapping and therefore only unimproved ratings are provided

For this assessment, it was assumed that land within the Erosion Impact Line would be permanently lost to agricultural production over a period of 100 years of reservoir operation. Due to the lower probability for loss of land or effects within the other impact lines caused by the creation and operation of the reservoir, areas within these lines have
not been added to the total estimates of permanently lost land. Flooding within the Flood Impact Line may not result in loss of land, but may result in crop losses when flooding occurs.

The areas within the Erosion Impact Line have been included in the totals for permanently lost land that are summarized in Section 20.3.2.4.

20.3.2.2 Changes in Groundwater Elevations
The reservoir would result in rises in the groundwater elevation in areas near the reservoir and may affect agricultural land where the water table is anticipated to rise within 1 m of surface. Yields or the range of suitable crops may be affected on agricultural properties located on low terraces and banks near the proposed reservoir. However, since the majority of the cultivated lands within the agricultural land LAA are located topographically above the proposed reservoir levels by greater than 1 m, and in most cases by greater than 10 m, only limited effects related to water table rise are anticipated.

Groundwater elevations in areas where agricultural lands may be affected will be evaluated to determine if potential productivity is altered.

In some locations, a rise in the groundwater elevation could benefit agricultural production by increasing soil moisture levels and increasing yields, while not affecting the crop health.

Further information on potential changes in groundwater elevations is contained in Volume 2 Section 11.6 Groundwater Regime.

20.3.2.3 Transmission Line
Maintenance and vegetation management within the transmission line right-of-way are not expected to have any effects on the agricultural land base. Vegetation management within the transmission right-of-way may have a positive effect in maintaining a higher level of forage production than currently exists within the existing right-of-way.

20.3.3 Summary and Comparison of Permanent Losses of Agricultural Lands
The following sections summarize the permanent loss of agricultural land that would occur with project operations. Losses for individual project components have been described above. Summaries are provided by capability class and compared to totals for the Peace River valley, the Peace Agricultural Region and the province to provide a relative measure of the loss. Land losses are also summarized by tenure, ALR status, and agricultural utility.

20.3.3.1 Permanent Land Loss by Capability
Table 20.16 and Table 20.17 summarize the permanent loss of agricultural land, by capability, which would occur as a result of the Project. These tables summarize unimproved capability and include losses during both construction and operations. The majority of the permanent loss of land would occur during construction. The only permanent loss resulting from Project operations is the loss of land within the Erosion impact line.

Table 20.16 summarizes the permanent loss of land by project component:
• 4,523 ha (70%) of the total 6,469 ha of permanently lost within the Project activity zone would be within the reservoir.

• 3,225 ha (85%) of the Class 1 to 5 land would be within the reservoir.

**Table 20.16 Permanently Lost Agricultural Land (ha) Within the Project Activity Zone, by Unimproved Capability**

<table>
<thead>
<tr>
<th>Project Component or Activity</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Subtotal Class 1–5</th>
<th>Subtotal Class 6 &amp; 7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoir</td>
<td>0</td>
<td>2,290</td>
<td>685</td>
<td>182</td>
<td>68</td>
<td>3,225</td>
<td>1,298</td>
<td>4,523</td>
</tr>
<tr>
<td>Highway</td>
<td>0</td>
<td>149</td>
<td>32</td>
<td>66</td>
<td>1</td>
<td>248</td>
<td>82</td>
<td>330</td>
</tr>
<tr>
<td>Erosion</td>
<td>0</td>
<td>87</td>
<td>34</td>
<td>25</td>
<td>15</td>
<td>161</td>
<td>1,212</td>
<td>1,373</td>
</tr>
<tr>
<td>Dam site</td>
<td>0</td>
<td>75</td>
<td>29</td>
<td>0</td>
<td>0</td>
<td>104</td>
<td>61</td>
<td>165</td>
</tr>
<tr>
<td>Access roads</td>
<td>0</td>
<td>0</td>
<td>52</td>
<td>7</td>
<td>19</td>
<td>78</td>
<td>0</td>
<td>78</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>2,601</td>
<td>832</td>
<td>280</td>
<td>103</td>
<td>3,816</td>
<td>2,653</td>
<td>6,469</td>
</tr>
</tbody>
</table>

To provide a relative measure of the loss of agricultural land, the permanent loss of 6,469 ha was compared to areas with agricultural capability that have been mapped in the Peace River valley between the Peace Canyon Dam and the Alberta border, the Peace Agricultural Region, and the entire province (B.C.). These comparisons are summarized in Table 20.17.

Comparing Class 1 and 2 lands permanently lost, the 2,601 ha within the Project activity zone is:

• 24.8% of the Peace River valley total
• 2.1% of the Peace Agricultural Region total
• 1.0% of the provincial total

Comparing Class 1 through 3 lands permanently lost, the 3,433 ha within the Project activity zone is:

• 20.6% of the Peace River valley total
• 0.7% of the Peace Agricultural Region total
• 0.4% of the provincial total

Comparing Class 1 through 5 lands permanently lost, the 3,816 ha within the Project activity zone is:

• 19.0% of the Peace River valley total
• 0.1% of the Peace Agricultural Region total
• 0.04% of the provincial total

Table 20.17 shows tenure and ALR status of the areas within the Project activity zone.
### Table 20.17  Local, Regional and Provincial Comparison of Permanent Land Loss (ha), by Unimproved Capability

<table>
<thead>
<tr>
<th>Area</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Subtotal Class 1–2</th>
<th>Class 3</th>
<th>Subtotal Class 1–3</th>
<th>Class 4</th>
<th>Subtotal Class 1–4</th>
<th>Class 5</th>
<th>Subtotal Class 1–5</th>
<th>Subtotal Class 6&amp;7</th>
<th>Total Class 1–7</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAZ</td>
<td>0</td>
<td>2,601</td>
<td>2,601</td>
<td>832</td>
<td>3,433</td>
<td>280</td>
<td>3,713</td>
<td>103</td>
<td>3,816</td>
<td>2,653</td>
<td>6,469</td>
</tr>
<tr>
<td>Peace River valley</td>
<td>926</td>
<td>9,551</td>
<td>10,477</td>
<td>6,150</td>
<td>16,627</td>
<td>1,949</td>
<td>18,576</td>
<td>1,480</td>
<td>20,056</td>
<td>35,031</td>
<td>55,087</td>
</tr>
<tr>
<td>PAZ as % of Peace River valley</td>
<td>0.0%</td>
<td>27.2%</td>
<td>24.8%</td>
<td>13.5%</td>
<td>20.6%</td>
<td>14.4%</td>
<td>20.0%</td>
<td>7.0%</td>
<td>19.0%</td>
<td>7.6%</td>
<td>11.7%</td>
</tr>
<tr>
<td>Peace Agricultural Region</td>
<td>3,833</td>
<td>121,013</td>
<td>124,846</td>
<td>365,043</td>
<td>489,889</td>
<td>501,036</td>
<td>990,925</td>
<td>1,683,351</td>
<td>2,674,276</td>
<td>2,091,078</td>
<td>4,765,354</td>
</tr>
<tr>
<td>PAZ as % of Peace Agricultural Region</td>
<td>0.0%</td>
<td>2.1%</td>
<td>2.1%</td>
<td>0.2%</td>
<td>0.7%</td>
<td>0.1%</td>
<td>0.4%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Province</td>
<td>21,057</td>
<td>235,480</td>
<td>256,537</td>
<td>692,041</td>
<td>948,578</td>
<td>1,701,715</td>
<td>2,650,293</td>
<td>6,671,820</td>
<td>9,322,113</td>
<td>20,674,336</td>
<td>29,996,449</td>
</tr>
<tr>
<td>PAZ as % of Province</td>
<td>0.0%</td>
<td>1.1%</td>
<td>1.0%</td>
<td>0.1%</td>
<td>0.4%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

**NOTE:**

1. PAZ – Project activity zone

---

**For Generations**
### Table 20.18  Tenure and Agricultural Land Reserve Within Project Activity Zone (ha), by Unimproved Capability

<table>
<thead>
<tr>
<th>Tenure and ALR Status</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 1 – 5</th>
<th>Class 6&amp;7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BC Hydro</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-ALR</td>
<td>0</td>
<td>71</td>
<td>24</td>
<td>3</td>
<td>0</td>
<td>98</td>
<td>155</td>
<td>253</td>
</tr>
<tr>
<td>ALR</td>
<td>0</td>
<td>462</td>
<td>83</td>
<td>43</td>
<td>0</td>
<td>588</td>
<td>152</td>
<td>740</td>
</tr>
<tr>
<td><strong>Private</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-ALR</td>
<td>0</td>
<td>58</td>
<td>15</td>
<td>3</td>
<td>0</td>
<td>76</td>
<td>165</td>
<td>241</td>
</tr>
<tr>
<td>ALR</td>
<td>0</td>
<td>260</td>
<td>19</td>
<td>43</td>
<td>3</td>
<td>325</td>
<td>46</td>
<td>371</td>
</tr>
<tr>
<td><strong>Crown</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-ALR</td>
<td>0</td>
<td>684</td>
<td>445</td>
<td>133</td>
<td>33</td>
<td>1,295</td>
<td>1,905</td>
<td>3,200</td>
</tr>
<tr>
<td>ALR</td>
<td>0</td>
<td>1,066</td>
<td>246</td>
<td>55</td>
<td>67</td>
<td>1,434</td>
<td>230</td>
<td>1,664</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>2,601</td>
<td>832</td>
<td>280</td>
<td>103</td>
<td>3,816</td>
<td>2,653</td>
<td>6,469</td>
</tr>
</tbody>
</table>

| By Tenure             |         |         |         |         |         |             |           |       |
| BC Hydro              | 0       | 533     | 107     | 46      | 0       | 686         | 307       | 993   |
| Private               | 0       | 318     | 34      | 46      | 3       | 401         | 211       | 612   |
| Crown                 | 0       | 1,750   | 691     | 188     | 100     | 2,729       | 2,135     | 4,864 |
| **Total**             | 0       | 2,601   | 832     | 280     | 103     | 3,816       | 2,653     | 6,469 |

| By ALR Status         |         |         |         |         |         |             |           |       |
| Non-ALR               | 0       | 813     | 484     | 139     | 33      | 1,469       | 2,225     | 3,694 |
| ALR                   | 0       | 1,788   | 348     | 141     | 70      | 2,347       | 428       | 2,775 |
| **Total**             | 0       | 2,601   | 832     | 280     | 103     | 3,816       | 2,653     | 6,469 |

**NOTE:**

2 ALR – Agricultural Land Reserve
The majority (over 70%) of the more agriculturally capable lands within the Project activity zone are Crown lands. Of the remainder, BC Hydro owns more land than is currently under private ownership. The majority of the agriculturally capable lands are within the ALR, although over one-third is outside the ALR.

Of the total of 3,433 ha of Class 1 through 3 land within the Project activity zone:
- 640 ha or 18.6% is owned by BC Hydro
- 353 ha or 10.3% is privately owned
- 2,441 ha or 71.1% is Crown land
- 2,136 ha or 62.2% is within the ALR
- 1,297 ha or 37.8% is outside of the ALR

Comparing Class 1 through 5 lands yields similar proportions of tenure and ALR status.

Of the total of 3,816 ha of Class 1 through 5 land within the Project activity zone:
- 686 ha or 18.0% is owned by BC Hydro
- 401 ha or 10.5% is privately owned
- 2,729 ha or 71.5% is Crown land
- 2,347 ha or 61.5% is within the ALR
- 1,469 ha or 38.5% is outside of the ALR

### 20.3.3.2 Permanent Land Loss by Utility

Permanently loss land was classified by agricultural utility as described in Section 20.2.4. These utility ratings are shown in Figure 20.4 Maps 1 through 16 and summarized by tenure and ALR status in Table 20.19.

#### Table 20.19 Land Lost by Utility, Tenure, and Agricultural Land Reserve Status (ha)

<table>
<thead>
<tr>
<th>Tenure and ALR Status</th>
<th>High Utility</th>
<th>Moderate Utility</th>
<th>Total High and Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By Tenure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td>542</td>
<td>42</td>
<td>584</td>
</tr>
<tr>
<td>Private</td>
<td>289</td>
<td>37</td>
<td>326</td>
</tr>
<tr>
<td>Crown</td>
<td>468</td>
<td>288</td>
<td>756</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,299</td>
<td>367</td>
<td>1,666</td>
</tr>
<tr>
<td><strong>By ALR Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-ALR</td>
<td>212</td>
<td>53</td>
<td>265</td>
</tr>
<tr>
<td>ALR</td>
<td>1,087</td>
<td>314</td>
<td>1,401</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,299</td>
<td>367</td>
<td>1,666</td>
</tr>
</tbody>
</table>

**NOTE:**

ALR – Agricultural Land Reserve
<table>
<thead>
<tr>
<th>Tenure and ALR Status</th>
<th>High Utility (%)</th>
<th>Moderate Utility (%)</th>
<th>Total High and Moderate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By Tenure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td>41.7%</td>
<td>11.4%</td>
<td>35.1%</td>
</tr>
<tr>
<td>Private</td>
<td>22.2%</td>
<td>10.1%</td>
<td>19.6%</td>
</tr>
<tr>
<td>Crown</td>
<td>36.0%</td>
<td>78.5%</td>
<td>45.4%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>By ALR Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-ALR</td>
<td>16.3%</td>
<td>14.4%</td>
<td>15.9%</td>
</tr>
<tr>
<td>ALR</td>
<td>83.7%</td>
<td>85.6%</td>
<td>84.1%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**NOTE:**
ALR – Agricultural Land Reserve

Of the areas lost with high and moderate utility, the majority (approximately 45%) are Crown lands. Of the remainder, approximately 35% is owned by BC Hydro and approximately 20% is currently under private ownership. Most of the high and moderate utility areas, approximately 84%, are within the ALR.

An agricultural utility rating was also assigned to remaining land (land that would not be permanently lost) within the Peace River valley between the Peace Canyon Dam and the Alberta border, as described in Section 20.2.4.

Table 20.21 summarizes the utility ratings by tenure and ALR status.

<table>
<thead>
<tr>
<th>Tenure and ALR Status</th>
<th>High Utility (ha)</th>
<th>Moderate Utility (ha)</th>
<th>Total High and Moderate (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By Tenure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td>609</td>
<td>60</td>
<td>669</td>
</tr>
<tr>
<td>Private</td>
<td>6328</td>
<td>1271</td>
<td>7599</td>
</tr>
<tr>
<td>Crown</td>
<td>2841</td>
<td>1418</td>
<td>4259</td>
</tr>
<tr>
<td>Total</td>
<td>9778</td>
<td>2749</td>
<td>12527</td>
</tr>
<tr>
<td><strong>By ALR Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-ALR</td>
<td>1356</td>
<td>1101</td>
<td>2457</td>
</tr>
<tr>
<td>ALR</td>
<td>8422</td>
<td>1648</td>
<td>10070</td>
</tr>
<tr>
<td>Total</td>
<td>9778</td>
<td>2749</td>
<td>12527</td>
</tr>
</tbody>
</table>

**NOTE:**
ALR – Agricultural Land Reserve
Table 20.22  Remaining Land by Utility, Tenure, and Agricultural Land Reserve Status (%)

<table>
<thead>
<tr>
<th>Tenure and ALR Status</th>
<th>High Utility</th>
<th>Moderate Utility</th>
<th>Total High and Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Tenure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td>6.2%</td>
<td>2.2%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Private</td>
<td>64.7%</td>
<td>46.2%</td>
<td>60.7%</td>
</tr>
<tr>
<td>Crown</td>
<td>29.1%</td>
<td>51.6%</td>
<td>34.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>By ALR Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-ALR</td>
<td>13.9%</td>
<td>40.1%</td>
<td>19.6%</td>
</tr>
<tr>
<td>ALR</td>
<td>86.1%</td>
<td>59.9%</td>
<td>80.4%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

NOTE:
ALR – Agricultural Land Reserve

Of the remaining land with high and moderate utility, approximately 41% is privately owned. Of the remainder, about 34% is Crown land and approximately 5% is owned by BC Hydro. Most of the high and moderate utility areas, approximately 80%, are within the ALR.

Table 20.23 provides a comparison, by utility, for permanently lost and remaining land with the Peace River valley.

Table 20.23  Agricultural Utility Within the Peace River Valley (ha)

<table>
<thead>
<tr>
<th>Area</th>
<th>High Utility</th>
<th>Moderate Utility</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanently lost land</td>
<td>1,299</td>
<td>367</td>
<td>1,666</td>
</tr>
<tr>
<td>Remaining land</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left bank remaining</td>
<td>4,165</td>
<td>8,53</td>
<td>5,018</td>
</tr>
<tr>
<td>Downstream of Site C</td>
<td>5,613</td>
<td>1,896</td>
<td>7,509</td>
</tr>
<tr>
<td>Remaining land</td>
<td>9,778</td>
<td>2,749</td>
<td>12,527</td>
</tr>
<tr>
<td>Total Peace River valley</td>
<td>11,077</td>
<td>3116</td>
<td>14,193</td>
</tr>
<tr>
<td>% permanently lost</td>
<td>11.7%</td>
<td>11.8%</td>
<td>11.7%</td>
</tr>
</tbody>
</table>

Of the permanently lost land, 1,299 ha was identified as high utility, and 367 ha identified as moderate utility. Of the remaining lands within the Peace River valley, 12,527 ha were identified as having high or moderate utility, including 9,778 ha of high utility lands and 2,749 ha of moderate utility lands. Within the Peace River valley, the permanently lost land would represent:

- 11.7% of the total of 11,077 ha with high utility
- 11.8% of the total of 3,116 ha with moderate utility
- 11.7% of the total of 14,193 ha with high or moderate utility

20.3.4 Mitigation Measures – Agricultural Land Base

Recommended measures to mitigate potential adverse effects to the agricultural land base are described below.
20.3.4.1 Construction Activities

Construction activities would result in both the temporary and permanent loss of agricultural land. Preliminary design of Highway 29 realignments considered agricultural effects and attempted to minimize those effects. During detailed design of project components that would affect agricultural land, including realignment of Highway 29, potential agricultural effects will be further considered and detailed designs will be developed to minimize effects on agricultural land to the extent practical.

20.3.4.1.1 Temporary Loss of Agricultural Land

Areas of temporary soil disturbance on agricultural lands will be reclaimed in accordance with the Project:

- Soil Management, Site Restoration, and Revegetation Plan
- Borrow and Quarry Sites Reclamation Plan
- Vegetation and Invasive Plant Management Plan

These plans will be developed before construction, and would be part of the overall construction environmental management framework as described in Volume 5 Section 35 Summary of Environmental Management Plans.

20.3.4.1.2 Permanent Loss of Agricultural Land

The majority of the loss of agricultural land base would occur during construction and reservoir filling. Additionally, relatively small amounts of agricultural land would be lost to erosion after the reservoir has been filled, and productivity in some areas may be affected by changes in groundwater elevations. Changes in groundwater elevations during operations may reduce the capability in some areas.

The agriculturally capable land that would be permanently lost cannot be replaced. The measures discussed below are enhancement measures that would improve productivity on remaining lands as a means to mitigate these losses. Such measures will be supported by the implementation of a proposed agricultural compensation fund, which is discussed in Section 20.3.9.

Mitigation measures that could be implemented to offset the permanent loss of agricultural lands and to improve the physical productivity of the unaffected agricultural land base within the Peace River valley and within the Peace Agricultural Region include the following:

- Irrigation improvements
- Drainage improvements
- Relocation of suitable quality soils
- Inclusion of land in the ALR

These measures will be investigated and implemented if they are determined to be technically and economically feasible. Each of these potential enhancement measures are discussed below.
Irrigation Improvements

Irrigation has been identified by several of the interviewed agricultural producers and industry representatives as a means of improving yields and the range of crops that can be successfully grown, although several stakeholders have noted that the costs of irrigating may not be justified by current revenues for many crops.

Although the costs of irrigation may not be justified by increased yields or crop diversification at this time, the availability of irrigation water in the future may benefit agriculture. Based on the analysis of climate data conducted as part of this assessment, the annual moisture deficit, which is crop water requirements less growing season precipitation with a one in 10-year probability of being exceeded, is estimated to be approximately 250 mm per year. The average annual moisture deficit is estimated to be 148 mm per year, but it is common practice to design irrigation systems to supply water for a drier than average year.

The actual amount of irrigation water that would have to be delivered to meet the moisture deficit would have to include an allowance for inefficiencies in water delivery and application. Applying a factor of 65% to account for these inefficiencies, the annual irrigation water requirement would be approximately 385 mm. With a reservoir area of 9,330 ha, the volume in a 0.5 m depth over the reservoir would be sufficient to irrigate approximately 12,000 ha.

BC Hydro does not have authority over issuance of Water Licences to support irrigation from the reservoir; however, BC Hydro will not oppose applications seeking to license water withdrawals from the reservoir for irrigation purposes. Accordingly, BC Hydro will support the Comptroller of Water Rights in its consideration of applications for Water Licences to support local valley-based irrigation projects.

Irrigation research, demonstration projects, and funding assistance for irrigation water supply infrastructure will be considered within the proposed agricultural compensation fund, which is discussed in Section 20.3.9.

Drainage Improvements

Some agricultural operators have noted on-farm drainage limitations, but the identified problems are limited in area. No large areas that would benefit from drainage improvements were identified during interviews.

Improved drainage in areas where poor drainage limits agricultural production would improve agricultural productivity. There may be environmental constraints to implementing drainage improvements, especially if the drainage works would affect areas of valuable habitat. Funding assistance for drainage improvements will be considered within the proposed agricultural compensation fund, which is discussed in Section 20.3.9.

Relocation of Suitable Quality Soil

Surface soils of suitable quality, salvaged from areas that would be inundated or from areas disturbed by Highway 29 relocation works, could be placed in areas of poorer quality soil or in low-lying, poorly drained areas to improve agricultural productivity.

Several of the interviewed agricultural producers indicated that there were areas that could be improved with soil relocation, and observations of other agricultural areas
outside of areas affected by interviewed operators suggest that there are other lands that could also be improved.

Although relocation of soils can improve agricultural productivity in certain locations, opportunities to implement this mitigation strategy will be constrained by concerns related to the following:

- Disturbance of archaeological sites
- Erosion and sediment control
- Weed control
- Habitat degradation

Soil relocation will be considered on a site-specific basis.

Surface soils will be salvaged from temporarily disturbed agricultural areas, such as temporary access roads and quarried and excavated materials source locations, and stored for later use in reclamation of these areas. Surface soils will also be salvaged from areas of new highway construction and used to reclaim or improve other areas.

**Inclusion of Land in the Agricultural Land Reserve**

Table 20.24 shows areas, by ownership, of Class 1 through 5 lands within the Peace River valley that are not within the ALR. The totals include land:

- On the left bank between Hudson’s Hope and Site C, excluding land
  - Within the reservoir
  - Within the Erosion Impact Line
  - Within the dam site
  - Adjacent to tributaries
- Between Site C and the Alberta border, excluding land
  - On islands
  - Adjacent to the Pine River

**Table 20.24  Land Capability, Class 1 – 5 Non-ALR (ha) (Unimproved)**

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Subtotal Class 1 - 4</th>
<th>Class 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>8</td>
<td>48</td>
<td>98</td>
<td>0</td>
<td>154</td>
<td>0</td>
<td>154</td>
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<tr>
<td>Private</td>
<td>85</td>
<td>356</td>
<td>166</td>
<td>67</td>
<td>674</td>
<td>223</td>
<td>898</td>
</tr>
<tr>
<td>Crown</td>
<td>62</td>
<td>308</td>
<td>225</td>
<td>204</td>
<td>799</td>
<td>606</td>
<td>1405</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>155</strong></td>
<td><strong>712</strong></td>
<td><strong>489</strong></td>
<td><strong>271</strong></td>
<td><strong>1627</strong></td>
<td><strong>830</strong></td>
<td><strong>2357</strong></td>
</tr>
</tbody>
</table>

A total of 2,357 ha of Class 1 through 5 non-ALR lands were identified, of which 1,627 ha are Class 1 through 4. Of the Class 1 to 4 non-ALR lands, 154 ha (10%) are owned by BC Hydro, 674 ha (41%) are under private ownership, and 799 ha (49%) are Crown land.

There may be opportunities to include some of these agriculturally capable areas in the ALR to partially mitigate the loss of agricultural land. Including lands in the ALR would
not increase the amount of land with agricultural capability, but would reduce the opportunities for non-agricultural use on the included lands, increasing the likelihood that the areas would be used for agriculture.

However, there are issues that need to be considered:

- The possible reluctance of landowners to include land in the ALR and limit their land use options. Some landowners may expect to have other land excluded from the ALR or approved for non-farm use.
- Non-ALR land would likely be valued for non-farm use potential
- Competing resource uses, such as habitat use, particularly for Crown land
- Plans for future non-agricultural uses

BC Hydro will consult with government agencies and landowners to determine if there are opportunities to include agriculturally capable land in the ALR.

20.3.5 Effects Assessment – Construction – Agricultural Operations

The identification of potential effects to individual farms during construction is based on information collected during the interviews with agricultural owners and or operators, and on discussions with regulatory agency personnel.

Potential adverse effects on farm operations would include:

- Permanent loss of land and resulting loss of crop production and pasture capacity
- Temporary loss of land and resulting loss of crop production and pasture capacity, including soil disturbance and compaction
- Changes to grazing tenures and resultant loss of livestock carrying capacity
- Loss of farm infrastructure (buildings, farm utilities, and other improvements)
- Loss of irrigation and livestock watering facilities; changes to local hydrology, groundwater, and agricultural drainage
- Livestock access to the reservoir
- Changes to access routes to farm properties and to areas of agricultural activities within farms
- Changes to livestock movement
- Severance of farm properties
- Introduction and proliferation of invasive plant species
- Increased damage and loss of crops and stored livestock feed by wildlife
- Increased biosecurity risks
- Increased farm worker safety risks due to construction and operation of the facilities, including increased vehicular traffic during construction and the potential for induced or stray voltages from operation of the transmission works
20.3.5.1 On-Farm Effects

Table 20.25 shows which of the on-farm effects listed above would likely occur for each of the evaluated farms. Section 20.3.4.2 summarizes the permanent loss of land which was cultivated in 2011 and Section 20.3.4.3 summarizes the permanent loss of land which would occur within grazing tenures.

The loss of land and soil disturbance effect refers to the permanent loss of owned or leased land, the temporary loss of owned or lease farm land where disturbed areas can be rehabilitated, and the permanent loss of land within existing grazing tenures. The loss of land includes all tenures including private, BC Hydro-owned, and Crown land, and does not differentiate between ALR and non-ALR land.

Where livestock access to the reservoir is noted as a potential effect, it reflects potential restrictions on access for livestock watering, as well as safety hazards for the livestock around the reservoir.

Within the farm access effects include potential field access effects associated with the 85th Avenue Industrial Lands till source conveyor belt.

Table 20.25 Potential On-Farm Effects

<table>
<thead>
<tr>
<th>Farm Number</th>
<th>Loss of Land, Production and Soil Disturbance</th>
<th>Infrastructure (Buildings, Septic Systems, etc.)</th>
<th>Water Supplies</th>
<th>Livestock Access to Reservoir</th>
<th>Access to and Within Farms</th>
<th>Fencing/Livestock Movement</th>
<th>Severance/Fragmentation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Permanent, Owned or Leased</td>
<td>Temporary, Owned of Leased</td>
<td>Permanent Grazing Tenure</td>
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<td>1</td>
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<td>Temporary, Owned, or Leased</td>
<td>Permanent, Grazing Tenure</td>
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</tbody>
</table>

**NOTE:**
1 N/A – not applicable (no effect is anticipated)
2 In addition to the agricultural effects listed in Table 20.25 above, there are additional potential effects that are applicable to many of the farm operations, including:
3 • Introduction of weeds
4 • Increased traffic on Highway 29
5 • Increased unauthorized access
6 • Increased damage and loss of crops and stored livestock feed resulting from changes in wildlife migrations and habitat use patterns
Increased biosecurity risks and safety issues related to induced or stray voltages from operation of the transmission works were not noted as concerns by any of the interviewed farm operators.

### 20.3.5.2 Permanent Loss of Cultivated Land

Table 20.26 summarizes the permanent loss of cultivated land for each of the operations where there is currently cultivated land within the Project activity zone. Operations not listed in this table would not permanently lose currently cultivated land. The areas of cultivated land include private land, BC Hydro-owned private land, and Crown land.

#### Table 20.26 Summary of Loss of Cultivated Land by Agricultural Operation (ha)

<table>
<thead>
<tr>
<th>Cultivation, by Farm No.</th>
<th>Canola</th>
<th>Grain</th>
<th>Forage</th>
<th>Pasture</th>
<th>Total</th>
<th>Percentage Cultivated Land Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Current</td>
<td>0</td>
<td>78</td>
<td>420</td>
<td>122</td>
<td>620</td>
</tr>
<tr>
<td></td>
<td>Lost</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>0</td>
<td>78</td>
<td>375</td>
<td>122</td>
<td>575</td>
</tr>
<tr>
<td>3</td>
<td>Current</td>
<td>0</td>
<td>0</td>
<td>224</td>
<td>64</td>
<td>288</td>
</tr>
<tr>
<td></td>
<td>Lostc</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>0</td>
<td>0</td>
<td>224</td>
<td>63</td>
<td>287</td>
</tr>
<tr>
<td>4</td>
<td>Current</td>
<td>0</td>
<td>0</td>
<td>104</td>
<td>23</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>Lostc</td>
<td>0</td>
<td>0</td>
<td>104</td>
<td>0</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>0</td>
<td>0</td>
<td>104</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>15</td>
<td>Currenta</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Lost</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>17</td>
<td>Currenta</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Lostc</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>18</td>
<td>Current</td>
<td>79</td>
<td>0</td>
<td>280</td>
<td>56</td>
<td>415</td>
</tr>
<tr>
<td></td>
<td>Lost</td>
<td>79</td>
<td>0</td>
<td>39</td>
<td>56</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>0</td>
<td>0</td>
<td>241</td>
<td>0</td>
<td>241</td>
</tr>
<tr>
<td>19</td>
<td>Currentb</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Lostc</td>
<td>34</td>
<td>0</td>
<td>5</td>
<td>3</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>23</td>
<td>Current</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Lost</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>24</td>
<td>Current</td>
<td>20</td>
<td>0</td>
<td>113</td>
<td>24</td>
<td>157</td>
</tr>
<tr>
<td></td>
<td>Lost</td>
<td>2</td>
<td>0</td>
<td>8</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>18</td>
<td>0</td>
<td>105</td>
<td>17</td>
<td>140</td>
</tr>
<tr>
<td>26</td>
<td>Current</td>
<td>0</td>
<td>0</td>
<td>119</td>
<td>0</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>Lostc</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Remaining</td>
<td>0</td>
<td>0</td>
<td>99</td>
<td>0</td>
<td>99</td>
</tr>
<tr>
<td>Cultivation, by Farm No.</td>
<td>Canola</td>
<td>Grain</td>
<td>Forage</td>
<td>Pasture</td>
<td>Total</td>
<td>Percentage Cultivated Land Remaining</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------</td>
<td>-------</td>
<td>--------</td>
<td>---------</td>
<td>-------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>37</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Lost</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Remaining</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>36</td>
<td>36</td>
<td>97.3%</td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>0</td>
<td>165</td>
<td>104</td>
<td>0</td>
<td>269</td>
<td></td>
</tr>
<tr>
<td>Lost</td>
<td>0</td>
<td>90</td>
<td>12</td>
<td>0</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>Remaining</td>
<td>0</td>
<td>75</td>
<td>92</td>
<td>0</td>
<td>167</td>
<td>62.1%</td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current(^b)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Lost</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Remaining</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Total lost cultivated land</td>
<td>117</td>
<td>90</td>
<td>251</td>
<td>83</td>
<td>541</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. Estimates of currently cultivated land are not available because the operator either declined to or did not respond to an interview request.
2. Estimates of currently cultivated land are not available because the operation includes lands outside of the Peace River valley and detailed information on cultivation on these lands was not obtained.
3. The Percentage Cultivated Land Remaining includes an overestimate of land loss due to inclusion of Highway 29 realignment corridors where final alignment is uncertain.
4. NA – data not available.

Approximately 541 ha of currently cultivated land are within the Project activity zone.

Cropping of this area in 2011 included 117 ha of canola, 90 ha of grain, 251 ha of forage, and 83 ha of improved pasture.

Information was available to estimate the loss of cultivated land for 14 agricultural operations. The three operations that would experience the greatest effect would have up to approximately 18%, 58%, and 62% of currently cultivated land remaining. A further three operations would have between 80% and 89% remaining, three operations would have between 90% and 99% remaining, and five operations would experience no loss of currently cultivated land.

At the owner’s request and at BC Hydro’s discretion, BC Hydro may purchase entire farming operations where there are proportionally large losses of cultivated land.

The loss of land on some affected farms may result in the sale of livestock herds associated with those operations. This would be discussed with the owners of the affected farms and, where appropriate, agreements would be entered into as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

### 20.3.5.3 Permanent Loss of Grazing Land

Table 20.27 shows the areas of current grazing leases and grazing licences that are within the Project activity zone and that would incur a permanent loss of land. These areas are included in the summaries of permanent land loss by capability class and the potential effects to individual agricultural operations are summarized in Section 20.3.2.4. The estimated areas of permanent loss of land include those that would occur during construction and operations.
### Table 20.27 Permanent Land Losses – Grazing Tenures

<table>
<thead>
<tr>
<th>Tenure Number</th>
<th>Crown Grazing Tenure</th>
<th>Total Area of Tenure (ha)</th>
<th>Dam Site</th>
<th>Reservoir</th>
<th>Erosion</th>
<th>Transmission Line</th>
<th>Highway 29 Realignment</th>
<th>Construction Access</th>
<th>Quarried and Excavated Materials</th>
<th>Permanent Land Loss (ha)</th>
<th>% Total Area Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Licence</td>
<td>252</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>0.8%</td>
</tr>
<tr>
<td>2</td>
<td>Lease</td>
<td>8,271</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>200</td>
<td>2.4%</td>
</tr>
<tr>
<td>4</td>
<td>Licence</td>
<td>258,523</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>7</td>
<td>0.003%</td>
</tr>
<tr>
<td>8</td>
<td>Licence</td>
<td>5,228</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>234</td>
<td>4.5%</td>
</tr>
<tr>
<td>9</td>
<td>Licence</td>
<td>345</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>250</td>
<td>72.5%</td>
</tr>
<tr>
<td>10</td>
<td>Licence</td>
<td>17,227</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>267</td>
<td>1.5%</td>
</tr>
<tr>
<td>11</td>
<td>Licence</td>
<td>813</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>127</td>
<td>15.6%</td>
</tr>
<tr>
<td>15 &amp; 16</td>
<td>Lease</td>
<td>730</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>96</td>
<td>13.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1183</strong></td>
<td><strong>N/A</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>N/A</strong></td>
<td></td>
<td><strong>N/A</strong></td>
</tr>
</tbody>
</table>

**NOTE:**

1. N/A – not applicable

Four tenures have areas within the stability or Flood Impact Line. No permanent loss of land is assumed for areas within the Stability or Flood Impact Lines as the likelihood of permanent loss of land is low.

Three tenures would be affected only by activities associated with the transmission line and, therefore, the permanent loss of land within these tenures is negligible.

Three tenures would be affected by temporary access roads. These roads would be reclaimed with no permanent loss of agricultural land.

Tenures 15 and 16, which are two contiguous leases that are part of the same agricultural operation, may effectively lose an additional 137 ha of grazing lease area, as the reservoir may prevent access to a portion of this tenure. This would increase the loss to 31.9% of the total tenure area. The additional area is steep, north-facing, and of lower productivity than the remainder of the tenure area.

For those tenures that would experience a permanent loss of land, the loss ranges from 0.003% through 72.5% of the total area. Five of those tenures lose less than 5% of the total tenure area.

As discussed in Section 20.2.6, the B.C. Ministry of Forests, Lands and Natural Resource Operations (2011) indicated that range carrying capacity in the Peace River valley generally varies from 3.2 through 6.1 ha per animal unit month (AUM), and information from Range Use Plans showed carrying capacities varying from 2.3 through 20.7 ha per AUM. Assuming an average 4.7 ha per AUM, the permanent loss of land within grazing tenures would represent a loss of approximately 252 AUMs.

### 20.3.6 Effects Assessment – Operations – Agricultural Operations

Potential effects that would be experienced during operation of the Project include effects due to erosion, potential changes in groundwater elevations, effects of road...
maintenance and vegetation management along the transmission line right-of-way, and potential reservoir-induced changes to microclimate:

- Estimates of permanent loss of land within the Erosion Impact Line have been included in the discussion in Section 20.3.2.1
- Flooding within the Flood Impact Line may result in crop losses when flooding occurs
- Changes in groundwater elevations, discussed in Section 20.3.2.2, will be evaluated to determine if there are any effects on agricultural operations
- Effects of transmission line operation activities are discussed in Section 20.3.2.3

Predicted changes in microclimate are described in Volume 2 Section 11.10 Microclimate. These predicted changes were analyzed to assess potential microclimate effects to farm operations. The results of this analysis are described in Volume 3 Appendix D Agricultural Assessment Supporting Documentation and summarized below:

- Agricultural productivity may increase due to a longer frost-free period
- Increases in humidity in the late summer and fall, which could increase the time required for crop drying in areas close to the reservoir
- No change on winter wind chill effects on livestock is expected, as no statistically significant changes to winter wind chill factors are predicted
- No effects on irrigation water requirements are expected, as no statistically significant changes to potential evapotranspiration or growing season precipitation are predicted
- No effects on overwintering perennial crops are expected, as no statistically significant changes to winter precipitation or winter minimum temperatures are predicted
- No effects on field trafficability (the ability of the soil to bear traffic without damage to soil structure) are expected, as no statistically significant changes to evapotranspiration or growing season precipitation are predicted

Predicting the effect that the reservoir might have on crop drying is made difficult by the complexity of the effect of the reservoir on several climatic parameters that drive both drying and wetting effects. Generally, the RWDI model predicts increases in humidity up to 15% for stations located closely adjacent to the reservoir during the summer and fall months. The model predicts the effect on humidity during the summer and fall not to be statistically significant for locations not directly adjacent to the reservoir. The RWDI report predicts that effects on fog formation from the reservoir are in the order of 0.5% or less over the year. However, due to the increased humidity, the reservoir could potentially have a small effect on crop drying during summer and early fall in the Peace River valley in areas adjacent to the reservoir.
20.3.7 Mitigation Measures – Agricultural Operations

Measures and strategies to mitigate potential adverse effects to agricultural operations during construction and operation of the Project are discussed below.

20.3.7.1 Construction

Potential effects to agricultural operations during project construction are discussed in Section 20.3.4. Construction mitigation measures to minimize potential effects associated with loss of agricultural land from farm operations are discussed below.

20.3.7.1.1 Permanent Loss of Agricultural Land

The loss of agricultural land crop production and grazing may be partially mitigated by improving the capability or productivity of remaining land. This may be achieved by relocating surface soils from areas of permanent disturbance and placing them in areas outside of the Project activity zone, and by reclaiming abandoned sections of Highway 29, as described in Volume 1 Section 4 Project Description. Abandoned sections of Highway 29 or other roads that are adjacent to agriculturally capable lands will be reclaimed in accordance with the Project Soil Management, Site Restoration, and Revegetation Plan, as described in Volume 5 Section 35 Summary of Environmental Management Plans.

Agricultural land that is required for the Project will be acquired and associated financial losses, if any, will be reimbursed as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

20.3.7.1.2 Farm Operational Effects

Construction-related effects to individual farms, including the temporary loss or disturbance to land, will be mitigated with the implementation of best management practices and environmental management plans, or by providing compensation to the farm to replace lost infrastructure or offset higher operating costs, based on farm-specific appraisals.

Table 20.28 lists potential effects to agricultural operations during project construction, other than permanent loss of land, and the mitigation measures that will be implemented.
## Table 20.28 Mitigation of Operation-Specific Effects

<table>
<thead>
<tr>
<th>Effect to Farm Operation</th>
<th>Mitigation Measures to Be Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary loss of land</td>
<td>Compensation will be provided for temporary loss of land or soil disturbance; temporarily disturbed land will be reclaimed in accordance with the Project Soil Management, Site Restoration, and Revegetation Plan</td>
</tr>
<tr>
<td>Disruption of farming operations during construction(^a)</td>
<td>Disruptions will be mitigated or compensation provided for increased operational costs</td>
</tr>
<tr>
<td>Disruption of livestock movement patterns</td>
<td>Alternative livestock movement options and compensation for associated increased costs will be provided</td>
</tr>
<tr>
<td>Loss of farm infrastructure (buildings, corrals, septic fields, etc.)</td>
<td>Infrastructure will be relocated or replaced, or appropriate compensation provided</td>
</tr>
<tr>
<td>Loss of water supplies</td>
<td>Alternative water supplies will be provided or appropriate compensation provided</td>
</tr>
<tr>
<td>Farm yard and field access</td>
<td>Alternative access will be provided</td>
</tr>
<tr>
<td>Equipment and livestock crossings of Highway 29</td>
<td>Alternative highway crossings will be provided</td>
</tr>
<tr>
<td>Current and potential Highway utility (water, electricity) crossings</td>
<td>Alternative utility crossings will be provided</td>
</tr>
<tr>
<td>Loss or disruption of livestock watering or drainage works</td>
<td>Alternative livestock watering and drainage works will be provided during construction, and original works will be restored after construction is completed</td>
</tr>
<tr>
<td>Highway traffic and congestion</td>
<td>A Traffic Management Plan will be implemented</td>
</tr>
<tr>
<td>Increased public access during construction</td>
<td>Access to farm properties by construction workers will be minimized and measures to minimize unauthorized public access will be implemented</td>
</tr>
<tr>
<td>Loss of fencing</td>
<td>Fencing will be replaced or compensation for replacement fencing will be provided</td>
</tr>
<tr>
<td>Severance or fragmentation of farm properties</td>
<td>Fragmented parcels will be consolidated with other parcels, where practical and when owner(s) agree(s)</td>
</tr>
<tr>
<td>Introduction and proliferation of invasive plant species</td>
<td>A Vegetation and Invasive Plant Management Plan will be implemented</td>
</tr>
<tr>
<td>Farm worker safety</td>
<td>A Public Safety Management Plan will be implemented</td>
</tr>
</tbody>
</table>

**NOTE:**

\(^a\) Includes disruptions to equipment and livestock movement which would result from the 85th Avenue Industrial Lands till source conveyor belt

Potential risks associated with the transmission of livestock diseases were not identified as a concern by any of the interviewed farm operators. However, if the potential for disease transmission becomes a concern (for example, if a communicable livestock disease is identified in the area), appropriate biosecurity protocols will be developed and implemented.

Following the project approval process, professional appraisals and Farm Mitigation Plans will be developed for each of the directly affected farms, in consultation with the owner and or operator. These plans will describe appropriate mitigation measures, including compensation, to address potential effects for each agricultural operation. Implementation of Farm Mitigation Plans, including appropriate compensation, will mitigate construction-related effects to farm operations.
20.3.7.2 Operation Activities

The following discusses mitigation measures to address potential effects to agricultural activities during the operational phase of the Project. The potential effects include:

- Damage and loss of crops and stored livestock feed resulting from changes in wildlife migrations and habitat use patterns
- Reduced crop drying and consequent reduction in quality that may result from increased humidity during the summer and fall at farms close to the reservoir
- Reduced productivity from changes in groundwater elevations
- Increased public access to farm properties
- Increased livestock safety risks due to access to the reservoir

20.3.7.2.1 Wildlife Damage

The loss of wildlife habitat in the reservoir may lead to an increase in wildlife in agricultural areas near the reservoir, which could lead to wildlife damage to crops and stored livestock feed for farm operations. All potential project effects will be discussed with directly affected property owners and, where appropriate, agreements would be entered into as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

20.3.7.2.2 Crop Drying

Reservoir-induced local climate effects on agriculture are anticipated to be limited to possible effects on crop drying within 1 km of the reservoir. Predicted increases in humidity during the summer and fall may influence crop drying. All potential project effects will be discussed with directly affected property owners and, where appropriate, agreements would be entered into as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

20.3.7.2.3 Change in Groundwater Elevation

Reservoir influenced changes in groundwater elevations are expected to be limited to within 2 km of the reservoir. If groundwater elevations adjacent to the reservoir rise close to the ground surface on agricultural lands, the range of suitable crops and crop yield may be reduced. In other cases, groundwater elevation changes may improve agricultural conditions. All potential project effects will be discussed with directly affected property owners, and where appropriate, agreements would be entered into as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

20.3.7.2.4 Unauthorized Public Access to Farm Properties

The reservoir may increase opportunities for unauthorized access to some farm properties by providing boat access to areas that are currently difficult to access. Concerns in this regard will be evaluated on a farm-specific basis and the issue will be discussed with directly affected landowners and, where appropriate, agreements would be entered into as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.
20.3.7.2.5 Livestock Access to the Reservoir

Some farm operators may benefit from livestock access to the reservoir for watering, while others may be concerned that there may be a risk to livestock falling into the reservoir. These concerns will be evaluated on a farm-specific basis and the issues will be discussed with affected landowners and, where appropriate, agreements would be entered into as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

20.3.8 Effects Assessment – Construction – Agricultural Economic Activity

The major effects to agricultural economic activity would be associated with the foregone economic activity that results from the loss of agricultural land.

20.3.8.1 Agricultural Land in the Project Activity Zone

The area and characteristics of agricultural land that would be affected by the Project are described in Sections 20.3.1 and 20.3.2. These previous sections have explained that some Class 1 through 5 lands are of low to nil utility for cultivated agriculture because of their location, configuration, lack of access, or designated use for non-agricultural purposes. Class 6 and 7 lands are rated as having low to nil utility, although some of these lands can be used for grazing.

Table 20.29 summarizes the agricultural land affected by the Project by capability and utility.

### Table 20.29 Summary of Lost Agricultural Land (ha), by Utility and Capability

<table>
<thead>
<tr>
<th>Land Category</th>
<th>Subtotal Class 1–5</th>
<th>Subtotal Class 6–7</th>
<th>Total in PAZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total high to moderate utility</td>
<td>1,666</td>
<td>0</td>
<td>1,666</td>
</tr>
<tr>
<td>Total low to nil utility</td>
<td>2,150</td>
<td>2,653</td>
<td>4,803</td>
</tr>
<tr>
<td>Total</td>
<td>3,816</td>
<td>2,653</td>
<td>6,469</td>
</tr>
</tbody>
</table>

**NOTES:**
- PAZ – Project activity zone
- Unimproved rating

A total of 6,469 ha are within the Project activity zone, of which 3,816 ha are Class 1 through 5, and 2,653 ha are Class 6 and 7. Of the 3,816 ha of Class 1 through 5, 1,666 ha are rated as having high to moderate utility for agricultural use, and 2,150 ha are rated as having low to nil utility for cultivated agriculture. Of the 1,666 ha of high to moderate utility land, 541 ha are currently cultivated, and 1,125 ha are not cultivated.

There are 2,653 ha of low to nil utility that are rated Class 6 and 7. Some of this area could be used for grazing. The current area of grazing licences and leases within the Project activity zone is 1,183 ha. This includes areas of high, moderate, and low to nil utility.

There is also potential for construction activities to affect farming operations near the Project activity zone. Although these effects have the potential to create economic losses associated with temporary disruptions to agricultural operations, impacts other than those associated with the loss of land have not been included in this evaluation on agricultural economic activity. If these other effects cannot be mitigated, compensation
will be provided to individual farm operations resulting in no net effect on regional agricultural economic activity.

20.3.8.2 Agricultural Land Use Without the Project

In assessing project effects on agricultural economic activity, the following assumptions were made regarding future land use without the Project:

- The currently cultivated land would continue to be farmed
- The unused Class 1 through 5 high to moderate utility lands would become fully developed for cultivation over time
- The unused Class 1 through 5 low to moderate utility lands would become fully used for grazing over time
- 50% of the Class 6 and 7 lands would become fully used for grazing over time

Table 20.30 indicates the projected extent of fully developed future agricultural land use within the Project activity zone, assuming that the Project did not proceed.

Table 20.30 Future Agricultural Land Use Without the Project (ha)

<table>
<thead>
<tr>
<th>Land Category</th>
<th>Cultivated</th>
<th>Grazing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High to moderate utility</td>
<td>1,666</td>
<td>0</td>
<td>1,666</td>
</tr>
<tr>
<td>Class 1 to 5 low to nil utility</td>
<td>0</td>
<td>2,150</td>
<td>2,150</td>
</tr>
<tr>
<td>Class 6 and 7</td>
<td>0</td>
<td>1,327</td>
<td>2,653</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,666</strong></td>
<td><strong>3,477</strong></td>
<td><strong>6,469</strong></td>
</tr>
</tbody>
</table>

NOTE:

Unimproved rating

The projected future agricultural land use within the Project activity zone without the Project is assumed to be:

- 1,666 ha of cultivated land
- 3,477 ha of grazing land

20.3.8.3 Foregone Agricultural Economic Activity

Implementation of the Project would result in the loss of all agricultural land within the Project activity zone and the corresponding loss of agricultural economic activity associated with those lands. In estimating the value of foregone agricultural economic activity, the net present value of agricultural production that would occur from land within the Project activity zone without the Project was estimated under different land use scenarios. As the loss of land would occur over several years during the construction period, the net present value of any production from Project activity zone lands that would continue to occur during construction was also estimated and deducted from estimated value of production without the Project to determine an overall net value of foregone agricultural economic activity.
The analysis of foregone agricultural economic activity is summarized in the following sections. Additional information on this analysis is contained in Volume 3 Appendix D, Agricultural Assessment Supporting Documentation.

20.3.8.4 Agricultural Economic Activity Without the Project

Estimates of the present value of the returns to agricultural land within the Project activity zone without the Project were based on the following assumptions:

- Future growth and development starts from the current level and type of agricultural activity
- Three alternative scenarios of the pattern of future agricultural development are considered:
  - Scenario 1 is based on expansion of the current cropping mix, with no new crop types added. The total area in crops and the area of grazing both increase to the amounts shown in Table 20.31.
  - Scenario 2 is identical to Scenario 1, except that vegetable production, increasing to 100 ha by year 100, is included. The vegetable production is assumed to supplant an equal area of other crops. This scenario is employed in the base case evaluation of foregone agricultural activity.
  - Scenario 3 is identical to Scenario 2, except that vegetable cropping reaches 200 ha by year 100, supplanting an equal area of other crops.
Table 20.31 Future Agricultural Development Scenarios

<table>
<thead>
<tr>
<th>Crop</th>
<th>Year 1</th>
<th>Year 5</th>
<th>Year 10</th>
<th>Year 15</th>
<th>Year 20</th>
<th>Year 25</th>
<th>Year 50</th>
<th>Year 100</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Scenario 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>117</td>
<td>129</td>
<td>141</td>
<td>153</td>
<td>166</td>
<td>178</td>
<td>239</td>
<td>360</td>
</tr>
<tr>
<td>Canola</td>
<td>90</td>
<td>99</td>
<td>109</td>
<td>118</td>
<td>127</td>
<td>137</td>
<td>184</td>
<td>277</td>
</tr>
<tr>
<td>Grain</td>
<td>251</td>
<td>277</td>
<td>303</td>
<td>329</td>
<td>355</td>
<td>381</td>
<td>512</td>
<td>773</td>
</tr>
<tr>
<td>Forage</td>
<td>83</td>
<td>92</td>
<td>100</td>
<td>109</td>
<td>118</td>
<td>126</td>
<td>169</td>
<td>256</td>
</tr>
<tr>
<td>Range</td>
<td>1,183</td>
<td>1,298</td>
<td>1,412</td>
<td>1,527</td>
<td>1,642</td>
<td>1,757</td>
<td>2,330</td>
<td>3,477</td>
</tr>
<tr>
<td>Idle</td>
<td>3,419</td>
<td>3,248</td>
<td>3,077</td>
<td>2,906</td>
<td>2,735</td>
<td>2,564</td>
<td>1,710</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total ha</strong></td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
</tr>
<tr>
<td><strong>Scenario 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Canola</td>
<td>117</td>
<td>128</td>
<td>139</td>
<td>150</td>
<td>161</td>
<td>172</td>
<td>228</td>
<td>339</td>
</tr>
<tr>
<td>Grain</td>
<td>90</td>
<td>99</td>
<td>107</td>
<td>116</td>
<td>124</td>
<td>133</td>
<td>175</td>
<td>261</td>
</tr>
<tr>
<td>Forage</td>
<td>251</td>
<td>275</td>
<td>299</td>
<td>322</td>
<td>346</td>
<td>370</td>
<td>489</td>
<td>727</td>
</tr>
<tr>
<td>Pasture</td>
<td>83</td>
<td>91</td>
<td>99</td>
<td>107</td>
<td>114</td>
<td>122</td>
<td>162</td>
<td>240</td>
</tr>
<tr>
<td>Range</td>
<td>1,183</td>
<td>1,298</td>
<td>1,412</td>
<td>1,527</td>
<td>1,642</td>
<td>1,757</td>
<td>2,330</td>
<td>3,477</td>
</tr>
<tr>
<td>Idle</td>
<td>3,419</td>
<td>3,248</td>
<td>3,077</td>
<td>2,906</td>
<td>2,735</td>
<td>2,564</td>
<td>1,710</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total ha</strong></td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
</tr>
<tr>
<td><strong>Scenario 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Canola</td>
<td>117</td>
<td>127</td>
<td>137</td>
<td>147</td>
<td>157</td>
<td>167</td>
<td>217</td>
<td>317</td>
</tr>
<tr>
<td>Grain</td>
<td>90</td>
<td>98</td>
<td>105</td>
<td>113</td>
<td>121</td>
<td>128</td>
<td>167</td>
<td>244</td>
</tr>
<tr>
<td>Forage</td>
<td>251</td>
<td>272</td>
<td>294</td>
<td>315</td>
<td>337</td>
<td>358</td>
<td>466</td>
<td>680</td>
</tr>
<tr>
<td>Pasture</td>
<td>83</td>
<td>90</td>
<td>97</td>
<td>104</td>
<td>111</td>
<td>118</td>
<td>154</td>
<td>225</td>
</tr>
<tr>
<td>Range</td>
<td>1183</td>
<td>1,298</td>
<td>1,412</td>
<td>1,527</td>
<td>1,642</td>
<td>1,757</td>
<td>2,330</td>
<td>3,477</td>
</tr>
<tr>
<td>Idle</td>
<td>3,419</td>
<td>3,248</td>
<td>3,077</td>
<td>2,906</td>
<td>2,735</td>
<td>2,564</td>
<td>1,710</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total ha</strong></td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
<td>5,143</td>
</tr>
</tbody>
</table>

- Growth in agricultural use is assumed to occur at a constant rate over time. The base case evaluation assumes full development would occur within 100 years of the estimated first year of construction (that is, by year 100). The sensitivity of the present value of agricultural effects to three different time frames to full development has been considered:
  - 50 years from the estimated start of project construction
  - 100 years from the estimated start of project construction
  - 150 years from the estimated start of project construction

- Two time periods have been used to estimate foregone agricultural returns due to the Project:
  - Period A: Project-related lost returns are calculated over a 100-year horizon. This time period is assumed for the base case evaluation of foregone agricultural activity.
Period B: Project-related lost returns are calculated in perpetuity

Over the first 100 years of the analysis period, the real terms of trade for agricultural products are assumed to improve by 0.5% per annum relative to the prices of all other products and services in the economy. This translates to real prices for agricultural products increasing at this rate. The sensitivity of the present value of displaced agricultural returns to this assumption has been examined using the following alternative rates:

- 0.25% annual growth rate
- 0.5% annual growth rate
- 0.75% annual growth rate

For base case present value calculations, the following social discount rates have been used:

- Discount Rate 1: 3.5% per annum for displaced agricultural returns within the first 50 years following project implementation
- Discount Rate 2: 2.5% per annum for the foregone returns in the second 50 years
- Discount Rate 3: 2% per annum for the foregone returns in the second 100-year period following project implementation (Period B only)
- Discount Rate 4: 1.5% per annum for any foregone returns after 200 years (Period B only)

The sensitivity of the evaluation to alternative discount rates during the first 100 years has been tested by varying Discount Rates 1 and 2 by ±0.5%, with the discount rate in years 51 to 100 set at 1% lower than the discount rate in years 1 to 50.

The sensitivity of the evaluation has also been tested by varying the project horizon in the base case to Period B (in perpetuity) and varying the discount rates during the first 100 years, with the discount rate set 1% lower in years 51 to 100 than it is in years 1 to 50.

### 20.3.8.5 Agricultural Economic Activity During Construction

To estimate the agricultural economic activity that would be generated from land within the Project activity zone during the construction period, it was assumed that:

- The area of cultivated land would be unaffected until construction year 5, and then decrease by equal annual amounts until reaching zero in the final construction year 8.
- The area of grazing land would decrease in equal annual amounts starting in construction year 1 and reaching zero in construction year 10. This assumes that the use of grazing areas would be affected by land clearing activities before effects to cultivated land would occur.

The estimate of agricultural economic activity during construction is based on:

- Enterprise budgets of returns to land from canola, grains, forage, pasture, and grazing production as described in Volume 3 Appendix D Agricultural Assessment Supporting Documentation
• An annual growth of 0.5% per year to the real value of agricultural revenues

• An interest on investment rate matching the rate used for Discount Rate 1 in the base case evaluations and in the various sensitivity analyses

Table 20.32 shows the assumed agricultural land use within the Project activity zone during construction and the estimated returns to land over the construction period.

Table 20.32  Schedule of Farming Cessation During Construction in the Project Activity Zone

<table>
<thead>
<tr>
<th>Year</th>
<th>Cultivated Area ha</th>
<th>Grazing Area ha</th>
<th>Annual Returns to Land (Year 1$ Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>541</td>
<td>1,183</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>541</td>
<td>1,065</td>
<td>161,485</td>
</tr>
<tr>
<td>2</td>
<td>541</td>
<td>946</td>
<td>164,251</td>
</tr>
<tr>
<td>3</td>
<td>541</td>
<td>828</td>
<td>166,890</td>
</tr>
<tr>
<td>4</td>
<td>541</td>
<td>710</td>
<td>169,402</td>
</tr>
<tr>
<td>5</td>
<td>541</td>
<td>592</td>
<td>171,788</td>
</tr>
<tr>
<td>6</td>
<td>541</td>
<td>473</td>
<td>174,047</td>
</tr>
<tr>
<td>7</td>
<td>406</td>
<td>355</td>
<td>134,713</td>
</tr>
<tr>
<td>8</td>
<td>271</td>
<td>237</td>
<td>92,594</td>
</tr>
<tr>
<td>9</td>
<td>135</td>
<td>118</td>
<td>47,689</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

20.3.8.6  Net Foregone Primary Agricultural Economic Activity

BC Hydro proposes an analysis period of 100 years (Period A) starting with the commencement of project construction. Within this time frame, the base case valuation of foregone agricultural economic activity uses the following assumptions:

• Full utilization of the farmland base over 100 years

• Scenario 2, which allows for 100 ha of vegetable production at full development

• Annual growth in the real value of agricultural production of 0.5%

• The following social discount rates:
  o Discount Rate 1 (1 to 50 years) of 3.5%
  o Discount Rate 2 (51 to 100 years) of 2.5%

As shown in Table 20.33, the present value of this base case is estimated to be $22.3 million (in Year 1 dollars).

Table 20.33 also summarizes results of a sensitivity analysis where various parameters were adjusted from that of the base case. In this sensitivity analysis, foregone agricultural returns range from a low of $13.0 million to a high of $36.6 million. This summary shows that the base case valuation is most sensitive to the following:

• The length of the period over which foregone benefits are calculated

• The area of vegetable production included
The length of the period over which the full development of the agricultural potential of the Project activity zone is assumed to occur.

Modifying the project horizon in the base case to Period B (in perpetuity) and varying the discount rates generates a range of estimated net present values of foregone economic activity to between $26.2 and $52.7 million.

The assumptions used in the sensitivity analysis are summarized in Section 20.3.7.4.

Table 20.33 Sensitivity Analysis of Foregone Agricultural Economic Activity

<table>
<thead>
<tr>
<th>Parameter Varied (others held constant as in base case)</th>
<th>Economic Valuation (Year 1$, million)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Development scenario (1, 2, or 3)</td>
<td>$13.0</td>
</tr>
<tr>
<td>Development period (50, 100, or 150 years)</td>
<td>$17.2</td>
</tr>
<tr>
<td>Annual real growth rate (0.25%, 0.5%, or 0.75%)</td>
<td>$17.3</td>
</tr>
<tr>
<td>Foregone benefits period (100 years or in perpetuity)</td>
<td>N/A</td>
</tr>
<tr>
<td>Discount rate (base rate ±0.5%)</td>
<td>$17.2</td>
</tr>
</tbody>
</table>

20.3.8.7 Foregone Secondary Agricultural Economic Activity

Table 20.34 estimates expected Project activity zone revenues and direct expenses, in Year 1$, in Year 1, and in Year 100 under cropping Scenario 2. The expected values are based on average historical prices, yield, and revenue-expense relationships.

It is estimated that current agricultural activity in the Project activity zone could produce a gross return of $392,000 in Year 1, with expansion in Year 100 to approximately $1,628,000 in Year 1 dollars. These revenues represent only 0.3% and 1.1%, respectively, of total gross farm receipts of $144.9 million generated in the Peace Agricultural Region in 2010 (Statistics Canada 2012a). As such, the estimated revenue streams generated by agriculture in the Project activity zone represent a small proportion of current Peace Agricultural Region agriculture revenues, and are projected to represent only about 1% of gross farm receipts, even with possible future development expansion into vegetables and utilization of currently unused farmland within the Project activity zone. This calculation does not adjust for likely growth in Peace Agricultural Region agricultural activity outside of the Project activity zone. The impact of the direct loss of these revenues is likely to be low in terms of effect on direct investment in the regional agricultural economy.
### Table 20.34 Estimated Revenues and Expenses Associated With Project Activity Zone Cropping

<table>
<thead>
<tr>
<th>Crop</th>
<th>Year 1 (Year 1$)</th>
<th>Year 100 (Year 1$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area (ha)</td>
<td>Total Gross Farm Receipts</td>
</tr>
<tr>
<td>Vegetables</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Canola</td>
<td>117</td>
<td>150,151</td>
</tr>
<tr>
<td>Grains</td>
<td>90</td>
<td>82,134</td>
</tr>
<tr>
<td>Forage</td>
<td>251</td>
<td>120,972</td>
</tr>
<tr>
<td>Pasture</td>
<td>83</td>
<td>30,752</td>
</tr>
<tr>
<td>Range</td>
<td>1,181</td>
<td>7,607</td>
</tr>
<tr>
<td>Total – PAZ</td>
<td>1,722</td>
<td>391,615</td>
</tr>
<tr>
<td>Peace Agricultural Region*</td>
<td>2,522,867</td>
<td>144,940,291</td>
</tr>
</tbody>
</table>

**NOTES:**
* Statistics Canada 2012a

Another way of looking at lost economic activity is in terms of the effect of farm-related expenditures on the demand for farm inputs and services. Table 20.35 indicates that total direct expenses related to Project activity zone agriculture could range between approximately $172,000 and $671,000 annually, assuming an expansion into 100 ha of vegetables. Relative to 2010 expenditures in the Peace Agricultural Region of $137.2 million (Statistics Canada 2012a) expenses in the Project activity zone would represent between 0.1% and 0.4% of regional agricultural expenses, depending on future development in the Project activity zone and not taking into consideration agricultural growth in other parts of the region.

Data on economy multipliers for the Canadian agriculture and agri-food sector (Agriculture and Agri-Food Canada 2007) indicate that for every dollar of direct gross domestic product (GDP) created in primary farm gate-level agriculture, an additional $1.80 in indirect spending is generated. Application of this factor to the estimates of primary agricultural activity within the Project activity zone results in estimates of between approximately $310,000 (Year 1) and $1.21 million (Year 100) in foregone annual secondary spending.

Data on the Canadian agriculture and agri-food sector (Agriculture and Agri-Food Canada 2007) also indicate that for every job created in primary agriculture, another 0.91 indirect jobs are created in the economy. Based on the ratio of farm employment to gross farm receipts in the region as whole, it is estimated that paid employment in the Project activity zone, based on an estimate of 49 weeks of employment per year per full-time worker, was 1 to 2 person-years in 2010 (Statistics Canada 2012a), but could rise to 3 to 4 person-years with future development within the Project activity zone. This analysis does not account for family labour for which no formal wages are paid. As outlined in Section 20.2.8.2, only about 20% of farms in the Peace Agricultural Region pay formal wages.
20.3.9 Effects Assessment – Operations – Agricultural Economic Activity
The assessment of effects on agricultural economic activity is based on the permanent loss of land. As the majority of the permanent loss of land would occur during construction, the effects assessment of Section 20.2.7 includes the small amount of erosion-related loss that would occur during the operational phase of the Project. Effects during operations have not been assessed separately from those during construction.

20.3.10 Mitigation Measures – Change in Agricultural Economic Activity
Mitigation measures to address changes in agricultural economic activity include measures to improve the productivity of remaining agricultural land to increase the level of agricultural economic activity.

20.3.10.1 Construction
Changes in agricultural economic activity would result from the permanent loss of agricultural land, and almost all of the permanent loss of land would occur during construction.

20.3.10.1.1 Permanent Loss of Agricultural Land
To mitigate the agricultural economic activity that would be foregone due to the loss of agricultural land, BC Hydro will establish an agricultural compensation fund to support Peace River valley and regional agricultural projects. These projects will focus on enhancements to improve agricultural production on a local and regional scale.

The administration and governance of the fund, and the magnitude of the fund, will be developed through consultation with agricultural organizations, the ALC, the B.C. Ministry of Agriculture, and the local agricultural community. A series of workshops with representatives from local and regional agricultural organizations and agencies is considered the first step in designing the administrative and governance structure of the fund, and in determining the types of projects that may receive funding assistance.

Types of projects that the proposed fund may support are listed below, recognizing that some projects already receive funding assistance from existing programs:

- Agricultural Land Base Improvements:
  - Provide funding to implement shelterbelt or windbreaks to supplement the B.C. Agricultural Council Environmental Farm Plan program
  - Provide funding to implement alternative cattle watering systems that limit direct animal access to riparian areas to supplement the Environmental Farm Plan program; this could result in improved systems with respect to reliability and water quality in addition to environmental benefits
  - Provide funding to implement fencing schemes to better manage grazing lands and improve riparian function in an environmentally sustainable fashion to supplement the Environmental Farm Plan program
  - Provide assistance in improving or expanding the use of Crown land for grazing, including community pastures
  - Provide funding for developing methods for improving the grazing capacity of cut blocks
• Provide funding for fencing for wildlife control, particularly to protect feed storage areas
• Assist in expanding the agricultural land base in Fort Nelson; assistance in land use planning for the area may be a possibility
• Support regional weed management initiatives to supplement existing weed management programs

- Support for agricultural research and development
  • Support research and demonstration to promote adoption of irrigation technology
  • Support research and demonstration to increase yields and commercialize new crops and varieties (e.g., vegetables, specialty crops, biofuels)
  • Support research into on-farm responses to climate change (e.g., perennial cereals, drought-resistant varieties)
  • Support extension activities, demonstration projects, and variety trials, focusing on transfer of knowledge to the farming or ranching sector
  • Support demonstration of advanced fertility management (e.g., liming, crop nutrition, nitrogen-fixing rotations)
  • Support demonstration of new production techniques
  • Support research into, and demonstration of, weed and disease control measures

- Support and accelerate regional value-added initiatives in the agricultural sector:
  • Support feasibility studies of potential opportunities such as regional food processing, slaughter capacity, bioproducts (e.g., from hemp, Russian dandelion, Jerusalem artichoke), and nutraceuticals; if such potential opportunities appear feasible, support implementation
  • Support local marketing initiatives
  • Create markets for local agricultural products (e.g., food for construction workers during project construction), including support for local farmers’ markets
  • Support local market infrastructure development such as cleaning and packing, warehousing and storage, and distribution
  • Support attraction of investment into agricultural value-added opportunities

- Improve the sustainability of the agricultural sector:
  • Support investigation into carbon credit opportunities for agriculture
  • Assist adoption of green and alternative technologies in place of fossil fuel-driven energy systems to supplement the Environmental Farm Plan program

- Improve regional infrastructure such as facilities, services, and installations in support of agriculture:
  • Develop irrigation infrastructure
  • Develop regional transportation network
o Improve the regional electrical grid
o Improve access to natural gas
o Develop regional agricultural and domestic water supply plans
o Facilitate clean energy agricultural hook-ups to the grid
• Assist in improving access to the Internet and cellphone coverage

20.3.10.2 Operations
The majority of the Project activities that would affect agricultural economic activity will occur during construction. Additional agricultural land may be lost due to erosion during operations and affect agricultural economic activity. Measures to mitigate this additional loss of land are the same as those discussed above.

20.3.11 Effects Assessment – Construction – Food Production and Consumption
Table 20.35 summarizes the area of farmland in the Project activity zone and compares these areas to regional and provincial totals. The comparisons assume no increase in farmland use in the region from 2013 through 2112 other than in the Project activity zone.

Table 20.35 Summary Project Activity Zone, Regional and Provincial Farmland Totals

<table>
<thead>
<tr>
<th>Geographic Area, Year, Data Source</th>
<th>Land in Crops (ha)</th>
<th>Percent of B.C. Total</th>
<th>Tame &amp; Seeded Pasture (ha)</th>
<th>Total (ha)</th>
<th>Percent of B.C. Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAZ, projected Year 1</td>
<td>458</td>
<td>0.076%</td>
<td>83</td>
<td>541</td>
<td>0.065%</td>
</tr>
<tr>
<td>Peace Agricultural Region, 2011 Census</td>
<td>270,506</td>
<td>45.1%</td>
<td>100,406</td>
<td>370,912</td>
<td>44.9%</td>
</tr>
<tr>
<td>B.C., 2011 Census</td>
<td>599,674</td>
<td>100.0%</td>
<td>226,298</td>
<td>825,972</td>
<td>100.0%</td>
</tr>
<tr>
<td>PAZ, projected Year 100</td>
<td>1410</td>
<td>0.235%</td>
<td>256</td>
<td>1,666</td>
<td>0.202%</td>
</tr>
<tr>
<td>Peace Agricultural Region, 2011 Census</td>
<td>270,506</td>
<td>45.1%</td>
<td>100,406</td>
<td>370,912</td>
<td>44.9%</td>
</tr>
<tr>
<td>B.C., 2011 Census</td>
<td>599,674</td>
<td>100.0%</td>
<td>226,298</td>
<td>825,972</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

NOTE:
PAZ – Project activity zone
Table 20.35 indicates that the Peace Agricultural Region encompasses 44.9% of the currently cultivated land in B.C.
The area that could be cultivated in the Project activity zone is estimated to be the 1,666 ha that was rated as having high or moderate utility. This 1,666 ha represents 0.4% of the currently cultivated land in the Peace Agricultural Region and 0.2% of the currently cultivated land in the province.

Land currently in crops in the Project activity zone represents 0.17% of the Peace Agricultural Region’s land in crops. Without the Project, this assessment projects maximum agricultural development of the Project activity zone to occur by Year 100.
With this projected full utilization within the Project activity zone, land in crops within the
Project activity zone would represent 0.52% of the Peace Agricultural Region’s 2011 area of land in crops.

20.3.11.1 Short-Term Effects

The short-term effect of the Project on regional self-reliance is anticipated to be low to non-existent since there has been, prior to 2012, little or no vegetable or fruit cropping in the Project activity zone, except for home gardens, for the past several years. There was one market garden operation within the Project activity zone in 2012. However, the potential for vegetable production in the Project activity zone cannot be discounted, as it could occur if future market developments were to create economic opportunities. Most of the currently minor amount of Peace Agricultural Region commercial vegetable production occurs on farmland outside of the Project activity zone and could be increased by demand from a growing population, including that created by construction workers on the Project.

20.3.11.2 Long-Term Effects

The Peace Agricultural Region population, projected out to the year 2036, is anticipated to grow at an average annual rate of about 1.09% (BC Stats No date). Extrapolating that rate over the next 100 years, the Peace Agricultural Region population may grow to approximately 210,000 people in 2112, or about triple what it is today. Assuming food consumption patterns do not change appreciably into the future, Table 20.36 shows that future regional vegetable consumption would also be expected to triple. A 50% self-reliance in vegetables capable of being grown in the Peace Agricultural Region would require approximately 755 ha of vegetable production in 2112, and a 100% self-reliance would require approximately 1,510 ha of vegetable production.

**Table 20.36 Peace Agricultural Region Population Growth in Relation to Food Self-Reliance in Vegetables to 2112**

<table>
<thead>
<tr>
<th>Year</th>
<th>Peace Region Population</th>
<th>50% Self-Reliance</th>
<th>100% Self-Reliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vegetables Required (ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>71,000</td>
<td>255</td>
<td>511</td>
</tr>
<tr>
<td>2036</td>
<td>93,100</td>
<td>335</td>
<td>670</td>
</tr>
<tr>
<td>2062</td>
<td>122,100</td>
<td>439</td>
<td>878</td>
</tr>
<tr>
<td>2112</td>
<td>209,900</td>
<td>755</td>
<td>1,510</td>
</tr>
</tbody>
</table>

**NOTES:**

a BC Stats (No date)

b Refers to self-reliance in vegetables that can currently be grown in the Peace Agricultural Region

For crops that are climatically adapted, it is anticipated that if the Project proceeds, there will be more than adequate land outside of the Project activity zone to meet self-reliance needs for at least the next 100 years. Of the 9,778 ha rated as having high utility outside of the Project activity zone, 6,606 ha have an unimproved capability of Class 1 and 2, and 3,172 ha of Class 3.

Self-reliance in dairy, meat, and egg and poultry products does not require higher capability farmland to support production. As such, the Project is not anticipated to be a determinant to achieving high levels of food self-reliance in these commodities, if economic conditions were to encourage such a trend.
20.3.12 Effects Assessment – Operations – Food Production and Consumption

The assessment of potential effects on food production and consumption is based on the permanent loss of land. As almost all of the permanent loss of land would occur during construction, the effects assessment of Section 20.3.10 includes the small amount of loss that would occur during operations. Effects during operations have not been assessed separately from those during construction.

20.3.13 Mitigation Measures – Change in Food Production and Consumption

The effects assessment concluded that there would be no adverse effect on food self-reliance for the Peace Agricultural Region. However, the measures included in the regional compensation program discussed in Section 20.3.9 could support increased food self-reliance.

Food self-reliance in the Peace Agricultural Region can be changed by creating opportunities to generate more agricultural products within the region from the remaining post-project farmland. Strategies that can increase the food production capacity of the region are those outlined in Section 20.3.9 and include:

- Raising the productivity of some remaining land through irrigation improvements and infrastructure
- Increasing potential crop yields by investing in varietal trials and new crop research on plants adapted to climate change
- Assisting in the development of the 45% of the ALR in the Peace Agricultural Region that has not yet come into production (ALC 1998)
- Supporting initiatives within the Peace Agricultural Region to increase value-added food production in the livestock and cereal sectors
- Supporting initiatives within the Peace Agricultural Region to attract under-represented food sectors such as dairy, poultry meat, and eggs

However, increasing production of crops to increase food self-reliance in commodities where self-reliance is currently low may not always be in the best economic interests of producers and care should be taken to ensure support is provided only when returns justify the costs of production.

20.4 Summary of Effects Assessment and Mitigation Measures

This assessment evaluated four potential effects to the agriculture VC:

- Loss of agricultural land
- Effects to individual farm operations
- Changes to agricultural economies
- Changes to local food production and consumption
20.4.1 Effects and Mitigation Measures

The permanent loss of agricultural land is a residual effect after taking into consideration proposed mitigation measures, since the lost land cannot be replaced. BC Hydro proposes to establish a compensation fund to support Peace River valley and regional agricultural projects targeted at improving production on remaining lands and at enhancing agricultural economic activity in the region. The fund will provide resources to increase agricultural production on remaining lands over a period of time. However, it remains that the loss of existing farm land as well as other lands with agricultural capability results in a permanent reduction in the agricultural land base of the region and the province.

Temporary loss of land and soil disturbance will be mitigated through implementation of management plans, such as Farm Mitigation Plans for individual farms and the Project Soil Management, Site Restoration, and Revegetation Plan as described in Volume 5 Section 35 Summary of Proposed Environmental Management Plans.

For each directly affected farm operation, a farm-specific analysis will be conducted and a Farm Mitigation Plan developed in consultation with the owner and or operator. These plans will describe appropriate mitigation measures to address specific on-farm effects for each farm operation. Agricultural land that is required for the Project will be acquired and associated financial losses (if any) will be reimbursed. Refer to Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements for additional information.

Farm-specific analysis would consider potential effects due to wildlife damage; changes to crop drying conditions, groundwater elevations, and crop production; unauthorized public access to farm properties; and livestock access to the reservoir, as described above in mitigation for farm operation activities, Section 20.3.7.2.

The permanent loss of land would result in a reduction in agricultural economic activity within the Peace Agricultural Region. BC Hydro’s proposed compensation fund, if implemented efficiently, will mitigate this effect. The design and amount of the fund will be structured to mitigate the adverse effects on agricultural economic activity.

There are no residual effects to the ability of the region to be food self-reliant in commodities that can be produced in the region, as there is sufficient land remaining for the region to be self-sufficient in these commodities.

A summary of potential effects and mitigation measures for the agriculture VC are summarized in Table 20.37.
### Table 20.37 Project Effects and Mitigation Measures for Agriculture

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Construction  | Loss of agricultural land              | For temporary loss of agricultural land, implement the following Environmental Management Plans:  
- Soil Management, Site Restoration and Revegetation Plans  
- Borrow and Quarry Site Reclamation Plans  
- Vegetation and Invasive Plant Management Plan  
For permanent loss of agricultural land:  
- Irrigation improvements  
- Drainage improvements  
- Relocation of suitable quality soil in selected locations  
- Inclusion of land in the Agricultural Land Reserve  
- Agricultural compensation fund | These mitigation measures for the temporary loss of agricultural land are expected to be effective, as they are common approaches to temporary disturbance during construction projects. A residual adverse effect is expected for the permanent loss of agricultural land. The mitigation measures could improve productivity on remaining and replace the productivity of the lost lands, but the lost land itself cannot be replaced. | BC Hydro and their contractors in developing and implementing the Soil Management, Site Restoration and Revegetation Plans, Borrow and Quarry Site Reclamation Plans and Vegetation and Invasive Plant Management Plan  
Management of the agricultural compensation fund in evaluating and funding irrigation and drainage improvements and in evaluating and funding other opportunities to increase production on remaining lands | |
<p>| Operations    | Loss of agricultural land              | As noted for Construction – Loss of agricultural land | As noted for Construction – Loss of agricultural land | As noted for Construction – Loss of agricultural land |</p>
<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Construction  | Effects on individual farm operations | ▪ Acquisition of land required for the Project  
▪ Reimbursement of associated financial losses  
▪ Farm Mitigation Plans:  
  o Environmental Management Plans including:  
    o Soil Management, Site Restoration and Revegetation Plans  
    o Vegetation and Invasive Plant Management Plan  
    o Traffic Management Plans  
    o Public Safety Management Plan  
    o Biosecurity protocols if required | Mitigation measures are expected to be effective, as they are common approaches to mitigating effects to individual farm operations | BC Hydro in acquiring land required for the Project and in providing reimbursement of associated financial losses  
BC Hydro and their contractors in developing and implementing the Farm Mitigation Plans and Environmental Management Plans  
Soil Management, Site Restoration and Revegetation Plans  
Borrow and Quarry Site Reclamation Plans and  
Vegetation and Invasive Plant Management Plan |
| Operations    | Effects on individual farm operations | Evaluate the following potential effects, and where appropriate enter into agreements with affected landowners:  
▪ Crop and stored feed damage due to changes in wildlife habitat utilization  
▪ Crop drying due to changes in climatic factors  
▪ Crop production due to changes in groundwater elevation  
▪ Potential for unauthorized access to farm properties due to change in land or water-based access  
▪ Livestock damage due to new access to the reservoir | Mitigation measures are expected to be effective in addressing adverse effects encountered during operations | BC Hydro in evaluating the potential effects and entering into agreements with affected landowners where appropriate |
## Project Phase

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and Operations</td>
<td>Change to agricultural economic activity</td>
<td>Agricultural compensation fund</td>
<td>An effectively designed, financed and managed agricultural compensation fund will mitigate effects to agricultural economic activity</td>
<td>BC Hydro in leading the consultation with agricultural organizations, the Agricultural Land Commission, the B.C. Ministry of Agriculture and other relevant agencies and the agricultural community to determine the amount and design of the fund. The fund management in evaluating funding opportunities, allocating funding and monitoring the effectiveness of funded projects</td>
</tr>
<tr>
<td>Construction and Operations</td>
<td>Change to regional food production and consumption</td>
<td>No mitigation required</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**NOTE:**

1. N/A – not applicable
20.4.2 Other Mitigation Options Considered

Large-scale relocation of suitable quality soil was also considered; however, this mitigation strategy would be constrained by:

- Concerns over disturbance to archaeological sites
- Erosion of disturbed areas during reservoir filling
- Weed control
- Habitat degradation

These constraints are not technically and economically feasible options for mitigation. At a site-specific level, topsoil may be relocated as part of site reclamation activities in a localized area, subject to consideration of environmental effects.

20.5 Residual Effects

This section describes the characterization of residual effects, thresholds for determining significance, and the determination of significant effects.

20.5.1 Characterization of Residual Effects

The 2,601 ha of Class 1 and 2 lands that would be permanently lost represent:

- 24.8% of the Peace River valley Class 1 and 2 land
- 2.1% of the Peace Agricultural Region Class 1 and 2 land
- 1.0% of the Provincial Class 1 and 2

The 3,433 ha of Class 1 through 3 lands that would be permanently lost represent:

- 20.6% of the Peace River valley Class 1 through 3 land
- 0.7% of the Peace Agricultural Region Class 1 through 3 land
- 0.4% of the Provincial Class 1 through 3 land

Of the land which would be lost, approximately 1,666 ha were identified as having high or moderate utility, 1,299 ha of high utility and 367 ha of moderate utility. Of the remaining lands within the Peace River valley, 12,527 ha were identified as having high or moderate utility, including 9,778 ha of high utility lands and 2,749 ha of moderate utility lands. Within the Peace River valley, the permanently lost land would represent:

- 11.7% of the total of 11,077 ha with high utility
- 11.8% of the total of 3,116 ha with moderate utility
- 11.7% of the total of 14,193 ha with high or moderate utility

In the absence of mitigation measures, this permanent loss of land would result in an overall reduction in future agricultural production and associated economic activity. The currently farmed portions of the Project activity zone are estimated to produce approximately 0.2% of the current regional gross farm receipts. Depending on the cropping scenario assumed, if all the high and moderate utility land were cultivated today, and with some grazing use in the remainder of the Project activity zone, the gross

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FOR GENERATIONS
farm receipts from land within the Project activity zone would represent between 0.7% through 1.3% of the current regional gross farm receipts, depending on the cropping scenario assumed. This estimate assumes no increase in gross farm receipts in the remainder of the region.

Residual effects were characterized based on the characteristics described in Table 20.38.

Table 20.38 Characterization Criteria for Residual Agricultural Effects

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
<th>Quantitative Measure or Definition of Qualitative Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
<td>The ultimate long-term trend of the effect (increase, decrease or neutral).</td>
<td>Adverse: condition of the VC is worsening in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive: condition of the VC is improving in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neutral: condition of the VC is unchanged in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td>Magnitude</td>
<td>The amount of change in a key indicator or variable relative to the 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.</td>
<td>Negligible: no detectable or measurable effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low: effect is detectable but is within the normal variability of baseline conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate: potential changes in the agricultural land base or agricultural economic activity are between 0.5 and 1.0% of baseline conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High: potential changes in the agricultural land base or agricultural economic activity are greater than 1.0% of baseline conditions</td>
</tr>
<tr>
<td>Geographical Extent</td>
<td>The geographic area in which an effect of a defined magnitude occurs (site-specific, local, regional, provincial, national, international)</td>
<td>Site-specific: the effect is within the Project activity zone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local: the effect is within the Peace River valley</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regional: the effect is within the Peace River Agricultural Region</td>
</tr>
<tr>
<td>Frequency</td>
<td>The number of times during a project or a specific project phase that an effect may occur (once, daily, weekly, monthly, continuous.).</td>
<td>Once: effect occurs once</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous: effect occurs at all times</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sporadic: occurs rarely and at irregular intervals</td>
</tr>
<tr>
<td>Duration</td>
<td>Period of time 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).</td>
<td>Short term: effect is limited to &lt;1 year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium term: effect is limited to &lt;10 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long term: effect lasts throughout the life of the Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Permanent: effect occurs in perpetuity</td>
</tr>
<tr>
<td>Reversibility</td>
<td>The degree or likelihood to which existing baseline conditions can be regained after the factors causing the effect are removed.</td>
<td>Effect reversible with reclamation and compensation or over time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Effect irreversible and cannot be reversed with reclamation or compensation or over time</td>
</tr>
<tr>
<td>Context</td>
<td>The extent to which the area within which an effect may occur; has already been adversely affected by human activities; and is ecologically fragile and has little resilience and resistance to imposed stressed</td>
<td>Low: low capacity for agriculture to accept change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate: moderate capacity for agriculture to accept change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High: high capacity for agriculture to accept change</td>
</tr>
<tr>
<td>Criterion</td>
<td>Description</td>
<td>Quantitative Measure or Definition of Qualitative Categories</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Level of Confidence</td>
<td>An evaluation of the scientific certainty one has in the review of project-specific data, relevant literature, and professional opinion. This includes the level of confidence in the assessment of direction, magnitude, duration, frequency and reversibility.</td>
<td><strong>Low:</strong> assessment is based on professional judgment and experience but is hampered by incomplete understanding of cause-effect relationships and or lack of data</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Moderate:</strong> assessment is based on professional judgment and experience including a reasonable understanding of cause-effect relationships and reasonable data</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>High:</strong> assessment is based on professional judgment and experience including a good understanding of cause-effect relationships and adequate data</td>
</tr>
<tr>
<td>Probability</td>
<td>The likelihood that an adverse effect will occur (e.g., low, high, unknown).</td>
<td><strong>Low:</strong> likelihood of occurrence is low</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>High:</strong> likelihood of occurrence is high</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Unknown:</strong> likelihood of occurrence is unknown</td>
</tr>
</tbody>
</table>

Characterization of potential adverse effects on the agricultural land base is shown in Table 20.39.
### Table 20.39 Characterization of Residual Agriculture Effects

<table>
<thead>
<tr>
<th>Activity</th>
<th>Effect</th>
<th>Residual Environmental Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direction</td>
<td>Magnitude</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Permanent loss of agricultural land</td>
<td>Adverse</td>
</tr>
</tbody>
</table>
As almost all adverse effects result from permanent land loss occur during construction, the characterization of these effects has not been repeated for the operational phase of the Project.

### 20.5.2 Standards or Thresholds for Determining Significance

There are no recognized government or industry guidelines or objectives for determining significance of effects to agriculture. A residual effect is considered significant if all of the following criteria are met:

- The effect is adverse
- The magnitude is moderate or high
- The duration is long term or permanent
- The frequency is continuous
- The effect is irreversible
- There is a low capacity for agriculture to accept change

### 20.5.3 Determination of Significance of Residual Effects

The implementation of the proposed compensation fund would result in improvements to production on remaining lands and mitigate the loss of current and potential production from permanently lost land. However, there would be a permanent loss of existing farm land, as well as other land with agricultural capability, which would result in a permanent reduction in the agricultural land base of the Peace Agricultural Region and the province. This permanent loss of land, in itself, is considered a significant residual effect.

Considering all aspects of the agriculture VC, an adequately funded and properly administered agricultural compensation fund, by enhancing regional agricultural production and replacing the net agricultural returns that would be displaced from permanently lost land, would mitigate the Project effects on agricultural production and agricultural economies. Therefore the Project’s net effect on agriculture is considered not significant.

Table 20.40 summarizes the assessment of potential significant residual adverse effects on the agriculture VC.

### Table 20.40 Summary of Assessment of Potential Significant Residual Adverse Effects on Agriculture

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Key Mitigation Measures</th>
<th>Significance Analysis of Residual Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Construction</td>
<td>Permanent loss of agricultural land</td>
<td>Agricultural compensation fund</td>
<td>Not significant</td>
</tr>
</tbody>
</table>
20.6 Cumulative Effects Assessment

A cumulative effect for agriculture would occur if there are adverse residual effects on agriculture that have spatial and temporal overlaps with residual effects of other current or reasonably foreseeable projects or activities.

Other projects that were screened in the assessment of cumulative effects to agriculture are summarized in Table 20.41. A full project inclusion list is included in Volume 2 Section 10 Effects Assessment Methodology.
### Table 20.41  Projects that Could Interact with Agriculture Residual Effects

<table>
<thead>
<tr>
<th>Site C Clean Energy Project Residual Effect</th>
<th>Other Project Description of Project</th>
<th>Potential Overlap with Site C</th>
<th>Potential Cumulative Effect Interaction with Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent loss of agricultural land</td>
<td>All other reasonably foreseeable projects in the RAA</td>
<td>• Underground and surface mines</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pipelines</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Waste management projects</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wind projects</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is no spatial overlap, as none of the projects are within the agricultural land LAA</td>
<td>No: not expected to contribute to adverse residual effects on agriculture in the agricultural land LAA, as there is no spatial overlap</td>
</tr>
<tr>
<td>Land tenure</td>
<td>Applications for agricultural tenures</td>
<td>One agricultural tenure application is within the agricultural land LAA, and the area included in this application has been included in the assessment of grazing tenures in the agricultural assessment</td>
<td>No: the one tenure application that includes land within the agricultural land LAA has been considered in the agricultural assessment</td>
</tr>
</tbody>
</table>
The only project or activity that would overlap spatially with the agricultural land LAA is one application for an agricultural tenure for grazing. The area of this application has been included in the consideration of grazing tenures in the agricultural assessment.

The adverse effect related to the permanent loss of agricultural land does not have spatial and temporal overlaps with residual effects of any other current or reasonably foreseeable projects or activities and therefore no further assessment of cumulative effects related to agriculture was conducted.

20.7 Monitoring and Follow-up

The following monitoring and follow-up programs are proposed where the creation of the reservoir may result in site-specific changes that may affect agricultural operations on individual farm operations, and where project effects on agricultural operations are not already addressed under agreements with BC Hydro. If they do occur, these changes would be detectable in the years immediately following reservoir filling.

The monitoring program objectives would be to a) confirm if a Project change has occurred, and b) specify the adverse effect on agricultural operations, and c) determine appropriate mitigation measures where adverse effects have been identified. The following are proposed to be monitored, including collection of relevant farm operating information, for at least 5 years prior to reservoir filling, and up to 5 years monitoring after reservoir filling, for agricultural operations not already covered by an agreement with BC Hydro:

- Monitor Project-induced changes in wildlife habitat utilization in, and evaluate associated crop or feed storage damage, for agricultural operations within 5 km of the reservoir, to assess if there is an increase in wildlife depredation due to Project-related habitat losses. Monitoring will include pre- and post-reservoir filling field surveys, wildlife monitoring, farm operator interviews, and analysis of relevant records related to wildlife depredation.

- Monitor Project-induced changes to humidity within 1 km of the reservoir, and evaluate associated effects on crop drying within this area. Monitoring will include collection and analysis of climate data, calculation of crop drying indices, and farm operator interviews.

- Monitor Project-induced changes to groundwater elevations within 2 km of the reservoir (the area potentially influenced by groundwater elevation changes), and evaluate associated effects on crop productivity. Monitoring will include field surveys and farm operator interviews.

The following monitoring program is proposed to support future decisions regarding irrigation improvements, in support of the projects that may be proposed under the agricultural compensation program:

- Monitor climatic factors to estimate moisture deficits and to estimate irrigation water requirements in the vicinity of the reservoir to provide information for potential future irrigation projects. Data collection will be undertaken before and in the early years after reservoir filling, and data will be reviewed as required for proposed irrigation projects.
## Table 20.42  Follow-up Program for Agriculture

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Monitoring Program Objective</th>
<th>Monitoring Program Frequency</th>
<th>Monitoring Program Duration</th>
</tr>
</thead>
</table>
| Agriculture      | Operations    | For reservoir-adjacent agricultural operations where there is not already an agreement with BC Hydro, monitor specific environmental factors, and evaluate associated potential effects, on:  
  - Crop and stored feed damage due to changes in wildlife habitat utilization  
  - Crop drying due to changes in climatic factors  
  - Crop production due to changes in groundwater elevation  
  - Potential for unauthorized access to farm properties due to change in land or water-based access  
  - Livestock damage due to new access to the reservoir  
|                  |               | Annual                       | First 5 years of operations |
| Agriculture      | Operations    | Monitor climatic factors relevant to future irrigation improvement decisions that may be proposed under the agricultural compensation fund. | Annual | First 5 years of operations |
References

Literature Cited


District of Hudson’s Hope. 2009. District of Hudson’s Hope Bylaw No. 750. Hudson’s Hope, B.C.


Peace River Regional District. 1996. Peace River Regional District Zoning By-law No. 1000. Dawson Creek, B.C.


Internet Sites


Agricultural Land Commission (ALC). 2010. Table 1: Area Included and Excluded from the ALR by Year, in hectares – 1974–2009. Available at:


Personal Communication

21 FORESTRY

21.1 Approach

The Project’s use of land has been assessed on the valued component (VC) of forestry, considering the Project interactions with the forest land base, with Crown forest land management, and with the forest industry.

21.1.1 Regulatory and Policy Setting

Crown forest regulation and management is the responsibility of the B.C. Ministry of Forests, Lands and Natural Resource Operations. The principal legal instruments are the Forest Act and the Forest and Range Practices Act.

The Forest Act identifies two broad categories of tenures for harvesting Crown timber: area-based tenures that give exclusive rights to harvest a specified annual volume of Crown timber from a defined area, which may comprise Crown and private lands, and volume-based tenures that entitle the holder to harvest a specified annual volume of Crown timber within a timber supply area (TSA).

The Chief Forester sets Annual Allowable Cuts (AACs), taking into consideration sustainable forest stewardship, a stable timber supply, and local social and economic objectives. Separate AACs are set for coniferous and deciduous leading stands and are typically reviewed every five years.

Crown forest land is also managed for other forest uses and values. For example, certain biodiversity goals are realized by reserving old growth management areas (OGMAs). OGMAs are established by legal order pursuant to the Land Act. Land use objectives may be established under the Forest and Range Practices Act.

The conversion of Crown forest land base and timber harvesting land base to other land uses is common. Common exclusions include the establishment of protected areas, clearing for rights-of-way (roads, pipelines, transmission lines), and conversion to agriculture. The B.C. Ministry of Forests, Lands and Natural Resource Operations has policies and procedures to manage change and Crown obligations to tenure holders.

Forest management in the Project activity zone is guided by two higher level plans, the Dawson Creek Land and Resource Management Plan, and the Fort St. John Land and Resource Management Plan (B.C. Ministry of Forests, Lands and Natural Resource Operations 1999, 1997). A recommendation in both plans was the establishment of the Peace River Boudreau Lake proposed protected area under the Environment and Land Use Act. While the protected area has not been formally designated, government has minimized timber harvesting in the proposed area.

21.1.2 Key Issues and Identification of Potential Effects

Issues, concerns, and interests identified during consultation with the public, Aboriginal groups, and government agencies guided the scope of the forestry assessment (refer to Volume 1 Section 9 Information Distribution and Consultation). The key issues identified and the approaches used to address issues are outlined in Table 21.1.
### Table 21.1 Key Issues: Forestry

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much timber harvesting land base that will be taken up by the Project, and what does that mean for the value of the Allowable Annual Cut?</td>
<td>The most up-to-date estimates of the Crown Forest and timber harvesting land base are reported in this assessment. The potential implications to the Allowable Annual Cut are examined.</td>
</tr>
<tr>
<td>Will the merchantable wood volumes from Project clearing disrupt the local mill operations?</td>
<td>Development of the Vegetation, Clearing, and Debris Management Plan (Volume 1 Appendix A) includes an inventory of milling capabilities and discussion about how the volume may be accommodated.</td>
</tr>
<tr>
<td>Will the old growth management areas taken up by the Project mean that biodiversity targets cannot be met?</td>
<td>The matter was discussed with the responsible agency and the findings are reported in this assessment.</td>
</tr>
<tr>
<td>How does the Project fit within the context of current land use planning for Peace Forest District?</td>
<td>The Dawson Creek and Fort St. John Land and Resource Management Plans were reviewed. Agency consultation updated the plans. The Project activity zone’s overlap with the land and resource management plan resource management zones is identified, incorporating project effects on timber harvesting.</td>
</tr>
<tr>
<td>First Nations concern – potential effects of the Project on forest harvesting</td>
<td>The potential implications to the Allowable Annual Cut and timber harvesting are examined in the forestry effects assessment.</td>
</tr>
<tr>
<td>First Nations concern – Access to valley bottom timber above the level of the reservoir may be enhanced or reduced by the reservoir</td>
<td>The potential implications to the Allowable Annual Cut and timber harvesting are examined in the forestry effects assessment. There is a Vegetation, Clearing, and Debris Management Plan for the Project (Volume 1 Appendix A).</td>
</tr>
</tbody>
</table>

The Project would occupy Crown forest land, some of which is available for harvesting by industry and managed for timber harvesting over the long term. The forest stands would be harvested, but future forest crops would be foregone by the Project’s occupation of the land. The Project would also remove merchantable timber that is deemed by the B.C. Ministry of Forests, Lands and Natural Resource Operations to be not available for harvest because of existing environmental and economic constraints. In the absence of the Project, this timber volume would not likely be harvested. Some of the lands not presently available for harvest are being managed to obtain other forest values, which would no longer be available for that purpose if the Project proceeds.

Potential project interactions with Forestry are summarized in Volume 2 Appendix A Project Interactions Matrix. Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a rank of “2” was given where interactions may result in an adverse effect and the nature of the effect and/or the effectiveness of mitigation measures is uncertain. These interactions were taken forward through the effects assessment.

Project interactions with a ranking of “2” are set out in Table 21.2 below. As seen in the table below, none of the project activities and physical works had an interaction with Crown forest management that warranted a “2” ranking.
### Table 21.2 Interactions of the Project With Forestry

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Change in Land Use, Resource Use, Access and Activities Related to Industrial Forestry Use</td>
</tr>
<tr>
<td>Construction</td>
<td>ụ</td>
</tr>
<tr>
<td>Dam and Generating Station Construction</td>
<td>N/A</td>
</tr>
<tr>
<td>Reservoir Preparation and Filling</td>
<td>N/A</td>
</tr>
<tr>
<td>Transmission System</td>
<td>N/A</td>
</tr>
<tr>
<td>Quarried and Excavated Material Source Development</td>
<td>N/A</td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td>N/A</td>
</tr>
<tr>
<td>Construction Access Road Development</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**NOTE:**

Only Project interactions ranked as “2” in Volume 2 Appendix A Project Interaction Matrix, Table 2 are carried forward to this table. A ✓ indicates that a project component or activity is likely to interact with forestry. N/A – not applicable.

#### 21.1.3 Standard Mitigation Measures and Effects Addressed

A ranking of “0” in Volume 2 Appendix A Project Interactions Matrix, Table 2 indicates that there is no potential interaction between the Project activity and the VC. For the Project operations phase, new or incremental effects are not anticipated and a “0” is assigned to the interaction.

A “1” ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and are well understood to be effective, and any residual effect is negligible. These interactions were not carried forward through the effects assessment.

A “1” ranking was applied to the southern and northern regional temporary accommodation activities of worker accommodation because, while there may be spatial overlaps with forestry, the tenures necessary to construct and operate them will be part of the Project’s overall tenuring processing and related mitigation, as outlined in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

A “1” ranking was also assigned to transportation of construction materials and supplies at the dam site, transportation of merchantable timber away from the reservoir, and West Pine quarry access. BC Hydro will prepare a Traffic Management Plan for the Project’s construction phase that will include applicable access restrictions and traffic control along roads and railway corridors. Where appropriate, the Project will enter into road use agreements. These actions are standard, and would address potential transportation conflicts between the Project and industrial forest use. In the long term, road upgrades could also benefit industrial forest users.

The Project activity zone overlap of the four OGMAs consists of two less than 40 ha and two in excess of 40 ha as described in Table 21.3. It was indicated that larger overlaps would be accommodated within the two affected TSAs (Ministry of Forests, Lands and Natural Resource Operations, Land and Resource Specialist 2011, 2012, pers. comm.). As the government has standard procedures for managing OGMA overlaps, there are no
expected residual adverse effects on forest management attributable to the Project. This aspect of the Project’s effect on forestry is not addressed further.

### Table 21.3 Old Growth Management Areas in the Project Activity Zone and Reservoir Impact Lines

<table>
<thead>
<tr>
<th>OGMA Identifier</th>
<th>Five-Year Beach Line(^a)</th>
<th>Site C Dam Site Area(^b)</th>
<th>Transmission Line(^c)</th>
<th>Construction Access Roads(^d)</th>
<th>Quarried &amp; Excavated Materials(^e)</th>
<th>Total Size</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSJ_DC_lmo_07</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4.7</td>
<td>0</td>
<td>1,480.0</td>
<td>0.3</td>
</tr>
<tr>
<td>FSJ_DC_lmo_12</td>
<td>0</td>
<td>0</td>
<td>65.1</td>
<td>2.4</td>
<td>0</td>
<td>1,337.3</td>
<td>5.1</td>
</tr>
<tr>
<td>FSJ_DC_lmo_13</td>
<td>0</td>
<td>0</td>
<td>36.9</td>
<td>0</td>
<td>0</td>
<td>876.7</td>
<td>4.2</td>
</tr>
<tr>
<td>FSJ_DC_pbo_13</td>
<td>1,458.2</td>
<td>47.4</td>
<td>0</td>
<td>20.7</td>
<td>0</td>
<td>14,564.7</td>
<td>28.8</td>
</tr>
</tbody>
</table>

**NOTES:**

\(^a\) Five-year Beach Line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

\(^b\) Site C dam site and substation construction areas and restricted access zones as described in Volume 1 Section 4 Project Description

\(^c\) Transmission line corridor and one-time clearing areas as described in Volume 1 Section 4 Project Description

\(^d\) Permanent and temporary roads, Highway 29 realignment as described in Volume 1 Section 4 Project Description

\(^e\) Off-site construction material sources as described in Volume 1 Section 4 Project Description

**Source:** Hillcrest Geographics (2012)

Forest development activities (e.g., road development, cutblock application) that may be proposed for lands adjacent to the reservoir that have the potential to be affected by the Project. These lands are discussed in Volume 2 Appendix B Geology, Terrain, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines.

There may be potential effects related to flooding, erosion, instability, and landslide-generated waves on these lands. BC Hydro would notify the applicant of the nature of the particular effect when contacted through the established referral process managed by the B.C. Ministry of Forest, Lands and Natural Resource Operations.

#### 21.1.4 Selection of Key Indicators

Key indicators listed in the EIS Guidelines for the forestry VC are standard measures associated with the forest land base, and measures that indicate the potential effects on industry activity. A key indicator for addressing project changes to the timber supply of the forest industry is the timber harvesting land base. The timber harvesting land base is defined as:

“Crown forest land within the timber supply area where timber harvesting is considered both acceptable and economically feasible, given objectives for all relevant forest values, existing timber quality, market values, and applicable technology.”

(BCMFR 2008)

The allowable annual cut is the rate of timber harvest permitted each year in a management unit, as determined by the Chief Forester. The volume (m³/y) is apportioned among timber tenures for the harvest of timber in the management unit. Site
index is a measure of a site’s tree growing potential and is embedded in the AAC
determination; hence, it is not reported as a separate indicator.

The timing and volume of the merchantable timber harvested from the Project activity
zone, forest sector employment, and B.C. government stumpage revenue are the key
indicators for characterizing the potential effects of the Project on the VC, forestry.

Key indicators are summarized in Table 21.4.

### Table 21.4  Key Indicators for Forestry

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in Land Use, Resource Use, Access</td>
<td>Timber harvesting land base (ha)</td>
<td>Timber harvesting land base is the Crown land area where timber harvesting is considered both acceptable and economically feasible</td>
</tr>
<tr>
<td>and Activities Related to Industrial Forestry</td>
<td>Site productivity</td>
<td>Measures the relative tree growing potential of the land</td>
</tr>
<tr>
<td>Use</td>
<td>AAC (m³)</td>
<td>Is the annual volume of timber that can be made available for harvest to holders of Crown forest tenures</td>
</tr>
<tr>
<td></td>
<td>Inventory of timber in the project clearing plan (m³)</td>
<td>This measures the merchantable volume generated from Project clearing activities available for forest industry use</td>
</tr>
<tr>
<td></td>
<td>Harvest trends (m³)</td>
<td>Provides context for Project’s contribution to regional timber production and industry capability</td>
</tr>
<tr>
<td></td>
<td>Forest Sector Employment (person-year; PY)</td>
<td>Employment is a desirable economic outcome</td>
</tr>
<tr>
<td></td>
<td>B.C. Government stumpage revenue ($)</td>
<td>Payment by the licensee to the resource owner</td>
</tr>
</tbody>
</table>

### 21.1.5  Spatial and Temporal Boundaries

#### 21.1.5.1  Spatial Boundaries

The Local Assessment Area (LAA) in the EIS Guidelines for the assessment of the VC of
forestry is the Project activity zone. The Regional Assessment Area (RAA) in the EIS
Guidelines is composed of three forest management units including: Dawson Creek
TSA, Fort St. John TSA, and Peace River supply block of Tree Farm Licence (TFL) 48.

The areas used for reporting in this assessment were updated from the originally
proposed spatial boundaries in the EIS Guidelines. The LAA selected for forestry is the
Project activity zone and the area within the Five-Year Beach Line, which includes all
areas from which trees would be removed prior to inundation, access to the timber
harvesting land base would be curtailed, and forest management potentially altered. The
Five-Year Beach Line is the predicted extent of shoreline retreat at the Maximum Normal
Reservoir Level approximately five years after impoundment of the proposed reservoir
as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2
Preliminary Reservoir Impact Lines.

The Regional Assessment Area (RAA) is the area within which other Projects are
identified, whose project effects could interact with effects on forestry from the Project,
causing measurable cumulative effects. The RAA is composed of three forest
management units:
Site C Clean Energy Project Environmental Impact Statement
Volume 3: Economic and Land and Resource Use Effects Assessment
Section 21: Forestry

- Dawson Creek TSA
- Fort St. John TSA
- Peace River supply block of Tree Farm Licence (TFL) 48

The spatial boundaries are described in Table 21.5 and shown in Figure 21.1.

Table 21.5  Spatial Assessment Area for Forestry

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project activity zone and area within 5-Year Beach Line</td>
<td>Dawson Creek TSA, Fort St. John TSA, Peace River supply block of TFL 48</td>
</tr>
</tbody>
</table>

21.1.5.2  Temporal Boundaries

The potential effects of the Project on forestry are assessed for the construction phase of the Project, as this is the phase that forestry would be displaced as a land use in the Project activity zone and when merchantable timber from clearing activities would be available. Site reclamation activities would occur in temporary use areas, by the end of the construction phase. There would be no incremental adverse effects to Forestry during operations.

21.2  Information Sources and Methodology

21.2.1  Literature Review

The two main forest management units within the Project activity zone, the Dawson Creek and Fort St. John timber supply areas, are subject to timber supply reviews, which were reviewed for information on the forest resource and socio-economic conditions. The Dawson Creek and Fort St. John Land and Resource Management Plans (B.C. Ministry of Forests, Lands and Natural Resource Operations 1997 and 1999, respectively) were reviewed to understand where and how industrial timber harvesting would likely occur in the future. The Vegetation, Clearing, and Debris Management Plan (Volume 1 Appendix A) was reviewed to understand the standing inventory within Project activity zone, and the proposed timing and volume of merchantable timber to be removed from the Project activity zone. Background reports supporting the Vegetation, Clearing, and Debris Management Plan provided information on the potentially affected industry (IFS 2012).

21.2.2  Interviews

Interviews were held with B.C. Ministry of Forests, Lands and Natural Resource Operations staff related to the timber supply review documents, with a focus on baseline data, trends, investment plans, and how project effects would be managed through existing policies and practices. Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 1 Land and Resource Use Assessment Interview Methodology provides details on the interview methodology. Personal communications are noted at the end of this section.
21.2.3 Field Investigations

No fieldwork was undertaken for this assessment.

21.2.4 Data Management, Mapping, and Modelling

Data sources included the B.C. government land and resource data warehouse and the Vegetation, Clearing, and Debris Management Plan (Volume 1 Appendix A).

21.2.5 Aboriginal Community and Traditional Knowledge

Aboriginal traditional and community knowledge related to the forestry VC was obtained through results of BC Hydro’s consultation with Aboriginal groups and of First Nations community baseline studies prepared by the following First Nations located in the RAA: Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations. While the communities and traditional territories of the Blueberry First Nations, McLeod Lake Indian Band, and Saulteau First Nations are also in or near the boundaries of the RAA, BC Hydro had not received community baseline information from them at the time of writing.

Baseline information and data as well as First Nations concerns and interests relevant to forestry are incorporated in the baseline and effects assessment sections below. The First Nations community baseline reports are provided in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Integration of Community Baseline Profiles into EIS: Integration Summary Table Doig River First Nation, Halfway River First Nation, Prophet River First Nation, West Moberly First Nations.

BC Hydro’s approach to gathering community-based social and economic data with First Nations is described in Volume 3 Appendix B First Nations Community Baseline Reports, Part 1 Approach to Gathering and Integrating Community Baseline Information.

21.3 Baseline Conditions

21.3.1 Overview

The forest industry makes an important contribution to the northeast B.C. economy. It supports employment in timber harvesting and wood manufacturing, ranking behind the region’s oil and gas, mining and construction industries (B.C. Ministry of Citizens’ Services and Open Government 2012). The AAC of the two TSAs in the LAA is 3.97 million m³, or 5.1% of the provincial AAC (B.C. Ministry of Forests, Lands and Natural Resource Operations 2012a). The AAC includes harvest of coniferous and deciduous stands.

The Project activity zone is within the Fort St. John and Dawson Creek Land and Resource Management Plan areas. These plans were developed in the 1990s by a multi-stakeholder consultative process and accepted by government. Each plan has defined resource management zones with specified management objectives and strategies. The objectives and strategies provide management direction to Crown land/resource managers, including rate of timber harvest and limitations on timber harvesting. The Project activity zone overlaps several resource management zones, including the recommended Peace River Boudreau Lake proposed protected area. The area of overlap by resource management zone is summarized in Volume 3 Appendix C
Land and Resource Use Assessment Supporting Documentation. Although the protected area has not been proclaimed, the B.C. Ministry of Forests, Lands and Natural Resource Operations has not been approving applications for timber harvesting in the designated area.

### 21.3.2 Forest Management Units and Timber Harvesting Land Base and Site Productivity

The Project activity zone overlaps three forest management units; the Fort St. John and Dawson Creek TSAs, and TFL 48. Table 21.6 summarizes the total land area and the timber harvesting land base (THLB) of the three management units. The Fort St. John TSA is the larger of the two TSAs, covering 4.7 million ha, as compared to 2.3 million ha in the Dawson Creek TSA. The THLB varies among the management units as a proportion of the total land base. It comprises 32% of the Dawson Creek TSA, 14% of the Fort St. John TSA, and 57% of TFL 48.

The northern boundary of the Dawson Creek TSA is the south shore of the Peace River before crossing to the north shore near Hudson’s Hope. The Fort St. John TSA is bounded by the Peace River and the Dawson Creek TSA in the south. TFL 48 (also known as the Chetwynd TFL) covers 643,000 ha. It consists of five discrete supply blocks, one of which is located south of the Peace River, across from Farrell Creek.

### Table 21.6  Timber Harvesting Land Base and Allowable Annual Cut for Management Units

<table>
<thead>
<tr>
<th>Management Unit</th>
<th>Total Land Area (ha)</th>
<th>Leading Species</th>
<th>THLB in Management Unit (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dawson Creek TSA</td>
<td>2,300,000</td>
<td>Coniferous</td>
<td>469,878</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deciduous</td>
<td>260,342</td>
</tr>
<tr>
<td>Fort St. John TSA</td>
<td>4,700,000</td>
<td>Coniferous</td>
<td>733,221</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deciduous</td>
<td>325,318</td>
</tr>
<tr>
<td>TFL 48</td>
<td>643,000</td>
<td>Coniferous</td>
<td>314,829</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deciduous</td>
<td>48,539</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>7,643,000</strong></td>
<td><strong>N/A</strong></td>
<td><strong>2,152,127</strong></td>
</tr>
</tbody>
</table>

**NOTE:**
- THLB – timber harvesting land base
- N/A – not applicable

**Sources:** BCMFR (2003a, 2003b, 2007a)

Site productivity is an index of the land’s tree growing potential as measured by the height of the tallest trees in a stand at 50 years, expressed as an index. In the Project activity zone, site productivity has been assessed on 15,708 ha, with 0.1% identified as having high growth potential, 67% medium potential and 33% poor (Hillcrest Geographics 2012).

### 21.3.3 Annual Allowable Cut and Timber Harvest Trends

The current AAC for each of the management units in the region is shown in Table 21.7. It is set separately for coniferous and deciduous leading stands. The next AAC determination for the Dawson Creek TSA is scheduled for release in 2012, in 2013 for

**Table 21.7 Allowable Annual Cut for Management Units**

<table>
<thead>
<tr>
<th>Management Unit (MU)</th>
<th>Leading Species</th>
<th>AAC (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dawson Creek TSA</td>
<td>Coniferous</td>
<td>978,000</td>
</tr>
<tr>
<td></td>
<td>Deciduous</td>
<td>882,000</td>
</tr>
<tr>
<td>Fort St. John TSA</td>
<td>Coniferous</td>
<td>1,200,000</td>
</tr>
<tr>
<td></td>
<td>Deciduous</td>
<td>915,000</td>
</tr>
<tr>
<td>TFL 48</td>
<td>Coniferous</td>
<td>800,000</td>
</tr>
<tr>
<td></td>
<td>Deciduous</td>
<td>100,000</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>4,875,000</td>
</tr>
</tbody>
</table>

**NOTE:**

The timber harvest volume between 2003 and 2011 (including non-AAC volume such as private timber) is presented in Figure 21.2. The total harvest available for wood manufacturing has varied widely over the period, climbing to a peak in 2007 at 4.3 million m³ and then falling by approximately 50% to about 2.2 million m³ in 2009. The increased harvest in the Fort St. John TSA after 2006 is attributed to increases in the harvest of aspen with the opening of the oriented strand board mill in Fort St. John. The sharp drop in harvest levels precipitated by the recession in 2008 and 2009 had only partially rebounded by 2011. The average annual harvest volume over the 2003 and 2011 period was 3.363 million m³ per year. It is noted that the total harvest was less than the AAC throughout this period.

From 2003 to 2011, timber volume from private land averaged about 11% of the total harvest volume in the region. The balance of the volume was harvest from provincial Crown land.

Timber harvesting activity in the region is seasonal, with harvest sharply curtailing during April and May when ground conditions are not suitable (Figure 21.3). Harvest more closely matches processing requirements in the summer and early fall. From November to the end of March, harvest volumes peak as mills stockpile logs to satisfy their log input year-round.

**21.3.4 Employment and Stumpage Revenue**

Direct employment in harvesting and manufacturing of timber from the management units has been an estimated 2,250 person-years of employment per year, given the harvest volume averaged over the period 2003 to 2011 (B.C. Ministry of Forests, Lands and Natural Resource Operations 2012). Employment coefficients (direct employment including harvesting, silviculture, and processing) for Fort St. John TSA are estimated at 0.67 person-years; Dawson Creek TSA (and TFL 48) are estimated at 0.71 person-years in total.

Stumpage revenue paid by industry to the provincial government has varied from a high of $46.5 million in 2005 to a low of $3.4 million in 2011. The stumpage rate averaged $5.77 per m³ over the period 2003 to 2011 (B.C. Ministry of Forests, Lands and Natural Resource Operations 2011).
21.3.5 Major Tenure Holders and Regional Timber Manufacturing Industry

Timber manufacturing capacity in the region is summarized in Table 21.8. Approximately two-thirds of the total harvest is linked directly to licensees’ mill operations. The remaining one-third is distributed to the region’s mills through market arrangements. Mills adjust their log sources to minimize log costs and adapt to market conditions, including third-party supply and timber harvested from their own licences.

The four major tenure holders with mill operations in the region are West Fraser Timber, Canadian Forest Products (Canfor), Tembec, and Louisiana Pacific (IFS 2012):

- West Fraser operates a sawmill in Chetwynd, the input log capacity is estimated at 750,000 m³ (coniferous) per year. The company holds a renewable forest licence (volume based) in the Dawson Creek TSA, with an annual allowable harvest of 371,567 m³. The mill’s operating area for harvesting Crown timber is west and south of Chetwynd. It also purchases a large volume of wood from private landowners, the oil and gas industry, community forests, and timber awarded under the B.C. Timber Sales program. The Chetwynd mill is planning to increase its processing capacity to 1.1 million m³ per year and to add a bioenergy plant that would burn wood waste and produce electricity.

- Canfor manufactures the largest wood volume in the region. The company operates a sawmill in Chetwynd with an annual log input capacity of 900,000 m³. The mill obtains most of its wood supply from Tree Farm 48. The TFL’s annual available volume is 900,000 m³, of which 678,782 m³ is apportioned to Canfor, and the remainder to B.C. Timber Sales and other licences. A small portion of the TFL is in the Project activity zone. The mill also purchases wood from private landowners, the oil and gas industry, community forests, and timber awarded under B.C. Timber Sales program.

In the Fort St. John TSA, Canfor operates a sawmill in Fort St. John, a pulp mill in Taylor, and the Peace Valley OSB (oriented strand board) mill in partnership with Louisiana Pacific in Fort St. John. The sawmill, with an input capacity of 1,062,000 m³, obtains its wood supply from north of the Peace River, about half from its own Crown forest licences, and the remainder through purchases from private landowners, the oil and gas industry, and timber awarded under B.C. Timber Sales program. A substantial portion of the log volume heading to the Fort St. John mill moves down the Farrell Creek road and Highway 29. The pulp mill in Taylor relies on residual chips from the sawmill and deciduous wood supply. At capacity production, the oriented strand board mill consumes 1 million m³ of deciduous logs per year. About 50% of the volume is supplied through the joint venture’s pulp wood agreement. The remainder is purchased from private landowners, participants in the B.C. Timber Sales program, the oil and gas industry, and its own tenures.

- Louisiana-Pacific owns an oriented strand board plant in Dawson Creek that is closed pending an improvement in market conditions (Dawson Creek Daily News 2011). When operating, the plant consumes about 600,000 m³ of deciduous logs that are sourced from its Crown licence (pulp wood agreement), purchases of Crown wood, and from private landowners. The plant targets aspen species and obtains a portion of its log supply from the area south of the Peace River (Del Rio area). The company also holds Crown forest licences for deciduous leading stands in the Fort St. John TSA totalling 193,000 m³.
Tembec Industries (Tembec) owns a pulp mill near Chetwynd that closed indefinitely in 2012 (Vancouver Sun 2012). When operating, the mill consumed about 500,000 m³ of deciduous logs harvested from its Crown licence in the Dawson Creek TSA and through a supply agreement with Louisiana-Pacific. About 15% of the mill's supply was purchased from private landowners, B.C. Timber Sales operators, and others. An important log supply area is south of the Peace River.
Table 21.8  Major Tenure Holders, Annual Allowable Cut Volumes and Wood Processing Plants

<table>
<thead>
<tr>
<th>Major Tenure Holders</th>
<th>Management Unit</th>
<th>Annual Crown Licensed Volume (m³)</th>
<th>Wood Processing Plants</th>
<th>Species Utilized b</th>
<th>Annual Log Input at Full Capacity (m³) c</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Fraser</td>
<td>Dawson Creek</td>
<td>371,567</td>
<td>Sawmill, Chetwynd</td>
<td>C</td>
<td>750,000</td>
</tr>
<tr>
<td>Canfor</td>
<td>Dawson Creek</td>
<td>100,000</td>
<td>Sawmill, Chetwynd</td>
<td>C</td>
<td>2,962,000</td>
</tr>
<tr>
<td></td>
<td>TFL 48</td>
<td>678,782</td>
<td>N/A</td>
<td>N/A</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Fort St. John</td>
<td>1,044,952 (500,000 (deciduous))</td>
<td>Sawmill, Fort St. John; OSB plant, Fort St. John; pulp mill, Taylor</td>
<td>C, D, residual chips</td>
<td>NA</td>
</tr>
<tr>
<td>Louisiana-Pacific</td>
<td>Dawson Creek</td>
<td>445,585 (deciduous)</td>
<td>OSB plant, Dawson Creek</td>
<td>D</td>
<td>600,000</td>
</tr>
<tr>
<td></td>
<td>Fort St. John</td>
<td>193,000 (deciduous)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Tembec Industries Ltd.</td>
<td>Dawson Creek</td>
<td>349,584 (deciduous)</td>
<td>Pulp mill, Chetwynd</td>
<td>D</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td>Fort St. John</td>
<td>69,085</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>B.C. Timber Sales</td>
<td>Dawson Creek</td>
<td>401,186</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Fort St. John</td>
<td>622,059</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TFL 48</td>
<td>58,630</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Woodlots</td>
<td>Dawson Creek</td>
<td>32,600</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Fort St. John</td>
<td>36,500</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Community Forest</td>
<td>Dawson Creek</td>
<td>60,000</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Fort St. John</td>
<td>20,000</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total in Management Units</td>
<td></td>
<td>5,180,312</td>
<td>Total log input at full capacity of wood processing plants</td>
<td>5,177,000</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
2. C – coniferous D - deciduous
3. IFS 2012
4. Operations idled at time of writing
5. NA – data not available
Site C Clean Energy Project Environmental Impact Statement  
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Section 21: Forestry

West Moberly First Nations is a joint venture partner with Canfor in two non-replaceable forest licences; Non-Replaceable Forest Licence A57332 with an AAC of 100,000 m³ over a 20-year term in the Dawson Creek TSA and Non-Replaceable Forest Licence A56771 with an AAC of 250,000 m³ over a 20-year term in the Fort St. John TSA.

Dunne-za Ventures LP, wholly owned by West Moberly First Nations, has an agreement with ProAction Corp. to provide timber tenure and development services in the Peace region. The company has undertaken forestry contract services for several companies, including Canfor, Peace Valley OSB, and Louisiana-Pacific (Dunne-za Ventures LP 2012).

Saulteau First Nations owned 4 Evergreen Resources LP undertakes full scale logging under contract, as well as road building and excavation-related services (4 Evergreen Resources LP No date).

B.C. Timber Sales offices in Dawson Creek and Fort St. John are responsible for managing a portion of the Crown forest and making its apportioned wood volume available for auction. The allocations are 400,000 m³ in the Dawson Creek TSA and 620,000 m³ in the Fort St. John TSA. Part of this harvest is undertaken by small processors and logging contractors that sell the logs to mills in the region.

Each mill establishes an input log profile that matches its production requirements, specifying species, diameter, length, and quality. Logs are sorted based on these criteria prior to hauling. Due to the preponderance of mixed stands in the region, logs are actively traded among mills and companies to optimize desired log profiles. Harvest priorities are also determined based on recent mountain pine beetle infestations, with harvesting newly attacked coniferous stands a priority before the stand value deteriorates.

21.3.6 Outlook

Analysis completed for the most recent timber supply review for the Fort St. John TSA indicated that a harvest volume of 2.72 million m³ could be maintained for three decades, after which time it would decline to 2.44 million m³ (BCMFR 2003b). The AAC was set in 2003 at 2.115 million m³. In 2007, the Chief Forester issued a delay order, postponing the next AAC determination to 2013 because he concluded that the current AAC would likely not change with a new determination (BCMFR 2007b). The timber supply analysis for the Dawson Creek TSA is scheduled for completion in late 2012. TFL 48’s current AAC of 900,000 m³ is elevated to salvage pine stands susceptible to mountain pine beetle attack. The timber supply analysis completed for the latest determination indicated that a harvest level of 737,000 m³ could be maintained indefinitely (BCMFR 2007a).

21.4 Effects Assessment

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

- Land use, resource use, access, and activities related to industrial forestry use
- Crown forest management
The Project’s effect on Crown forest management would be addressed by existing processes in which suitable forest lands would be located such that the biodiversity targets would continue to be met. This aspect of the Project was addressed in Section 21.1.3.

Changes in land use, resource use, access, and activities related to industrial forestry use will result in the clearing of merchantable timber from the Project activity zone and the continuing overlap of the Project activity zone on the timber harvesting land base. The changes in the aspect are assessed taking into account the changes in the following key indicators:

- Timber harvesting land base
- Allowable annual cut
- Merchantable timber volume harvested according to the clearing plan
- Harvest trends
- Forest sector employment
- B.C. government stumpage revenue

### 21.4.1.1 Timber Harvesting Land Base

The Project activity zone would overlap the three management units and relatively small areas of THLB in each unit (Table 21.9). The total THLB in the Project activity zone is estimated to be 409.8 ha, distributed over the three management units, or 0.0002% of their THLB. For context, proposed mine developments in the region would typically have greater effects on THLB (B.C. Ministry of Forests, Lands and Natural Resource Operations, Project Manager 2012, pers. comm.)

#### Table 21.9 Potential Timber Harvesting Land Base in the Project Activity Zone

<table>
<thead>
<tr>
<th>Classification</th>
<th>Overlap by Management Unit (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dawson Creek</td>
</tr>
<tr>
<td>Project activity zone</td>
<td>7,201.7</td>
</tr>
<tr>
<td>Timber Harvesting Land Base in Project activity zone</td>
<td>132.0</td>
</tr>
</tbody>
</table>

**NOTE:**

Source: IFS 2012

### 21.4.1.2 Annual Allowable Cut

Reductions in the THLB could result in reductions in the AAC. The estimated total AAC contribution of the THLB in the Project activity zone is 933 m³ per year, shown in Table 21.9, or 0.02% of the AAC in each management unit. A reduction of this magnitude would not be expected to trigger a reduction of harvest quotas contained in forest tenures held by industry to cut timber in the management unit (B.C. Ministry of Forests, Lands and Natural Resource Operations, Project Manager 2012, pers. comm.). Hence, there would be no expected change in harvest volumes and associated economic activity due to the Project overlap with THLB.
Table 21.10 Potential Change to AAC

<table>
<thead>
<tr>
<th>Forest Management Unit</th>
<th>Estimated AAC Contribution of THLB in Project Activity Zone (m$^3$/year)</th>
<th>AAC Impact as Percent of Management Unit AAC $^a$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort St. John TSA</td>
<td>381</td>
<td>0.02</td>
</tr>
<tr>
<td>Dawson Creek TSA</td>
<td>336</td>
<td>0.02</td>
</tr>
<tr>
<td>TFL 48</td>
<td>216</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>933</strong></td>
<td><strong>0.02</strong></td>
</tr>
</tbody>
</table>

**NOTES:**

$^a$ Percentage estimated by dividing the AAC effect shown in this table by the Management Unit’s AAC reported in Table 21.7, which are the sums of the coniferous and deciduous volumes

**Source:** IFS 2012

The project’s transmission line right-of-way and Del Rio off-site material source location would overlap approximately 7 ha of the area of a woodlot licence. Mitigation for the woodlot licensee would be addressed by B.C. Ministry of Forests, Lands and Natural Resource Operations by providing a suitable replacement area such that the potential reduction associated with the Project is fully offset (B.C. Ministry of Forests, Lands and Natural Resource Operations, Project Manager 2012, pers. comm.).

21.4.1.3 Merchantable Timber from Project Clearing Plan

The expected volume of merchantable timber to be cleared within the Project activity zone, by year and by project component, is summarized in Table 21.11. The harvest volume of merchantable timber would be made available in Years 1 to 4 of construction. The total estimated volume is 1.4 million m$^3$, with about 80% of that volume being available in Years 1 and 2. Further information on the timber volume, areas, and species that would be cleared is available in Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan.
Table 21.11 Merchandable Volume by Year and Project Activity Zone

<table>
<thead>
<tr>
<th>Year</th>
<th>Project Activity Zone</th>
<th>Merchandable Volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dam Site</td>
<td>292,618</td>
</tr>
<tr>
<td></td>
<td>Highway 29 Realignment</td>
<td>9,515</td>
</tr>
<tr>
<td></td>
<td>Construction Material Sites</td>
<td>5,695</td>
</tr>
<tr>
<td></td>
<td>Access Road</td>
<td>11,864</td>
</tr>
<tr>
<td></td>
<td>Reservoir</td>
<td>127,922</td>
</tr>
<tr>
<td>2</td>
<td>Construction Material Sites</td>
<td>60,180</td>
</tr>
<tr>
<td></td>
<td>Access Road</td>
<td>9,203</td>
</tr>
<tr>
<td></td>
<td>Reservoir</td>
<td>208,419</td>
</tr>
<tr>
<td></td>
<td>Transmission Corridor</td>
<td>130,808</td>
</tr>
<tr>
<td>3</td>
<td>Highway 29 Realignment</td>
<td>14,470</td>
</tr>
<tr>
<td></td>
<td>Construction Material Sites</td>
<td>23,581</td>
</tr>
<tr>
<td></td>
<td>Access Road</td>
<td>9,161</td>
</tr>
<tr>
<td></td>
<td>Reservoir</td>
<td>188,933</td>
</tr>
<tr>
<td></td>
<td>Access Road</td>
<td>11,367</td>
</tr>
<tr>
<td>4</td>
<td>Reservoir</td>
<td>310,307</td>
</tr>
<tr>
<td>All Years</td>
<td>Dam Site</td>
<td>292,618</td>
</tr>
<tr>
<td></td>
<td>Highway 29 Realignment</td>
<td>23,986</td>
</tr>
<tr>
<td></td>
<td>Construction Material Sites</td>
<td>89,455</td>
</tr>
<tr>
<td></td>
<td>Access Road</td>
<td>41,594</td>
</tr>
<tr>
<td></td>
<td>Reservoir</td>
<td>835,580</td>
</tr>
<tr>
<td></td>
<td>Transmission Corridor</td>
<td>130,808</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td>1,414,042</td>
</tr>
</tbody>
</table>

NOTE: The majority of the merchantable timber cleared would only be available for harvest if the Project proceeds, as it is not located in the current THLB; therefore, clearing of this volume would be net incremental volume.

21.4.1.4 Mill Capacity and Harvest Trends

The existing regional forest industry (i.e., within a 100 km radius of the proposed Project) has the capacity to utilize all of the merchantable wood that would be harvested for Project clearing purposes. The merchantable volume from the Project clearing activities would equate to approximately 33% of the forest industry's annual deciduous volume demand and 15% of the annual coniferous log demand (IFS 2012), with the volume mostly distributed over Years 1 and 2 of Project construction. Mills currently purchase about 25% to 30% of their logs from the market; hence, the Project volume may be expected to compete within the established regional market. Given market process, the Project volume may displace higher cost wood sources for the several years the clearing plan is in operation, or incrementally increase total harvest volume if the industry is supply constrained at the time the clearing volume comes to market. As noted in the baseline, recent harvest volume has been consistently less than the licence volume available. Therefore, the Project would not be expected to change overall harvest trends in the region, as annual fibre sources to mills are commonly influenced by market supply and price factors.
21.4.1.5 Forest Sector Employment

The merchantable volume would support employment in the logging and wood manufacturing industries. The logging employment is embedded in the Project construction employment estimates, but manufacturing employment is not. It is estimated that a total of 570 person-years of employment would be supported in regional mills in processing the timber from the Project clearing plan (B.C. Ministry of Forests, Lands and Natural Resource Operations 2012). If the logs from the clearing plan are displacing higher cost logs, employment in both the harvesting and milling phases would exist at about the same magnitude without the Project.

21.4.1.6 Government Revenue

The merchantable timber would be subject to stumpage charge, as determined by application of the Interior Appraisal Manual and policies that apply at the time of harvest. The determination of the stumpage rate using the Interior Appraisal Manual is in accordance with the Canada/U.S. Softwood Lumber Agreement. The revenue collected would add incrementally to government revenue.

21.5 Summary of Effects Assessment and Mitigation Measures

The Project's potential to adversely affect forestry was assessed with respect to its effect on two aspects: 1) land use, resource use and related forestry use and 2) forest management. The Project activity zone overlaps a relatively small amount of THLB, or the land base on which industrial forestry activity would occur. The total of some 410 ha accounts for less than 0.02% of the industry's total THLB. It follows from the negligible land effect that there would be no effect on the AAC or the licence quotas held by industry to harvest Crown timber. A portion of area-based woodlot licence is overlapped by the Project activity zone but suitable replacement land would be made available by B.C. Ministry of Forests, Lands and Natural Resource Operations. There is no adverse residual effect on forestry associated with the Project’s effects on land use and activities related to forest industry use.

The LAA’s established timber mills have the capacity to process the merchantable timber volumes associated with the clearing volumes. Mills may obtain the timber through established market arrangements (e.g., bid on a harvesting contract or purchase logs from an independent logger).

The Project activity zone overlaps four OGMAs, which were established to achieve biodiversity targets for each TSA. The B.C. Ministry of Forests, Lands and Natural Resource Operations would address this effect by existing procedures and policies that would result in fully mitigating the potential Project effects such that the biodiversity targets would continue to be met.

No residual effects are anticipated for forestry; therefore, no mitigation measures are required.
Table 21.12  Project Effects and Mitigation Measures on Forestry

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and Operations</td>
<td>Change in land use, resource use, access, and activities related to industrial forestry use</td>
<td>No change anticipated to industrial forest use</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Construction and Operations</td>
<td>Change in land use that affects Crown Forest Management</td>
<td>The province would use existing policies to manage changes to Old Growth Management Areas and one wood lot license area</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

NOTE:  
N/A – not applicable  
As referenced in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements, BC Hydro will discuss any overlap with the Project activity zone and the area within the impact lines with affected forest operators and, where appropriate, enter into agreements regarding potential conflicts. This mitigation measure is considered standard mitigation, per Volume 3 Section 23 Minerals and Aggregates, Section 23.1.3 Standard Mitigation Measures and Effects Addressed.

21.5.1  Other Mitigation Options Considered  
There were no other mitigation measures considered by BC Hydro for effects on Forestry.

21.6  Residual Effects  
No residual effects are anticipated, as no project effects were identified.

21.7  Cumulative Effects Assessment  
No cumulative effects are anticipated, because no residual effects are anticipated.

21.8  Monitoring and Follow-Up  
Monitoring and follow-up is not required for forestry.
References

Literature Cited

Internet Sites

1 B.C. Ministry of Citizens’ Services and Open Government. 2012. A Guide to the BC Economy and
Labour Market. Northeast Region. Table 14. Victoria, B.C. Available at


3 B.C. Ministry of Forests, Lands and Natural Resource Operations. 2012a. Apportionment and
Commitments. Available at:
November 2012.


Personal Communications

5 B.C. Ministry of Forests, Lands and Natural Resource Operations. 2011. Project Manager,

6 B.C. Ministry of Forests, Lands and Natural Resource Operations. 2012. Project Manager,

In-person interview November 2011.

Telephone conversation May 2012.
22 OIL, GAS, AND ENERGY

22.1 Approach
The Project would physically overlap areas where oil and gas exploration and development occurs. The Project’s use of land was assessed on the valued component (VC) of oil, gas, and energy, considering the Project’s interactions with the land base and with the oil, gas, and energy industry activity.

22.1.1 Regulatory and Policy Setting
The assessment was prepared in accordance with Section 16.4 of the Site C Clean Energy Project Environmental Impact Statement Guidelines (the Minister of Environment of Canada and the Executive Director of the BCEAO 2012) (EIS Guidelines).

Oil, gas and energy activity in the province is the responsibility of the B.C. Ministry of Energy, Mines and Natural Gas and the B.C. Oil and Gas Commission (BCOGC), and is regulated through the following primary legislation:

- **The Petroleum and Natural Gas Act** – provides the framework for the administration of Crown-owned subsurface petroleum and natural gas rights. The Act deals with most aspects of entry, geophysical exploration (including permits), leases, tenures, taxation, royalties, and conservation.

- **The Oil and Gas Activities Act** – consolidates the powers and duties of the BCOGC as well as the rules regulating persons carrying out an oil and gas activity in the province. The BCOGC was established as a Crown corporation to regulate upstream oil and gas activity in B.C., including exploration, development, pipeline transportation to facilities, and reclamation activities. Regulatory authority is derived from numerous other acts and legislation. While petroleum and natural gas rights provide the right to the subsurface petroleum and natural gas resources, all exploration and development activities conducted on petroleum and natural gas tenures, including well drilling, pipeline, and facility or road construction, are authorized and regulated by the **Oil and Gas Activities Act**.

- **Clean Energy Act** – guides government, BC Hydro and the British Columbia Utilities Commission in advancing the province’s sustainable energy vision. Key objectives include electricity self-sufficiency, promoting economic development, reducing greenhouse gas emissions, and investing in new clean and renewable energy.

B.C. has jurisdiction over the generation, transmission, and distribution of electricity within its provincial boundaries. Primary legislative authority over these activities in B.C. is provided through the:

- **Hydro and Power Authority Act**
- **Transmission Corporation Act**
- **BC Hydro Public Power Legacy and Heritage Contract Act**
- **Utilities Commission Act**

The undertaking of oil, gas, and energy projects is also subject to other legislation, depending on the nature of the activity.
The federal National Energy Board (NEB) regulates the international and interprovincial aspects of the oil, gas, and electric utility industries. The purpose of the NEB is to regulate pipelines, energy development, and trade in the Canadian public interest.

### 22.1.2 Key Issues and Identification of Project Effects

A review of public consultation materials and information requests to BC Hydro from regulatory agencies, the public, and Aboriginal groups regarding the draft EIS Guidelines did not identify potential adverse effects on oil, gas, and energy as a result of the Project. BC Hydro’s technical engagement process with local government also did not identify any potential effects of the Project on the industry (See Volume 1 Section 9 Information Distribution and Consultation).

Nevertheless, the industry does actively use the proposed Project activity zone for exploration and development, and infrastructure is in place. Discussions with government and industry indicated that there are oil, gas, and energy interests in the Project activity zone and that overlaps exist.

The key issues for industry, as identified in Table 22.1, are project construction activities that would result in a physical loss of land, and change in access to or use of the land base for oil, gas, and energy industry activity and development.

Industry also identified the potential for traffic conflicts resulting from the Highway 29 realignment, and the development and use of construction access roads on the north banks. Both potential effects are considered in other sections of the EIS. Regarding north and south bank activity, any overlap or conflict between existing third-party tenure holders and BC Hydro’s proposed activities, or BC Hydro’s required tenure over Crown land, would be addressed through discussions and, where appropriate, agreements with the tenure holders to address any potential project effects noted in Table 22.2. Further information about third-party Crown land tenures is available in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.
## Table 22.1  Key Issues: Oil, Gas, and Energy

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
</table>
| The Project would inundate or otherwise physically displace infrastructure, including wells and pipelines in the Project activity zone.                                                                                                                                   | ▪ A geographic information systems analysis of government tenures and resource estimates was undertaken to identify spatial overlaps, as well as tenure status, type, and ownership.  
▪ Discussions were conducted with government and industry to identify potential effects and mitigation options.  
▪ Addressed as one of two potential effects in this assessment.  
▪ As further outlined in Volume 2 Section 11.3, Land Status, Tenure, and Project Requirements, BC Hydro would address any overlap on Crown land between third-party tenures and BC Hydro’s proposed tenure through discussions and, where appropriate, agreements with the tenure holders.                                                                                                                                                                                                 |
| Project could affect access to subsurface resources and future development potential in the Project activity zone.                                                                                                                      | ▪ A geographic information systems analysis of government tenures and resource estimates was undertaken to identify spatial overlaps, as well as tenure status, type, and ownership.  
▪ Discussions were conducted with government and industry to identify potential effects and the need for mitigation, with a focus on how the Project might affect current and future production activity.  
▪ Addressed as one of two potential effects in this assessment.                                                                                                                                                                                                                                                                                                                                 |
| Project activities could interrupt industry activities on the north bank of the Peace River due to use of petroleum development roads that increase traffic risk and the development of temporary access roads that cross pipelines and other infrastructure. | ▪ As indicated in Volume 2 Section 11.3, Land Status, Tenure, and Project Requirements, BC Hydro would address any overlap on Crown land between third-party tenures and BC Hydro’s proposed tenure through discussions and, where appropriate, agreements with the tenure holders.  
▪ Traffic-related issues would be addressed by BC Hydro by entering into road use agreements with the oil and gas industry (also outlined in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements) and through implementation of the Transportation Management Plan (Volume 5 Section 35 Summary of Environmental Management Plans).                                                                                                                                                                                                 |
| Highway 29 realignment would interact with the transport of oil and gas industry workers.                                                                                                                                                                                                                                           | ▪ Transportation and traffic issues are assessed in Volume 4 Section 31 Transportation, and mitigation will be implemented through implementation of the Transportation Management Plan (Volume 5 Section 35 Summary of Environmental Management Plans).                                                                                                                                                                                                                                                                 |
| Project would limit fracking activity in the vicinity of the Site C dam site due to seismic concerns.                                                                                                                                                                                                                           | ▪ BC Hydro will not be requesting restrictions on fracking activity in the Site C reservoir or Site C dam site area.                                                                                                                                                                                                                                                                                                                                 |
• Access and activities for the oil, gas, and energy sectors

Potential project interactions with oil, gas and energy are summarized in Volume 2 Appendix A Project Interactions Matrix, Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a rank of “2” was given where interactions may result in an adverse effect and the nature of the effect and/or the effectiveness of mitigation measures is uncertain. These interactions were taken forward through the effects assessment.

Project interactions that were ranked as “2” for oil, gas, and energy are summarized in Table 22.2.

Table 22.2 Interactions of the Project with Oil, Gas, and Energy

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land and resource use</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>Dam and Generating Station Construction</td>
<td>✓</td>
</tr>
<tr>
<td>Reservoir Preparation and Filling</td>
<td>✓</td>
</tr>
<tr>
<td>Transmission System</td>
<td>✓</td>
</tr>
<tr>
<td>Quarried and Excavated Material Source Development</td>
<td>✓</td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td>✓</td>
</tr>
<tr>
<td>Construction Access Road Development</td>
<td>✓</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
</tr>
<tr>
<td>Operation of the powerhouse, substation, and Site C reservoir; includes downstream water management</td>
<td>✓</td>
</tr>
</tbody>
</table>

22.1.3 Standard Mitigation Measures and Effects Addressed

A “0” ranking in Table 2 in Volume 2 Appendix A Project Interactions Matrix means that there is no predicted interaction between a Project component and the VC. A “0” ranking was given to the following construction activities:

• Supply and transportation of goods and services for camp
• In-community accommodation
• Temporary accommodation – Site C dam site
• RV parks

A “0” ranking was also assigned to all but one of the operating activities or components. However, water temperature and sediment conditions may interact with the Spectra water intake downstream of the Site C dam at Taylor. This interaction is further evaluated in this assessment.

A “1” ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. These interactions were not carried forward through the effects assessment.
A “1” ranking was applied to the southern and northern regional temporary accommodation activities because, while there is expected to be spatial overlaps with oil, gas, and energy, the tenures necessary to construct and operate them will be part of the Project’s overall tenuring processing and related mitigation, as outlined in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

Oil, gas, and energy development activities that may be proposed for lands adjacent to the reservoir have the potential to be affected by the Project. These lands, defined spatially as the reservoir impact lines, are discussed in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines.

There may be potential effects related to flooding, erosion, instability, and landslide-generated waves on these lands. BC Hydro would notify the tenure holder of the nature of the particular effect when contacted through the established referral process managed by the B.C. Ministry of Energy, Mines and Natural Gas, and the B.C. Oil and Gas Commission.

Any overlap or conflict between existing third-party tenure holders and BC Hydro’s proposed activities, or BC Hydro’s required tenure over Crown land, will be addressed through discussions, and where appropriate, agreements with the tenure holders as described in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

### 22.1.4 Selection of Key Indicators

Key indicators for the oil, gas, and energy VC include measures relevant to potential changes to land and resource use and to industry activity. Existing Crown tenures that allow industry to explore and place infrastructure on the land base are used to characterize land and resource use. Measures of industry exploration and development activity, and estimates of future resource potential are indicators that demonstrate change in access and industry activity. In this assessment, access is defined in the broad sense to mean the ability to develop resources as allowed by the terms of petroleum and natural gas tenures issued by government.

The key indicators used in the assessment of potential effects on the oil and gas industry are listed in Table 22.3.

### Table 22.3 Key Indicators for Oil, Gas, and Energy

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land and resource use</td>
<td>Tenured oil, gas, and energy activities, operations, and facilities</td>
<td>Tenured activities identify spatial areas of current or anticipated industry activity</td>
</tr>
<tr>
<td>Access and activities for the oil, gas, and energy sectors</td>
<td>Production activity Industry characteristics, including new extraction technologies</td>
<td>Development activity and potential could be adversely affected in the future if access to the resources is impaired</td>
</tr>
</tbody>
</table>
22.1.5 Spatial and Temporal Boundaries

22.1.5.1 Spatial Boundaries

The Local Assessment Area (LAA) and Regional Assessment Area (RAA) in the EIS Guidelines for the assessment of the VC of oil, gas and energy is the Project activity zone. The areas used for reporting in this assessment were updated from the originally proposed spatial boundaries in the EIS Guidelines. The LAA, which consists of the Project activity zone, the area within the Five-Year Beach Line, and Spectra Energy’s water intake in the Peace River just south of Taylor, is the area where physical changes to the land base or changes to land use would interact with oil, gas, and energy activity. The Five-Year Beach Line is the extent of reservoir clearing and the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir, as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines.

The regional RAA is the same as the LAA.

Spatial boundaries are shown in Table 22.4 and illustrated in Figure 22.1.

Table 22.4 Spatial Assessment Areas for Oil, Gas, and Energy

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project activity zone, area within Five-Year Beach Line and Spectra Energy’s Taylor water intake</td>
<td>Project activity zone, area within Five-Year Beach Line and Spectra Energy’s Taylor water intake</td>
</tr>
</tbody>
</table>

22.1.5.2 Temporal Boundaries

Project interactions would occur during the full eight-year construction period. They would commence during early years of construction, fully materialize at Site C reservoir filling, and continue indefinitely, as the Site C reservoir and Site C dam are assumed to operate in perpetuity.

New or incremental effects during operations are only anticipated for the Spectra water intake, due to potential changes in water conditions.

22.2 Information Sources and Methodology

22.2.1 Review of Existing Information

The profile of the oil and gas sector in the LAA was compiled based on provincial licence and permit data. The Canadian Association of Petroleum Producers (CAPP) statistical tables were used for describing the regional and provincial industry context. Reports from government and BC Hydro were reviewed for information pertaining to future energy development and issues concerning land use and tenure.

22.2.2 Interviews

Interviews were conducted with representatives of the B.C. Ministry of Energy, Mines and Natural Gas, the BCOGC, local government, and with licensees to obtain information on baseline conditions, perspectives on key issues, and project interactions. Volume 3
Appendix C Land and Resource Use Assessment Supporting Documentation, Part 1 Land and Resource Use Assessment Interview Methodology provides details of the interview methodology. Personal communications are listed in References at the end of this section.

22.2.3 Data Management, Mapping, and Modelling

A spatial analysis was undertaken to identify the overlap between the Project activity zone and the area within the reservoir impact lines and oil, gas, and energy activity. Oil, gas, and energy resource potential; Crown tenures; exploration and development sites; and facilities for the exploration, production, distribution and transmission of oil, gas, and energy resources were identified.

Data were geospatially represented using Geographic Information System (GIS) analysis. The GIS results were also used for figure preparation.

22.2.4 Aboriginal Community and Traditional Knowledge

Aboriginal community and traditional knowledge related to the oil, gas, and energy VC was gained through review of results of BC Hydro’s consultation with Aboriginal groups and review of First Nations community baseline studies prepared by the following First Nations:

- Doig River First Nation
- Halfway River First Nation
- Prophet River First Nation
- West Moberly First Nations

While the communities and traditional territories of the Blueberry First Nations and Saulteau First Nations are in or near the boundaries of the LAA (and by extension, the RAA), BC Hydro had not received community baseline information from them at the time of writing.

Baseline information and data, as well as First Nations concerns and interests relevant to oil, gas, and energy, are incorporated in the baseline and effects assessment sections. The First Nations community baseline reports are provided in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

BC Hydro’s approach to gathering community-based social and economic data with First Nations is described in Volume 3 Appendix B First Nations Community Baseline Reports, Part 1 Approach to Gathering and Integrating Community Baseline Information.

22.3 Baseline Conditions

Oil, gas and energy includes the oil and gas industry, and other forms of energy production, which, in the northeast region of B.C., includes small-scale hydro, wind power, and biomass energy.
22.3.1 Regional Overview of Production

The province is the second-largest natural gas producer in Canada. The industry in northeast B.C. is primarily focused on the upstream activities of exploration and production of petroleum commodities. A small component of the industry is part of the midstream sector (pipeline transportation, storage, and sulphur extraction). The downstream sector (refining, distribution, and petrochemical production) does not exist in the northeast.

The northeast is the only area of B.C. producing commercial quantities of oil and gas, and it accounts for the majority of exploration and development activity (B.C. Ministry of Energy, Mines and Natural Gas 2012a) in the province. Major gas discoveries in the last decade have consistently increased annual reserve estimates (B.C. Ministry of Energy, Mines and Petroleum Resources 2010a). According to the 2006 Census, over 8,492 jobs were attributable to oil and gas and mining activities in the northeast, while in the Fort St. John area, one-third of all community income was derived from the oil and gas industry (Horne 2009).

Increased gas production is expected in the future, as companies have increased the amount of land they are leasing from the provincial government, and as new discoveries are made (CAPP 2011a). The gas industry invested close to $30 billion in B.C. between 2001 and 2009, resulting in 34,000 direct and indirect jobs (Collyer 2009).

Activity is dominated by Alberta-based companies. The B.C. component is made up of services that support the exploration, drilling, production, and servicing of the thousands of wells across the region. These businesses are generally contractors to the major oil and drilling companies.

Gathering and processing facilities tend to be located as close as possible to producing areas. There are three major gas plants in B.C. located in Taylor, in Fort Nelson, and near Chetwynd. Three main gathering systems deliver crude oil and natural gas liquids to facilities at Taylor. There are no oil refineries in the region, and the majority of the oil is transported by pipeline to Kamloops, and then to Vancouver and Washington area refineries via Kinder Morgan’s Trans Mountain Pipeline. A small percentage is processed in Prince George. Further information about the oil and gas industry production activity and characteristics are discussed in Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 3 Oil, Gas, and Energy Exploration and Production Activity.

22.3.2 Production in the Peace River Area

The Montney Play region, which is one of northeast’s most active exploration and development areas for unconventional gas deposits, includes the area of the Peace River between Fort St. John and Hudson’s Hope. A summary of recent industry activity is presented in Figure 22.2. Exploration and development focus on the Upper and Lower Montney using horizontal drilling techniques, but proven production is primarily in the Upper Montney in the Dawson Creek/Fort St. John area (B.C. Ministry of Energy, Mines and Petroleum Resources 2010b).

Wells for conventional and unconventional resources are dispersed throughout the region, and while indicated tenure areas and production zones are mostly east of the proposed Site C dam site, a development cluster is located on the plateau above the south banks of the Peace River in the Monias area, approximately 25 km southwest of Fort St. John. Major
producing areas other than Monias, including Swan, Dawson, and Saturn, are all south of the LAA in the Dawson Creek area.

While conventional production and reserve additions have been on the decline over the past decade, development of B.C.’s unconventional gas deposits has increased and is responsible for the increasing reserve additions. The Montney continues to be the most active natural gas play in B.C., accounting for 26% of the total production within the province (BCOGC 2011).

There is no coalbed methane production in B.C. at this time.

### 22.3.3 Tenured Oil and Gas Facilities in the LAA

Data in Table 22.5 indicates a total of six wells and eight facilities within the LAA, representing 0.03% and 0.07% of the total Peace River Regional District count, respectively. Most wells have joint ownership licensees, including Terra Energy Corp., Penn West Petroleum Ltd., Arc Resources Ltd., Canada Natural Resources Limited, and Pioneer Natural Resources Inc.

Petroleum rights-of-way totalling 2.9 ha are within the LAA, representing 0.02% of the total area allocated to pipeline rights-of-way in the Peace River Regional District. Ten separate rights of way are affected. The licensees include Spectra Energy, Canadian Natural Resources Ltd., Terra Energy Corp., Petrobakken Energy Ltd., and Penn West Petroleum Ltd.

The locations of these facilities are shown in Figure 22.3.

### Table 22.5 Oil and Gas Facilities in the LAA and Peace River Regional District

<table>
<thead>
<tr>
<th>Facility</th>
<th>LAA</th>
<th>PRRD</th>
<th>LAA as % of PRRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and gas wells (count)</td>
<td>6</td>
<td>20,918</td>
<td>0.03</td>
</tr>
<tr>
<td>Oil and gas facilities (count)</td>
<td>8</td>
<td>10,891</td>
<td>0.07</td>
</tr>
<tr>
<td>Oil and gas pipelines (right-of-way) (hectares)</td>
<td>2.9</td>
<td>16,381</td>
<td>0.02</td>
</tr>
</tbody>
</table>

**NOTE:**
Source: Hillcrest Geographics (2012)

### 22.3.4 Petroleum and Natural Gas Tenures in the LAA

A list of the top five licensees for petroleum and natural gas titles falling inside the LAA is shown in Table 22.6. The total number of licensees is 24 companies, and they include coalbed methane developers, land companies acting on behalf of producers, large integrated producers, and junior companies. These tenures have been issued from 1955 to the current year and have remained active through a combination of competitive bids (new tenures), conversions, extensions, and renewals. All tenures that fall within the provincial Order-in-Council reserve are advertised as such by government.
22.3.5 Extraction Technologies

The oil and gas sector in B.C. is developing and adopting innovative technologies for extracting energy resources, with a focus on directional drilling as an alternative to conventional vertical drilling methods. Directional drilling can allow companies to tap deposits of oil and gas at almost any depth from drilling sites up to 10 km away from the resource. Directional drilling has proven technically and economically feasible for tight gas and coalbed methane gas resources with high potential in the region. These new technologies have not only proven to substantially increase producible reserves, but they are often more profitable than vertical drilling (Molvar 2003). An illustration of the drilling techniques used in the northeast is presented in Figure 22.4.

In the Montney, companies drill vertical wells and then drill across or horizontally, which allows for higher levels of production. The cost of drilling a horizontal well is roughly double that of a vertical well, but new fracturing techniques have made shale plays profitable (Shale News 2012). Drilling operations are more streamlined than conventional vertical methods, with fit-for-purpose rigs, multi-well drilling pads, and a manufacturing-style approach to all operations (gas factories). This has allowed continuous cost improvements and enhanced competitiveness during a period of low commodity prices (Conrad 2010).

Access to the subsurface resource delineated in the petroleum and natural gas tenure does not necessarily occur within the surface area defined for that tenure, and in some cases surface access is not allowed. Licensees can access the resource by occupying other Crown or private land for drilling activities (B.C. Ministry of Energy, Mines and Natural Gas, Director of Resource Development 2012, pers. comm.).

In North Dakota, oil companies have begun tapping crude oil and gas underneath Lake Sakakawea (the state’s biggest lake) using advanced horizontal drill techniques. The federal government created the 180-mi.-long reservoir when the Garrison Dam was built on the Missouri River in the 1950s. The lake flooded more than 60,703 ha and has more than 2,736 km of shoreline. With the new technologies, wells can be situated at an environmentally safe distance from shore, drilled vertically to about 3,048 m, and then pushed an equal distance horizontally to reach the resource (MacPherson 2008).

In northeast B.C., new oil and gas tenures are available in protected areas designated as candidates for directional drilling, although tenures are only issued with a condition of no
surface disturbance. Directional drilling is a requirement for all drilling taking place near the proposed Peace River Boudreau Lake proposed protected area (B.C. Ministry of Forests, Lands and Natural Resource Operations 1999). It is also increasingly used to access the unconventional resources in the Montney play. The majority of drilling is now using directional methods (BCOGC, Area Director 2011 pers. comm.). However, directional drilling techniques are not being used by the licensee exploring for coalbed methane in the LAA (Jones 2012, pers. comm.).

22.3.6 Other Energy Developments in the Peace Region

The renewable energy potential of the Peace region is among the highest of the province’s development regions, due to wind power resource and small and large hydro-electric resources. The B.C. Ministry of Energy, Mines and Natural Gas estimates the Peace River Development Region’s potential for small hydro at 258 MW and the potential for wind power at 6,256 MW (B.C. Ministry of Energy, Mines and Natural Gas 2012b).

BC Hydro classifies micro hydro developments as those with an installed capacity of less than 2 MW (2,000 kW) and small hydro developments as those with an installed capacity of between 2 and 50 MW. BC Hydro has signed electricity purchase agreements for 19 small hydro projects to be owned, built, and operated by independent power producers (BC Hydro 2012). None are situated in northeast B.C. and no water licences for power purposes exist in the LAA (Table 22.7).

Table 22.7 Water and Wind Licences in the LAA

<table>
<thead>
<tr>
<th>Licence</th>
<th>Five-Year Beach Line</th>
<th>Site C Dam Site Area</th>
<th>Transmission Line</th>
<th>Construction Access Roads</th>
<th>Quarried &amp; Excavated Materials</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power-commercial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Wind Power (count)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

NOTES:

a Five-Year Beach Line is the predicted position of the toe of the bluff at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

b Site C dam site and substation construction areas and restricted access zones as described in Volume 1 Section 4 Project Description
c Transmission line corridor and one-time clearing areas as described in Volume 1 Section 4 Project Description
d Permanent and temporary roads, and Highway 29 realignment as described in Volume 1 Section 4 Project Description
e Off-site construction material sources as described in Volume 1 Section 4 Project Description

Source: Hillcrest Geographics (2012)

In 2008, the wind energy potential, including investigative sites, wind energy regime, and total energy capacity, was assessed for all B.C. regions. Development potential was favorable and attributable to high wind speeds and the unidirectional nature of the wind regimes, which are able to deliver an overall lower cost of energy. A total of 96 investigative sites were identified for the Peace region, the large majority of which were located in elevated areas to maximize terrain speedup (Garrad Hassan Canada Inc. 2008). The nearest sites identified were approximately 20 km north of Hudson’s Hope.
BC Hydro has signed Electricity Purchase Agreements with several existing and proposed wind farms in B.C., most of which are in the Peace River region. The Bear Mountain Wind Park near Dawson Creek was commissioned in 2009, and the Dokie Wind Project near Chetwynd began operating in 2011. The Dokie Wind Project is owned by a partnership of Alterra Power and Halfway River First Nation, McLeod Lake Indian Band, Saulteau First Nations, and West Moberly First Nations. Quality Wind Project (Tumbler Ridge) is a 142 MW wind farm under construction that is due to begin commercial operation late in 2012. Another eight proposed wind farms are in various stages of pre-development planning. Most are located near Tumbler Ridge or Chetwynd. The nearest development, the Hackney Hills Wind Project, is located 50 km northwest of Hudson’s Hope. There are no wind power licences in the LAA (Table 22.7).

The First Nations Clean Energy Business Fund was created in 2010 to support First Nations and new power projects. The provincial government contributed an initial $5 million to the Fund and will contribute a percentage of land and water rentals generated by eligible projects until the fund becomes self-supporting in the future. To date, the fund has provided $1.97 million to 41 Aboriginal communities in B.C. to support First Nations participation in the clean energy sector (BCMARR 2012). In the third round of funding from the fund, the Treaty 8 Tribal Council in Fort St. John received $40,000 to determine the engineering, preliminary construction, and economic feasibility of moving the Mt. Lavitah Wind Farm project to the next phase. Mt. Lavitah is in the Fraser–Fort George Regional District, adjacent to Highway 97, approximately 18 km northeast of the Mackenzie junction. There are no proposed developments in the LAA.

A 2010 assessment of wood-based biomass energy potential indicated that there is supply potential in the Peace River region to support an electrical generating facility in Chetwynd in the future (IFS 2010). No potential for facility development was identified for the LAA.

22.3.7 Oil, Gas, and Energy Outlook

As discussed above, there is little or no potential for future development of micro and small hydro, wind power, and biomass in and near the LAA.

The Peace River corridor has oil, gas, and energy potential that will support the ongoing growth of the industry. Estimates of marketable oil and gas reserves in B.C. as of 2009 are shown in Table 22.8. The majority of these resources are located in northeast B.C., where current industry activity, investment, and future production plans are focused.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Category</th>
<th>Unit</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas (2010)</td>
<td>Remaining established reserves</td>
<td>Million m³</td>
<td>931,971</td>
</tr>
<tr>
<td>Crude oil (2010)</td>
<td>Remaining established reserves</td>
<td>Thousand m³</td>
<td>18,653</td>
</tr>
<tr>
<td>Natural gas liquids (2009)</td>
<td>Remaining established reserves</td>
<td>Thousand m³</td>
<td>25,863</td>
</tr>
<tr>
<td>Pentanes plus (2009)</td>
<td>Remaining established reserves</td>
<td>Thousand m³</td>
<td>9,959</td>
</tr>
</tbody>
</table>

NOTE: Remaining established reserves are those recoverable under current technology and present and anticipated economic conditions. Source: CAPP (2011b); BCOGC (2011)
Unconventional gas holds the highest potential for remaining technically recoverable natural gas resources in the northeast (CAPP 2011b). Advances in drilling and fracturing technology have turned worldwide attention to several B.C. areas, including the Montney play.

Persistent low natural gas prices and excess supply in North America have curtailed development activity in the Montney in 2012 as major producers implement production cuts. The decline is reflected in lower proceeds for petroleum and natural gas rights, and royalty payments to government.

Industry and government continue to investigate new and expanded targets for the province’s gas productions, with a focus on higher-priced markets in Asia. Planned Liquefied Natural Gas plants on the west coast would provide new market opportunities for producers in northeast B.C. New Asian investment in the industry and the revenue potential of the Montney’s wet gas resource are other factors that are expected to keep investment and production buoyant in the regional oil and gas sector (Hamilton 2012).

Land use constraints on the oil, gas, and energy sector in the vicinity of the LAA would change if the Peace River Boudreau Lake proposed protected area were to be designated a park. The protected area designation was established in the Dawson Creek land and resource management plan and, although the area is managed as a protected area, it has yet to be officially designated. The land and resource management plan Working Group recommended that oil and gas tenures be grand-parented under existing normal rules, voluntarily surrendered, expropriated by government, or otherwise resolved. Existing tenures could be developed subject to environmental guidelines, and directional drilling methods from outside the park would be encouraged to access subsurface resources. Tenures would only be reissued with a no surface access condition attached to the tenure (B.C. Ministry of Forests, Lands and Natural Resource Operations 1999).

22.4 Effects Assessment

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

- Land use and resource use
- Access and activities for the oil, gas, and energy sectors

22.4.1 Effects Assessment – Construction – Change in Land and Resource Use

The Project would change land and resource use conditions for the oil, gas, and energy industry by occupying or inundating surface lands that have existing infrastructure, including pipelines, wells, and other facilities on Crown land.

The spatial analysis of Land Act tenures did not identify energy infrastructure or tenures other than that of the oil and gas industry in the LAA.

The Project would create new, and use existing, transportation routes, including petroleum development roads, to transport materials, equipment, and worker vehicles to work areas in the LAA. Conflicts with the oil and gas infrastructure could occur if a Project component or activity were to directly cross a gas pipeline, be within a prescribed distance of a pipeline, or encroach on the site of an oil and gas company (referred to as pipeline permit holder), such as a well site or a right-of-way. These conflicts would be primarily due to loading or
proximity concerns associated with the transport of materials, equipment, labour, and initial road construction.

Oil and gas industry infrastructure would be flooded in the Site C reservoir or affected (e.g., the Project crosses a pipeline, comes within a prescribed distance, or encroaches on well site or right-of-way) in other project components such as the Site C dam site and the transmission line. Temporary components related to construction, including temporary access roads and off-site material sources, would generate similar effects during the construction period only, after which there would be a return to baseline conditions. As noted previously in Table 22.5, six wells, eight facilities, and 2.9 ha of pipeline right-of-way are thus affected, with one well, four facilities and 1.65 ha of pipeline in the reservoir.

The Spectra Energy water intake in the Peace River just south of Taylor could be affected by the predicted physical changes in suspended sediment during construction, or by event driven sediment discharges during construction. The main concerns related to the construction phase raised by Spectra Energy to BC Hydro relate to the potential for increased suspended sediment that could affect their operations, as follows:

- Increased suspended sediment in the water (i.e., higher turbidity) could lead to an increase in the required frequency of maintenance.

Expected changes with Site C during construction, in the vicinity of the Spectra intake are described in Volume 2 Section 11.8 Fluvial Geomorphology and Sediment Transport. In summary, expected changes with Site C related to the concerns of Spectra include:

- It is expected that there would be periods of increased suspended sediment / turbidity during construction.

While the physical changes can be characterized, it is not clear based on what is known today that these physical changes expected due to Site C would lead to an actual adverse effect on Spectra Energy’s operations. The modelling of predicted changes in water temperature and sediment transport expected during construction, along with specific information from Spectra on the relationship between these variables and its operations, can be used to inform and develop an appropriate construction monitoring program with Spectra.

**22.4.2 Effects Assessment – Operations – Change in Land and Resource Use**

During operations, the Spectra Energy water intake could be affected by changes in water temperature as well as suspended sediments.

- If river water temperature downstream of Site C increases, more water would have to be pumped from the river to achieve the same amount of cooling. When water temperature approaches 15 – 17°C, Spectra may need to cut back production. This typically happens, currently, on hot summer days, during daylight hours.

- Increased suspended sediment in the water (i.e. higher turbidity) could lead to an increase in the required frequency of maintenance.

Expected changes with Site C during operations, in the vicinity of the Spectra intake are described in Volume 2 Section 11.4 Surface Water Regime, Volume 2 Section 11.7 Thermal and Ice Regime, and in Volume 2 Section 11.8 Fluvial Geomorphology and
Sediment Transport. In summary, expected changes with Site C related to the concerns of Spectra include:

- Modelled temperatures at the Site C outlet were warmer than observed temperatures at the same location between July and January, ranging from 0.3°C in July to 1.5°C higher than existing conditions in October. The monthly modelled outlet temperatures were between 0.4 and 0.9 °C cooler from March to June, and in all months had a smaller daily range than the existing river.

- During operation, the turbidity during the spring freshet would be substantially reduced. At other times of the year (during the first 10 years of operation) there would be a slight increase in the suspended sediment due to additional inputs to the reservoir from the erosion of shorelines. After the first 10 years the sediment input from the shorelines is expected to decrease.

As during the construction phase, while the physical changes can be characterized, it is not clear based on what is known today that these physical changes expected due to Site C would lead to an actual adverse effect on Spectra Energy’s operations. The modelling of predicted changes in water temperature and sediment transport expected during operations, along with specific information from Spectra on the relationship between these variables and its operations, can be used to inform and develop an appropriate construction monitoring program with Spectra.

22.4.3 Mitigation Measures – Construction – Change in Land and Resource Use

Standard mitigation of effects on tenure holders would apply for existing oil, gas, and energy structures affected by the Project (Section 22.1.3).

22.4.4 Effects Assessment – Construction – Change in Access and Industry Activities

The Project would occupy or flood surface lands that are, or could be, used by oil, gas, and energy companies to exploit the energy resources of the region. This could directly affect the access to, and the commercial viability of, surface and subsurface energy resources by industry.

22.4.4.1 Oil and Gas

The LAA has been actively explored and developed for oil and gas. Petroleum and natural gas leases and licences overlap most of the proposed project components. Just over half of the LAA is covered by active petroleum and natural gas tenures, comparable to the coverage for the Peace River Regional District, which is approximately 46%.

In the future, the conventional and unconventional oil and gas fields that underlie the Peace River would generate currently unknown land sales, exploration, and development and production activity. Tenures would be newly issued and renewed so industry could continue to exploit reserve potential. The LAA overlays 0.07% of regional district oil fields, 0.08% of conventional gas fields, and 0.51% of the Montney Basin.
### Table 22.9 Comparison of Petroleum and Natural Gas Tenures and Resource Areas in the LAA and the Peace River Regional District

<table>
<thead>
<tr>
<th>Tenure/Resource Area</th>
<th>LAA</th>
<th>PRRD</th>
<th>LAA as % of PRRD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PNG Tenures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Petroleum and Natural Gas Tenures (ha)</td>
<td>5,774</td>
<td>5,477,363</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Resource Areas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas fields (ha)</td>
<td>2,139</td>
<td>2,713,745</td>
<td>0.08</td>
</tr>
<tr>
<td>Percent of total area (%)</td>
<td>15.6</td>
<td>22.7</td>
<td>N/A</td>
</tr>
<tr>
<td>Oil fields (ha)</td>
<td>530</td>
<td>801,150</td>
<td>0.07</td>
</tr>
<tr>
<td>Percent of total area (%)</td>
<td>3.9</td>
<td>6.7</td>
<td>N/A</td>
</tr>
<tr>
<td>Coal Bed Methane Potential (ha)</td>
<td>13,598</td>
<td>1,935,190</td>
<td>0.70</td>
</tr>
<tr>
<td>Percent of total area (%)</td>
<td>99.2</td>
<td>16.2</td>
<td>N/A</td>
</tr>
<tr>
<td>Unconventional Play Trends – Montney Basin (ha)</td>
<td>13,254</td>
<td>2,594,685</td>
<td>0.51</td>
</tr>
<tr>
<td>Percent of total area (%)</td>
<td>96.7</td>
<td>21.7</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**NOTES:**
- N/A – not applicable
- **Source:** Hillcrest Geographics (2012)

Petroleum and natural gas tenure areas within the LAA are shown in Table 22.10. The area of tenures directly affected by Project construction include:

- 1,270 ha of drilling licences and 2,633 ha of oil and gas leases in areas that would be permanently occupied by the Project
- 1,073 ha of drilling licences, 18 ha of natural gas leases, and 881 ha of petroleum and natural gas leases in temporary components

Major licensees were previously identified in Table 22.6.

As noted in Table 22.9, the sum area of these tenures account for 0.23% of the more than 5,000,000 ha of tenures issued in the PRRD. However, even if the Project proceeds, the status of all tenures within the LAA would remain largely unaffected and licensees would continue to have access to subsurface resources through deployment of horizontal drilling methods, the predominant form of drilling in the Montney.

The licensee with coalbed methane tenure in the Project activity zone (near Farrell Creek) has indicated that the Project would affect only a small part of their concessions and would neither limit future resource potential nor increase development and production costs (Jones 2012, pers. comm.).

While there is no coalbed methane production currently in the LAA at this time, the resource still exists beneath virtually the entire Project activity zone, and might be commercially developable in the future if higher gas prices were to occur. The predominant means of accessing this resource is through vertical drilling, which places a premium on surface access above the resource. Unlike shale gas, coalbed methane resources beneath the Project activity zone would be more difficult and expensive to access and develop in the future. The context of this potential opportunity includes the following two important factors:

- With or without the Project, the current intention of government is to create the Peace River Boudreau Lake proposed protected area, which would exclude all surface access
for new drilling activity. This essentially eliminates access to the south bank of the Peace River for coalbed methane development. The Project would therefore have no incremental effect on south bank coalbed methane activity.

- As noted in Section 22.3.5, directional drilling techniques are being developed to access coalbed methane in North America, even though vertical drilling is still the predominant form of access. In considering the advancements in drilling technology in the last five years, which have unlocked shale and deep gas potential in the province, and considering that the surface area on the north bank that would be lost to vertical drilling access, the Project would not limit access to the coalbed methane resource in the LAA.

In consideration of the foregoing, adverse effects on the access to resources by the oil and gas industry are therefore not anticipated.

Table 22.10 Petroleum and Natural Gas Tenures in LAA

<table>
<thead>
<tr>
<th>Tenure</th>
<th>Five-Year Beach Line</th>
<th>Site C Dam Site Area</th>
<th>Transmission Line</th>
<th>Construction Access Roads</th>
<th>Quarryed &amp; Excavated Materials</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drilling Licence (ha)</td>
<td>1,043.5</td>
<td>N/A</td>
<td>303.2</td>
<td>42.1</td>
<td>58.3</td>
<td>1,447.1</td>
</tr>
<tr>
<td>Natural Gas Lease (ha)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>17.9</td>
<td>17.9</td>
</tr>
<tr>
<td>Petroleum and Natural Gas Lease and Agreements (ha)</td>
<td>2,958.2</td>
<td>323.7</td>
<td>754.5</td>
<td>126.0</td>
<td>146.7</td>
<td>4,309.2</td>
</tr>
<tr>
<td>Underground Storage Lease (ha)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total (ha)</td>
<td>4,001.7</td>
<td>323.7</td>
<td>1,057.6</td>
<td>168.2</td>
<td>223.0</td>
<td>5,774.3</td>
</tr>
</tbody>
</table>

NOTES:
- Five-Year Beach Line is the predicted position of the toe of the bluff at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines
- Site C dam site and substation construction areas and restricted access zones as described in Volume 1 Section 4 Project Description
- Transmission line corridor and one-time clearing areas as described in Volume 1 Section 4 Project Description
- Permanent and temporary roads, and Highway 29 realignment as described in Volume 1 Section 4 Project Description
- Off-site construction material sources as described in Volume 1 Section 4 Project Description
- N/A – not applicable

Source: Hillcrest Geographics (2012)

22.4.4.2 Other Energy Sources

The Project could change access to other energy activities other than oil and gas through the same pathways; that is, changes in access to land to develop that potential.

At this time, there are no existing or proposed commercial energy operations in or near the LAA for small-scale hydro, wind power, or biomass energy production. Technical studies do not show commercially viable resource values in the LAA, and Crown tenure activity does not indicate exploration or development activity.

As illustrated in Table 22.7, there are no licences for wind power within or near the LAA.

Two investigative permits downstream of the Site C dam site would not be affected by the Project (Hillcrest Geographics 2012).
None of the water licences (points of diversion) in the LAA are for general power production or storage. Similarly, a review of Land Act tenures shows no licensing for energy production purposes other than oil and gas facilities (Hillcrest Geographics 2012).

In the absence of reasonably foreseeable interest or investment in small-scale hydro, wind power, or biomass energy production, adverse effects on other energy sources are not anticipated.

22.4.5 Mitigation Measures – Change in Access and Industry Activities

Potentially adverse effects are not anticipated for existing and future potential petroleum and natural gas licensees that require access to subsurface resources below the Project activity zone, or for other potential sources of commercial energy production, including small hydro and wind power. Therefore, mitigation is not proposed.

22.5 Summary of Effects Assessment and Mitigation Measures

A summary of project effects and mitigation measures on oil, gas, and energy is presented in Table 22.11.

Table 22.11 Project Effects and Mitigation Measures on Oil, Gas and Energy

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Operations</td>
<td>Project would change land and resource use, and could affect oil and gas infrastructure</td>
<td>Standard mitigation: agreements would be concluded where appropriate with third-party tenure holders. Spectra Energy monitoring: if adverse effects identified, mitigation would be implemented.</td>
<td>Spectra Energy may experience adverse effects if increases in sedimentation during construction, and in sedimentation and water temperature during operations affect its operations. Mitigation measures would be determined once operating effects are defined and monitoring is undertaken. With appropriate mitigation residual adverse effects would not be expected.</td>
<td>BC Hydro</td>
</tr>
<tr>
<td>Construction</td>
<td>Project could affect access to oil and gas resources and industry activity</td>
<td>Access to resources would not be restricted. No mitigation required.</td>
<td>Residual effects are not anticipated</td>
<td>N/A</td>
</tr>
</tbody>
</table>

NOTE:
N/A – not applicable

In summary, the Project’s use of land inside the LAA would change the conditions of access and use by the oil, gas, and energy industry, and it would inundate, displace, or otherwise affect the existing infrastructure of the oil, gas and energy industry. However, the Project’s use of land would not measurably affect the industry’s ability to access resources. The
Project activity zone and the Five-Year Beach Line would occupy a negligible area – 0.11% of the total petroleum and natural gas tenure area in the Peace River Regional District. Small-scale hydro, wind power, and biomass energy production potential has not been identified within the LAA.

As referenced in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements, BC Hydro will discuss any overlap with the Project activity zone and reservoir impact lines with affected third-party tenure holders and, where appropriate, enter into agreements regarding potential conflicts with oil, gas and energy tenure holders. This mitigation measure is considered standard mitigation, per Section 22.1.3 Standard Mitigation Measures and Effects Addressed.

22.5.1 Other Mitigation Options Considered

There were no other mitigation measures considered by BC Hydro for effects on oil, gas and energy.

22.6 Residual Effects

As described above, there is a potential for Spectra Energy to experience adverse effects if increases in sedimentation during construction, and in sedimentation and water temperature during operations affect its operations. As these effects are uncertain monitoring is proposed. Mitigation measures would be determined once operating effects are defined and monitoring is undertaken.

With appropriate mitigation no residual adverse effects are anticipated.

22.7 Cumulative Effects Assessment

No cumulative effects are anticipated, because no residual effects are anticipated following mitigation.

22.8 Monitoring and Follow-Up

While the physical changes can be characterized, it is not clear based on what is known today that these physical changes expected due to Site C would lead to an actual adverse effect on Spectra Energy’s operations. The modelling of predicted increases in water temperature and sedimentation expected during construction and operations, along with specific information from Spectra on the relationship between these variables and its operations, will be used to inform and develop an appropriate construction monitoring program with Spectra.

BC Hydro will develop a program with Spectra Energy, focused on monitoring of water temperature and sedimentation, at the Spectra water intake in Taylor, to determine if future mitigation by BC Hydro will be required. The frequency will be determined in consultation with Spectra, while duration would be for construction and the first 10 years of operations.
### Table 22.12  Follow-up Program for Oil, Gas, and Energy

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Monitoring Program Objective</th>
<th>Monitoring Program Frequency</th>
<th>Monitoring Program Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil, Gas and Energy</td>
<td>Construction Operations</td>
<td>At Spectra Energy intakes, monitor baseline conditions, and effects of increased sedimentation during construction, and effects of increased water temperature and sedimentation during operations, on Spectra cooling operations.</td>
<td>To be determined in discussion with Spectra</td>
<td>Construction and first 10 years of operations</td>
</tr>
</tbody>
</table>
References

Literature Cited


Internet Sites

Personal Communications


23 MINERALS AND AGGREGATES

23.1 Approach

The mineral and aggregate industry includes the exploration for, development of, and extraction of subsurface mineral resources. The Project’s use of land would overlap with areas where potential exists for mineral and aggregate production, or where there are existing quarries or pits. The Project’s effects on the valued component (VC) of minerals and aggregate has been assessed in consideration of the interaction of the Project to land use; resource use; access as related to industrial mineral and aggregate utilization; the Project’s consumption of local aggregate deposits for construction activities; and any new or improved access to aggregate sources created by the Project.

23.1.1 Regulatory and Policy Setting

The assessment was prepared in accordance with Section 16.5 of the Site C Clean Energy Project Environmental Impact Statement Guidelines (The Minister of Environment of Canada and the Executive Director of the BCEAO 2012) (EIS Guidelines).

Minerals are defined in the Mines Act and the Coal Act, which set out the regulatory framework for developing the respective subsurface resources. Aggregate material (i.e., construction material such as sand and gravel) is tenured under the Land Act except where the right has been granted to the surface landowner.

Unless the right has been granted, the Province owns the resource beneath Crown and private land. Rights to enter land and explore for subsurface resources is conveyed by the Mineral Tenure Act for metallic and industrial minerals and placer deposits, and under the Coal Act for coal resources. Work on mineral tenures and aggregate pits that involves land disturbance are regulated under various acts, including the Mines Act and the Land Act.

Government may also place a “reserve” on land to constrain certain uses or maintain land use options as set out in the conditions of the reserve, which depend on the reserve’s purpose. For instance, a “no registration reserve” (formerly termed a “no staking reserve”) precludes the issuance of a mineral tenure because mineral development may not be a compatible land use (e.g., reserving the land for designation under the Park Act). The province may register a reserve on land earmarked for future development. The B.C. Ministry of Transportation and Infrastructure (BCMtoTI) has many reserves on land with known sand and gravel deposits. A reserve may be established under various acts (e.g., Land Act, Mineral Act, Coal Act). Reserves with these types of conditions exist in the Project activity zone.

23.1.2 Key Issues and Identification of Project Effects

In consultation with stakeholders, a concern was expressed in public and property owner consultations about the availability of gravel, and how the Project may deplete local supplies. In addition, mineral exploration and development, particularly coal development, is an important industry in northeast B.C. Growth in the region’s economy fuels a broad range of construction projects that require aggregate material. Given the
strategic role of Minerals and Aggregates in the region’s development, it is important to assess whether the Project’s use of land, or use in meeting its construction requirements, may impinge upon these aspects.

In accordance with Section 16.5 of the EIS Guidelines, the potential to adversely affect the mineral and aggregate VC has been assessed by taking into account the potential for the Project to result in changes to the following key aspects:

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

Project interactions with VCs are ranked in Volume 2 Appendix A Project Interactions Matrix, Table 2, a rank of “2” was given where interactions may result in an adverse effect and the nature of the effect and/or the effectiveness of mitigation measures is uncertain. These interactions were taken forward through the effects assessment.

Project interactions that were ranked as “2” are summarized in Table 23.1. The key issues for Minerals and Aggregates are project construction activities that would result in a change in minerals and aggregates available for industry activity and development. For those Project components that would occupy land, or restrict access to it, there is potential interaction with mineral development activities. The Project’s consumption of local aggregate resources is related to those Project components that will require aggregate materials in their construction, as well as the development of pits/quarries to meet the construction requirement. The potential for new and improved access to aggregate sources would be associated with the Project’s quarry development activities. The nature of project effects would be similar for all project components; therefore, the assessment of effects is discussed for all activities as a whole during construction, with reference made to key activities where relevant.

### Table 23.1 Interactions of the Project With Minerals and Aggregates

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
<th>Changes in land use, resource use, access and activities related to industrial mineral and aggregate utilization</th>
<th>Project’s consumption of local aggregate deposits for construction activities</th>
<th>New or improved access to aggregate sources created</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam Site and Generating Station</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Reservoir Preparation and Filling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission System</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarried and Excavated Material Source Development</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Construction Access Roads</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
### 23.1.3 Standard Mitigation Measures and Effects Addressed

A ranking of "0" in Volume 2 Appendix A Project Interactions Matrix, Table 2, indicates that there is no potential interaction between the Project activity and the VC. For Project Operations phase, new or incremental effects are not anticipated and a "0" is assigned to the interaction.

Table 23.1 indicates that some project components may potentially interact with some aspects of Mineral and Aggregates, but not others. For instance, the Project’s consumption of aggregate deposits is limited to construction of the Site C dam site and generating station, and Highway 29 realignment project components, as well as the pits/quarries expected to be used by the Project for sourcing the aggregate material. The Site C reservoir filling activity, constructing the transmission system, and worker accommodation do not involve consumption of aggregate deposits.

A “1” ranking was applied to the southern and northern regional temporary accommodation activities of worker accommodation because, while there may be spatial overlaps with mineral and aggregates, the tenures necessary to construct and operate them will be part of the Project’s overall tenuring processing and related mitigation, as outlined in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements.

Mineral and aggregate development activities that may be proposed for lands adjacent to the reservoir have the potential to be affected by the Project. These lands are discussed in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines and defined spatially as the reservoir impact lines.

There may be potential effects related to flooding, erosion, instability and landslide-generated waves on these lands. BC Hydro would notify the mineral tenure holder of the nature of the particular effect when contacted through the notice of work referral process, an established process managed by the B.C. Ministry of Energy, Mines and Natural Gas.

The potential beneficial effect of improved new or improved access to aggregate sources would be related to the Project’s quarry development activities. The specific quarries are identified in the assessment. For the other Project components, there is no overlap in time or space with this aspect of minerals and aggregates.

As referenced in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements, BC Hydro will consult with affected third-party tenure holders and, where appropriate, enter into agreements to mitigate any potential project effects.

For market interactions, such as the Project purchasing aggregate material on the local market in competition with other buyers, the price mechanism serves to allocate aggregate products to highest valued uses and is considered a standard mitigation measure.

### 23.1.4 Selection of Key Indicators

Key indicators for the minerals and aggregate VC are standard measures that indicate potential effects on industry activity. The indicators include descriptors of the resources within the Project area – including potential, production, tenures, and activity – which collectively provide a view of the existence or probability of certain types of deposits. The indicators also include descriptors of the market in consideration of the Project’s material requirements for construction, identified material sources, and market pricing and
demand factors. Employment associated with the Project extraction activities is included in the Project’s employment forecast (Volume 3 Section 17 Labour Market). Mineral reserve is included as an indicator because it is a mechanism for regulating where mineral development activities occur.

The key indicators for assessing potential project effects on mineral and aggregate resource developments are summarized in Table 23.2.

### Table 23.2 Key Indicators for Minerals and Aggregates

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
</table>
| Changes in land use, resource use, access, and activities related to aggregate utilization | Metal, industrial mineral and aggregate potential  
Record of exploration and development  
Historic production record  
Remaining mine or pit life  
Existing mineral and aggregate tenures  
Mineral reserves | Known and potential mineral resources that could be developed in the future but would not be, if the Project proceeded. |
| Project’s consumption of local aggregate deposits for construction activities | Volume of aggregate material expected to be purchased by the Project relative to local market conditions  
Local and regional aggregate pricing and current and forecast consumption profile | Project requirements relative to the local supply and demand for aggregate. |
| New or improved access to aggregate sources created                         | Remaining mine, quarry, or pit life                                                              | Identifies the Volume of aggregate that may be for other applications                                        |

### 23.1.5 Spatial and Temporal Boundaries

### 23.1.6 Spatial Boundaries

The Local Assessment Area (LAA) in the EIS Guidelines for the assessment of the VC of minerals and aggregates is the Project activity zone. The Regional Assessment Area (RAA) in the EIS Guidelines is the north Peace area, consisting of the City of Fort St. John, the districts of Taylor and Hudson’s Hope, and Area C of the Peace River Regional District.

The area used for reporting in this assessment was updated from the originally proposed spatial boundaries in the EIS Guidelines. The spatial boundary selected for the LAA is the Project activity Zone plus the area within the Five-Year Beach Line, which is the area where the Project occupation of the land base would interact with the exploration or development of minerals and aggregates. The Five-Year Beach Line is adopted, as it is the extent of reservoir clearing and predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines.

The RAA is defined as the north Peace area, consisting of the City of Fort St. John, the districts of Taylor and Hudson’s Hope, and Area C of the Peace River Regional District. The RAA captures the spatial extent of the aggregate market, as constrained by the low value of the product relative to transportation costs, and where minerals and aggregate activities may act cumulatively with project residual effects.
Spatial boundaries are shown in Table 23.3 and illustrated in Figure 23.1.

**Table 23.3  Spatial Assessment Area for Minerals and Aggregates**

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project activity Zone and area within</td>
<td>Fort St. John, Taylor, Hudson’s Hope, Area C of the</td>
</tr>
<tr>
<td>Five-Year Beach Line</td>
<td>Peace River Regional District</td>
</tr>
</tbody>
</table>

**23.1.7  Temporal Boundaries**

Project interactions for the three key aspects would occur during the full eight-Year construction period. With respect to the changes in land use, resource use, access, and activities related to aggregate utilization, the interaction would commence during the early years of construction and continue indefinitely, as the Project is assumed to operate in perpetuity.

New or incremental effects of potential aggregate consumption during the operations phase is not anticipated in consideration of Draft Construction Materials Development Plans as described in Volume 1 Appendix C.

The new or improved access to aggregate sources created by the Project would commence at the conclusion of the construction phase and continue until the deposits were exhausted.

**23.2  Information Sources and Methods**

**23.2.1  Review of Existing Information**

The profile of mineral and aggregate resource and the mineral development history and potential was compiled from the MINFILE database, maintained by the B.C. Ministry of Energy, Mines and Natural Gas. The Ministry’s regional overview provided the most up-to-date review of the exploration and development prospects located in the region. Assessment reports of exploration activity in or near the Project activity Zone were also reviewed and the pertinent findings presented in the baseline.

**23.2.2  Interviews**

The Manager of Regional Aggregate Resources of the B.C. Ministry of Transportation and Infrastructure was interviewed to obtain information on baseline conditions, and perspectives on key issues and project interactions. Volume 3 Appendix C Land and Resource Use Assessment, Part 1 Land and Resource Use Assessment Interview Methodology details the interview methodology.

**23.2.3  Field Investigations**

BC Hydro undertook field investigations to identify the location, quality, and quantity of construction material within the Project activity zone, except where access was restricted (e.g., private land) (BC Hydro 2012a).
23.2.4 Data Management, Mapping, and Modelling

GIS analysis was undertaken to provide quantitative estimates of the overlap of the Project activity Zone including the area within the Five-Year Beach Line with certain mineral and aggregate indicators (Hillcrest Geographics 2012). The source of data was the B.C. government land and resource data warehouse, and the Project activity Zone (BC Hydro 2012b).

23.2.5 Aboriginal Community and Traditional Knowledge

Aboriginal community and traditional knowledge related to the minerals and aggregates VC was gained through review of results of BC Hydro’s consultation with Aboriginal groups and review of First Nations community baseline studies prepared by the following First Nations:

- Doig River First Nation
- Halfway River First Nation
- Prophet River First Nation
- West Moberly First Nations

While the communities and traditional territories of the Blueberry First Nations and Saulteau First Nations are in or near the boundaries of the LAA and the RAA, BC Hydro had not received community baseline information from them at the time of writing.

Baseline information and data as well as concerns and interests of Aboriginal groups relevant to minerals and aggregates are incorporated into the baseline and effects assessment sections below. The First Nations community baseline reports are provided in Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations.

BC Hydro’s approach to gathering community-based social and economic data with First Nations is described in Volume 3 Appendix B First Nations Community Baseline Reports, Part 1 Approach to Gathering and Integrating Community Baseline Information.

23.3 Baseline Conditions

23.3.1 History of Mineral Development Activities and Mineral Potential

The Peace River Regional District has an established mineral development history, most notably coal. Eighteen past producing mines, 37 developed prospects (i.e., advanced exploration stage), three prospects, and over 100 showings (i.e., initial evidence of mineral occurrence) are on record. Most of the past producing mines and the developed prospects were metal or coal sites. In 2011, three coal mines were in operation, all in the vicinity of Tumbler Ridge and Chetwynd (Brule, Trend, Perry Creek, and Willow Creek) (DeGrace 2011).

The LAA’s mineral development record shows one past producer and two showings (Table 23.4). The past producer is a coal property on Portage Mountain adjacent to potential Project source of riprap material for use in the realignment of Highway 29 and for the Hudson’s Hope Shoreline Protection. The two recorded showings are over

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50 years old. One is near Hudson’s Hope, which is a showing of travertine (typically used in floor tiles) recorded in 1957. The other, near the confluence of the Peace River and the Moberly River, was recorded in 1949 and identified the presence of sulphur and iron.

Table 23.4  Summary of Mineral Development Indicators in the LAA

<table>
<thead>
<tr>
<th>Indicator</th>
<th>LAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record of Mineral Development Number of (or count)</td>
<td></td>
</tr>
<tr>
<td>Developed Prospect</td>
<td>0</td>
</tr>
<tr>
<td>Past Producer</td>
<td>1</td>
</tr>
<tr>
<td>Producer</td>
<td>0</td>
</tr>
<tr>
<td>Prospect</td>
<td>0</td>
</tr>
<tr>
<td>Showing</td>
<td>2</td>
</tr>
<tr>
<td>Tenures (ha)</td>
<td>Total area under respective tenure type (ha)</td>
</tr>
<tr>
<td>Coal Application</td>
<td>69.5</td>
</tr>
<tr>
<td>Coal Leases</td>
<td>0</td>
</tr>
<tr>
<td>Coal Licences</td>
<td>0</td>
</tr>
<tr>
<td>Mineral Claim</td>
<td>0</td>
</tr>
<tr>
<td>Placer Claim</td>
<td>0</td>
</tr>
<tr>
<td>Quarrying (forestry special use permit)</td>
<td>0</td>
</tr>
<tr>
<td>Notice of Work (Mineral, Coal, Placer, Sand and Gravel) (count)</td>
<td>0</td>
</tr>
</tbody>
</table>

**NOTE:**

**Source:** Hillcrest Geographics (2012)

A province-wide assessment of mineral potential found that three developable gold placer deposits and eight industrial mineral deposits at the 5% confidence level (a low level of confidence) occur in the LAA (Kilby 2004). At the 90% confidence level (a high level of confidence), there are no deposits indicated. Overall, the mineral potential in the LAA is low relative to the mineral potential in the rest of the province (a rank of 186, compared to highest potential track of 794) for metallic potential and 138 for industrial mineral, both considered low potential. The corresponding assessment of aggregate potential was not reported in the province-wide assessment.

Coal is the most likely mineral for future development in the Peace River Regional District. The Peace River corridor is part of the Peace River Coalfield, which is estimated to contain more than 160 billion t of medium- and low-volatile bituminous coal reserves. In the first quarter of 2012, there were four major coal projects in northeast B.C. (all outside the LAA) in the B.C. environmental assessment process: the Roman Coal and Horizon Coal Mine projects near Tumbler Ridge; the Gething Coal Mine project, approximately 25 km west of Hudson’s Hope; and a restart of the Quintette coal mine near Tumbler Ridge (BCEAO 2012). The more accessible and commercially viable deposits are south of the LAA.

Within and near the LAA there is a scarcity of natural outcrops of coal. Limited exploratory drilling failed to find thick coal seams, indicating that an economically viable coal resource is not present (Kelman and Hovis 2007). Nevertheless, under economic conditions favourable for coal development, the industry would likely continue to search for viable coal deposits in the LAA.
There is a limited history of drilling for metallic minerals such as gold, silver, copper, and molybdenum in the LAA. Existing mineral reserves restrict tenuring for these minerals in the LAA; however, exploration and development potential is low due to unfavourable geology.

### 23.3.2 Mineral Tenures

At the time of the records being reviewed (November 2012), there were no mineral tenures in the LAA (Table 23.4). Application for coal exploration covers areas temporally required by the Project to extract aggregate materials. The notice of work indicators reflect the level of activity undertaken on tenures. Most of the notices are associated with mineral and coal tenures in Peace River Regional District. There are no notices of work recorded in the LAA (Hillcrest Geographics 2012).

### 23.3.3 Aggregate Development Activities

Deposits of aggregate of various dimensions are used directly as an ingredient of concrete and asphalt, road construction, and for road maintenance. Aggregate itself is a relatively low-value product; however, transportation costs are a major factor in the delivery price of aggregate, so deposits tend to be as close as possible to the location of demand.

The majority of aggregate production is alongside major river corridors where water has sorted the clay and sand overburden. There are a number of private and Crown-owned operating pits located along the Peace River. These are located in the Hudson’s Hope area, in Beryl Prairie, and in several pits situated downstream of the potential Site C dam site, near Taylor. The Halfway River First Nation and West Moberly First Nations engage in gravel extraction and sales (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012 – included as Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations).

The Ministry of Transportation and Infrastructure manages pits on Crown lands for use by its contractors for road construction and maintenance work. The ministry manages several pits in the vicinity of the LAA. Approximately 170,000 m³ are extracted annually from the pits listed in Table 23.5, and about 342,000 m³ is used by Ministry of Transportation and Infrastructure annually in the Fort St. John area. In recent years, very little has been extracted from the Teko pit because of access constraints (BCMoTI, Manager Regional Aggregate Resources 2012, pers. comm.). Three pits, Peace View, Tompkins, and Riske are adjacent to the Peace River upstream of the proposed dam site (Figure 23.1). The Wuthrich and West Pine quarries are operated by Ministry of Transportation and Infrastructure, producing riprap material, and will be further developed by the Project (Figure 23.1).

In addition to the pits listed in Table 23.5, the Ministry of Transportation and Infrastructure holds reserves over numerous known sand and gravel deposits to meet future road building/maintenance needs.
Table 23.5 Summary of B.C. Ministry of Transportation and Infrastructure Aggregate Pits

<table>
<thead>
<tr>
<th>Pit Name</th>
<th>Est. Proven Reserves (m$^3$)</th>
<th>Quality of Pit</th>
<th>Importance to BCMoTI Operations in District</th>
<th>BCMoTI Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pits located in the LAA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Del Rio</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Medium</td>
<td>Important for future use</td>
</tr>
<tr>
<td>Peace View</td>
<td>1.5 million</td>
<td>High</td>
<td>High</td>
<td>NA</td>
</tr>
<tr>
<td>Tompkins</td>
<td>135,000</td>
<td>High</td>
<td>High</td>
<td>Approximately 40 ha of reserve still remains to be assessed for Volume potential</td>
</tr>
<tr>
<td>Riske Pit</td>
<td>100,000</td>
<td>High</td>
<td>High</td>
<td>NA</td>
</tr>
<tr>
<td>Bear Flats</td>
<td>Unknown</td>
<td>Low</td>
<td>Low</td>
<td>Poor durability characteristics of the bedrock</td>
</tr>
<tr>
<td>Other ministry pits located in the region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beryl Prairie</td>
<td>2.6 million</td>
<td>High</td>
<td>High</td>
<td>NA</td>
</tr>
<tr>
<td>Benard</td>
<td>500,000</td>
<td>High</td>
<td>High</td>
<td>Potential for more volumes; only a portion has been assessed</td>
</tr>
<tr>
<td>Ardill</td>
<td>NA</td>
<td>High</td>
<td>Low</td>
<td>Close to depletion</td>
</tr>
<tr>
<td>Johnson pit</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Close to depletion</td>
</tr>
<tr>
<td>Teko</td>
<td>6.0 million</td>
<td>High</td>
<td>High</td>
<td>Source very important to BCMoTI, even though there are challenges with access</td>
</tr>
<tr>
<td>Reserves</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>NA</td>
</tr>
<tr>
<td>Southwick</td>
<td>960,000</td>
<td>High</td>
<td>High</td>
<td>NA</td>
</tr>
<tr>
<td>Hudson’s Hope</td>
<td>NA</td>
<td>High</td>
<td>High</td>
<td>Tenure issues exist with District of Hudson’s Hope</td>
</tr>
<tr>
<td>Southwick Notation</td>
<td>500,000</td>
<td>High</td>
<td>High</td>
<td>Tenure issues exist with District of Hudson’s Hope</td>
</tr>
</tbody>
</table>

Notes:
- BCMoTI – B.C. Ministry of Transportation and Infrastructure
- NA – data not available
- $^a$ This relates to how well the physical quality of the deposit meets BCMoTI requirements
- $^b$ This includes consideration of the quality of the deposit, its location, cost of extraction, size, and other factors that make it more or less important to the BCMoTI

Source: BCMoTI, Manager Regional Aggregate Resources (2012, pers. comm.)

23.3.4 Local and Regional Aggregate Pricing and Current and Forecast Consumption Profile

Some gravel sizes are relatively scarce in the northeast. The Ministry of Transportation and Infrastructure pays the highest price for crushed gravel in the northeast and central region as compared to the rest of the province, a reflection of local scarcity (BCMoTI, Manager Regional Aggregate Resources 2012 pers. comm.).

Granular materials from private pits supply the Fort St. John area’s construction, paving, and oil and gas industry requirements. Industry may also excavate nearby pockets of granular material for immediate and short-term needs, such as local road building and drilling pad development. The larger commercial pits near Taylor have been operating for at least two decades and have known reserves to continue current production for at least 20 years.

Total aggregate consumption is the sum of private sector projects and road work proceeding in any given year. In recent years, total annual consumption has been in the range of 590,000 m$^3$ (1 million t). Future demand will grow to supply new construction...
and to maintain an expanded and upgraded road network. The gravel requirements will
be met from existing private and government-managed pits, and the development of new
pits.

Future pit development over the next two decades would continue to focus on the Taylor
area. The Teko pit and surrounding area has large aggregate reserves, but road access
is required to fully develop the property. The proximity of Teko pit to the area of demand
would concentrate effort to provide access to this site. There are other potential sources
similar to the Teko Pit concentrated along the Peace River basin that may prove viable.

23.3.5 Mineral Reserves

A “mineral reserve” may be attached to Crown land to restrict or prohibit the
establishment of mineral tenures, because such activities would not be compatible with
the preferred land use. A reserve may apply individually to minerals, placer activity or
coal, and mineral reserves may overlap on the land base. The mineral reserves in the
LAA, rationale for their issuance, and their conditions are summarized in Table 23.6. The
total size of the reserve is reported in the table. The overlaps of the various reserves in
the LAA were removed by allocating land to the most restrictive reserve first (i.e., Peace
River Boudreau Lake proposed protected area), moving down the list of reserves in
Table 23.6 from top to bottom.

The most restrictive condition is a “no registration reserve”, in which no mineral, placer,
or coal tenure may be issued after the effective date of the reserve. The Peace River
Boudreau Lake proposed protected area and the Peace Moberly reserves have these
restrictions and cover a total of about 7,371 ha within the LAA. Four mineral reserves are
related to hydro developments and cover about 4,800 ha in the LAA (excluding overlaps)
Note that these reserves do not restrict staking for coal. That is, if these reserves were
removed, the incremental change is that tenuring for mineral and placer would be
allowed. But, as discussed earlier, the potential for discovering these minerals in the
LAA is considered low.

The B.C. Ministry of Transportation and Infrastructure also puts a reserve over known
deposits of material (e.g., sand and gravel deposits) that it may require for future road
construction or maintenance. Several of these reserves are present in the LAA and will
be discussed in the next section.
Table 23.6  Mineral Reserves in the Local Assessment Area

<table>
<thead>
<tr>
<th>Name</th>
<th>C</th>
<th>M</th>
<th>P</th>
<th>Reason</th>
<th>Date Created</th>
<th>Restriction</th>
<th>Total size (ha)</th>
<th>Non-Overlapped area in LAA (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peace River Boudreau Lake</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Proposed protected area</td>
<td>29/01/2009</td>
<td>No staking</td>
<td>42,483</td>
<td>6,668.9</td>
</tr>
<tr>
<td>Fort St. John</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>Trans. line &amp; hydro project</td>
<td>01/01/2006</td>
<td>Conditional</td>
<td>26,489</td>
<td>2,021.6</td>
</tr>
<tr>
<td>Peace Moberly</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>Study area</td>
<td>15/03/2005</td>
<td>No staking</td>
<td>109,014</td>
<td>702.0</td>
</tr>
<tr>
<td>G.M. Shrum Generating Site</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>Transmission Line</td>
<td>16/12/1976</td>
<td>Release required</td>
<td>25,691</td>
<td>39.4</td>
</tr>
<tr>
<td>Hudson Hope</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>Hydro project</td>
<td>07/08/1959</td>
<td>No staking</td>
<td>48,243</td>
<td>190.7</td>
</tr>
<tr>
<td>Wennergren Reserve</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
<td>Flooding</td>
<td>11/10/1957</td>
<td>No staking</td>
<td>243,747</td>
<td>2,559.4</td>
</tr>
</tbody>
</table>

NOTES:
C – Coal
M – Mineral
P – Placer
N/A – not applicable
Source: Hillcrest Geographics (2012)

23.4  Effects Assessment

The potential to affect minerals and aggregates is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

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

The first two aspects could give rise to adverse effects after the application of standard mitigation measures, and are addressed in the following effects assessment. The third aspect is a potential beneficial effect.

23.4.1  Effects Assessment – Construction – Land Use, Resource Use, Access, and Activities Related to Industrial Mineral and Aggregate Utilization

Changes in industrial mineral and aggregate utilization were assessed considering changes to land use, resource use, access, and activities. The effect mechanism was the Project’s use or occupation of surface lands that would preclude or restrict mineral or aggregate development. The Project would obtain its construction material requirements from a number of sources as shown in Figure 23.1.
23.4.2 Access to Mineral and Coal Development

During Project construction, mineral exploration activities could be limited in temporary Project areas, and the Site C reservoir filling would permanently preclude existing and potential mineral and aggregate use. Nevertheless, the record of exploration in the LAA shows no sustained industry exploration effort, and the LAA’s geological characteristics are not favourable for most valuable minerals, except for coal. The record of mineral exploration shows limited evidence of valuable deposits; consequently, the mineral potential land is low (Table 23.4). Furthermore, the 4,800 ha in the LAA exclusively subject to mineral reserve for a hydro development purpose allows for coal tenuring, which appears to be relatively greater potential for future development (Table 23.6).

Based on these observations, the probability of reduced access to undiscovered mineral potential as a result of the Project is low.

23.4.3 Access to Aggregate Deposits

Three Ministry of Transportation and Infrastructure pits would be affected by the Project. The Peace View pit would be alienated from future use, as it would become an island after Site C reservoir filling, while the Tompkins and Riske pits would be within the reservoir impact lines, and future use would be technically assessed (Figure 23.1).

The Ministry of Transportation and Infrastructure’s Del Rio Pit is located in the transmission line corridor. It would remain a gravel source to the ministry after the Project was completed.

The Portage Mountain quarry would remain a BC Hydro quarry for future use in maintenance of Hudson’s Hope Shoreline Protection and the W.A.C. Bennett Dam as required, and would be potentially available to Ministry of Transportation and Infrastructure.

The 85th Avenue Industrial Lands would be remediated based on post-construction use of the site to be considered in relation to the Official Community Plans of both the regional and local governments.

The B.C. Ministry of Transportation and Infrastructure also holds seven sand and gravel reserves that overlap the LAA. The area of overlap of the reserves by project component is summarized in Table 23.7. Except for the overlap with the reservoir component (i.e., Five-Year Beach Line), the Project will have minimal effect on B.C. Ministry of Transportation and Infrastructure’s access to the reserved deposit. Material extracted from the reserves for the Project will be addressed under the terms of a memorandum of understanding with the B.C. Ministry of Transportation and Infrastructure.
Table 23.7  B.C. Ministry of Transportation and Infrastructure Sand Gravel Map
Reserves in LAA (ha)

<table>
<thead>
<tr>
<th></th>
<th>Five-Year Beach Line</th>
<th>Site C Dam Site Area</th>
<th>Transmission Line</th>
<th>Construction Access Roads</th>
<th>Quarried &amp; Excavated Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>57.1</td>
<td>0.0</td>
<td>19.2</td>
<td>14.3</td>
<td>199.5</td>
</tr>
</tbody>
</table>

NOTES:

*a* Five-Year Beach Line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

*b* Site C dam site and substation construction areas and restricted access zones as described in Volume 1 Section 4 Project Description

*c* Transmission line corridor and one-time clearing areas as described in Section 4 Project Description

*d* Permanent and temporary roads, Highway 29 realignment as described in Section 4 Project Description

*e* Off-Site Construction material sources as described in Section 4 Project Description

Source: Hillcrest Geographics (2012)

The B.C. Ministry of Transportation and Infrastructure would continue to have access to the Wuthrich and West Pine quarries during construction. Following Project construction, the surplus quarry materials in the two quarries would be available to Ministry of Transportation and Infrastructure for further development. In summary, the low mineral potential of the LAA, as implied by past exploration efforts, indicates that the Project’s restrictions on access and land use would not constrain mining industry’s activity. The Project would utilize and/or inundate developed and undeveloped aggregate pits used by B.C. Ministry of Transportation and Infrastructure.

The West Pine and Wuthrich quarries would be expanded and the Portage Mountain quarry developed specifically for the Project. The three quarries would provide riprap and bedding material for the Project, and they would be available for further production after Project construction. The surplus material is an estimated 2.9 million m$^3$ from the three quarries for use by Ministry of Transportation and Infrastructure (Volume 1 Section 4 Project Description), which is a beneficial effect.

**23.4.4 Effects Assessment – Construction – Consumption of Local Aggregate Deposits**

The Project would require an estimated 40 million m$^3$ of construction material (Volume 1 Section 4 Project Description, Section 4.3.5, Tables 4.6 to 4.7), the majority of which would be sourced directly by the Project from new sources, or as agreed with Ministry of Transportation and Infrastructure for the use of Ministry sources. The Project may purchase material in the local market for the period of time the material is needed.

Material purchased from private pits is expected to consist mostly of concrete aggregates, which would be used in building bridges for Highway 29. For purchased material, the responsible contractors would negotiate a supply agreement from a local pit. Up to 28,000 m$^3$ could be purchased from private pits, subject to the bidding process. This would be a small Volume relative to the project’s total requirements and in relation to local consumption of about 590,000 m$^3$. 
In summary, the Project would obtain a large proportion of the material from deposits located within the LAA, with a relatively small Volume purchased from the private sector. As the Project would be largely self-sufficient in aggregate use, with little reliance on private sources, it would not disrupt the local aggregate market.

**23.4.5 Mitigation Measures**

BC Hydro will negotiate a memorandum of understanding with the B.C. Ministry of Transportation and Infrastructure to compensate for material used by the Project and to maintain material availability for Ministry operational needs. The Project will reduce the B.C. Ministry of Transportation and Infrastructure’s use of existing pits and future use of undeveloped deposits reserved for their use. With these measures, in addition to the use after construction of the West Pine, Portage Mountain, and Wuthrich quarries by the B.C. Ministry of Transportation and Infrastructure, no adverse effects would be expected.

**23.4.6 Summary of Effects Assessment and Mitigation Measures**

A summary of potential effects and mitigation measures are shown for minerals and aggregates in Table 23.8. With the implementation of mitigation discussed above there will be no adverse residual effects to minerals and aggregates.

**Table 23.8 Project Effects and Mitigation Measures on Minerals and Aggregates**

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Land use, resource use, access, and activities related to industrial mineral and aggregate utilization</td>
<td>Negotiate a memorandum of understanding with the BCMoTI to compensate for material used by the Project and to maintain material availability for ministry operational needs. Memorandum of understanding to include: 1) aggregate source strategy to compensate for inundated Ministry aggregate sources 2) BC Hydro commitment to stockpile surplus rock material at the West Pine, Wuthrich, and Portage quarries</td>
<td>Negotiated agreement will address BCMoTI identified needs Residual effects are not anticipated</td>
<td>BC Hydro</td>
</tr>
</tbody>
</table>

As referenced in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements, BC Hydro will discuss any overlap with the Project activity Zone and preliminary reservoir impact lines with affected third-party tenure holders and, where appropriate, enter into agreements regarding potential conflicts with mineral and aggregate tenure holders. This mitigation measure is considered standard mitigation, per Section 23.1.3 Standard Mitigation Measures and Effects Addressed.

**23.4.7 Other Mitigation Options Considered**

There were no other mitigation measures considered by BC Hydro for effects on minerals and aggregates.
23.5 Residual Effects
No residual effects are anticipated following the proposed mitigation measures.

23.6 Cumulative Effects Assessment
No cumulative effects are anticipated, because no residual effects are anticipated following mitigation.

23.7 Monitoring and Follow-Up
Monitoring and follow-up is not required for minerals and aggregates.
References

Literature Cited


Internet Sites

British Columbia Environmental Assessment Office (BCEAO). 2012. Project Status Report for list of coal projects in northeast BC. Available at: http://a100.gov.bc.ca/pub/epic/projectStatusCategoryReport.do;jsessionid=8fcd9a50aa2672ea39e203119f5658a17ce039be760f38b776b9a4f3260b401.e3uMah8KbhmLe34Qbh0MaNeOby1yncnvrkLOIQzNp65In0?ceSearchIndex=&cuSearchIndex=2#curr. Accessed: October 2012.

Personal Communications

24 HARVEST OF FISH AND WILDLIFE RESOURCES

24.1 Approach

The Peace River and area is used for the harvest of fish and wildlife resources. The Project would affect these opportunities through physical change of the land base. The Project effects on harvest of fish and wildlife resources were assessed by considering Project changes to the use of and access to hunting, fishing, trapline, and guide outfitter areas, tenures areas, or the availability of harvested species based on the results of the assessment of the Project on fish and wildlife resources. Harvest of fish and wildlife resources was chosen as a VC, as it reflects concerns raised in public and Aboriginal consultation on the Project. The Project is expected to have effects on the use of and access to harvesting areas (including tenured harvesting areas), and has the potential to affect the availability of harvested species. While Project effects on Aboriginal use of and access to tenured traplines are discussed in this section, they are also considered from an Aboriginal use and rights perspective in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes and Volume 5 Section 34 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Requirements.

24.1.1 Regulatory and Policy Setting

The assessment was prepared in accordance with Section 15.2 of the Site C Clean Energy Project Environmental Impact Statement Guidelines (the Minister of Environment of Canada and the Executive Director of the BCEAO 2012) (EIS Guidelines).

The Project would require both authorizations and approvals to secure use of the land base where there are existing tenures. Due to the Project’s interaction with land and water, engagement of Crown tenure holders and regulatory bodies is required to secure short-term and long-term use approvals under the Land Act. Working through identified conflicts with existing tenure holders (e.g., trapline holders and guide outfitters) is required as a part of permitting.

In B.C., fishing is regulated by the Wildlife Act and administered by the Fish and Wildlife Branch of the British Columbia Ministry of Environment (BCMOE). The Branch establishes legislation, policies, and procedures for managing fishing activities, and for the allocation of fish resources for recreational and commercial use.

In B.C., hunting is regulated by the Wildlife Act and administered by the Fish and Wildlife Branch of the BCMOE. The BCMOE manages hunting through various legislative, policy, program, and procedural tools, issues rights and permits for the commercial and recreational use of wildlife, manages the guiding industry, and systematically collects hunter and harvest activity data. Non-B.C. residents hunting big game must be accompanied by a licensed B.C. guide; however, a non-resident of B.C. who is a resident of Canada or a Canadian citizen may be accompanied by a resident of B.C. who holds a Permit to Accompany. Guide outfitters are subject to the conditions laid out in the Commercial Activities Regulation of the Wildlife Act. The federal Migratory Birds Regulations, including regulatory requirements regarding migratory bird hunting, is managed by Environment Canada under the Migratory Birds Conventions Act.
Commercial trapping for fur-bearers is regulated under the provincial *Wildlife Act*. A trapline is defined in the Act as “an area for which registration is granted to one or more licensed trappers for the trapping of furbearing animals”. A trapline gives the holder exclusive trapping rights to the trapline area, but does not exclude other uses (e.g., timber, mineral, oil and gas exploration, and grazing). Section 42 of the Act provides for the granting of registration to persons or groups of persons. A "registered trapper" includes any trapper who holds a current trapping licence and has permission from the registered trapline owner to trap that line. The Act and regulations set out the legal framework in which the registered trapper conducts trapping activities. The trapline holder is not required to prepare a management plan, nor does the Crown set harvest quotas for the individual traplines. Treaty 8 First Nations do not need a licence to trap for personal use. Traplines, which may be held by First Nations bands, families, and individuals, are often used by several community members and are viewed as a community asset. Furs sold commercially by First Nations are subject to the Act.

Although not compelled by law, the oil and gas industry has established a referral and compensation policy in cooperation with the BCMOE to address those cases where traps and structures need to be moved.

### 24.1.1 Key Issues and Identification of Potential Effects

There is the potential for adverse effects on harvest of fish and wildlife resources due to changes in the following as a result of the Project:

- Changes in fishing opportunities, which considers the following key aspects:
  - Use of and access to fishing area
  - Availability of harvested species based on the results of the assessment of the potential effects of the Project on the fish and fish habitat

- Changes in hunting opportunities, which considers the following key aspects:
  - Use of and access to hunting areas
  - Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources

- Changes in use of harvesting areas, which considers the following key aspect:
  - Use of and access to hunting and fishing areas

- Changes in trapping opportunities, which considers the following key aspects:
  - Use of and access to trapline areas
  - Tenured areas, and specific harvest areas within tenured areas, using spatial analysis
  - Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources

- Changes in guide outfitting activities, which considers the following key aspects:
  - Use of and access to guide outfitter areas
  - Tenured areas, and specific harvest areas within tenures areas, using spatial analysis
Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources. Project construction activities would interact with the use of and the access to fishing, hunting, trapping, and guide outfitting harvesting activities, as well as with the habitat supporting harvested species. The use of public fishing and hunting areas could also be affected by population change forecast during construction.

At the end of the construction period, the filling of the Site C reservoir would permanently change the areas available for fishing, trapping, and guide outfitting. In particular, fishing use and access would change from a river setting to reservoir setting.

Measurable population change due to Project operational workforce requirements is not anticipated; therefore, there would be no further changes to use of public fishing and hunting areas through this phase.

Issues, concerns, and interests identified during consultation with the public, Aboriginal groups, and government agencies guided the scope of the harvest of fish and wildlife resources assessment (refer to Volume 1 Section 9 Information Distribution and Consultation). The key issues identified and the approaches used to address issues are outlined in Table 24.1. In all of these consultations, members of the public, Aboriginal groups, regulatory agencies, and local government representatives voiced concerns regarding how access to and the use of harvesting areas would be affected by the Project during construction and during operations as a result of physical works, potential effects on the availability of harvested species, or due to demands of the temporary workforce population or in-migrants arriving in the region as a result of the Project.

These concerns were considered in the development of mitigation measures, in the design of the Project (e.g., access consideration), and in management plans, including the Outdoor Recreation Mitigation Plan (Volume 3 Appendix E) and the Vegetation, Clearing, and Debris Management Plan (Volume 1 Appendix A).

### Table 24.1 Key Issues: Harvest of Fish and Wildlife Resources

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
</table>
| Fishing Opportunities                                                      | • Changes in access to and navigation of fishing areas is assessed in Section 24.4 Effects Assessment  
                          | • Mitigation measures were developed to develop access and support navigation of the Site C reservoir (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation).  
                          | • Potential effects on sport fish populations are assessed in Volume 2 Section 12 Fish and Fish Habitat and Section 24.4 Effects Assessment considers effects of the Project on the availability of harvested species. |
## Key Issues Approach to Addressing Key Issues

### Hunting Opportunities

| The Project would change access to hunting areas | Changes in access to hunting areas is assessed in Section 24.4 Effects Assessment |
|------------------------------------------------|---------------------------------------------------------------------------------
| The Project could affect game populations       | Mitigation measures were developed to develop access and support navigation of the Site C reservoir (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation). |
|                                                | Potential effects on wildlife populations are assessed in Volume 2 Section 14 Wildlife Resources and Section 24.4 Effects Assessment considers effects of the Project on the availability of harvested species. |

### Use of Harvesting Areas

<table>
<thead>
<tr>
<th>The Project will result in changes to the temporary and resident population, which could lead to changes in the use of harvesting areas</th>
<th>Volume 4 Section 28 Population and Demographics assessed the changes in population and demographics that may occur in the Regional Assessment Area (RAA) during construction and operations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Project could affect fur-bearer populations</td>
<td>The results of this assessment were used to estimate the increase in licensed hunters and anglers in the RAA that may occur as a result of the Project.</td>
</tr>
</tbody>
</table>

### Trapping Opportunities

<table>
<thead>
<tr>
<th>The Project would change access to trapping areas</th>
<th>Potential effects on wildlife populations are assessed in Volume 2 Section 14 Wildlife Resources and Section 24.4 Effects Assessment considers effects of the Project on the availability of harvested species.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Project could affect fur-bearer populations</td>
<td></td>
</tr>
</tbody>
</table>

### Guide Outfitting Activities

<table>
<thead>
<tr>
<th>The Project would change access to guide outfitter areas</th>
<th>Potential effects on wildlife populations are assessed in Volume 2 Section 14 Wildlife Resources and Section 24.4 Effects Assessment considers effects of the Project on the availability of harvested species.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Project could affect game populations</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Concerns from Aboriginal Groups

<table>
<thead>
<tr>
<th>Concern about loss of income from reduced harvesting opportunities (DFN a, MLIB b, T8TA c)</th>
<th>Section 24.4 Effects Assessment considers changes in reported trapline harvest volumes, trapline operations and revenue.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern about increased access for recreational non-Aboriginal harvesters to the area between the Project and Hudson’s Hope, including tributary rivers</td>
<td>Section 24.4 Effects Assessment considers changes in access for harvesting</td>
</tr>
<tr>
<td></td>
<td>Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes considers effects of changes in access on Aboriginal use of lands and resources</td>
</tr>
<tr>
<td>Concern that an increase in population of some fish species has the potential to increase sport fishing and promote charter fishing tours (T8TA c)</td>
<td>Volume 3 Section 26 Navigation considers changes to access and boat traffic</td>
</tr>
</tbody>
</table>

### NOTES:

1. DFN – Duncan’s First Nation
2. MLIB – McLeod Lake Indian Band
3. T8TA – Treaty 8 Tribal Association

Potential project interactions with harvest of fish and wildlife resources are summarized in Volume 2 Appendix A Project Interactions Matrix, Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a rank of “2” was given where interactions may result in an adverse effect and the nature of the effect and/or the effectiveness of
mitigation measures is uncertain. These interactions were taken forward through the effects assessment.

Project interactions with a ranking of “2” are set out in Table 24.2 below.

### Table 24.2 Interactions of the Project With Harvest of Fish and Wildlife Resources

<table>
<thead>
<tr>
<th>Project Components and Activities</th>
<th>Key Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Changes in Fishing Opportunities</td>
</tr>
<tr>
<td>Construction</td>
<td>✓</td>
</tr>
<tr>
<td>Dam and Generating Station</td>
<td>✓</td>
</tr>
<tr>
<td>Construction</td>
<td>✓</td>
</tr>
<tr>
<td>Reservoir Preparation and Filling</td>
<td>✓</td>
</tr>
<tr>
<td>Transmission System</td>
<td>✓</td>
</tr>
<tr>
<td>Quarried and excavated material</td>
<td>✓</td>
</tr>
<tr>
<td>source development</td>
<td></td>
</tr>
<tr>
<td>West Pine Quarry</td>
<td>✓</td>
</tr>
<tr>
<td>Portage Mountain Quarry</td>
<td>✓</td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td>✓</td>
</tr>
<tr>
<td>Construction Access Road</td>
<td>✓</td>
</tr>
<tr>
<td>Development</td>
<td></td>
</tr>
<tr>
<td>Transmission Line Access Roads</td>
<td>✓</td>
</tr>
<tr>
<td>Jackfish Lake Road Works</td>
<td>✓</td>
</tr>
<tr>
<td>Worker Accommodation</td>
<td>✓</td>
</tr>
<tr>
<td>Construction and Operations</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td></td>
</tr>
<tr>
<td>Reservoir and Generating Station</td>
<td>✓</td>
</tr>
<tr>
<td>Operation (including Hudson’s</td>
<td></td>
</tr>
<tr>
<td>Shoreline Protection Maintenance)</td>
<td></td>
</tr>
</tbody>
</table>

#### 24.1.2 Standard Mitigation Measures and Effects Addressed

A “1” ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. These interactions were not carried forward through the effects assessment.

A “1” ranking was assigned to activities associated with the construction access road development component including: Old Fort Road realignment, extension of 240 and 369 roads, West Pine quarry access, West Pine siding construction, and Septimus rail siding construction. A Traffic Management Plan (including access restrictions where
required) will mitigate potential effects on the harvest of fish and wildlife resources (see Volume 5 Section 35 Summary of Environmental Management Plans).

All other project activities listed in Table 2 of Volume 2 Appendix A Project Interactions Matrix were ranked “0” because no interaction is predicted between the Project component and the harvest of fish and wildlife resources.

Any overlap or conflict between existing third-party tenure holders and BC Hydro’s proposed activities, or BC Hydro’s required tenure over Crown land, will be addressed through discussions, and where appropriate, through agreements with the tenure holders. Further information is available in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements in Volume 2 Section 11 Environmental Background.

### 24.1.3 Selection of Key Indicators

Key indicators for the harvest of fish and wildlife resources VC include relevant measures of public fishing and hunting activity, and tenured trapline and guide outfitting activity. The indicators include potential Aboriginal participation in tenured activities.

A list of key indicators, including a rationale for their selection is provided in Table 24.3.
### Table 24.3  Key Indicators for Harvest of Fish and Wildlife Resources

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in fishing opportunities</td>
<td>• Public fishing licence sales</td>
<td>• Fishing and hunting licence sales are indicators of participation in fishing and hunting in the Peace region</td>
</tr>
<tr>
<td></td>
<td>• Public fishing areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public fishing harvest information including numbers and species</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Angler creel survey results</td>
<td></td>
</tr>
<tr>
<td>Changes in hunting opportunities</td>
<td>• Public hunting licence sales</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public hunting areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public hunting harvest information including numbers and species</td>
<td></td>
</tr>
<tr>
<td>Changes in use of harvesting areas</td>
<td>• Public hunting and fishing licence sales</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public hunting and fishing areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public hunting and fishing harvest information including numbers and species</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Angler creel survey results</td>
<td></td>
</tr>
<tr>
<td>Changes in trapping opportunities</td>
<td>• Tenured trapline areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tenured trapline infrastructure (e.g., cabins, trails)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tenured trapline harvest volumes and areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tenure trapline operating and economic information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Aboriginal employment or use of tenured tralines</td>
<td></td>
</tr>
<tr>
<td>Changes in guide outfitting activities</td>
<td>• Tenured guide outfitter areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tenure guide outfitter infrastructure (e.g., cabins, trails)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tenured guide outfitter harvest volumes and areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tenured guide outfitter operating and economic information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Aboriginal participation in tenured guide outfitting operations</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
- * Includes input from consultation with regulators, First Nations, affected stakeholders, and the public, as well as regulatory guidelines, policies and programs

### 24.1.4  Spatial and Temporal Boundaries

#### 24.1.4.1  Spatial Boundaries

The Local Assessment Area (LAA) in the EIS Guidelines for the assessment of the VC of harvest of fish and wildlife resources is the Project activity zone and the Peace River downstream to Alberta Border. The Regional Assessment Area (RAA) in the EIS Guidelines is the Peace River Regional District (PRRD).

The areas used for reporting in this assessment were updated from the originally proposed spatial boundaries in the EIS Guidelines. The spatial boundary for the LAA for harvest of fish and wildlife (harvesting) is the Project activity zone, the area within reservoir impact lines, and the Peace River downstream to the Alberta border. This
includes the areas that may be changed due to Project activities where changes in the land or setting would affect harvesting activities, or which overlap with administrative boundaries for harvesting related tenures and licences, including the Peace River downstream to the Alberta border for fishing activities.

The RAA is the PRRD, and corresponds to the administrative boundary where the Project is occurring. Interactions of other project activities with the Project in relation to harvest of fish and wildlife resources could occur outside the RAA, but they would not be detectable or measurable.

The spatial study areas for the harvest of fish and wildlife resources VC are noted in Table 24.4 and illustrated in Figure 24.1.

**Table 24.4 Spatial Assessment Areas for Harvest of Fish and Wildlife Resources**

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project activity zone, the area within preliminary reservoir impact lines, and the Peace River downstream to the Alberta border</td>
<td>Peace River Regional District</td>
</tr>
</tbody>
</table>

**24.1.4.2 Temporal Boundaries**

The assessment has been conducted for the project construction and operations phases, which are described in Volume 1 Section 4 Project Description. Where applicable, seasonal and annual variations in effects on harvesting are also considered in the assessment.

**24.2 Information Sources and Methods**

**24.2.1 Literature Review**

The following information was used to formulate the baseline, and assist with assessment of potential effects:

- Project description and other project-related information
- B.C. Ministry of Forestry, Lands and Natural Resource Operations data, including harvests, licence sales, quotas, numbers of resident and non-resident hunters, and hunter days, pelt prices, and trapping royalties for management units and tenured trapping and guide outfitter areas within the LAA
- Reports on LGL (2010) creel survey and other fishing survey results

Public hunting data were acquired from B.C. Ministry of Forestry, Lands and Natural Resource Operations hunter harvest data, studies on economic effects and value of resident hunting, wildlife studies, traditional land use studies, and other data as made available to BC Hydro.

Fishing data were acquired from B.C. Ministry of Forestry, Lands and Natural Resource Operations licence sales, creel survey results, regional angling surveys, fisheries studies, and traditional land use studies.
While traditional land use studies were reviewed to confirm the types of harvested animals and key harvesting areas in the LAA, details regarding potential effects on traditional land use are addressed in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes and Volume 5 Section 34 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Requirements.

Trapline tenure and harvest data were acquired from provincial government sources and supported by interviews with trapline holders.

Guide outfitting data were acquired from B.C. Ministry of Forestry, Lands and Natural Resource Operations hunter harvest data, guide outfitter licence areas, the Guide Outfitting Association of British Columbia database, interviews with guide outfitters, and studies on the economic effects and value of guided hunting.

### 24.2.2 Interviews

Individual and group interviews were conducted to gather information regarding harvesting activities in the LAA and potential interactions with the Project. Government representatives from the BCMOE and B.C. Ministry of Forestry, Lands and Natural Resource Operations, and hunting and fishing group representatives were interviewed to identify secondary data sources, validate secondary data, and gain perspectives on key access points and harvesting areas that may be affected by the Project. The following hunting and fishing group representatives were interviewed:

- Dawson Creek Sportsman’s Club
- Hudson’s Hope Rod and Gun Club
- Chetwynd and District Rod and Gun Club
- North Peace Road and Gun Club (based in Fort St. John)

BC Hydro conducted interviews with trappers and guide outfitters with tenures in the Project activity zone to identify cabins, access points, trapping areas, and hunting areas that may be affected by the Project. This information was considered in the trapping and guide outfitting effects assessment.

Volume 3 Appendix C Land and Resource Use Assessment, Part 1 Land and Resource Use Assessment Interview Methodology summarizes interview methodology. Personal communications are listed in References at the end of this section.

### 24.2.3 Field Investigations

A field visit took place on July 14, 2011 to view formal and informal recreation sites potentially used for harvesting activities on the Peace River within the Project activity zone and along Highway 29 between Fort St. John and Hudson’s Hope. The visit was conducted to identify potential site-specific interactions with areas potentially used for harvesting or access to harvesting areas.

Field surveys were completed in 2008 to 2009 (LGL 2010) to develop an understanding of outdoor recreation sites, features, and amenities, as well as use levels and activities. The survey objectives also included completion of an angler and creel survey to obtain information on fishing areas, fishing activity, and fish harvest in the Peace region.
24.2.4 Data Management, Mapping and Modelling

A spatial analysis was undertaken to identify the overlap between the Project activity zone and area within reservoir impact lines, and limited entry hunting areas, traplines, and guide outfitting areas.

Data were geospatially represented using Geographic Information System (GIS) analysis. The GIS results were also used for figure preparation.

24.2.5 Aboriginal Community and Traditional Knowledge

Aboriginal community and traditional knowledge related to the harvest of fish and wildlife resources VC was obtained from results of BC Hydro’s consultation with Aboriginal groups, First Nations Traditional Use Studies, and First Nations Community Baseline Studies. First Nations concerns and information pertaining to tenured activities are included in this section. Details regarding potential effects on traditional land and resource use are addressed in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes, and Volume 5 Section 34 Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests, and Information Requirements.

24.3 Baseline Conditions

The sections that follow present an overview of current conditions related to the public and tenured harvest of fish and wildlife resources within the LAA.

24.3.1 Public Hunting and Fishing

24.3.1.1 Public Hunting and Fishing Licence Sales

Both hunting and fishing licence sales indicate a general trend of sustained or increased interest in hunting and fishing in the Peace Region, compared to a decrease in the province as a whole.

Hunting licence sales data available for the Peace Region (Region 7B under B.C. hunting regulations) and the province of B.C. are shown in Table 24.5. The LAA is within Region 7B. The number of licences sold in Region 7B increased by 2% between 2000 and 2007, compared to a provincial decline of 6%.
Table 24.5  Hunting Licence Sales in the Peace Region and British Columbia, 2000 to 2009

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Peace Region (Region 7B) a</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Licences sold</td>
<td>8,524</td>
<td>7,697</td>
<td>7,995</td>
<td>7,955</td>
<td>8,198</td>
<td>8,543</td>
<td>8,659</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>2</td>
</tr>
<tr>
<td>Fee revenue ($)</td>
<td>219,577</td>
<td>199,630</td>
<td>205,583</td>
<td>264,096</td>
<td>249,945</td>
<td>263,042</td>
<td>280,029</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>24</td>
</tr>
<tr>
<td>British Columbia</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Licences sold – resident b</td>
<td>93,740</td>
<td>86,580</td>
<td>85,714</td>
<td>81,736</td>
<td>84,003</td>
<td>85,633</td>
<td>87,170</td>
<td>87,722</td>
<td>90,867</td>
<td>92,235</td>
<td>-6</td>
</tr>
<tr>
<td>Licences sold – non-resident b</td>
<td>5,887</td>
<td>5,612</td>
<td>5,752</td>
<td>5,785</td>
<td>5,931</td>
<td>6,387</td>
<td>6,244</td>
<td>5,891</td>
<td>5,620</td>
<td>5,112</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Fee revenue ($1000) a</td>
<td>2,165</td>
<td>1,996</td>
<td>2,022</td>
<td>2,659</td>
<td>2,797</td>
<td>2,784</td>
<td>2,862</td>
<td>2,844</td>
<td>NA</td>
<td>NA</td>
<td>31</td>
</tr>
</tbody>
</table>

NOTES:
1. NA – data not available
2. Sources:
   a BCMOE (2009); b B.C. Ministry of Forests, Lands and Natural Resource Operations, Environmental Assessment Coordinator (2011a pers. comm.)
The lowest yearly sales for Region 7B was in 2004, and for the province it was in 2003. While licence sales are indicative of hunting activity, they do not indicate where the licensee hunted.

Fishing licence sales for Region 7B and the province of B.C. are shown in Table 24.6. The number of licences sold in the Peace Region increased by 8% between 2000 and 2007, while sales in B.C. decreased by 6% over the same time period. While licence sales are considered to be broadly indicative of regional fishing activity, they do not distinguish between resident and non-resident purchases, and do not indicate where the licensee fished.

Table 24.6  Fishing Licence Sales for Region 7B and British Columbia, 2000 to 2009

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Peace Region</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Licences sold</td>
<td>11,449</td>
<td>11,879</td>
<td>11,570</td>
<td>10,839</td>
<td>10,627</td>
<td>11,309</td>
<td>13,361</td>
<td>12,303</td>
<td>NA</td>
<td>NA</td>
<td>7</td>
</tr>
<tr>
<td>Fee revenue ($)</td>
<td>175,412</td>
<td>179,605</td>
<td>175,923</td>
<td>284,697</td>
<td>284,670</td>
<td>295,427</td>
<td>357,341</td>
<td>330,791</td>
<td>NA</td>
<td>NA</td>
<td>89</td>
</tr>
<tr>
<td>British Columbia</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Licences sold – resident b</td>
<td>278,646</td>
<td>285,517</td>
<td>275,554</td>
<td>276,206</td>
<td>248,052</td>
<td>251,993</td>
<td>260,135</td>
<td>261,505</td>
<td>246,388</td>
<td>287,561</td>
<td>-6</td>
</tr>
<tr>
<td>Licences sold – non-resident b</td>
<td>76,853</td>
<td>79,932</td>
<td>79,868</td>
<td>69,402</td>
<td>68,328</td>
<td>67,370</td>
<td>70,937</td>
<td>59,081</td>
<td>64,555</td>
<td>64,555</td>
<td>-8</td>
</tr>
<tr>
<td>Fee revenue ($'000)</td>
<td>5,007</td>
<td>5,069</td>
<td>4,979</td>
<td>7,796</td>
<td>7,759</td>
<td>7,601</td>
<td>7,998</td>
<td>7,883</td>
<td>NA</td>
<td>NA</td>
<td>57</td>
</tr>
</tbody>
</table>

NOTES:
NA – data not available

Sources:
a BCMOE (2009);
b B.C. Ministry of Forests, Lands and Natural Resource Operations, Environmental Assessment Coordinator (2011a pers. comm.)

24.3.1.2 Public Hunting and Fishing Areas

24.3.1.2.1 Fishing

The Peace River and its tributaries support angling for a variety of sport fish including lake trout, northern pike, walleye, Arctic grayling, bull trout, rainbow trout, mountain whitefish, lake whitefish, kokanee, goldeye, and burbot (GSGislon 2009; LGL 2010). Tributaries within the LAA, or entering the LAA, that support angling include the Moberly, Halfway, Beatton, and Pine rivers, and several smaller streams.

Fishing as a percentage of total outdoor recreation activity on the Peace River and its tributaries has been as high as 16% in the LAA (LGL 2010). There are 49 recreation sites on the Peace River between Hudson’s Hope and the Alberta border, 15 of which were noted as sites where fishing occurs. These locations provide shore or boat access...
for fishing. Table 24.7 shows the general location on the river segment for the
15 recreation sites where fishing occurs, along with the number of fishing participants

Table 24.7  Recreation Sites where Fishing Occurs in the LAA

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Peace Canyon Dam to Hudson’s Hope</th>
<th>Hudson’s Hope to Site C Dam Site</th>
<th>Site C Dam Site to Alberta Border</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Fishing Participants (2008–2009)</td>
<td>313</td>
<td>419</td>
<td>232</td>
</tr>
<tr>
<td>Recreation Sites and Locations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highway 29 Bridge</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Alwin Holland Memorial Park</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Hudson’s Hope Boat Launch</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Lynx Creek Boat Launch</td>
<td>○</td>
<td>●</td>
<td>○</td>
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<tr>
<td>Lynx Creek RV Park</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>The Gates Boat Launch</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Unmaintained Campsite B</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Farrell Creek</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td>Peace Island Park</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Confluence of Beatton River</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Blackfoot Park/&quot;Clayhurst&quot;</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Shoreline Access D</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Shoreline Access E</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Pine River: East Pine</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Pine River: Twidwell Bend</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

NOTES:
● – indicates presence of recreation site within river stratum
○ – indicates that the recreation site is not present within the river stratum
N/A – not applicable
River stratum refers portions of the Peace River or Pine River as defined in LGL 2010
Source: LGL (2010)

24.3.1.2.2  Hunting

The RAA has four rod and gun clubs with an estimated total of over 2,000 members, of
which about 80% are active hunters. The North Peace Rod and Gun Club (based in Fort
St. John) has a current membership of over 600 (including youths, adults, and families),
the Hudson’s Hope Rod and Gun Club has about 50 single and family memberships, the
Chetwynd Rod and Gun Club has about 153 members, and the Dawson Creek Club has
about 1,200 members.

The Peace River is valued for its hunting opportunities, notably the islands and the north
bank, south-facing slopes where wildlife is more abundant, and (in the case of the
islands) where less hunter effort is needed. Within the LAA, the south bank of the Peace
River receives about 20% of total hunter effort, while the islands and north bank receive
about 80% of effort (Holland 2009, pers. comm.).
For hunters from Hudson’s Hope, specific hunting areas within the LAA include Bear Flat, the Gates, up the Halfway River, and Farrell Creek (Hudson’s Hope Rod and Gun Club, Members 2011, pers. comm.).

Most North Peace club members also hunt throughout the Peace River Regional District, north of the Peace river, and as far north as the Muskwa-Kechika area (North Peace Rod and Gun Club, Members 2011, pers. comm.).

Hunters from Chetwynd use the Peace River corridor; however, they also choose to hunt closer to the Del Rio and Stewart Lake areas south of the Peace River (Eastman 2009, pers. comm.). The Del Rio is a hunting area with oil and gas roads that provide good access (Chetwynd and District Rod and Gun Club, Members 2011, pers. comm.).

Roughly half of the 1,200 members of the Dawson Creek Sportsman’s Club use the Peace River and its major tributaries for hunting due to its proximity to the community and ease of access via the Peace Island Park boat launch (Mathias 2009, pers. comm.; Mayor 2011, pers. comm.). Areas north of Chetwynd, Stewart Lake, and especially the Del Rio area are also used by club members.

As evidenced in the areas used by club members, access is a factor in the distribution of hunting activities within the LAA. Hunting on the north bank occurs on private (where permissible) and Crown land. Hunting on private land occurs between Bear Flat and the Halfway River. During April and May 2011, BC Hydro mailed questionnaires to property owners who own or lease land within areas potentially affected by the Project. Of those who responded, 24% indicated that they allow hunting on their property.

Eighteen per cent of those who allow hunting on their property indicated that they allowed hunting for deer, 16% allowed hunting for elk, 8% allowed hunting for moose, 8% allowed hunting for black bear, and 3% allowed hunting for Nabor’s buffalo.

Hunters use river boats to travel along the Peace, Pine, and Halfway rivers, making the islands and the south bank accessible. Boats are launched from Peace Island Park (near Taylor), Halfway River, and Lynx Creek (Hudson’s Hope), as well as from informal locations. Approximately half of the hunters launching from Peace Island Park travel upstream to river islands, while the other half travel downstream or up the Pine River. Hunters launching at the Halfway River typically head both upstream and downstream on the Peace, while some also go up the Halfway River (Holland 2009, pers. comm.).

There is also a variety of public and resource development roads that allow for access to hunting areas within the LAA.

24.3.2 Public Fishing and Harvest Information

24.3.2.1 Public Fishing

The LGL (2010) creel study indicated that total angling effort was 24,622 angler-hours (6,757 angler-days), of which 18,489 angler-hours (5,070 angler-days) were in the Peace River mainstem (LGL 2010). Within the Peace River, 53% of the angling activity occurred in the river stratum from Hudson’s Hope to the Site C dam site. Similar levels of angler effort were identified 20 years prior by DPA (1991) (Table 24.8). The similarity in angler-hour estimates across a 20-year period indicates that overall demand for fishing is not increasing. A discussion of the limitations of creel data is included in Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 3 Harvest of Fish and Wildlife Resources.
Table 24.8 compares fishing levels on the Peace River from historical creel surveys to the most recent data available. Whitefish and rainbow trout were the most commonly caught fish across all of the studies. Walleye or perch were more common downstream of the Site C dam site. The 2008–2009 catch (fish harvested and released) estimates showed that Arctic grayling (2,446 fish) and mountain whitefish (2,443 fish) were the species that were caught in greatest numbers, the majority of which were caught in the Pine River (LGL 2010). The total catch of rainbow trout and bull trout, summed across all strata, was estimated at 1,883 fish and 1,569 fish, respectively. Annual catch estimates for the Peace River mainstem indicated that rainbow trout were caught most frequently (1,786 fish), followed by bull trout (983 fish), and mountain whitefish (978 fish). For certain species (e.g., rainbow trout), the distribution of catch across river strata varies, with larger numbers of fish caught in areas upstream of the Project. Retention rates were highest for lake trout and northern pike, with 27% and 14% of catch retained, respectively.
Table 24.8  Peace River Fishing Surveys

<table>
<thead>
<tr>
<th>Year</th>
<th>Area</th>
<th>Season</th>
<th>Angler-Hours</th>
<th>Angler-Days</th>
<th>Hours per Angler-Days</th>
<th>Effort per River km</th>
<th>Total Catch (No.)</th>
<th>Catch per Hour</th>
<th>Catch by Species (No. and %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>Peace Canyon Dam to Farrell Creek (14 km)</td>
<td>June 1985 to October 1985</td>
<td>16,898</td>
<td>NA</td>
<td>NA</td>
<td>1,207 hrs/km</td>
<td>7,667</td>
<td>0.45/hr</td>
<td>rainbow trout: 4,469 (58%)</td>
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<td></td>
<td></td>
<td></td>
<td>whitefish: 2,890 (38%)</td>
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<td></td>
<td></td>
<td></td>
<td>Arctic grayling: 164 (2%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>bull trout: 144 (2%)</td>
</tr>
<tr>
<td>1989/90</td>
<td>Peace Canyon Dam to Farrell Creek (14 km)</td>
<td>May 1989 to April 1990</td>
<td>9,970</td>
<td>4,420</td>
<td>2.26</td>
<td>712 hrs/km</td>
<td>5,073</td>
<td>0.51/hr</td>
<td>rainbow trout: 2,005 (40%)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>315 days/km</td>
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<td>whitefish: 2,400 (47%)</td>
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<td></td>
<td>Arctic grayling: 389 (8%)</td>
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<td></td>
<td></td>
<td>bull trout: 149 (3%)</td>
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<td></td>
<td></td>
<td></td>
<td>kokanee: 101 (2%)</td>
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<td></td>
<td></td>
<td></td>
<td>northern pike: 29 (0.6%)</td>
</tr>
<tr>
<td>1989/90</td>
<td>Peace Canyon Dam to Site C (83 km)</td>
<td>May 1989 to April 1990</td>
<td>17,430</td>
<td>7,550</td>
<td>2.31</td>
<td>210 hrs/km</td>
<td>9,432</td>
<td>0.54/hr</td>
<td>rainbow trout: 2,445 (26%)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>91 days/km</td>
<td></td>
<td></td>
<td>whitefish: 4,747 (50%)</td>
</tr>
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<td></td>
<td></td>
<td>Arctic grayling: 1,399 (15%)</td>
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<td></td>
<td>bull trout: 304 (3%)</td>
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<td></td>
<td></td>
<td></td>
<td>kokanee: 129 (1%)</td>
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<td></td>
<td></td>
<td></td>
<td>northern pike: 359 (4%)</td>
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<td></td>
<td></td>
<td></td>
<td>walleye/pickerel: 49 (1%)</td>
</tr>
<tr>
<td>2008/09</td>
<td>Peace Canyon Dam to Hudson’s Hope (7km)</td>
<td>April 2008 to March 2009</td>
<td>3,032</td>
<td>833</td>
<td>3.64</td>
<td>433 hrs/km</td>
<td>864</td>
<td>0.28/hr</td>
<td>rainbow trout: 602 (70%)</td>
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<td></td>
<td></td>
<td>119 days/km</td>
<td></td>
<td></td>
<td>whitefish: 71 (8%)</td>
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<td></td>
<td></td>
<td></td>
<td>Arctic Grayling: 18 (2%)</td>
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<td></td>
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<td></td>
<td>bull trout: 143 (17%)</td>
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<td></td>
<td></td>
<td>northern pike: 8 (1%)</td>
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<td></td>
<td></td>
<td></td>
<td>walleye/pickerel: 9 (1%)</td>
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<td></td>
<td></td>
<td></td>
<td>goldeye: 13 (2%)</td>
</tr>
</tbody>
</table>
### Harvest of Fish and Wildlife Resources

<table>
<thead>
<tr>
<th>Year</th>
<th>Area</th>
<th>Season</th>
<th>Angler-Hours</th>
<th>Angler-Days</th>
<th>Hours per Angler-Days</th>
<th>Effort per River km</th>
<th>Total Catch (No.)</th>
<th>Catch per Hour</th>
<th>Catch by Species (No. and %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008/09 a</td>
<td>Peace Canyon Dam to Site C (83 km)</td>
<td>April 2008 to March 2009</td>
<td>12,875</td>
<td>3,537</td>
<td>3.64 a</td>
<td>155 hrs/km 43 days/km</td>
<td>3,418</td>
<td>0.27/hr</td>
<td>rainbow trout: 1,692 (50%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>0.97/day</td>
<td>whitefish: 515 (15%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Arctic Grayling: 300 (9%)</td>
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<td></td>
<td></td>
<td></td>
<td>bull trout: 635 (19%)</td>
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<td></td>
<td></td>
<td></td>
<td>northern pike: 102 (3%)</td>
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<td></td>
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<td></td>
<td>bull trout: 635 (19%)</td>
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<td></td>
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<td>northern pike: 102 (3%)</td>
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<td>bull trout: 635 (19%)</td>
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<td></td>
<td></td>
<td></td>
<td>northern pike: 102 (3%)</td>
</tr>
<tr>
<td>2008/09 b</td>
<td>Site C to Alberta Border (49 km)</td>
<td>April 2008 to March 2008</td>
<td>5,613</td>
<td>1,542</td>
<td>3.64 a</td>
<td>114 hrs/km 31 days/km</td>
<td>1,439</td>
<td>0.26/hr</td>
<td>rainbow trout: 70 (5%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>0.94/day</td>
<td>whitefish: 120 (8%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Arctic grayling: 94 (7%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>bull trout: 259 (18%)</td>
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<td></td>
<td></td>
<td></td>
<td>northern pike: 236 (16%)</td>
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<td></td>
<td>walleye/pickerel: 550 (38%)</td>
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<td></td>
<td></td>
<td></td>
<td>goldeye: 110 (8%)</td>
</tr>
</tbody>
</table>

**NOTES:**

1. a Data from Hammond (1986)
2. b Data from DPA (1991)
3. c Data from LGL (2010)
4. d Pooled study average (not corrected for river stratum)
5. hr – hour
6. hrs – hours
7. NA – data not available
8. **Sources:** DPA (1991); Hammond (1986); LGL (2010)
24.3.2.2 Public Hunting

The LAA overlaps four management units (MUs 7-32, 7-33, 7-34, and 7-35). Management Unit 7-20A is designated for Limited Entry Hunting (LEH) and fully encompasses MU 7-32, 7-33, and 7-34, as well as portions of 7-35. The provincial government manages game species and maintains hunting opportunities through hunting seasons, licensing, and regulations of various types and permits designed to retain the sustainability and health of the resource. For most species, the hunting season runs from late August to late November, with most species hunted in the late October and early November periods. Bag limits are one for all ungulates and cougar, two for black bear, and three for wolf (BCMOE 2012). There is no bag limit for coyote. Bag limits for birds range from nine for Sharp-Tailed Grouse to 30 for Spruce and Ruffed Grouse.

The LEH allocates hunting opportunities by lottery to help meet wildlife management objectives. LEH seasons are introduced where necessary to limit:

- The number of hunters
- The number of animals that may be taken
- The harvest to a certain class of animal

Elk (antlerless or unrestricted) and moose (calf only) LEH draws are available in the LAA. The elk LEH season is open from December 1 to February 28. The moose LEH season is August 15 to August 30, and October 16 to October 31. Although general open seasons are available for elk and moose, the class of animal available will often be different. Table 24.9 and Table 24.10 show elk and moose LEH harvest statistics for the most recent years available in the LAA (Management Unit 7-20A).
### Table 24.9 Elk Limited Entry Hunting Harvest Statistics in the Management Unit Within the LAA

<table>
<thead>
<tr>
<th>Year</th>
<th>Management Unit</th>
<th>Animal Class</th>
<th>Permits Available (No.)</th>
<th>Applicants (No.)</th>
<th>Respondents (No.)</th>
<th>Estimated Hunters (No.)</th>
<th>Success Rate (%)</th>
<th>Estimated Kills (No.)</th>
<th>Estimated Days Hunting</th>
<th>Days per Kill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elk</td>
<td>2008 7-20 Zone A</td>
<td>Antlerless</td>
<td>1,240</td>
<td>4,056</td>
<td>561</td>
<td>552.6</td>
<td>48.8</td>
<td>269.7</td>
<td>2,542</td>
<td>9.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any sex/age</td>
<td>800</td>
<td>3,144</td>
<td>354</td>
<td>404.5</td>
<td>45.2</td>
<td>182.9</td>
<td>1,848</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>Antlerless</td>
<td>1,240</td>
<td>4,500</td>
<td>609</td>
<td>635.3</td>
<td>44.2</td>
<td>281.0</td>
<td>3,026</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any sex/age</td>
<td>800</td>
<td>3,450</td>
<td>433</td>
<td>423.2</td>
<td>48.5</td>
<td>205.1</td>
<td>1,850</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>Antlerless</td>
<td>1,240</td>
<td>5,966</td>
<td>531</td>
<td>464.7</td>
<td>48.2</td>
<td>224.2</td>
<td>2,162</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
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<td>Any sex/age</td>
<td>800</td>
<td>3,946</td>
<td>332</td>
<td>343.1</td>
<td>46.6</td>
<td>160.0</td>
<td>1,468</td>
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</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage change antlerless</td>
<td>0.0</td>
<td>47.0</td>
<td>-5.3</td>
<td>-15.9</td>
<td>-1.2</td>
<td>-16.9</td>
<td>-14.9</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage change any sex/age</td>
<td>0.0</td>
<td>25.5</td>
<td>-6.2</td>
<td>-15.2</td>
<td>3.1</td>
<td>-12.5</td>
<td>-20.6</td>
<td>-8.9</td>
<td></td>
</tr>
<tr>
<td>Total antlerless</td>
<td>3,720</td>
<td>14,522</td>
<td>1,701</td>
<td>1,652.6</td>
<td>46.9</td>
<td>775.0</td>
<td>7,730</td>
<td>10.0</td>
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<td></td>
</tr>
<tr>
<td>Total any sex/age</td>
<td>2,400</td>
<td>10,540</td>
<td>1,119</td>
<td>1,170.8</td>
<td>46.8</td>
<td>548</td>
<td>5,166</td>
<td>9.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
1. Success rate is the ratio of the number of estimated kills to the number of estimated hunters.
2. **Source:** B.C. Ministry of Forests, Lands and Natural Resource Operations, Environmental Assessment Coordinator (2011a pers. comm.)
## Table 24.10  Moose Limited Entry Hunting Harvest Statistics in the Management Units in the LAA

<table>
<thead>
<tr>
<th>Year</th>
<th>Management Unit</th>
<th>Animal Class</th>
<th>Permits Available (No.)</th>
<th>Applicants (No.)</th>
<th>Respondents (No.)</th>
<th>Estimated Hunters (No.)</th>
<th>Success Rate (%)</th>
<th>Estimated Kills (No.)</th>
<th>Estimated Days Hunting</th>
<th>Days per Kill</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>7-32, 7-33, and 7-34</td>
<td>Calf only</td>
<td>137</td>
<td>161</td>
<td>90</td>
<td>76.1</td>
<td>15.1</td>
<td>11.5</td>
<td>289</td>
<td>25.1</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
<td>165</td>
<td>141</td>
<td>92</td>
<td>84.2</td>
<td>15.0</td>
<td>12.6</td>
<td>318</td>
<td>25.2</td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
<td>165</td>
<td>179</td>
<td>99</td>
<td>78.7</td>
<td>38.2</td>
<td>30.1</td>
<td>317</td>
<td>10.5</td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td></td>
<td>165</td>
<td>162</td>
<td>102</td>
<td>86.0</td>
<td>29.9</td>
<td>25.7</td>
<td>377</td>
<td>14.7</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td>165</td>
<td>137</td>
<td>85</td>
<td>76.5</td>
<td>30.1</td>
<td>23.0</td>
<td>400</td>
<td>17.4</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td>180</td>
<td>105</td>
<td>68</td>
<td>68.5</td>
<td>47.0</td>
<td>32.2</td>
<td>463</td>
<td>14.4</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td>240</td>
<td>135</td>
<td>71</td>
<td>94.6</td>
<td>45.2</td>
<td>42.8</td>
<td>457</td>
<td>10.7</td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td>240</td>
<td>142</td>
<td>74</td>
<td>85.0</td>
<td>22.2</td>
<td>18.9</td>
<td>444</td>
<td>23.5</td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td>240</td>
<td>130</td>
<td>62</td>
<td>74.4</td>
<td>17.7</td>
<td>13.2</td>
<td>510</td>
<td>38.6</td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td>240</td>
<td>142</td>
<td>80</td>
<td>86.4</td>
<td>29.7</td>
<td>25.7</td>
<td>483</td>
<td>18.8</td>
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<tr>
<td>2010</td>
<td></td>
<td></td>
<td>240</td>
<td>163</td>
<td>73</td>
<td>70.0</td>
<td>32.9</td>
<td>23.0</td>
<td>626</td>
<td>27.2</td>
</tr>
<tr>
<td></td>
<td>Percentage change</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Total</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
Success rate is the ratio of the number of estimated kills to the number of estimated hunters

**Source:** B.C. Ministry of Forests, Lands and Natural Resource Operations, Environmental Assessment Coordinator (2011a pers. comm.)
Harvest data by species for the LAA management units, and for the 11-year period ending in 2010 are shown in Table 24.11. Harvesting has increased overall for all of the animals hunted in the LAA since 1999. Hunting activity data for management units in the LAA for the 13-year period between 1996 and 2008 are shown in Table 24.12.

There has been a province-wide decline in hunting licences issued and hunting activity over the last 30 years; however, the number of resident hunters in the Peace Region increased by 33% between 1996 and 2008. Hunters from southern B.C. who hunt in the Peace region are contributing to this increase as hunting areas elsewhere in the province shrink due to the encroachment of urban development and the expansion of protected areas. In addition, with the creation of the Agriculture Zone Hunt, local hunting opportunities have increased in the last three to four years, creating hunter interest from inside and outside the PRRD. This trend is captured in Table 24.12 (BCMOE, Wildlife Biologist 2009a pers. comm.).
Table 24.11  Big Game Species Harvested in Management Units in the LAA, 1999 to 2010

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Black bear</td>
<td>63</td>
<td>129</td>
<td>79</td>
<td>101</td>
<td>55</td>
<td>68</td>
<td>75</td>
<td>58</td>
<td>102</td>
<td>63</td>
<td>83</td>
<td>32</td>
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<tr>
<td>Caribou</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cougar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Elk</td>
<td>99</td>
<td>122</td>
<td>172</td>
<td>170</td>
<td>246</td>
<td>243</td>
<td>376</td>
<td>387</td>
<td>375</td>
<td>746</td>
<td>652</td>
<td>559</td>
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<td>Goat</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Grizzly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Moose</td>
<td>452</td>
<td>570</td>
<td>782</td>
<td>885</td>
<td>1,009</td>
<td>542</td>
<td>897</td>
<td>936</td>
<td>310</td>
<td>267</td>
<td>552</td>
<td>22</td>
</tr>
<tr>
<td>Mule deer</td>
<td>634</td>
<td>935</td>
<td>782</td>
<td>773</td>
<td>773</td>
<td>715</td>
<td>893</td>
<td>1,234</td>
<td>1,254</td>
<td>1,108</td>
<td>635</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Sheep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>White-tailed deer</td>
<td>258</td>
<td>406</td>
<td>110</td>
<td>300</td>
<td>318</td>
<td>277</td>
<td>423</td>
<td>342</td>
<td>438</td>
<td>524</td>
<td>731</td>
<td>183</td>
</tr>
<tr>
<td>Wolf</td>
<td>23</td>
<td>57</td>
<td></td>
<td>29</td>
<td>27</td>
<td>17</td>
<td>16</td>
<td>10</td>
<td>40</td>
<td>23</td>
<td>48</td>
<td>109</td>
</tr>
<tr>
<td>Total</td>
<td>1,529</td>
<td>2,220</td>
<td>1,925</td>
<td>2,258</td>
<td>2,429</td>
<td>1,862</td>
<td>2,680</td>
<td>2,967</td>
<td>2,522</td>
<td>2,732</td>
<td>2,701</td>
<td>77</td>
</tr>
</tbody>
</table>

NOTES:
2 N/A – not applicable
3 — data not collected
### Table 24.12  Hunting Activity in Management Units in the LAA, 1996 to 2008

<table>
<thead>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resident Hunters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of hunters</td>
<td>5,797</td>
<td>5,907</td>
<td>7,089</td>
<td>6,514</td>
<td>6,411</td>
<td>5,329</td>
<td>6,204</td>
<td>5,991</td>
<td>4,905</td>
<td>6,454</td>
<td>6,766</td>
<td>7,301</td>
<td>7,704</td>
<td>33</td>
</tr>
<tr>
<td>Hunter days</td>
<td>34,357</td>
<td>34,332</td>
<td>41,409</td>
<td>42,028</td>
<td>41,393</td>
<td>36,704</td>
<td>37,322</td>
<td>32,899</td>
<td>27,611</td>
<td>38,627</td>
<td>37,552</td>
<td>48,011</td>
<td>49,215</td>
<td>43</td>
</tr>
<tr>
<td>Harvest (no. of animals)</td>
<td>1,574</td>
<td>1,849</td>
<td>2,216</td>
<td>1,504</td>
<td>2,172</td>
<td>1,882</td>
<td>2,227</td>
<td>2,398</td>
<td>1,825</td>
<td>2,632</td>
<td>2,924</td>
<td>2,492</td>
<td>2,691</td>
<td>71</td>
</tr>
<tr>
<td>Expenditure ($ million)</td>
<td>1.6</td>
<td>1.6</td>
<td>1.9</td>
<td>2.0</td>
<td>2.0</td>
<td>1.9</td>
<td>2.0</td>
<td>1.7</td>
<td>1.5</td>
<td>2.2</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>38</td>
</tr>
<tr>
<td>Consumer surplus ($ million)</td>
<td>1.6</td>
<td>1.7</td>
<td>2.0</td>
<td>2.1</td>
<td>2.1</td>
<td>1.9</td>
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<td>1.8</td>
<td>1.6</td>
<td>2.2</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>37</td>
</tr>
<tr>
<td><strong>Non-Resident Hunters</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of hunters</td>
<td>97</td>
<td>80</td>
<td>77</td>
<td>72</td>
<td>114</td>
<td>167</td>
<td>107</td>
<td>115</td>
<td>103</td>
<td>147</td>
<td>110</td>
<td>95</td>
<td>109</td>
<td>12</td>
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<tr>
<td>Hunter days</td>
<td>686</td>
<td>492</td>
<td>452</td>
<td>435</td>
<td>785</td>
<td>1,234</td>
<td>796</td>
<td>710</td>
<td>525</td>
<td>809</td>
<td>567</td>
<td>395</td>
<td>124</td>
<td>-82</td>
</tr>
<tr>
<td>Harvest (no. of animals)</td>
<td>48</td>
<td>36</td>
<td>38</td>
<td>25</td>
<td>48</td>
<td>43</td>
<td>31</td>
<td>31</td>
<td>37</td>
<td>48</td>
<td>43</td>
<td>30</td>
<td>41</td>
<td>-15</td>
</tr>
<tr>
<td>Expenditure ($ million)</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.3</td>
<td>0.5</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.4</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>43</td>
</tr>
<tr>
<td>Consumer surplus ($ million)</td>
<td>0.04</td>
<td>0.03</td>
<td>0.03</td>
<td>0.05</td>
<td>0.1</td>
<td>0.06</td>
<td>0.05</td>
<td>0.04</td>
<td>0.07</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>52</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
1. Due to rounding, percentage changes may not equal the percentage change of the dollar values presented in the table.
2. NA – data not available.
24.3.3 Tenured Traplines

24.3.3.1 Tenured Trapline Areas, Infrastructure, and Harvest

Registered trapping tenures are administered by the Fish and Wildlife Branch of the BCMOE. The registered trapline system is the primary management tool for the commercial use of fur-bearing animals. In 1926, the province was divided into registered traplines, giving the trapline owner the exclusive right to trap fur-bearing animals inside the trapline area. Traplines typically cover a large land area, and there are 16 traplines overlapping with the LAA (Figure 24.2), half of which are held by or used by Aboriginal trappers through agreements with the registered trapline owners. Trappers also often build cabins on their traplines to facilitate trapping. There are cabins located within the Project activity zone and reservoir impact line, and BC Hydro is confirming the location of cabins that would need to be relocated.

Trappers access trapping areas by foot, snowshoe, horse, snowmobile, all-terrain vehicle, or truck. Methods chosen depend on the level of access and the desire to create or maintain new access to areas within the trapline. Linear access includes roads, trails, and cutlines. Boats are also used to reach trapping areas along the Peace and Moberly rivers. Local roads such as the Medicine Woman Road, Jackfish Lake Road, and the Del Rio Road are used by trappers south of the river. Trappers access the LAA regularly during the trapping season and noted the importance of these trails or roads for their traplines (Trapper Interviews 2012, pers. comm.).

Trapping does occur along the breaks and lower benches north of the Peace River. One trapper noted that the trapping locations are based on distribution of animals throughout a trapline, which is affected by plant growth and weather (Trapper Interviews 2012, pers. comm.). Two trappers commented that they avoid trapping along the Peace River due to water level fluctuations affecting trapping success. Marten, beaver, and fisher were the most commonly trapped species in the LAA (Figure 24.3). Table 24.13 summarizes the harvest from the traplines overlapping the LAA between 2001 and 2008. The data may not include harvest by Aboriginal trappers, as they are not required to supply the provincial government with harvest reports. As a result, harvest data from up to half of the traplines may not be presented here.
### Table 24.13 Trapping Harvests in Traplines within the Local Assessment Area, 2001 to 2008

<table>
<thead>
<tr>
<th>Species Harvested</th>
<th>Total Harvest (2001–2008)</th>
<th>Average Annual Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaver</td>
<td>255</td>
<td>32</td>
</tr>
<tr>
<td>Black bear</td>
<td>2</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Coyote</td>
<td>90</td>
<td>11</td>
</tr>
<tr>
<td>Fisher</td>
<td>37</td>
<td>5</td>
</tr>
<tr>
<td>Fox</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Lynx</td>
<td>31</td>
<td>4</td>
</tr>
<tr>
<td>Marten</td>
<td>1,684</td>
<td>211</td>
</tr>
<tr>
<td>Mink</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Muskrat</td>
<td>73</td>
<td>9</td>
</tr>
<tr>
<td>Otter</td>
<td>1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Squirrel</td>
<td>4,072</td>
<td>509</td>
</tr>
<tr>
<td>Weasel</td>
<td>334</td>
<td>42</td>
</tr>
<tr>
<td>Wolf</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Wolverine</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,628</strong></td>
<td><strong>829</strong></td>
</tr>
</tbody>
</table>

**NOTE:** Totals may not add up, due to rounding

**Source:** B.C. Ministry of Forests, Lands and Natural Resource Operations, Environmental Assessment Coordinator (2011b pers. comm.)

#### 24.3.3.2 Tenured Trapline Operating and Economic Information

Collectively, marten, lynx, beaver, and fisher made up an average of 60% of the annual trapping revenue between 2005 and 2008 (Table 24.14). Based on low annual trapping revenues, trapping is pursued more often as a lifestyle or subsistence activity, rather than as a primary income source.
Table 24.14  Trapping Values for Traplines in the Local Assessment Area, 2005 to 2008

<table>
<thead>
<tr>
<th>Animals Harvested</th>
<th>Average Annual Harvest</th>
<th>Average Price per Animal ($)</th>
<th>Price Range ($)</th>
<th>Average Annual Revenue ($)</th>
<th>Average Royalty per Animal ($)</th>
<th>Average Annual Royalty per Animal ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaver</td>
<td>47</td>
<td>26.68</td>
<td>22.47 – 28.27</td>
<td>1,253.96</td>
<td>0.77</td>
<td>36.19</td>
</tr>
<tr>
<td>Coyote</td>
<td>29</td>
<td>33.30</td>
<td>24.47 – 42.16</td>
<td>965.70</td>
<td>1.13</td>
<td>32.77</td>
</tr>
<tr>
<td>Fisher</td>
<td>13</td>
<td>87.10</td>
<td>70.68 – 94.33</td>
<td>1,132.30</td>
<td>1.99</td>
<td>25.87</td>
</tr>
<tr>
<td>Fox</td>
<td>3</td>
<td>25.87</td>
<td>21.33 – 31.66</td>
<td>77.61</td>
<td>0.85</td>
<td>2.55</td>
</tr>
<tr>
<td>Lynx</td>
<td>26</td>
<td>170.79</td>
<td>138.41 – 203.28</td>
<td>4,440.54</td>
<td>5.14</td>
<td>133.64</td>
</tr>
<tr>
<td>Marten</td>
<td>459</td>
<td>71.01</td>
<td>57.88 – 80.31</td>
<td>32,593.59</td>
<td>1.88</td>
<td>862.92</td>
</tr>
<tr>
<td>Mink</td>
<td>9</td>
<td>17.98</td>
<td>14.96 – 21.33</td>
<td>161.82</td>
<td>0.56</td>
<td>5.04</td>
</tr>
<tr>
<td>Muskrat</td>
<td>8</td>
<td>3.99</td>
<td>2.62 – 6.73</td>
<td>31.92</td>
<td>0.10</td>
<td>0.80</td>
</tr>
<tr>
<td>Otter</td>
<td>2</td>
<td>71.56</td>
<td>39.70 – 152.78</td>
<td>143.12</td>
<td>3.94</td>
<td>7.88</td>
</tr>
<tr>
<td>Squirrel</td>
<td>323</td>
<td>1.38</td>
<td>1.22 – 1.46</td>
<td>445.74</td>
<td>0.04</td>
<td>12.92</td>
</tr>
<tr>
<td>Weasel</td>
<td>79</td>
<td>7.50</td>
<td>5.31 – 9.30</td>
<td>592.50</td>
<td>0.19</td>
<td>15.01</td>
</tr>
<tr>
<td>Wolf</td>
<td>2</td>
<td>98.60</td>
<td>75.39 – 129.57</td>
<td>197.20</td>
<td>2.60</td>
<td>5.2</td>
</tr>
<tr>
<td>Wolverine</td>
<td>1</td>
<td>230.61</td>
<td>169.04 – 297.48</td>
<td>230.61</td>
<td>6.00</td>
<td>6.0</td>
</tr>
<tr>
<td>Total (all animals)</td>
<td>1,001</td>
<td>65.11</td>
<td>2.62 – 297.48</td>
<td>65,175.11</td>
<td>1.94</td>
<td>1,941.94</td>
</tr>
</tbody>
</table>

NOTE:


Trapping values are transferable and may be sold by the registered holder. The price of a trapline depends on abundance of valuable fur-bearers and presence of infrastructure (e.g., cabin). Recent prices for traplines ranged from $15,000 to $25,000 (BCMOE, Wildlife Biologist 2009c pers. comm.). The price of some traplines south of the LAA have sold for higher prices, but the primary purpose for these areas may be recreation, since a trapline licence allows one to construct a cabin on Crown land without additional permitting. In these cases, owners may only register the minimum harvest required to maintain active status, as opposed to actively trapping for fur.

24.3.3.3 Aboriginal Use of Tenured Traplines

Aboriginal people are involved in the use of half of the traplines overlapping the LAA, either as the registered owner or through agreements with the registered owner (Trapper Interviews 2012, pers. comm.). Aboriginal trapping is described in more detail in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes.

24.3.4 Tenured Guide Outfitting

24.3.4.1 Tenured Guide Outfitter Areas, Infrastructure, and Harvest

There are four guide outfitters with hunting territories overlapping the LAA (Figure 24.4). One guide outfitter identified up to three cabins within the LAA that may be affected by inundation (Guide Outfitter Interviews 2012, pers. comm.). Two cabins located near the Peace River downstream of the Site C dam site are not within the inundation area. One
guide outfitter has licence of occupation for a hunting camp within the footprint of the proposed Site C dam site.

One outfitter indicated that 40–50% of his hunts occur adjacent to the Peace River in November, and during the spring and fall bear hunts (Guide Outfitter Interviews 2012, pers. comm.). He offers charter fishing, boat operation, camping, and day use on islands on the Peace River. Another outfitter indicated that the Peace River valley is a good area for hunting as far up as Maurice Creek across from Hudson’s Hope, and that he provides hunts on horseback in areas with limited access between Hudson’s Hope and Taylor (Guide Outfitter Interviews 2012, pers. comm.). Another outfitter’s spring bear hunt occurs in the area of Bullhead and Portage Mountain (Guide Outfitter Interviews 2012, pers. comm.).

Outfitters commented that traffic detours or access restrictions that result from construction or industrial activities in the region adversely affect guided outfitting hunting experience for clientele and, in turn, can affect outfitters’ operations and revenue (Guide Outfitter Interviews 2012, pers. comm.). In general, the outfitters are concerned with increased competition for resources through increased access in the LAA and RAA, as well as diminished wilderness experience due to visible industrial activities or the need for or exposure to motorized access. (Guide Outfitter Interviews 2012, pers. comm.). Some outfitters indicate that the oil and gas industry and forestry have already disturbed their guiding areas to the point where few untouched hunting areas remain (Guide Outfitter Interviews 2012, pers. comm.).

Table 24.15 shows outfitters’ quotas (2007 to 2011) and harvests (2006 to 2010) in the LAA.
Table 24.15  Quotas (2007 to 2011) and Harvests (2006 to 2010) for Local Assessment Area Guide Outfitters

<table>
<thead>
<tr>
<th>Tenure #</th>
<th>700551</th>
<th>701241</th>
<th>701222</th>
<th>701245</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
<td>Quota</td>
<td>Harvest</td>
<td>Quota</td>
<td>Harvest</td>
</tr>
<tr>
<td>Black bear</td>
<td>N/A</td>
<td>36</td>
<td>N/A</td>
<td>15</td>
</tr>
<tr>
<td>Cougar</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>Elk (antlerless)</td>
<td>15</td>
<td>44b</td>
<td>6</td>
<td>10b</td>
</tr>
<tr>
<td>Other elk</td>
<td>8a</td>
<td>4a</td>
<td>0a</td>
<td>0a</td>
</tr>
<tr>
<td>Grizzly bear</td>
<td>5</td>
<td>2a</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Lynx</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>Moose (bull)</td>
<td>N/A</td>
<td>14</td>
<td>N/A</td>
<td>3</td>
</tr>
<tr>
<td>Mountain goat</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mule deer</td>
<td>N/A</td>
<td>38</td>
<td>N/A</td>
<td>18</td>
</tr>
<tr>
<td>Stone sheep</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Whitetail deer</td>
<td>N/A</td>
<td>31</td>
<td>N/A</td>
<td>27</td>
</tr>
<tr>
<td>Wolf</td>
<td>N/A</td>
<td>0</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>165</td>
<td>15</td>
<td>71</td>
</tr>
</tbody>
</table>

NOTES:

a  2008 to 2011
b  Including bulls not included in the quota
N/A – not applicable

24.3.4.2  Tenured Guide Outfitter Operating and Economic Information

Outfitters whose tenures overlap the LAA offer a variety of species and hunts, with moose and deer accounting for the majority of hunter effort, harvest, and expenditures (Table 24.15 and Table 24.16). Approximately half of the outfitters’ clients are American, with the remainder coming from Europe, New Zealand, Australia, and other parts of Canada outside of B.C. One outfitter identified that the recent downturn in the U.S. economy has affected their operation, experiencing almost a 50% drop in clientele over the last five years (Guide Outfitter Interviews 2012, pers. comm.).
Table 24.16  Business Profile of Guide Outfitters in the Technical Study Area

<table>
<thead>
<tr>
<th>Guide Outfitter Tenure #</th>
<th>Location</th>
<th>Management Unit</th>
<th>Hunts and Adventures Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>700551</td>
<td>Hudson’s Hope</td>
<td>7-35, 7-43</td>
<td>Black bear, cougar, deer, elk, grizzly bear, lynx, moose, wolf, freshwater angling, photo safaris, trail rides, wildlife viewing, cross-country skiing</td>
</tr>
<tr>
<td>701241</td>
<td>Charlie Lake</td>
<td>7-31, 7-35, 7-36</td>
<td>Black bear, deer, grizzly bear, moose, wolf, stone sheep</td>
</tr>
<tr>
<td>701222</td>
<td>Chetwynd</td>
<td>7-31</td>
<td>Black bear, cougar, deer, elk, grizzly bear, goat, lynx, moose, wolf, wolverine, photo safaris, wildlife viewing</td>
</tr>
<tr>
<td>701245</td>
<td>Chetwynd</td>
<td>7-21, 7-22, 7-32</td>
<td>Black bear, cougar, deer, elk, grizzly bear, goat, lynx, moose, wolf, trail rides, photo safaris, wildlife viewing</td>
</tr>
</tbody>
</table>

NOTE:  
Source: GOABC (2012)

24.3.4.3  Aboriginal Participation in Tenured Guide Outfitting Operations

Three elders from the West Moberly First Nation were identified as working as guides for one guide outfitter operation (Guide Outfitter Interviews 2012, pers. comm.). There are no Aboriginal-owned tenured guide outfitter operations overlapping the LAA.

24.4  Effects Assessment

Potential Project effects on the harvest of fish and wildlife resources are presented for all construction phase components and for all operations phase components because:

- The effects mechanism is the same for all project components (i.e., harvesting is affected by changes in access due to the Project activity zone)
- Government response to potential effects (e.g., changes in harvest quotas) and proposed mitigation would be associated with the combined effects on licensees and the public

24.4.1  Effects Assessment – Construction – Changes in Fishing Opportunities

The potential to adversely affect fishing opportunities is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Use of and access to fishing areas
- Availability of harvested species based on the results of the assessment of the potential effects of the Project on the fish and fish habitat VC

The following indicators are used to describe potential effects during construction:

- Public fishing areas
- Public fishing harvests
24.4.1.1 Changes in Public Fishing Areas

During the construction phase, there are two key changes that would affect use of and access to public fishing areas:

- Access restrictions due to construction activities
- Change of the Peace River to a reservoir during Site C reservoir filling

Some access restrictions due to public safety and site management would apply during construction and Site C reservoir filling. The following public access and safety approach would apply to the Peace River during construction:

- Due to public safety concerns associated with boat traffic within the Site C dam site area, boat passage would be permanently restricted at the Site C dam site beginning in Year 1 of construction
- Boat access would be restricted on either side of the Site C dam site construction zone, including approximately 3 km upstream of the Site C dam site, through the entire construction period
- Due to the placement of a debris collection boom in construction Year 2, boat access on the Peace River would be restricted approximately 12 km from the Site C dam site in the vicinity of Wilder Creek
- Based on debris boom placement, access to the Peace River upstream of Wilder Creek would be permitted through the final six years of construction. However, temporary restrictions would occur throughout the river during periods when specific project activities (e.g., vegetation clearing, Hudson’s Hope shoreline protection, and Highway 29 construction) would take place.
- It is expected that both the Lynx Creek and Halfway River boat launches would remain open during construction through to Site C reservoir filling, which is proposed late in construction Year 7, with temporary closures
- The Site C reservoir may be closed to navigation during the Site C reservoir filling period and early Site C reservoir operations due to debris and slope stability hazards

The access restrictions and initial Site C reservoir use limitations would reduce use of and access to fishing opportunities in the LAA during construction. Anglers would likely use alternative fishing areas when restricted on the Peace River, such as the Peace River downstream of the Site C dam site, the Pine River, Dinosaur Reservoir, or other areas in the region.

24.4.1.2 Changes in Public Fishing Harvests

During construction, the movement of fish and aquatic productivity patterns would change, with some species benefiting and others adversely affected, due to habitat changes. Per Volume 2 Section 12 Fish and Fish Habitat, Project effects on fish during the construction period include:

- During river channelization (Years 1–4), fish would successfully pass through the dam site with no expected effect on harvested fish populations
- During river diversion (Years 5–7), fish passage will be affected at the dam site due to diversion works:
o Anticipated decrease in harvest opportunities of cold/clear water sport fish group including bull trout, arctic grayling, and mountain whitefish from the dam site to Peace Canyon dam, due to blocked passage at the dam site

o No anticipated effect to harvest of cool/turbid water group including walleye, burbot, and northern pike within the LAA

- During river diversion (Years 5–7), fish will be affected by changes in water quality and associated increases in turbidity (i.e., increased sedimentation due to headponding upstream of the dam):
  o Anticipated decreased harvest opportunities of cold water species from Cache Creek to the Pine River confluence, due to avoidance of turbidity
  o No anticipated effect to harvest of cool water species, given tolerance for turbid conditions

- During reservoir filling in Year 8, harvest opportunities will be disrupted throughout the reservoir as the river environment transitions to a reservoir environment

Areas of the river where fish will be affected by turbidity will be largely closed to public access beginning in Year 1 of construction (dam site closure 3 km upstream and downstream) and in Year 2 (up to Wilder Creek due to debris boom placement); therefore, in these cases, the effects on fishing opportunities will be due to changes in access, rather than effects on the availability of harvested species.

24.4.2 Effects Assessment – Operations – Changes in Fishing Opportunities

The potential to affect fishing opportunities is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Use of and access to fishing areas
- Availability of harvested species based on the results of the assessment of the potential effects of the Project on the fish and fish habitat VC

The following indicators are used to describe potential effects during operations:

- Changes in public fishing areas
- Changes in public fishing harvests

24.4.2.1 Changes in Public Fishing Areas

During the initial years of Project operations, it is expected that Site C reservoir access would be managed for public safety by monitoring floating debris and slope stability hazards. Volume 3 Section 25 Outdoor Recreation and Tourism identifies BC Hydro’s approach to providing new Site C reservoir and shoreline access. As access restrictions are lifted, the Site C reservoir would provide new fishing areas, both from the water and the shoreline. Both the surface area of the Site C reservoir and the length of the shoreline would increase.

Boat and shoreline access would be provided at three BC Hydro boat launches (see Volume 3 Appendix E Outdoor Recreation Mitigation Plan). The Site C reservoir is expected to provide good navigational opportunities to support fishing (Volume 3
Section 26 Navigation), and would be supported by amenities constructed to facilitate access and use.

Fishing opportunities downstream of the Site C dam site would also change. Boating access would be limited to areas accessible from Peace Island Park, including the downstream Peace River and the Pine River. The Pine River would likely remain the main destination for anglers launching from Peace Island Park. Angling opportunities at the Pine River would be unchanged by the Project.

In general the Site C reservoir would likely support fishing opportunities similar to the Dinosaur Reservoir upstream with similar fish species available for harvest (B.C. Ministry of Forests, Lands and Natural Resource Operations, Environmental Assessment Coordinator 2012b pers. comm.). The Site C reservoir would support a wider variety of boats than the river does today, and would also be expected to offer new winter ice fishing opportunities (Section 11.7 Thermal and Ice Regime in Volume 2 Section 11 Environmental Background).

In summary, the Project would result in a beneficial effect on fishing areas during operations.

24.4.2.2 Changes in Public Fishing Harvests

During operations, the movement of fish and aquatic productivity patterns would change, with some species benefiting and others adversely affected, due to habitat changes. As described in Volume 2 Section 12 Fish and Fish Habitat, results from the fish community scenario modelling indicate an estimated three-fold increase in total biomass of fish in the reservoir relative to baseline conditions in the Peace River, though with a different species composition. Burbot, lake trout, rainbow trout, walleye, and northern pike are expected to increase in their overall biomass (increases in burbot, lake trout, northern pike, and rainbow trout offset decreases in walleye). The total biomass of Arctic grayling, mountain whitefish, and bull trout is expected to decline due to declines in the biomass of mountain whitefish and Arctic grayling. The changes in overall biomass are driven by an increase in kokanee and lake whitefish over both the near and long term, which would sustain harvestable fish populations in the reservoir.

Site C operations would result in ecological conditions that would allow Arctic grayling, bull trout, mountain whitefish, and rainbow trout populations to extend their distribution downstream into Alberta. Other species such as kokanee and lake trout would establish distributions immediately downstream of the Site C Dam, similar to the pattern that presently exists downstream of the Peace Canyon Dam. Downstream of the dam, modelling indicates the total biomass of fish is expected to increase by 1.2 to 1.4-fold. A 45% to 80% decrease in burbot, lake trout, rainbow trout, walleye, and northern pike is predicted to occur, but this would be counteracted by a 1.8 to 1.9-fold increase in the biomass of Arctic grayling, mountain whitefish and bull trout. This is due primarily to a doubling of mountain whitefish, which are assumed to benefit from increased water clarity downstream of the dam. Bull trout and Arctic grayling are expected to decline. Kokanee and lake whitefish are expected to contribute a negligible amount of biomass to the river downstream of the dam.

Volume 2 Section 12 Fish and Fish Habitat provides further information about expected Site C reservoir fish species composition, abundance, and harvest opportunities.
24.4.3 Mitigation Measures – Change in Fishing Opportunities

Mitigation measures to address adverse Project effects on fishing opportunities during construction will be achieved through the following commitments described in other sections of the EIS, including:

- Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Section 25 Outdoor Recreation and Tourism, and Volume 3 Section 26 Navigation) will mitigate construction effects on fishing opportunities (i.e., changes in public fishing harvest areas)

- Measures that support fish and fish habitat (Volume 2 Section 12 Fish and Fish Habitat), and therefore that support fish populations, will assist in mitigation of construction effects on fishing opportunities (i.e., changes in public fishing harvests).

For example:

- Bull trout passage upstream of the dam site during the river diversion phase will be facilitated by a trap and haul process to allow migration upstream to spawning locations in the Halfway River, which is expected to mitigate potential effects on bull trout population during construction and operations, therefore maintaining bull trout availability for harvest

24.4.4 Effects Assessment – Construction – Changes in Hunting Opportunities

The potential to adversely affect hunting opportunities is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Use of and access to hunting areas

- Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources VC (Volume 2 Section 14 Wildlife Resources)

The following indicators are used to describe potential effects during construction:

- Changes in public hunting areas

- Changes in public hunting harvests

24.4.4.1 Changes in Public Hunting Areas

The Project effects on hunting areas would occur when Project activities begin. No-access zones would be put in place within Project activity zone areas where BC Hydro has obtained legal rights. These areas would include the Site C dam site and off-site construction materials locations.

Hunting within other Project work areas such as the Project access road, Highway 29 realignment corridors, and Site C reservoir vegetation clearing areas would be restricted as defined by existing regulations governing the use of firearms.

As described in Section 24.4.1.1, access restrictions due to public safety and site management would apply during construction and Site C reservoir filling. The access restrictions and initial Site C reservoir use limitations would reduce use of and access to hunting opportunities in hunting areas along the Peace River access during construction.
Table 24.17 shows the area of LEH area 7-20a that is within the Project activity zone and reservoir impact lines.

### Table 24.17 Limited Entry Hunting Area in LAA

<table>
<thead>
<tr>
<th>LEH Area (ha)</th>
<th>Five-Year Beach Line</th>
<th>Site C Dam Site Area</th>
<th>Transmission Line</th>
<th>Construction Access Roads</th>
<th>Quarried &amp; Excavated Materials</th>
<th>Five-Year Beach Line to Outermost Impact Line</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,786,224</td>
<td>9,522.1</td>
<td>1,653.2</td>
<td>1,316.6</td>
<td>413.0</td>
<td>630.7</td>
<td>8,663.7</td>
<td>22,199.3</td>
</tr>
</tbody>
</table>

**NOTES:**

- a Five-Year Beach Line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines
- b Site C dam site and substation construction areas and restricted access zones, as described in Volume 1 Section 4 Project Description
- c Transmission line corridor and one-time clearing areas as described in Volume 1 Section 4 Project Description
- d Permanent and temporary roads, Highway 29 realignment as described in Volume 1 Section 4 Project Description
- e Off-site construction material sources as described in Volume 1 Section 4 Project Description
- f Five-Year Beach Line to outermost impact line including the stability impact line, landslide-generated wave impact line, or flood impact line, as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

**Source:** Adapted from Hillcrest Geographics (2012)

New temporary construction access roads would include all-season clearing roads (approximately 23 km) along the Site C reservoir and construction sites, and winter clearing roads (approximately 113 km), and temporary spans would be used to access islands for clearing activities. As these roads do not currently exist, there would be no change to hunting areas or access, compared with baseline conditions. In consideration of public safety hazards and associated use restrictions, these roads could be used during the construction period by hunters to gain access to previously inaccessible areas, but these temporary access roads would be reclaimed or inundated after clearing is complete.

The maximum hunting area affected by construction would be 0.8% of hunting areas in the LEH. Hunting would not be restricted within the reservoir impact lines. As a result of reduced hunting areas, hunting on Peace River islands would be lost and hunting activity would be displaced to other areas within and outside the LAA such as the Pine River.

**24.4.4.2 Changes in Public Hunting Harvests**

The Wildlife Resources Effects Assessment (Volume 2 Section 14) assesses potential Project effects on non-migratory game birds (key indicators: Sharp-Tailed and Ruffed Grouse), ungulates (key indicators: moose, elk, mule deer, and white-tailed deer) and large carnivores (key indicators: grey wolf and grizzly bear).

Ruffed Grouse and Sharp-Tailed Grouse are affected by direct loss of habitat and habitat fragmentation. These birds are also expected to be disturbed and displaced by construction activities. Direct and indirect mortality is expected due to construction activities, flooding, and collisions with equipment, machinery, and vehicles. Hunting
pressure was also assumed to increase due to increased human presence in the region during construction.

Ungulates are expected to move away from areas directly affected by construction activities. Construction activities, including flooding, may result in direct and indirect mortality of ungulates; however, there is a harvestable surplus of ungulates in the region under baseline conditions. Hunters are expected to shift the focus of their activities to new areas away from the Project activity zone.

Grizzly bear have been locally extirpated from the Peace River valley under baseline conditions, and grey wolf are affected by local predator control measures. The Project is not expected to have an additive effect on large carnivores, and hunting of large carnivores is not expected to be affected.

As the agency responsible for the implementation of the Wildlife Act, the BCMOE would determine the availability of hunting opportunities and manage any change in availability of harvestable animals through changes to the current hunting regulations.

24.4.5 Effects Assessment – Operations – Changes in Hunting Opportunities

The potential to adversely affect hunting during operations is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Use of and access to hunting areas
- Availability of harvested species based on the results of the assessment of the potential effects of the Project on wildlife resources (Volume 2 Section 14 Wildlife Resources)

The following indicators are used to describe potential effects during operations:

- Changes in public hunting areas
- Changes in public hunting harvests

24.4.5.1 Change in Public Hunting Areas

Public hunting areas correspond to any accessible public land where game is present (unless otherwise restricted by regulations). After the first several years of operation, full boater use would be expected in the majority of the Site C reservoir, providing access to hunting areas inaccessible during construction. Hunting areas closer to the Site C dam site and the Moberly reach could be restricted for longer periods of time, due to public safety considerations related to slope stability and woody debris hazards.

The area available for public hunting would not be changed due to Project operations, and there would be no restrictions on hunting activity within the reservoir impact lines. No effects on hunting areas are expected as a result of operation of the Site C reservoir and the Site C dam and generating station.

24.4.5.2 Changes in Public Hunting Harvests

Changes in hunting harvests during operations would be dependent upon Project effects on game animals. Game birds, ungulates, and large carnivores are not expected to be affected by the Project during operations.
If success rates change for LEH as a result of Project activities, then the province would adapt its quotas to maintain its harvesting objectives. The province would monitor ungulate populations and adjust harvest levels and seasons as required.

### 24.4.6 Mitigation Measures – Changes in Hunting Opportunities

Mitigation measures to address Project effects on hunting opportunities during construction will be achieved through the following commitments described in other sections of the EIS, including:

- Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Appendix E Outdoor Recreation Mitigation Plan) will mitigate construction effects on hunting opportunities (i.e., changes in public hunting areas).

- Measures that support wildlife and wildlife habitat, and therefore that support harvestable game populations, will mitigate construction effects on hunting opportunities (i.e., changes in public hunting harvests) (see Volume 2 Section 14 Wildlife Resources).

No effects on hunting opportunities are expected as a result of operations and therefore no mitigation is proposed.

### 24.4.7 Effects Assessment – Construction – Changes in Use of Harvesting Areas

The potential to affect harvest of fish and wildlife resources is assessed by taking into account the potential for the Project to result in changes to the following key aspect:

- Use of hunting and fishing areas

Change to the following key indicator is used to describe potential changes in the number of local fishers and hunters during construction:

- Public hunting and fishing licence sales

Table 24.18 shows the estimated change in use of harvesting areas due to direct, indirect, and induced population changes attributable to the Project. The full results of the Project population model are available in Volume 4 Section 28 Population and Demographics. The assumptions that were used to estimate demand are based on a study of mobile workers, and a survey of Peace region residents and questions regarding their likelihood of recreating on the Site C reservoir (Nichols Applied Management 2007; Kirk & Co. Consulting Ltd. and Synovate Ltd. 2009). Calculations are also based on recent licence sales in the Peace Region as a percentage of the total population of the Peace River Regional District (Table 24.5 and Table 24.6). People who migrate to the Peace Region would be expected to remain in the region at least for the duration of the construction phase. The demand for hunting and fishing opportunities would increase in the first five years of construction, as predicted by the analysis. As the workforce requirements of the Project would start to decline in Year 6, so too would the associated incremental change in demand for hunting and fishing licences.
### Table 24.18 Estimated Changes in Use of Harvesting Areas

<table>
<thead>
<tr>
<th>Workforce and Population Assumptions</th>
<th>Year of Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td></td>
<td>Incremental Change in Number of Licensed Anglers and Hunters</td>
</tr>
<tr>
<td>20% of camp workers would engage in outdoor recreation or harvesting activities</td>
<td>29 71 37 0 26 116 -29 -100 -107</td>
</tr>
<tr>
<td>22% of camp workers engaged in outdoor recreation or harvesting activities would fish</td>
<td>6 16 8 0 6 25 -6 -20 -24</td>
</tr>
<tr>
<td>22% of in-migrants will fish</td>
<td>66 107 50 7 60 65 -23 -70 -150</td>
</tr>
<tr>
<td>Total camp workers and in-migrants expected to fish</td>
<td>72 123 58 7 66 90 -29 -90 -174</td>
</tr>
<tr>
<td>14% of camp workers engaged in outdoor recreation or harvesting activities would hunt</td>
<td>4 10 5 0 4 16 -4 -12 -15</td>
</tr>
<tr>
<td>14% of in-migrants would hunt</td>
<td>42 68 32 4 38 42 -15 -44 -95</td>
</tr>
<tr>
<td>Total camp workers and in-migrants expected to hunt</td>
<td>46 78 37 4 42 58 -19 -56 -110</td>
</tr>
</tbody>
</table>

**NOTES:**

- Use estimates should not be considered additive for any given year, as the same person could engage in all activities.
- Changes in demand are based on assumptions adapted from Nichols Applied Management 2007, Kirk & Co. Consulting Ltd. and Synovate Ltd. 2009, and recent fishing and hunting licence sale data. Population changes are based on modelling of Project population effects (Volume 4 Section 28 Population and Demographics).
- The Project is expected to increase the number of licensed anglers by 416 by Year 5 of construction, or an average of 69 anglers per construction year, equivalent to a 3% increase above the baseline. After Year 5 of construction, licensed anglers would be expected to decrease by 293 up to the end of the construction period. The net change in licensed anglers during the construction period would be an estimated increase of 112 anglers, or an average increase of 12 anglers per year.
- The number of hunting licence holders in the Peace Region in 2007 (latest year available) was 8,659, or approximately 14% of the population of the Peace River Regional District. The Project would be expected to increase the number of licensed hunters by 265 by Year 5 of construction or an average of 44 per year; 265 hunters represents 3% of the baseline number of hunters. After Year 5 of construction, demand for hunting licences would be expected to decrease by 185 hunters over the last three years of the construction phase. The net change in licensed hunters during the construction period would be an estimated increase of 80, or an average increase of nine hunters per year. The potential effect of the Project on use of harvesting areas is considered positive.

#### 24.4.8 Mitigation Measures – Changes in Use of Harvesting Areas

An increase in the use of harvesting areas attributable to the Project is not considered an adverse effect. The Fish and Wildlife branch of the Ministry of Environment manages fish and wildlife harvesting. It is a management objective of the Ministry of Environment to increase participation in fishing and hunting at a provincial level (B.C. Ministry of Forests, Lands and Natural Resource Operations, Environmental Assessment.
Coordinator 2012b pers. comm.). As a result, mitigation measures by BC Hydro are not warranted.

24.4.9 Effects Assessment – Construction – Changes in Trapping Opportunities

The potential to adversely affect trapping opportunities is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Use of and access to trapline areas
- Tenured areas, and specific harvest areas within tenured areas, using spatial analysis
- Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources VC

Changes to the following indicators are used to describe potential effects during construction:

- Tenured trapping areas and infrastructure
- Trapline harvest volumes, and trapline operations and revenue
- Aboriginal use of tenured traplines

24.4.9.1 Changes in Tenured Trapping Area and Infrastructure

The Site C dam site area would be restricted as a trapping area throughout construction, whereas other Project components would only be restricted as trapping areas during active work periods. Project activities would overlap with a maximum of 13,701.5 ha (2.3%) of the 16 registered traplines within the LAA (not including the reservoir impact lines). Trapping will be permitted to continue within the reservoir impact lines. For individual traplines, overlaps with the Project activity zone would range from 0% to 11.7% (Table 24.19) of total trapline area, or 0% to 5.9%, not including the reservoir impact lines.
Table 24.19  Trapline Areas in LAA

<table>
<thead>
<tr>
<th>Trapline</th>
<th>Total Trapline Area</th>
<th>Five-Year Beach Line (a)</th>
<th>Site C Dam Site Area (b)</th>
<th>Transmission Line (c)</th>
<th>Construction Access Roads (d)</th>
<th>Quarryed &amp; Excavated Materials (e)</th>
<th>5-Year Beach Line to Outermost Impact Line (f)</th>
<th>Total</th>
<th>% of Trapline Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRO731T002</td>
<td>77,425</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>104.0</td>
<td>0.0</td>
<td>104.0</td>
<td>0.1</td>
</tr>
<tr>
<td>TRO731T005</td>
<td>48,911</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TRO731T007</td>
<td>32,229</td>
<td>65.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.4</td>
</tr>
<tr>
<td>TRO732T001</td>
<td>8,289</td>
<td>131.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>2.7</td>
</tr>
<tr>
<td>TRO732T002</td>
<td>36,181</td>
<td>41.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.1</td>
</tr>
<tr>
<td>TRO732T003</td>
<td>32,779</td>
<td>1,669.1</td>
<td>0.0</td>
<td>0.0</td>
<td>14.2</td>
<td>0.0</td>
<td>818.7</td>
<td>2,502.0</td>
<td>7.6</td>
</tr>
<tr>
<td>TRO732T004</td>
<td>21,634</td>
<td>867.1</td>
<td>0.0</td>
<td>0.0</td>
<td>15.4</td>
<td>0.0</td>
<td>1,303.6</td>
<td>2,186.1</td>
<td>10.1</td>
</tr>
<tr>
<td>TRO732T005</td>
<td>46,741</td>
<td>525.9</td>
<td>964.7</td>
<td>532.2</td>
<td>54.5</td>
<td>0.0</td>
<td>1,269.3</td>
<td>3,346.6</td>
<td>7.2</td>
</tr>
<tr>
<td>TRO732T006</td>
<td>43,278</td>
<td>0.0</td>
<td>0.0</td>
<td>313.9</td>
<td>5.7</td>
<td>142.4</td>
<td>0.0</td>
<td>462.0</td>
<td>1.1</td>
</tr>
<tr>
<td>TRO734T001</td>
<td>55,256</td>
<td>2,010.2</td>
<td>688.5</td>
<td>1.4</td>
<td>15.4</td>
<td>198.5</td>
<td>2,185.0</td>
<td>5,099.0</td>
<td>9.2</td>
</tr>
<tr>
<td>TRO734T002</td>
<td>37,062</td>
<td>1,223.7</td>
<td>0.0</td>
<td>0.0</td>
<td>112.7</td>
<td>46.6</td>
<td>867.2</td>
<td>2,250.2</td>
<td>6.1</td>
</tr>
<tr>
<td>TRO734T003</td>
<td>17,785</td>
<td>1,031.3</td>
<td>0.0</td>
<td>0.0</td>
<td>9.3</td>
<td>3.9</td>
<td>1,038.7</td>
<td>2,083.2</td>
<td>11.7</td>
</tr>
<tr>
<td>TRO735T001</td>
<td>11,755</td>
<td>144.1</td>
<td>0.0</td>
<td>0.0</td>
<td>35.5</td>
<td>0.6</td>
<td>148.2</td>
<td>26.7</td>
<td>3.0</td>
</tr>
<tr>
<td>TRO735T002</td>
<td>24,386</td>
<td>148.0</td>
<td>0.0</td>
<td>0.0</td>
<td>18.0</td>
<td>40.8</td>
<td>23.3</td>
<td>230.1</td>
<td>0.9</td>
</tr>
<tr>
<td>TRO735T004</td>
<td>57,334</td>
<td>352.9</td>
<td>0.0</td>
<td>0.0</td>
<td>65.2</td>
<td>15.6</td>
<td>117.8</td>
<td>551.5</td>
<td>1.0</td>
</tr>
<tr>
<td>TRO735T005</td>
<td>48,359</td>
<td>1,328.7</td>
<td>0.0</td>
<td>0.0</td>
<td>102.1</td>
<td>34.8</td>
<td>967.5</td>
<td>2,433.1</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>599,384</strong></td>
<td><strong>9,540.2</strong></td>
<td><strong>1,653.2</strong></td>
<td><strong>1,360.5</strong></td>
<td><strong>413.0</strong></td>
<td><strong>734.6</strong></td>
<td><strong>8,665.9</strong></td>
<td><strong>22,367.4</strong></td>
<td><strong>3.7</strong></td>
</tr>
</tbody>
</table>

**NOTES:**

1. **a** Five-Year Beach Line is the predicted position extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir, as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines.
2. **b** Site C dam site and substation construction areas and restricted access zones, as described in Volume 1 Section 4 Project Description.
3. **c** Transmission line corridor and one-time clearing areas, as described in Volume 1 Section 4 Project Description.
4. **d** Permanent and temporary roads, and Highway 29 realignment, as described in Volume 1 Section 4 Project Description.
5. **e** Off-site construction material sources as described in Volume 1 Section 4 Project Description.
6. **f** Five-Year Beach Line to outermost impact line including the stability impact line, landslide-generated wave impact line, or flood impact line, as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines.

**Source:** Hillcrest Geographics (2012)
The Project would displace trapping activities on existing traplines that overlap the Project footprint. For example, flats along the Peace River and its tributaries where trapping occurs would no longer be available.

Up to six cabins associated with traplines would be inundated by the Project or are within the reservoir impact lines. Safety considerations related to existing or proposed trapline cabins and supporting structures within reservoir impact lines would be evaluated based on erosion, stability, and landslide-generated wave hazards. There is a possibility that some of the existing cabins could be moved to another area of the tenure, or remain where they are, pending further site-specific analysis. BC Hydro would engage existing tenure holders and, where appropriate, based on further geotechnical investigations, enter into agreements to address the removal or relocation of these buildings, or outline the conditions upon which the buildings could remain. Standard mitigation of effects on tenure holders would apply for cabins affected by the Project (Section 24.1.3). Project-related road access would increase fragmentation of the landscape, and could increase vandalism or damage to traps, stands, cabins, and informal camp sites. These potential effects would be temporary, as the majority of Project roads are temporary and would be decommissioned following construction activities. The Project access road would be permanent; however, it is in an area already accessible to the public on existing resource roads.

Due to the implementation of standard mitigation measures (i.e., BC Hydro will have discussions with affected registered trappers and, where appropriate, enter into agreements) the Project is not expected to affect tenured trapping areas and infrastructure.

### 24.4.9.2 Changes in Trapline Harvest Volumes, Trapline Operations and Revenue

Project construction activities are expected to negatively affect beavers and fisher due to habitat loss, disturbance, and displacement as well as direct and indirect mortality. As a result, fur harvests during construction in those portions of traplines in the reservoir may be affected. Portion of traplines outside the reservoir are not expected to experience a change in fur harvests.

### 24.4.9.3 Changes in Aboriginal Use of Tenured Traplines

First Nations use approximately 50% of the affected traplines (or eight of the 16 traplines) either as registered owners or through agreements with the registered trapline owner (Trapper Interviews 2012, pers. comm.). The Project is not expected to change the level of Aboriginal use of tenured traplines because all eight of the traplines will be available for use. Over 90% of tenured trapline areas would remain available for use during construction. Other aspects of Aboriginal use of traplines and trapping are addressed in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes.

### 24.4.10 Effects Assessment – Operations – Changes in Trapping Opportunities

The potential to adversely affect trapping opportunities is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Use of and access to trapline areas
• Tenured areas, and specific harvest areas within tenured areas, using spatial analysis

• Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources VC (Volume 2 Section 14 Wildlife Resources)

Changes to four key indicators are used to describe potential changes in trapping opportunities and success during operations:

• Changes in tenured trapping areas and infrastructure
• Changes in trapline harvest volumes and areas
• Changes in trapline operation or revenue
• Changes in Aboriginal use of tenured traplines

24.4.10.1 Changes in Tenured Trapping Areas and Infrastructure

No additional effects on trapping areas and infrastructure would be expected as a result of operation of the Project reservoir and generating station.

24.4.10.2 Changes in Trapline Operation or Revenue

The Site C reservoir operations would have relatively small reservoir level fluctuations (1.8 m), which could improve conditions for trapping along the shoreline compared with baseline conditions (Volume 2 Section 11.4 Surface Water in Volume 2 Section 11 Environmental Background).

24.4.10.3 Changes in Aboriginal Use of Tenured Traplines

No change to Aboriginal use of tenured traplines would be expected during Project operations.

24.4.11 Mitigation Measures – Changes in Trapping Opportunities

Mitigation of effects on trapping opportunities will be achieved through commitments described in other sections of the EIS, including:

• Mitigation measures that support fur-bearing populations, within Volume 2 Section 14 Wildlife Resources, will support the availability of harvestable species for trapping. For example, BC Hydro may permit local trappers to hunt beaver prior to inundation to further prevent losses of the fur resource during flooding.

24.4.12 Effects Assessment – Construction – Changes in Guide Outfitting Activities

The potential to adversely affect guide outfitting activities is assessed by taking into account the potential for the Project to result in changes to the following key aspects:

• Use of and access to guide outfitter areas
• Tenured areas, and specific harvest areas within tenured areas, using spatial analysis
Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources VC (Volume 2 Section 14 Wildlife Resources)

Changes to four key indicators are used to describe potential changes in guide outfitting activities during construction:

- Changes in guide outfitter areas and infrastructure
- Changes in guide outfitter harvest volumes and areas
- Changes in guide outfitter operations or revenue
- Changes in Aboriginal participation in tenured guide outfitting operations

24.4.12.1 Changes in Guide Outfitter Areas and Infrastructure

The Site C dam site area would be restricted as an outfitting area throughout construction, whereas other Project components would only be restricted as outfitting areas during active work periods. Maximum occupation of the land base during construction activities would be 9,719.2 ha (0.6%) of the guide outfitting areas (not including the Site C reservoir impact line) (Table 24.20). Guide outfitting activities will be permitted to continue within the reservoir impact lines. About 97% (14,410.5 ha) of the Project activity zone and the area within the reservoir impacts lines is located within guide outfitting areas held by two outfitters.
### Table 24.20  Guide Outfitter Territories in LAA

<table>
<thead>
<tr>
<th>Guide Outfitter Tenure #</th>
<th>Total Guiding Area</th>
<th>Five-Year Beach Line</th>
<th>Site C Dam Site Area</th>
<th>Transmission Line</th>
<th>Construction Access Roads</th>
<th>Quarried &amp; Excavated Materials</th>
<th>Five-Year Beach Line to Outermost Impact Line</th>
<th>Total</th>
<th>% of Guiding Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td></td>
</tr>
<tr>
<td>700551</td>
<td>300,679</td>
<td>1,811.7</td>
<td>0.0</td>
<td>0.0</td>
<td>185.3</td>
<td>91.2</td>
<td>1,108.5</td>
<td>3,196.7</td>
<td>1.1</td>
</tr>
<tr>
<td>701241</td>
<td>158,079</td>
<td>139.1</td>
<td>0.0</td>
<td>35.6</td>
<td>0.6</td>
<td>148.2</td>
<td>26.7</td>
<td>350.2</td>
<td>0.2</td>
</tr>
<tr>
<td>701222</td>
<td>470,324</td>
<td>9.0</td>
<td>0.0</td>
<td>42.9</td>
<td>0.0</td>
<td>104.0</td>
<td>2.3</td>
<td>158.2</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>701245</td>
<td>830,497</td>
<td>4,501.2</td>
<td>1,056.1</td>
<td>1,281.9</td>
<td>89.8</td>
<td>222.6</td>
<td>4,026.1</td>
<td>11,213.8</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,759,579</strong></td>
<td><strong>6,461.0</strong></td>
<td><strong>1,056.1</strong></td>
<td><strong>1,360.5</strong></td>
<td><strong>275.7</strong></td>
<td><strong>565.9</strong></td>
<td><strong>5,199.6</strong></td>
<td><strong>14,918.8</strong></td>
<td><strong>0.8</strong></td>
</tr>
</tbody>
</table>

**NOTES:**

- a Five-Year Beach Line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir, as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines
- b Site C dam site and substation construction areas and restricted access zones, as described in Volume 1 Section 4 Project Description
- c Transmission line corridor and one-time clearing areas, as described in Volume 1 Section 4 Project Description
- d Permanent and temporary roads, and Highway 29 realignment, as described in Volume 1 Section 4 Project Description
- e Off-site construction material sources, as described in Volume 1 Section 4 Project Description
- f Five-Year Beach Line to outermost line including the stability impact line, landslide-generated wave impact line, or flood impact line, as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines
- < – less than
- Totals may not add up, due to rounding
- **Source:** Hillcrest Geographics (2012)
Up to three cabins used by guide outfitters on the Peace River shoreline would be inundated by the Site C reservoir or are within the reservoir impact lines. A hunting camp in the area of the proposed Site C dam site would also need to be relocated. Safety considerations relating to any existing or proposed new guide outfitter cabins and supporting structures within reservoir impact lines would be evaluated based on erosion, stability, and landslide-generated wave hazards. There is a possibility that some of the existing cabins could be moved to another area of the tenure, or remain where they are today, pending further site-specific analysis. BC Hydro would engage existing tenure holders and, where appropriate, based on further geotechnical investigations, enter into agreements to address the removal or relocation of these buildings, or outline the conditions upon which the buildings could remain. Standard mitigation of effects on tenure holders would apply for cabins affected by the Project (refer to Section 24.1.3).

24.4.12.2 Changes in Guide Outfitter Harvest Volumes and Areas

One outfitter’s spring bear hunt occurs in the area of Bullhead and Portage Mountain. His activities would be permanently displaced from areas used for the proposed Portage construction materials source (Guide Outfitter Interviews 2012, pers. comm.).

After Site C reservoir filling, guide outfitting activities would be permanently displaced from the area of the Site C reservoir and the Site C dam site. Guide outfitters would hunt in adjacent areas or perhaps further afield in their territories, depending on effects on the movement of large game.

The Project access road would be permanent; however, it is in an area already accessible to public hunting on existing resource roads.

The change in harvest areas is very small relative to the total guiding areas, and activities will continue in areas not affected by Project activities. No effects are expected on guide outfitter harvest volumes of ungulates and large carnivores.

24.4.12.3 Changes in Guide Outfitter Operations and Revenue

Outfitters would avoid Project construction areas in response to major construction activities, including clearing of the Site C reservoir and realignment of Highway 29. Guide outfitting operations would be expected to continue during the construction phase and therefore no effects on guide outfitter operations and revenue are expected.

As described in Section 24.4.1.1, access restrictions due to public safety and site management would apply during construction and Site C reservoir filling. The access restrictions and initial Site C reservoir use limitations would reduce use of and access to guide outfitter operations along the Peace River during construction.

24.4.12.4 Changes in Aboriginal Participation in Tenured Guide Outfitting Operations

The Project would not be expected to change Aboriginal participation in tenured guide outfitting operations, as guide outfitting activities would be able to continue during the construction phase.
24.4.13 Effects Assessment – Operations – Changes in Guide Outfitting Activities

The potential to adversely affect harvest of wildlife resources would be assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Use of and access to guide outfitter areas
- Tenured areas, and specific harvest areas within tenured areas, using spatial analysis
- Availability of harvested species based on the results of the assessment of the potential effects of the Project on the wildlife resources VC (Volume 2 Section 14 Wildlife Resources)

Changes to the following key indicators are used to determine potential changes in guide outfitting activities during operations:

- Guide outfitter areas and infrastructure
- Guide outfitter harvest volumes and areas
- Guide outfitter operations or revenue
- Aboriginal participation in tenured guide outfitting operations

No potential effects during operations are identified on guide outfitter areas, infrastructure, harvest volumes and areas, or operations and revenue. The Project would not be expected to change Aboriginal participation in tenured guide outfitting operations, as guide outfitting activities would be able to continue during the Project operating phase.

24.4.14 Mitigation Measures – Changes in Guide Outfitting Activities

Mitigation of changes in guide outfitting opportunities and success during construction will be achieved through commitments described in other sections of the EIS, including:

- Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation) will mitigate construction effects on guide outfitting operations
- Communications regarding area or road closures, as part of a Public Safety Mitigation Plan, would help outfitters plan their guided adventures (Volume 5 Section 35 Summary of Environmental Management Plans)
- Mitigation measures that support game populations, within Volume 2 Section 14 Wildlife Resources, will support the availability of harvestable species for guide outfitting activities

24.5 Summary of Effects Assessment and Mitigation Measures

A summary of potential effects and mitigation measures is shown for harvest of fish and wildlife in Table 24.21.
Table 24.21 Project Effects and Mitigation Measures on Harvesting of Fish and Wildlife Resources

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Changes in fishing opportunities</td>
<td>• Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation) will mitigate construction effects on fishing opportunities (i.e., changes in public fishing harvest areas).&lt;br&gt;• Measures that support fish and fish habitat (Volume 2 Section 12 Fish and Fish Habitat) and therefore that support fish populations will mitigate construction effects on fishing opportunities (i.e., changes in public fishing harvests).&lt;br&gt;• Mitigation measures that address boating, shoreline and navigational access are common approaches in the construction of dams by BC Hydro province-wide and are expected to be effective.&lt;br&gt;The effectiveness of mitigation measures for fish and fish habitat are included in Volume 2 Section 12 Fish and Fish Habitat.&lt;br&gt;A residual adverse effect is expected, due to temporary losses of fishing opportunities as a result of construction.</td>
<td></td>
<td>BC Hydro and those groups and municipalities provided funds from BC Hydro to permit and build new infrastructure</td>
</tr>
<tr>
<td>Operations</td>
<td>Changes in fishing opportunities</td>
<td>• Not applicable.</td>
<td>Not applicable. A residual positive effect on fishing opportunities is expected during the operations phase.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Potential Effect</td>
<td>Mitigation Measures</td>
<td>Mitigation Effectiveness</td>
<td>Responsibility</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>---------------------</td>
<td>-------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Construction</td>
<td>Changes in hunting opportunities</td>
<td>▪ Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation) will mitigate construction effects on hunting opportunities (i.e., changes in public hunting areas). ▪ Measures that support wildlife and wildlife habitat and therefore that support harvestable game populations will mitigate construction effects on hunting opportunities (i.e., changes in public hunting harvests) (see Volume 2 Section 14 Wildlife Resources).</td>
<td>Mitigation measures that address boating, shoreline and navigational access are common approaches in the construction of dams by BC Hydro province-wide and are expected to be effective. The effectiveness of mitigation measures for wildlife resources are included in Volume 2 Section 14 Wildlife Resources. A residual adverse effect is expected due to temporary losses of hunting opportunities as a result of construction.</td>
<td>BC Hydro and those groups and municipalities provided funds from BC Hydro to permit and build new infrastructure.</td>
</tr>
<tr>
<td>Operations</td>
<td>Changes in hunting opportunities</td>
<td>▪ Not applicable.</td>
<td>Not applicable. There are no residual effects expected on hunting opportunities during operations.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Construction</td>
<td>Changes in use of harvesting areas</td>
<td>▪ Not applicable.</td>
<td>Not applicable. A residual positive effect on use of harvesting areas is expected during the construction phase.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Construction</td>
<td>Changes in trapping opportunities</td>
<td>▪ Mitigation measures that support fur-bearing populations, described within Volume 2 Section 14 Wildlife Resources, will support the availability of harvestable species for trapping.</td>
<td>The effectiveness of mitigation measures for wildlife resources are included in Volume 2 Section 14 Wildlife Resources. There are no residual effects expected on trapping opportunities during construction.</td>
<td>BC Hydro</td>
</tr>
<tr>
<td>Operations</td>
<td>Changes in trapping opportunities</td>
<td>▪ Not applicable</td>
<td>Not applicable. There is no residual effect.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Project Phase</td>
<td>Potential Effect</td>
<td>Mitigation Measures</td>
<td>Mitigation Effectiveness</td>
<td>Responsibility</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| Construction  | Changes in guide outfitter activities | ▪ Communications regarding area or road closures, as part of a Public Safety Management Plan, will help outfitters plan their guided activities.  
▪ Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation) will mitigate construction effects on guide outfitter operations  
▪ Mitigation measures that support game populations, described within Volume 2 Section 14 Wildlife Resources, will support the availability of harvestable species for guide outfitting activities. | Not applicable. There is no residual effect. | Not applicable |
| Operations    | Changes in guide outfitter activities | ▪ Mitigation measures that support large game populations, described within Volume 2 Section 14 Wildlife Resources. | Not applicable. | Not applicable |

As summarized in Table 24.21, with mitigation, Project construction would have an adverse effect on fishing, due to reduced access to fishing areas and potentially reduced fish harvest. During operations, the Project would have a beneficial effect, and fishing opportunities would be expected to increase over baseline conditions, as the Site C reservoir would support increased boating and angling use, and would continue to support sport fish.

With mitigation, construction activities would adversely affect hunting opportunities in the LAA. While mitigation measures are intended to maintain baseline conditions for access to hunting opportunities beyond the construction period, access would be affected by construction activities until boat launches could be replaced and full access to hunting areas accessed from the Site C reservoir would be available – that is, after the first year of operation and in consideration of ongoing access restrictions to the Site C dam site for public safety reasons.

Fur-bearer trapping harvests and revenue could decrease during construction as a result of potential decreases to fur-bearers due to habitat loss. Effects on trapping opportunities or harvest levels caused by Project activities would be mitigated through discussions and, where appropriate, agreements with the affected tenure holders.
(Section 11.3 Land Status, Tenure, and Project Requirements in Volume 2 Section 11 Environmental Background). This mitigation measure is considered standard mitigation, per Section 24.1.3 Standard Mitigation Measures and Effects Addressed. Trapping will remain viable on all traplines overlapping with the Project. No residual effects are expected for the construction phase.

Effects on guide outfitting activities will be mitigated through discussions and, where appropriate, agreements with the affected tenure holders (Section 11.3 Land Status, Tenure, and Project Requirements in Volume 2 Section 11 Environmental Background). This mitigation measure is considered standard mitigation, per Section 24.1.3 Standard Mitigation Measures and Effects Addressed. No residual effects are expected.

24.5.1 Other Mitigation Options Considered

There were no other mitigation measures considered by BC Hydro for effects on harvest of fish and wildlife resources.

24.6 Residual Effects

24.6.1 Characterization of Residual Effects

The potential for adverse effects on harvest of fish and wildlife resources is evaluated for significance based on the consideration of attributes summarized in Table 24.22.

Table 24.22 Characterization Criteria for Residual Harvest of Fish and Wildlife Resources Effects

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
<th>Quantitative Measure or Definition of Qualitative Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
<td>The ultimate long-term trend of the effect</td>
<td>Increase: key indicators of the VC are increasing in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease: key indicators of the VC are decreasing in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neutral: indicators of the VC are unchanged in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td>Magnitude</td>
<td>The amount of change in a key indicator or variable relative to baseline case</td>
<td>Low: effect cannot be distinguished from baseline case conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate: effect would result in demonstrable change, but remain within historic norms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High: effect results in changes that are beyond historic norms</td>
</tr>
<tr>
<td>Geographical Extent</td>
<td>The geographic area in which an effect of a defined magnitude occurs</td>
<td>Local: the expected measurable changes occur within the LAA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regional: the expected measurable changes occur within the RAA</td>
</tr>
<tr>
<td>Frequency</td>
<td>The number of times during a project or a specific project phase that an effect may occur</td>
<td>Once: the effect occurs once</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sporadic: the effect occurs rarely and at irregular intervals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous: the effect occurs on a regular basis and at regular intervals</td>
</tr>
<tr>
<td>Duration</td>
<td>The period of time required until the VC returns to its baseline condition, or the effect</td>
<td>Short term: effect is limited to &lt; 1 year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium term: effect occurs &gt; 1 year but not beyond the construction of the Project</td>
</tr>
<tr>
<td>Criterion</td>
<td>Description</td>
<td>Quantitative Measure or Definition of Qualitative Categories</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Can no longer be measured or otherwise perceived | Long term: effect lasts beyond the construction phase and up to 10 years of the operations phase  
Far future: effect extends > 10 years or for the life of the Project |
| Reversibility | The likelihood that a key indicator will recover from an effect  
Effect reversible with reclamation and/or over time  
Effect irreversible and cannot be reversed with reclamation and/or over time |
| Context | This refers to the extent to which the area within which an effect may occur has already been adversely affected by human activities; and is ecologically fragile, has little resilience and resistance to imposed stresses  
Resilient: the area is resilient to change and can respond to imposed stresses  
Not resilient: the area has little resilience to change and is resistant to imposed stresses |
| Level of Confidence | Certainty in quantifying or estimating the effect; the quality and/or quantity of data; the understanding of the effect mechanisms; and the effectiveness of mitigation  
Low: assessment is based on professional judgment and experience, but hampered by incomplete understanding of cause-effect relationships or lack of data  
Moderate: assessment is based on professional judgment and experience, including a reasonable understanding of cause-effect relationships and ample data  
High: assessment is based on professional judgment and experience, including a good understanding of cause-effect relationships and ample data |
| Probability | The likelihood that an adverse effect will occur  
Low: < 50% probability that the effect will occur  
High: > 50% probability that the effect will occur  
Unknown: the probability of the effect is unknown, due to incomplete understanding of the cause-effect relationship or lack of data |

The magnitude of residual adverse effect on fishing opportunities is moderate, as changes in public fishing areas and harvests would represent a demonstrable change, but changes are not considered beyond historical norms. Shifting activities away from development areas occurs in response to oil and gas and forestry activities in the region. The river itself has also been dammed previously. As was the case for the construction of the two other dams on the Peace River, there would be a decrease in access to fishing opportunities in the LAA during construction and, as a result, anglers would be displaced away from the river. The geographic extent of the effect would be local (i.e., restricted to the LAA). The effect would be long term (i.e., until after the first year of operation) and continuous (due to changes in access), but reversible. While fishing areas and fish harvest would be restricted during construction prior to inundation, with the creation of the Site C reservoir, restrictions to fishing areas and harvest would be reversed. In terms of social context, existing fishing opportunities are limited by the general need to have a motorized boat, but the region has many good fishing opportunities. The area is considered resilient to changes, as alternative opportunities are available outside the LAA and within the RAA, and the Peace River is also already a regulated river. The level of confidence in the adverse effects is moderate based on the reliability of effects on fish and fish habitat and the schedule for changes in access. The probability of an adverse effect during construction is high because physical changes in the Project activity zone, particularly Site C reservoir filling, would alter fishing areas.
The magnitude of the residual adverse effect on hunting opportunities is low, as changes in public hunting areas and harvests cannot be distinguished from baseline case conditions. The geographic extent of the effect would be local (restricted to the LAA). The effect would be long term (i.e., until after the first year of operation) and continuous but reversible, as hunters would adapt their activities to suit new wildlife distribution. In terms of social context, existing hunting opportunities are widely available in the RAA. The area is considered resilient to changes, as alternative opportunities are available outside the LAA and within the RAA. The level of confidence in the effects is moderate based on the reliability of effects on wildlife resources and the schedule for changes in access. The probability of an adverse effect during construction is high because physical changes in the Project activity zone, particularly the Site C reservoir, would alter hunting areas.

Residual adverse effects on fishing and hunting opportunities would result in an overall residual adverse effect on the harvest of fish and wildlife resources VC. The characterization of the residual effects is summarized in Table 24.23.
Table 24.23   Characterization of Residual Effects on Harvest of Fish and Wildlife Resources

<table>
<thead>
<tr>
<th>Effect</th>
<th>Phase</th>
<th>Residual Environmental Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Direction</td>
</tr>
<tr>
<td>Changes in Fishing Opportunities</td>
<td>Construction</td>
<td>Decrease (adverse)</td>
</tr>
<tr>
<td>Changes in Hunting Opportunities</td>
<td>Construction</td>
<td>Decrease (adverse)</td>
</tr>
</tbody>
</table>
24.6.2 Standards of Thresholds for Determining Significance

All of the residual effects criteria were taken into consideration in the determination of significance, as described in Section 24.6.1. Particular consideration was given to magnitude, duration, and context. These criteria take into account the way the provincial government manages wildlife and fish resources in response to industrial activities. The province evaluates changes in the status of fish and wildlife populations to set catch and bag limits for specific bodies of water and management units. If a Project were to affect fish and game such that catch limits and bag limits would be reduced, that may be considered a significant effect. Geographic extent and context are also important criteria to consider, as fishing and hunting opportunities in the PRRD are not limited to local water bodies or management units. Anglers and hunters can adapt their hunting and fishing locations to unaffected and accessible areas, and to places away from large construction zones. Therefore, significant adverse effects on fishing and hunting opportunities would occur if the changes are beyond historic norms (magnitude), result in the reduction of catch limits in the LAA or bag limits in management units in the LAA (geographic extent), occur over the long term (duration), and are such that anglers and hunters cannot respond and adapt their fishing and hunting locations to take advantage of alternative opportunities in the PRRD (context).

In all cases, changes should be reasonably attributed to the Project against base case conditions, which include macro-economic factors and broader trends in fish and wildlife harvesting. Specific thresholds are discussed in the context of identified potential effects and apply expert knowledge of government and industry.

24.6.3 Determination of Significance of Residual Effects

The potential residual effects during construction and operations on fishing, hunting, and trapping do not meet the above threshold. Fishing opportunities will increase during operations, and catch limits will not be reduced as a result of the Project. Hunting will continue in areas around the Site C reservoir and bag limits will not be reduced as a result of the Project. Therefore, the effects are not considered significant.

A summary of potential residual project effects, mitigation, and significance determination is presented in Table 24.24.
### Table 24.24 Summary of Assessment of Potential Significant Residual Adverse Effects

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Adverse Effect</th>
<th>Key Mitigation Measures</th>
<th>Significance Analysis of Residual Effects</th>
</tr>
</thead>
</table>
| Harvest of fish and wildlife resources| Construction  | Decrease in fishing opportunities         | ▪ Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation) will mitigate construction effects on fishing opportunities (i.e., changes in public fishing harvest areas).  
▪ Measures that support fish and fish habitat (Volume 2 Section 12 Fish and Fish Habitat), and therefore that support fish populations, will mitigate construction effects on fishing opportunities (i.e., changes in public fishing harvests). | Not significant                          |
| Construction                          | Decrease in hunting opportunities | ▪ Measures that support recreational shoreline use, boating access, and water-based navigation (Volume 3 Section 25 Outdoor Recreation and Tourism; Volume 3 Section 26 Navigation) will mitigate construction effects on hunting opportunities (i.e., changes in public hunting areas).  
▪ Measures that support wildlife and wildlife habitat, and therefore that support harvestable game populations, will mitigate construction effects on hunting opportunities (i.e., changes in public hunting harvests) (see Volume 2 Section 14 Wildlife Resources). | Not significant                          |

### 24.7 Cumulative Effects Assessment

#### 24.7.1 Screening of Cumulative Effects

A screening of the Project’s potential contribution to the cumulative effects was done in accordance with the procedures described in Volume 2 Section 10 Effects Assessment Methodology. The screening process establishes two conditions to warrant further assessment. These conditions are: (1) the Project results in a residual effect, and (2) these effects would act in a cumulative fashion with those of other projects and activities (i.e., spatial and temporal overlap).

The potential residual adverse effects of the Project on harvest of fish and wildlife would be a result of effects on fishing, hunting, and trapping resources (namely fishing,
hunting, and trapping areas, and fishing, hunting, and trapping harvests) during construction.

Other projects that are expected to interact with harvest of fish and wildlife resources residual effects are listed in Table 24.25. A full project inclusion list is included at the end of Volume 2 Section 10 Effects Assessment Methodology.

### Table 24.25 Projects that could Interact with Harvest of Fish and Wildlife Resources Residual Effects

<table>
<thead>
<tr>
<th>Site C Clean Energy Project Residual Effect</th>
<th>Other Project (Name of Project)</th>
<th>Description of Project</th>
<th>Potential Overlap with Site C</th>
<th>Potential Cumulative Effect Interaction with Harvest of Fish and Wildlife Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term (i.e., during the construction period and first year of operation) decrease in hunting and fishing opportunities</td>
<td>Montney Gas Play</td>
<td>Shale rock deposits containing large quantities of natural gas</td>
<td>Potential for oil and gas development to continue near the Site C dam site and within Project impact lines</td>
<td>No: may result in increased access in the LAA; not expected to result in adverse residual cumulative effects on harvest of fish and wildlife</td>
</tr>
</tbody>
</table>
| | All other reasonably foreseeable projects in the RAA | ▪ Underground and surface mines  
▪ Pipelines  
▪ Waste management projects  
▪ Wind projects | Temporal overlap is unknown; none of the projects are within the LAA | Yes: expected to contribute to residual adverse effects on hunting displaced from the LAA as a result of the Project |
| | Land tenure* | Applications for oil, gas, water, range and other land tenures, forest harvest plans | Temporal overlap is unknown; some overlap with Project activity zone | No: land tenure applications represent a continuation of existing multiple use patterns and levels |

**NOTES:**

* Further information is available in Section 11.3 Land Status, Tenure, and Project Requirements in Volume 2 Section 11 Environmental Background

The Montney Gas play is expected to have a positive effect on road and trail access in the LAA over time. Therefore, no residual adverse cumulative effects are expected on harvest of fish and wildlife in the LAA.

The reasonably foreseeable Projects above would not affect the harvest of fish resources within the LAA, and therefore would not combine with Project effects on the harvest of fish resources in the LAA. Further assessment of cumulative effects of changes in fishing is not required.

Reasonably foreseeable projects in the RAA are expected to have similar effects on hunting opportunities as the Project, in relation to changes in access and displacement of activities and wildlife away from the Project activity zone. As a result, access to public hunting areas in the LAA would be affected.

Applications for *Land Act* tenures, new oil and gas facilities, and forestry harvest plans and tenures would overlap spatially with the Project activity zone, but these would represent a continuation of existing baseline conditions. Oil and gas facilities, as
approved by the Oil and Gas Commission, are already included in the consideration of
the Montney Gas play. Range tenures issued by B.C. Ministry of Forests, Lands and
Natural Resource Operations represent a continuation of grazing activity for the region’s
livestock sector. Similarly, harvesting plans are typical licences to cut that are regularly
issued under the terms of a licensee’s forest tenure. Harvest of fish and wildlife already
interacts with these activities and therefore no residual effect is anticipated in the LAA.

Population changes in the RAA due to the workforce requirements of reasonably
foreseeable projects could increase the use of harvesting areas during the construction
and operations phases of the Project. However, population projections for the region that
were used in the assessment of changes in the use of harvesting areas consider the
population effects of reasonably foreseeable projects. Therefore, the assessment of
residual project effects considered the cumulative population effects of reasonably
foreseeable projects during the construction and operations phases of the Project.
Based on this, further assessment of cumulative effects of changes in the use of
harvesting areas was not carried out.

24.7.2 Description of Cumulative Effects

During project construction, hunting would be displaced from the LAA to other parts of
the RAA. The same effect is expected to occur with the above identified RAA projects.
Therefore, access to public hunting areas would be expected to decrease overall,
resulting in a cumulative residual adverse effect.

24.7.3 Cumulative Effects Mitigation Measures

In general, proponents (including BC Hydro) determine measures to minimize effects on
public access to areas used for harvesting activities. For example, BC Hydro is
mitigating effects on access to the Peace River by replacing boat launches. This will help
to mitigate changes in access to harvesting areas for hunting. BC Hydro will also
implement mitigation measures to mitigate potential effects on wildlife populations.

24.7.4 Residual Cumulative Effects

Conservatively, the residual cumulative adverse effects of changes in access and
increased disturbances on hunting opportunities could result in a cumulative effect of
moderate magnitude and regional geographic extent. Due to the lack of ample data
regarding footprints and effects on access of the reasonably foreseeable projects, the
level of confidence in estimating this cumulative effect is low.

24.7.5 Characterization of Residual Cumulative Effects

The characterization of the residual effects described above is summarized in
Table 24.23.
### Table 24.26  Characterization Criteria for Residual Cumulative Harvest of Fish and Wildlife Resources Effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Phase</th>
<th>Residual Cumulative Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direction</td>
<td>Magnitude</td>
</tr>
<tr>
<td>Changes in Hunting Opportunities</td>
<td>Construction</td>
<td>Decrease</td>
</tr>
</tbody>
</table>
24.7.6 Determination of Significance of Residual Cumulative Effects

Cumulative effects on hunting opportunities are not expected to result in the reduction of bag limits within LAA management units. Therefore, the effect is not considered significant.

24.8 Monitoring and Follow-Up

As the level of confidence in residual effects predicted for harvest of fish and wildlife resources is high, there are no monitoring or follow-up programs proposed for this VC. Monitoring and follow-up programs dealing specifically with fish and wildlife are described in Volume 2 Section 12 Fish and Fish Habitat and in Volume 2 Section 14 Wildlife Resources.
References

Literature Cited


Internet Sites


Personal Communications

<table>
<thead>
<tr>
<th>Reference</th>
</tr>
</thead>
</table>
25 OUTDOOR RECREATION AND TOURISM

25.1 Approach

The Peace River is used by tourists and residents for outdoor recreation activities. The Project would affect outdoor recreation and tourism through physical change to the land base. The potential Project effects on the Outdoor Recreation and Tourism valued component (VC) are assessed by considering the Project interactions with outdoor recreation and tourism features, amenities, sites, activities, visitor levels, and use levels. Outdoor recreation and tourism was chosen as a VC, as it reflects concerns that arose in public consultations about the Project, it is expected to have effects on recreation sites and tourism infrastructure, and it has the potential to affect outdoor recreation use levels and regional tourism visitor levels.

The following definitions are used in this assessment:

- **Tourists** – people who travel to, or stay at, a place outside their usual environment for a period of no more than a year. In this assessment, any person residing outside the Peace River Regional District who visits the region is a tourist. A tourist can travel either for business or for pleasure, but non-resident workers are not considered tourists. Tourists include day trippers as well as people making longer excursions (BC Stats 2009).

- **Outdoor recreation users** – residents who engage in outdoor, self-guided recreation in their usual environment. In this assessment, any person residing in the Peace River Regional District who participates in outdoor recreation in the region is an outdoor recreation user.

- **Outdoor recreation** refers to activities undertaken outside the confines of buildings, not involving organized competition or rules (i.e., sports), and generally requiring large areas of land or water in a predominantly natural landscape. While most outdoor recreation activity is considered to be non-reliant on built facilities, site improvements and some forms of infrastructure can exist to manage use and effects on the land base.

25.1.1 Regulatory and Policy Setting

The assessment was prepared in accordance with Section 16.7 of the Site C Clean Energy Project Environmental Impact Statement Guidelines (The Minister of Environment of Canada and the Executive Director of the BCEAO, 2012) (EIS Guidelines).

The administration and allocation of Crown land for recreation uses, resorts, and guided commercial recreation activities is managed by the B.C. Ministry of Forests, Lands and Natural Resource Operations, under the Land Act, the Ministry of Lands, Parks and Housing Act, and related regulations. The allocation of rights through the Land Act can include leases, licences, investigative permits, and notations.

Recreation sites may be approved and established under Section 57 of the Forest and Range Practices Act (FRPA). The intent of Section 57 is to allow for the construction,
25.1.2 Key Issues and Identification of Potential Effects

There is the potential for adverse effects on outdoor recreation and tourism due to changes in the following as a result of the Project:

- Changes in outdoor recreation and tourism infrastructure including:
  - Managed and unmanaged outdoor recreation sites, trails, parks, and the Peace River Boudreau Lake proposed protected area
  - Visitor centres, tourist accommodations, and tourist attractions

- Changes in outdoor recreation use levels and regional tourism visitor levels

Issues, concerns, and interests identified during consultation with the public, Aboriginal groups, and government agencies guided the scope of the outdoor recreation and tourism assessment (refer to Volume 1 Section 9 Information Distribution and Consultation). The key issues identified and the approaches used to address issues are outlined in Table 25.1. In all of these consultations, members of the public, regulatory agencies, and local government representatives voiced concerns regarding how access, capacity, and opportunities for outdoor recreation and tourism would be affected by the Project during construction and during operations as a result of physical works or due to demands of the temporary workforce population or in-migrants arriving in the region as a result of the Project. These concerns were considered in the development of mitigation measures, in the design of the Project, and in management plans, including the Outdoor Recreation Mitigation Plan (Volume 3 Appendix E) and the Vegetation, Clearing, and Debris Management Plan (Volume 1 Appendix A).
<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outdoor Recreation and Tourism Infrastructure</strong></td>
<td></td>
</tr>
<tr>
<td>Loss and changes in access to existing recreation sites</td>
<td>▪ Developed an Outdoor Recreation Mitigation Plan (Volume 3 Appendix E) in coordination with local, regional and provincial governments</td>
</tr>
<tr>
<td>Physical loss of land and features</td>
<td>▪ Mitigation measures were designed to address changes in infrastructure and access (see Sections 25.4.3 and 25.4.4)</td>
</tr>
<tr>
<td><strong>Outdoor Recreation Use Levels and Regional Tourism Visitor Levels</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Changes to the recreation environment including changes that may introduce new built and natural safety hazards | ▪ Assessed water and ice conditions on the Site C reservoir (Volume 2 Section 11.4 Surface Water Regime and Section 11.7 Thermal and Ice Regime) and designed measures to address potential effects consisting of:  
  o Clearing the Site C reservoir and managing debris to support boating on the Site C reservoir (Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan)  
  o Developing a Public Safety Management Plan that will identify public communications procedures for public safety hazards, and access restrictions and closures during construction and operation of the Site C reservoir (Volume 5 Section 35 Summary of Environmental Management Plans) |
| Changes in use levels due to Project-induced population change | ▪ Assessed potential changes in use levels resulting the Project-induced population change (Section 25.4 Effects Assessment)  
  ▪ BC Hydro is working with the private sector and local governments to develop new RV sites (Volume 4 Section 29 Housing)  
  ▪ Designed mitigation measures to enhance tourism benefits by avoiding shortages in hotel, motel, and campground availability that might inconvenience leisure travelers (Volume 4 Section 29 Housing) |
| Use of visitor accommodations during construction by temporary workers | |
| **Additional Concerns from Aboriginal groups** | |
| Concerned that the Project would destroy a historical Métis community that holds significant value from a heritage perspective, as well as yet-to-be-realized tourism and outdoor recreation potential (Métis Nation BC) | ▪ Heritage value was assessed in Volume 4 Section 32 Heritage Resources |
| Concerned about the effects of increased access and use by non-Aboriginal recreational users of the reservoir (Treaty 8 Tribal Association) | ▪ Section 25.4 Effects Assessment considers changes in access for recreation and changes in recreational use levels  
  ▪ Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes considers effects of changes in access on Aboriginal use of lands and resources |

Potential Project interactions with VCs are summarized in Volume 2 Appendix A Project Interactions Matrix, Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a “2” ranking is assigned where an interaction may result in an adverse effect and the nature of the effect and/or the effectiveness of mitigation measures is uncertain. These interactions were taken forward through the effects assessment.
1. Project interactions with a ranking of “2” are set out in Table 25.2 below.

### Table 25.2 Interactions of the Project with Outdoor Recreation and Tourism

<table>
<thead>
<tr>
<th>Project Components and Activities</th>
<th>Key Aspects</th>
<th>Changes in Outdoor Recreation and Tourism Infrastructure</th>
<th>Changes in Outdoor Recreation Use Levels and Regional Tourism Visitor Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam and Generating Station</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir Preparation and Filling</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Transmission System</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Quarried and Excavated Material Source Development</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>West Pine Quarry</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Portage Mountain</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Highway 29 Realignment</strong></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Construction Access Road Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Line Access Roads</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Jackfish Lake Road Works</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Worker Accommodation Construction and Operations</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir and Generating Station Operations</td>
<td>✓</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. Outdoor recreation and tourism infrastructure refers to managed and unmanaged outdoor recreation sites, trails and parks, visitor centres, accommodations, and tourist attractions.
2. N/A – not applicable.
3. The project construction components, and associated activities and physical works would require temporary occupation of the land base, resulting in either displacement or alteration of outdoor recreation and tourism infrastructure. Outdoor recreation and tourism infrastructure refers to managed and unmanaged outdoor recreation sites, trails and parks, visitor centres, accommodations, and tourist attractions.
4. The population change associated with direct, indirect, or induced employment opportunities during construction would increase use levels for outdoor recreation and tourism. Outdoor recreation and tourism use could also shift to areas outside of the LAA due to any restrictions to recreation sites caused by Project activities.
5. During Site C reservoir operations, there would be expected changes in recreation and tourism infrastructure over time, as the Site C reservoir would become a recreation destination for the region. Tourism demand would not be expected to change due to Project operations.
6. The Project’s operational labour requirement would be approximately 25 positions, which is low relative to the receiving population. Measurable population changes in the Project area due to direct operational workforce requirements and resultant changes in use levels of outdoor recreation and tourism are not anticipated. In-migrants who take up indirect and induced jobs and who remain in the region after construction would do so...
because of economic or social reasons not associated with the Project. Based on the
above factors, change in use levels for outdoor recreation and tourism as a result of
operations is not considered further in this assessment.

25.1.3 Standard Mitigation Measures and Effects Addressed
A “1” ranking was given where an adverse effect may result from an interaction, but
standard mitigation measures to avoid or minimize the potential effects are available and
well understood to be effective, and any residual effect is negligible. These interactions
were not carried forward through the effects assessment.
A “1” ranking was assigned to activities associated with the construction access road
development component, including: transportation of construction materials and
supplies, Old Fort Road realignment and widening, paving of 240 Road and paving and
extension of 269 Road, West Pine quarry access, West Pine siding construction, and
Septimus rail siding construction. A Traffic Access Management Plan (including access
restrictions where required) will mitigate potential effects on outdoor recreation and
tourism (see Volume 5 Section 35 Summary of Environmental Management Plans).
All other project activities listed in Table 2 of Volume 2 Appendix A Project Interactions
Matrix were ranked “0” because the activities do not interact with outdoor recreation and
tourism.
Any overlap or conflict between existing third-party recreation tenure holders and
BC Hydro’s proposed activities, or BC Hydro’s required tenure over Crown land, will be
addressed through discussions, permitting and, where appropriate, agreements with the
tenure holders. Further information is available in Volume 2 Section 11.3 Land Status,
Tenure, and Project Requirements.

25.1.4 Selection of Key Indicators
The key indicators for assessment of Project effects on outdoor recreation and tourism
are selected to include measures relevant to the outdoor recreation and tourism setting,
infrastructure, and activities in the area. A list of key indicators, including a rationale for
selection is provided in Table 25.3.
### Table 25.3  Key Indicators for Outdoor Recreation and Tourism

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in outdoor recreation and tourism infrastructure</td>
<td>• Outdoor recreation features and amenities, including recreation sites, trails, parks, and Peace River Boudreau Lake proposed protected area</td>
<td>Physical assets, facilities and infrastructure indicate presence of and potential for recreation and tourism use.</td>
</tr>
<tr>
<td></td>
<td>• Tourism features and amenities, including visitor centres, tourist accommodations, and attractions</td>
<td>Understanding recreational activities provides insights into use of the land base.</td>
</tr>
<tr>
<td></td>
<td>• Commercial outdoor recreation interests</td>
<td>Licensed uses indicate tourism business interest on Crown land.</td>
</tr>
<tr>
<td></td>
<td>• Recreation activities undertaken on the land base, including activities, locations, and seasonal nature of activities</td>
<td></td>
</tr>
<tr>
<td>Changes in outdoor recreation use levels and regional tourism visitor levels</td>
<td>• Outdoor recreation use levels</td>
<td>Use and visitor levels are a primary determinant of recreation and tourism value.</td>
</tr>
<tr>
<td></td>
<td>• Regional tourism visitor levels</td>
<td></td>
</tr>
</tbody>
</table>

#### 25.1.5  Spatial and Temporal Boundaries

##### 25.1.5.1  Spatial Boundaries

The Local Assessment Area (LAA) in the EIS Guidelines for the assessment of the VC of outdoor recreation and tourism is the Project activity zone and downstream to Peace Island Park. The Regional Assessment Area (RAA) in the EIS Guidelines is the Peace River Regional District.

The areas used for reporting in this assessment were updated from the originally proposed spatial boundaries in the EIS Guidelines. The LAA selected for outdoor recreation and tourism is the Project activity zone, the area within the reservoir impact lines and the Peace River downstream to Peace Island Park by Taylor. Changes in recreation and tourism infrastructure and demand would be attributable to physical change on the land base in the Project activity zone. The area within the reservoir impact lines will have land use restrictions that could affect recreation and tourism infrastructure. Peace Island Park is a key recreation and boat launching area on the Peace River that could be affected by changes to river levels during Project operations.

The RAA is the Peace River Regional District (PRRD), which is an administrative area that offers recreation and tourism opportunities similar to those present in the LAA.

Spatial boundaries are shown in Figure 25.1 and summarized in Table 25.4.
### Table 25.4 Spatial Assessment Areas for Outdoor Recreation and Tourism

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project activity zone, the area within reservoir impact lines and downstream to Peace Island Park</td>
<td>Peace River Regional District</td>
</tr>
</tbody>
</table>

### 25.1.5.2 Temporal Boundaries

The temporal boundary for the assessment is the Project construction and operations phases. The timing of the construction and operations phases, including construction and operations components and specific component activities, is described in Volume 1 Section 4 Project Description. The assessment also considers seasonal variations in outdoor recreation and tourism activities.

### 25.2 Information Sources and Methodology

#### 25.2.1 Literature Review

The following information was used to formulate the baseline, and assist with assessment of potential effects:

- Project description and other project-related information
- Government databases of recreation and tourism sites, infrastructure and tenures
- Report results from a local creel survey (LGL 2010)
- Government and industry studies and publications on recreation and visitor profiles, including activity preferences, use areas, use levels, spending, and economic values

Report references are listed at the end of this section.

#### 25.2.2 Interviews

Representatives from the following recreation groups were interviewed to identify secondary data sources, validate secondary data, and gain perspectives on key access points and recreation sites and facilities that could be affected by the Project:

- Chetwynd Snowmobile Club
- Northland Trailblazers (snowmobile club)
- Peace Country River Rats Club
- Whiskey Jack Nordic Ski Club
- Moose ATV Club

Tourism operators and representatives of government ministries with an interest in tourism were interviewed to identify data and information gaps, obtain baseline information, characterize tourism in the LAA, and discuss potential Project effects.

Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 1 Land and Resource Use Assessment Interview Methodology provides details on interview methodology. Personal Communications are listed at the end of this section.
25.2.3 Field Investigations

Field surveys were completed in 2008 to 2009 (LGL 2010) to develop an understanding of outdoor recreation sites, features, and amenities, as well as use levels and activities. The survey objectives also included completion of an angler and creel survey. A field visit took place on July 14, 2011 to view formal and informal recreation sites on the Peace River near the site of the Project and along Highway 29 between Fort St. John and Hudson’s Hope and to identify potential site-specific interactions.

25.2.4 Data Management, Mapping, and Modelling

A spatial analysis was undertaken to identify the overlap between the Project activity zone, including the area within the reservoir impact lines, and outdoor recreation and tourism values. Data were collected from the provincial land and resource data warehouse, government ministries, and BC Hydro. Data were geospatially represented using Geographic Information System (GIS) analysis. The GIS results were also used for figure preparation.

25.2.5 Aboriginal Community and Traditional Knowledge

Aboriginal community and traditional knowledge related to the Outdoor Recreation and Tourism VC was gained through review of results of BC Hydro’s consultation with Aboriginal groups, of First Nations Traditional Use Studies, and of Community Baseline Studies. Where First Nations concerns and information pertaining to tenured activities was available, they are included in this section. Details regarding potential effects on traditional land and resource use are addressed in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes and Volume 5 Section 34 Asserted or Established Aboriginal and Treaty Rights, Aboriginal Interests, and Information Requirements.

25.3 Baseline Conditions

The following sections summarize baseline conditions for outdoor recreation and tourism in the LAA. The regional context for outdoor recreation and tourism is described in Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 5 Outdoor Recreation and Tourism, and Navigation.

25.3.1 Outdoor Recreation Features and Amenities

25.3.1.1 Recreation Sites

Recreation sites include managed and unmanaged publicly accessible sites identified in Peace River Angling and Recreational Use Creel Survey (LGL 2010). Other parks, protected areas, and park facilities are described in the next section. LGL (2010) identified a total of 49 recreation sites along the Peace River and its major tributaries, 32 of which were found on the Peace River mainstem, two on the Halfway River and 15 on the Pine River between the Sukunka River and Peace River. Total annual recreational activity level was estimated to be 15,909 user days, of which 10,353 user days were on the Peace River.
All 49 sites are accessible by boat, and 20 are accessible by both boat and road. Of the sites accessible by road, the access road to two of the Peace River sites cross private land (confluence of Maurice Creek and Unmaintained Campsite E). Municipalities or private owners maintain the high-use campgrounds and boat launches, while the primitive maintained campsites (i.e., designated Forest Recreation sites) are kept up by the Peace Country River Rats boating club. The Peace Country River Rats campsites, which are used on a first-come, first-served basis, are maintained by the local boaters of the Peace River system, with facilities including an outhouse, fire pit, and picnic table. There are a number of unmaintained campsites, shoreline access sites, scenic locations, and boat launches. The unmaintained campsites are defined as an unmaintained area consisting of a clearing in the riparian zone for tents and homemade fire pits. These sites often show evidence of use over years, such as obvious bank trails to indicate their location, and are used on a first-come, first-served basis.

Table 25.5 lists the recreation sites within the LAA. Most of these sites were developed without approval under the Forest Practices Code of BC Act or the Forest and Range Practices Act (FRPA), but 10 sites are authorized with the provincial government under Section 57 of the FRPA. Although not officially recognized by government, unregistered sites support ongoing river use for outdoor recreation purposes. BC Parks signs are posted at some sites, even though a provincial park does not exist. In most cases, sites were developed by volunteers or evolved over time through continuous use. Campsites were the most abundant site type, followed by shore access points and boat launches.

<table>
<thead>
<tr>
<th>Type of Site</th>
<th>Peace Canyon Dam to Hudson's Hope</th>
<th>Hudson's Hope to Site C Dam Site</th>
<th>Site C Dam Site to Alberta Border</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public campground &amp; boat launch</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Boat launch &amp; unmaintained campsite</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Boat launch (only)</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Public campground (only)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Primitive maintained campsite</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Unmaintained campsite (only)</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Cabin</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shoreline access</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Scenic location</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>24</td>
<td>5</td>
<td>34</td>
</tr>
</tbody>
</table>

NOTE: Source: LGL (2010)

Recreation sites used by the public within the Project activity zone are listed in Table 25.6, including 10 sites that are authorized under Section 57 and managed by the Peace Country River Rats Club (River Rats). The current authorizations were signed in October 2009 for five years and will be re-evaluated at the end of the five-year term. The sites are listed by location from Hudson's Hope downstream towards the Site C dam site. Two of the Peace River sites (Confluence of Maurice Creek and Unmaintained Campsite E) are accessible by roads that cross private land and by boat.
## Table 25.6 Managed and Unmanaged Recreation Sites in the Project Activity Zone

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Location</th>
<th>Status</th>
<th>Ownership</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmaintained Campsite A</td>
<td>Upstream of Alwin Holland Memorial Park</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Beach area 18x77 m to set tents, a fire pit, and an outhouse</td>
</tr>
<tr>
<td>Alwin Holland Memorial Park</td>
<td>Bodeker Street off of Highway 29, Hudson's</td>
<td>Managed</td>
<td>District of Hudson's Hope</td>
<td>12 campsites present, some with fire pits and picnic tables. Pit toilets and refuse collection</td>
</tr>
<tr>
<td></td>
<td>Hope, B.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hudson's Hope Boat Launch</td>
<td>D.A. Thomas Road, Hudson's Hope</td>
<td>Managed</td>
<td>District of Hudson's Hope</td>
<td>Boat launch and shoreline access</td>
</tr>
<tr>
<td>Lynx Creek Boat Launch</td>
<td>East of Lynx Creek Bridge</td>
<td>Managed</td>
<td>BC Hydro</td>
<td>Boat launch and shoreline access</td>
</tr>
<tr>
<td>Confluence of Maurice Creek</td>
<td>Confluence of Maurice Creek</td>
<td>Unmanaged</td>
<td>Crown (access to the site crosses private land)</td>
<td>unmaintained camping</td>
</tr>
<tr>
<td>Lynx Creek RV Park</td>
<td>6 km west of Hudson's Hope, immediately west</td>
<td>Managed</td>
<td>Land is owned by BC Hydro and leased to private individual</td>
<td>Boat access, shoreline access, campsite (22 RV; 24 campsites; plus field for tents), picnic area; playground; horseshoe pits; volleyball net</td>
</tr>
<tr>
<td></td>
<td>of Lynx Creek</td>
<td></td>
<td>The RV park is owned by a private individual</td>
<td></td>
</tr>
<tr>
<td>Shoreline Access A</td>
<td>Off Highway 29, between Lynx Creek Boat</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>unmaintained launch</td>
</tr>
<tr>
<td></td>
<td>Launch and Lynx Creek RV Park</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Gates Campsite</td>
<td>Upstream of the Gates; on the south side of</td>
<td>Managed</td>
<td>Crown - maintained by the River Rats (Section 57)</td>
<td>Primitive site with one site and two adjacent spots cleared for tents. A table, grill, and sheltered tarp area</td>
</tr>
<tr>
<td></td>
<td>the river</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Gates Boat Launch</td>
<td>Off Highway 29, east of Hudson's Hope</td>
<td>Unmanaged</td>
<td>Unknown</td>
<td>Dirt road that extends into the river, roughly 9.5 m wide</td>
</tr>
<tr>
<td>Unmaintained Campsite B</td>
<td>Located on an island between Lynx Creek and</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Unmaintained campsites with some cleared areas for tents and a man-made fire pit</td>
</tr>
<tr>
<td></td>
<td>Farrell Creek</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmaintained Campsite C</td>
<td>Located on an island just downstream of Campsite B, between Lynx Creek and Farrell Creek</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Cleared area for tents, homemade fire pit with grill, firewood and homemade table</td>
</tr>
</tbody>
</table>
### Site C Clean Energy Project Environmental Impact Statement
#### Volume 3: Economic and Land and Resource Use Effects Assessment
##### Section 25: Outdoor Recreation and Tourism

<table>
<thead>
<tr>
<th>Site Name*</th>
<th>Location</th>
<th>Status</th>
<th>Ownership</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmaintained Campsite D</td>
<td>Located on an island just downstream of Campsite A and B, between Lynx Creek and Farrell Creek</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Two small cleared areas for tents and a homemade fire pit</td>
</tr>
<tr>
<td>Farrell Creek</td>
<td>Users park at Farrell Creek bridge and walk down to the confluence</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>None</td>
</tr>
<tr>
<td>Hawk Island Campsite</td>
<td>On an island in the Peace River, downstream of Farrell Creek</td>
<td>Managed</td>
<td>Crown – maintained by the River Rats (Section 57)</td>
<td>Primitive maintained campsite – Main area with additional cleared spots for other tents; there is an outhouse, fire pit, picnic table, and other furniture</td>
</tr>
<tr>
<td>Unmaintained Campsite E</td>
<td>Off Highway 29, between Farrell Creek and the Halfway River</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Unmaintained campsite with picnic area main area with a few adjacent cleared areas</td>
</tr>
<tr>
<td>Shoreline Access B</td>
<td>Halfway River, upstream of Highway 29 bridge crossing</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Unmaintained launch</td>
</tr>
<tr>
<td>Halfway River Bridge Boat Launch</td>
<td>Off Highway 29, east of Hudson's Hope, on east side Halfway River bridge</td>
<td>Managed</td>
<td>Crown – maintained by River Rats (Section 57)</td>
<td>Two dirt boat launches that extend down to the water</td>
</tr>
<tr>
<td>Rotary Campsite</td>
<td>On an island in the Peace River</td>
<td>Managed</td>
<td>Crown - maintained by the River Rats (Section 57)</td>
<td>Campsite consists of a cleared area for tents, an outhouse, homemade fire pits, picnic tables and a shelter area</td>
</tr>
<tr>
<td>Beaver House Campsite</td>
<td>Site located on an island, downstream of the rotary campsite</td>
<td>Managed</td>
<td>Crown - maintained by the River Rats (Section 57)</td>
<td>Primitive maintained campsite – Main area with additional cleared spots for other tents; there is an outhouse, fire pit, and picnic tables</td>
</tr>
<tr>
<td>Waterfalls Trail</td>
<td>South bank of the Peace River, downstream of Cache Creek</td>
<td>Managed</td>
<td>Crown – managed by the River Rats (Section 57)</td>
<td>Hiking trail that leads up to the falls</td>
</tr>
<tr>
<td>Unmaintained Campsite G</td>
<td>Located between Cache Creek and Wilder Creek</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Numerous small cleared areas for tents, homemade fireplace, benches, tables, chairs</td>
</tr>
<tr>
<td>Limestone Campsite</td>
<td>Downstream of Wilder Creek</td>
<td>Managed</td>
<td>Crown - maintained by the River Rats (Section 57)</td>
<td>Numerous small cleared areas for tents, homemade fireplace, benches, tables, chairs, and an outhouse</td>
</tr>
<tr>
<td>Primitive Maintained Campsite A (Island’s End)</td>
<td>Upstream end of Eagle’s Nest campsite</td>
<td>Managed</td>
<td>Crown - maintained by the River Rats (Section 57)</td>
<td>Main area with fire pit and picnic tables, small areas adjacent for tents, an outhouse</td>
</tr>
</tbody>
</table>
### Site Name

<table>
<thead>
<tr>
<th>Site Name*a</th>
<th>Location</th>
<th>Status</th>
<th>Ownership</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eagle Nest Campsite</td>
<td>Downstream end of Primitive Maintained Campsite</td>
<td>Managed</td>
<td>Crown - maintained by the River Rats (Section 57)</td>
<td>Main area with fire pit and picnic tables, small areas adjacent for tents, an outhouse</td>
</tr>
<tr>
<td>Shoreline Access C</td>
<td>Downstream end of Eagle’s Nest Campsite</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Fire pit</td>
</tr>
<tr>
<td>Unmaintained Campsite H</td>
<td>Upstream of the Moberly River confluence</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>Unmaintained campsite with outhouse, homemade fire pit, grill, bench and table</td>
</tr>
<tr>
<td>Birch Camp Campsite</td>
<td>Downstream of the Moberly</td>
<td>Managed</td>
<td>Crown - maintained by the River Rats (Section 57)</td>
<td>Unmaintained campsite with outhouse, homemade fire pit, grill, benches, hanging pole for hunting, teepee, and table</td>
</tr>
<tr>
<td>Unmaintained Campsite F</td>
<td>Halfway River, upstream of Shoreline Access B</td>
<td>Unmanaged</td>
<td>Crown</td>
<td>No maintained campsites but hunters are known to camp in this area, remnants of old fire pits have been observed</td>
</tr>
</tbody>
</table>

### NOTES:

1. * Listed upstream to downstream of the Project; sites identified in LGL (2010)
25.3.1.2 Recreation Reserves

There are seven Use, Recreation and Enjoyment of the Public (UREP) reserves that overlap the LAA and that cover 1,692 ha within the boundaries of the Peace River Regional District (Figure 25.1). A UREP reserve is established under Sections 11 and 12 of the Land Act over an area of Crown land outside of Provincial Forests to guard against unwarranted disposition or unplanned use (in this case, sale or use that would compromise an area’s current or potential recreation values or uses) (B.C. Ministry of Forests 1991). One is located near the Halfway and Peace rivers, one is near the Peace River, three are within the District of Hudson’s Hope, and two are on Bear Flat.

25.3.1.3 Parks and Protected Areas

Within the Peace River valley there are four local campgrounds in the District of Hudson’s Hope and one in the District of Taylor (Table 25.7). Collectively, the five campgrounds had 7,200 bookings in 2010. All are open from May to September. Peace Island Park and Alwin Holland Park are within the LAA.

Table 25.7 Municipal Parks and Campgrounds in the Peace River Valley

<table>
<thead>
<tr>
<th>Government</th>
<th>Park</th>
<th>Location</th>
<th>Amenities</th>
<th>Activities</th>
<th>Cost</th>
<th>2010 Stays</th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Taylor</td>
<td>Peace Island Park</td>
<td>1 km south of Taylor</td>
<td>Boat launch, campground (223 sites), day-use area, washrooms, water, sani-station, boat rentals</td>
<td>Boating, fishing, swimming</td>
<td>$15-$20 /vehicle/ night</td>
<td>5,469</td>
</tr>
<tr>
<td>District of Hudson’s Hope</td>
<td>Alwin Holland Park</td>
<td>3 km south of Hudson’s Hope</td>
<td>Campground (12 sites)</td>
<td>Fishing, hiking</td>
<td>$15/night</td>
<td>111</td>
</tr>
<tr>
<td>Cameron Lake Campground</td>
<td></td>
<td>24 km south of Hudson’s Hope</td>
<td>Campground (30 sites) day-use area</td>
<td>Canoeing, fishing, swimming</td>
<td></td>
<td>928</td>
</tr>
<tr>
<td>Dinosaur Lake Campground</td>
<td></td>
<td>7 km south of Hudson’s Hope</td>
<td>Boat launch, campground (50 sites) day-use area</td>
<td>Boating, fishing, swimming, hiking</td>
<td></td>
<td>486</td>
</tr>
<tr>
<td>King Gething Park</td>
<td>South entrance to Hudson’s Hope</td>
<td>Campground (15 sites), sani-station, day-use area</td>
<td>Sightseeing, in-town activities</td>
<td></td>
<td>243</td>
<td></td>
</tr>
</tbody>
</table>

Approximately 90% of Peace Island Park campers and park users are local families who come from Taylor, Fort St. John, or elsewhere in the Peace River Regional District. The number of overnight stays at Peace Island Park has been increasing since 2005 when the District opened 43 additional lots with electricity (Figure 25.2). A Development Plan for the park indicates a need for more campsites, as the campground is often at capacity.

Sources: District of Hudson’s Hope, Director of Public Works (2011 pers. comm.); District of Taylor, Administrator (2011 pers. comm.); BC Lodging and Campgrounds Association (2012); District of Hudson’s Hope (2012)
in the summer months. Taylor is considering adding 40 camping spaces (District of Taylor 2009).

Occupancy statistics are presented in Table 25.8 for the four District of Hudson’s Hope parks. Overall use has generally increased since 2005.

**Table 25.8 District of Hudson’s Hope Campground Occupancy, 2005 to 2010**

<table>
<thead>
<tr>
<th>Park</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Parties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alwin Holland</td>
<td>1,175</td>
<td>1,886</td>
<td>95</td>
<td>154</td>
<td>2,394</td>
<td>111</td>
</tr>
<tr>
<td>Cameron Lake</td>
<td>802</td>
<td>1,046</td>
<td>595</td>
<td>573</td>
<td>486</td>
<td>928</td>
</tr>
<tr>
<td>Dinosaur Lake</td>
<td>595</td>
<td>573</td>
<td></td>
<td>243</td>
<td></td>
<td></td>
</tr>
<tr>
<td>King Gething</td>
<td>256</td>
<td>268</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,175</td>
<td>1,886</td>
<td>1,748</td>
<td>2,041</td>
<td>2,394</td>
<td>1,768</td>
</tr>
</tbody>
</table>

**NOTE:**

Source: District of Hudson’s Hope, Director of Public Works (2011 pers. comm.)

The Peace River Boudreau Lake proposed protected area encompasses a major portion of the south bank of the Peace River valley, the lower Moberly River valley, and the Peace River islands between Maurice Creek and downstream of the Moberly River. This area was proposed for protection in the Fort St. John and Dawson Creek Land and Resource Management Plans (B.C. Ministry of Forests, Lands and Natural Resource Operations 1997, 1999). Current recreational activities in the proposed area include public and commercial boating, canoeing, bird watching, hunting, and fishing, although current access to many parts of the proposed park is limited and use levels are relatively low (BC Parks, Planning Officer 2009 pers. comm.). A recent survey, conducted for the PRRD Parks and Trails Master Plan, indicated that respondents felt that the Peace River area is among the special areas in the PRRD that should have additional Regional Parks (Kootenay Planning Consultants 2011). Suggestions submitted by respondents for consideration by the PRRD in the Parks and Trails Master Plan included trail development and access points along the Peace River (Kootenay Planning Consultants 2011).

**25.3.2 Tourism Features and Amenities**

**25.3.2.1 Fort St. John**

There are no accommodation properties or facilities in the LAA.

Adjacent to the LAA, in the Fort St. John area, are 22 hotels, motels, and bed and breakfasts with a total of 1,400 rooms. Five campgrounds and RV facilities have a total of 270 units. Three of these facilities have pull-through sites, which are an important feature in attracting RV travellers.

Conference, meeting, and trade and consumer show facilities range from small, limited-service meeting rooms to full-service conference and meeting facilities at the larger hotels. The Pomeroy Sports Centre, owned and operated by the City of Fort St. John, is able to host conferences, conventions, and trade and consumer shows. Sport tourism is supported by the facility, as well as the North Peace Leisure Pool, the North Peace Arena, Fort St. John Curling Club, North Peace Gymnastics, a skateboard park, and several playing fields.
Arts, cultural, and heritage attractions include the North Peace Cultural Centre, Fort St. John North Peace Museum, Lido Theatre, Heritage Kiosk Walking Tour, Peace Gallery North, the Fort St. John’s Arts Council, and an active performing arts community. Fort St. John is also assessing the feasibility of developing an Energy Interpretive Centre featuring the region’s oil and gas heritage.

Fort St. John hosts several festivals and events throughout the year, including the High on Ice Festival, Chocolate Festival, Peace River Zone Theatre Festival, Annual Art Auction, Fort St. John International Airshow, North Peace Fall Fair, and Classic Cruisers Show and Shine.

Fort St. John has a mix of agricultural attractions, including the North Peace Horticultural Society Flower Show, Farmer’s Market, July Garden Tour, and the Crushed Grapes Wine Festival.

The community has two golf courses, the Lakepoint Golf and Country Club and the Fort St. John Links Golf Course.

According to a 2010 Tourism Development Plan prepared for the City by Tourism BC, the following are the strongest regional (i.e., the city and the surrounding rural areas) tourism features (Tourism BC 2010):

- Oldest non-Aboriginal community in B.C. (1794)
- Earliest fort in B.C.
- Enerplex ice sports facility (sanctioned by Speed Skating Canada)
- Peace River transportation history (trading and cultural heritage traditions)
- Work camps positioned along the Alaska Highway during construction
- Charlie Lake Caves (dating back to 10,500 BC
- First oil well in North Peace area (discovery of high-grade oil in 1951)
- Monica Storrs (first Anglican missionary from England; arrived in Fort St. John in 1930)
- Agricultural heritage (in the 1930s, there was an influx of migrants from the Prairies and Ontario who were drawn by the area’s reputation for fine agricultural land)
- High On Ice Festival (held in January each year)

### 25.3.2.2 Taylor

Except for Peace Island Park, all of Taylor’s tourism features and amenities are outside the LAA.

The community features parks, trails, a self-guided heritage tour, and events that attract residents and visitors. The main activities are outdoor recreation, river boating, hunting, and sports tourism. Most outdoor activities are self-guided, but one operator offers guided boat tours and boat rentals. Overnight accommodation is limited to two motel properties with 26 rooms in total. Work crews are the primary market for these properties. Taylor also offers camping and RV sites at Peace Island Park, which caters to residents, tourists, and work crews.
Other visitor services include a small number of restaurants, a bar, a wine and beer store, a gas station, a laundromat, a seasonal Visitor Centre, video rentals, automotive shops, a hair salon, a framing shop, and civic amenities such as a library, a post office, and a medical clinic.

Notable tourism facilities and features in or near Taylor include (BCMTCA 2010):
- Peace Island Park
- Big Bam Ski Hill
- Lone Wolf Golf Club
- Motocross and stock car tracks
- Recreation facilities (ice centre, curling rink, swimming pool, tennis courts, baseball diamonds)
- Local trail system
- 18 annual festivals and events including the Annual World’s Invitational Class “A” Gold Panning Championships (the only “world invitational”)

25.3.2.3 Hudson’s Hope

Two tourism facilities in Hudson’s Hope are in the LAA, Alwin Holland Park, and the Lynx Creek RV Park.

Outside the LAA there is an abundance of publicly accessible lakes and rivers supporting outdoor recreation, while palaeontological resources are displayed at the Hudson’s Hope Museum. Visitor centres at BC Hydro’s two nearby dams, the W.A.C. Bennett Dam and the Peace Canyon Dam, interpret the surrounding natural and industrial heritage of the area and draw highway tourists. The Hudson’s Hope Visitor Centre operates from May through to September. Outdoor recreation occurs year-round and, except for guide outfitting, is generally self-guided.

A total of three hotel and motel properties offer 173 rooms. The hotel, which opened with 80 rooms approximately three years ago, includes a new restaurant adjacent to the hotel. Five campgrounds have 116 units for rent. The community has other facilities and services, including meeting rooms, an arena, retail shops, and a library.

Other tourism features, facilities and activities include (Tourism BC 2011):
- Two lodges
- Hudson’s Hope Museum
- River boating
- Hunting, fishing, and camping
- Several annual festivals and events

25.3.3 Commercial Outdoor Recreation Interests

A tourism operator who provides outdoor recreation services for compensation or reward from residents or non-residents on provincial Crown land must be authorized by the province and be issued an Adventure Tourism tenure (B.C. 2011). There are no such
tenures overlapping or near the Project activity zone (B.C. Ministry of Forests, Lands and Natural Resource Operations 2011).

In 2010, 143 tourism businesses were based adjacent to the LAA between Hudson’s Hope and Taylor (LGL 2010). This included 12 outdoor adventure operators who offer guided services to visitors. Four of the 12 are registered guide outfitters who cater predominantly to big game hunters. The remainders specialize in backcountry adventures in the remote wilderness. The one jet boat operator who offers custom tours of the Peace River guided between 18 and 30 tourists annually between 2008 and 2011 (Hopkins 2009 and 2011, pers. comm.). This operator’s guests are generally interested in sightseeing, wildlife viewing, and nature viewing.

### 25.3.4 Outdoor Recreation Activities

The Peace River Angler and Recreational Use Creel Survey (LGL 2010) documented recreation sites along the Peace River and its major tributaries between Peace Canyon Dam and the Alberta border. Table 25.9 shows camping and fishing to be the most widespread activities, occurring at 21 and nine recreation sites in the LAA, respectively.

**Table 25.9 Outdoor Recreation Activities Supported at Recreation Sites in the LAA**

<table>
<thead>
<tr>
<th>Recreational Activity</th>
<th>Number of Sites Supporting Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camping</td>
<td>21</td>
</tr>
<tr>
<td>Fishing</td>
<td>9</td>
</tr>
<tr>
<td>Boating (jet and other)</td>
<td>8</td>
</tr>
<tr>
<td>Shoreline leisure</td>
<td>3</td>
</tr>
<tr>
<td>Picnicking</td>
<td>3</td>
</tr>
<tr>
<td>Hunting</td>
<td>3</td>
</tr>
</tbody>
</table>

Camping was the most popular activity from May through September, and jet boating was the most popular in April, October, and November (LGL 2010). Fishing was a popular activity until October, and hunting was popular in the fall. In the summer months, swimming, camping, picnicking, and shoreline leisure were popular activities. Fishing and jet boating were the predominant activities on the Peace River upstream of the Site C dam site location, whereas camping and jet boating were most popular downstream of the Site C dam site and in the Pine River. In terms of river access, Peace Island Park was used more than any other site.

The Moose all-terrain vehicle (ATV) Club promotes use of nine different trails systems within the RAA, three of which occur southeast of the Site C dam site (Septimus-Mud, Stewart, and Johnson) but not within the LAA (Figure 25.1). The club is looking to expand its trail system to avoid competing with off-road trucks and dirt bikes for existing trails. The club estimates 5,000 to 6,000 ATV users in Fort St. John (Hergott 2008, pers. comm.).

Within the RAA, the Whiskey Jack Nordic Ski Club sets trails at the Fort St. John Links Golf Course, Peace Island Park (Taylor), the Fish Creek Community Forest, and in Beatton Provincial Park (Charlie Lake). The Peace Island Park trail is the only...
designated cross-country ski trail within the LAA. Current plans include the purchase of new grooming equipment, trail widening, and a warming hut. Approximately 300 cross-country skiers actively use the Peace valley, with most activity occurring on designated trails. Skiing along the Peace River (within the LAA) does occur, including along Old Hope Road as far as private cultivated lands near Wilder Creek and occasionally along Farrell Creek. Crown land is not managed for recreational access, which limits opportunities in the region (Stanford 2008, 2011 pers. comm.).

The Northland Trailblazers Snowmobile Club estimates 5,000 snowmobiles and between 3,000 and 4,000 active snowmobilers in the RAA. Popular use areas within the RAA and near the LAA include the upper Pine River, the Monias area (when the Pine is frozen), the Septimus-Mud and Stewart Lake trails (with some cut lines leading down to the Peace River within the LAA), around Dinosaur and Charlie lakes, and on lower Cache Creek adjacent to Bear Flat (within the LAA). The Cache Creek trails are not official (i.e., registered with the province) but they are marked (the club has discussed recognition with the provincial government). The Stewart Lake trail has been registered with the province and as a result, oil and gas companies are required to contact the club before working in the area. Within the LAA, snowmobilers use Old Hope Road as far as Bear Flat on a regular basis. Other informal trails include pipeline rights-of-way, seismic lines, and hydro lines (Dancey 2008, pers. comm.; Northland Trailblazers, group interview 2011, pers. comm.). Outer areas of Peace Island Park further west along “Big Bam Road” are used to provide access to trails for motorized activities such as snowmobiling, quad touring, and motocross (District of Taylor, Administrator 2009, pers. comm.).

Most of all-terrain vehicle use, cross-country skiing and snowmobiling occurs on designated and informal trails outside the LAA. Use areas within the LAA include Peace Island Park, snowmobile trails on lower Cache Creek adjacent to Bear Flat, and Old Hope Road.

The Peace Country River Rats (River Rats) is an organized group of river boaters with a membership of over 300 boats and 600–1,500 persons (two to five per boat) from Fort St. John and the surrounding area. The club represents mainly jet boaters; this activity is increasing in popularity due to the prevalence of rivers versus lakes in the region and the improving technology. Organized activities such as poker runs and stewardship initiatives, including riverside cleanup, are regularly held. Based on interviews with users, at any given time up to 100 jet boats, or an average of 50 to 60 jet boats on weekends (and a small number of canoeists and aluminum boats), are on the local rivers. The boating season lasts as long as the rivers are not frozen. Approximately 60% of local river use is on the Pine River, 35% on the Peace River upstream of the Pine River confluence (the majority destined for the Halfway River), and 5% on the Peace River downstream of Pine River. There is a small amount of jet boat use on the West Moberly River. The Pine River is preferred due to its close proximity to Peace Island Park, favourable sites, and relatively warm water. Club members who are using the Peace River and tributaries sites are usually camping, fishing, and hunting (Dorey 2008, pers. comm.; Ebert 2009, 2011a, 2011b, pers. comm.). Club sites and use are described in LGL (2010).

The River Rats built and maintain many of the sites documented in the LGL (2010) survey and listed in Section 25.3.1. The club estimates that it spent $2,500 per site on 11 sites within the Peace, Pine, and Moberly rivers between 2003 and 2008. These sites are designated Forest Recreation Sites with short-term Section 57 authorizations issued.
to the River Rats. In cooperation with BC Hydro, the River Rats invested $14,000 in 2010 to upgrade the Halfway River boat Launch.

In April and May 2011, BC Hydro surveyed people who own or lease land within the Project area on the type of recreational uses they allow on their privately owned or leased land. Survey results are summarized in Table 25.10. In general, property owners or lessees permit recreational access by friends and family. Most of the owners and lessees reported use of their property by people without permission.

### Table 25.10 Recreational Use of Private Property

<table>
<thead>
<tr>
<th>General Location</th>
<th>Public Recreational Use on the Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lynx Creek</td>
<td>No ATVs or snowmobiles are allowed; hunting is allowed occasionally; occasional riding. People enter the property without permission – dog walkers, and hikers. Trapper has the line, but does not trap anymore. ATVs and snowmobiles not much of a problem due to fencing. No recreational horse riding. No fishing.</td>
</tr>
<tr>
<td>Farrell Creek</td>
<td>There is no public recreational use on the farm. They will allow family-only skiing, snowmobiling, and quad access. May allow friends to hunt on the property.</td>
</tr>
<tr>
<td>Lynx and Farrell Creek areas</td>
<td>Allow friends and family to ride on property, fish, ride ATVs, and hunt deer and elk. Have call out for limited entry elk hunting. Allow river access.</td>
</tr>
<tr>
<td>Halfway River</td>
<td>Recreational use (including hunting) is allowed by invitation only. There is no public recreational use.</td>
</tr>
<tr>
<td>Halfway River and Farrell Creek areas</td>
<td>An outfitter brings hunting guests to the ranch. Family and friends also hunt on the ranch, and some ATV and snowmobile use is allowed with permission</td>
</tr>
<tr>
<td>Halfway River and Wilder Creek areas</td>
<td>Occasional access for fishing and hunting is allowed; no snowmobiles or ATVs are allowed.</td>
</tr>
<tr>
<td>Cache Creek</td>
<td>There is no public recreational use on the farm. Invited guests and family occasionally ride and hunt on the ranch. ATVs, snowmobiles, riding, hunting; generally do not allow non-family members access for recreational use. Hunting is allowed for family and friends; no shooting within ¼ mile of highway. There have been problems with others during the hunting season and occasionally unauthorized access has been a problem. Groups (Scouts, etc.) camped at “gravel pit” site. Allow friends and family to ride on property. Have call out for limited entry elk hunting (15 to 20 people per year). Allows access to river for fishing and boating. Occasional trespass and vandalism issues.</td>
</tr>
<tr>
<td>Cache Creek and Wilder Creek areas</td>
<td>Allow hunting (primarily to control elk populations), horseback riding and hiking, with permission. Try to control access to walking or by horseback. 4x4s and ATVs are not allowed.</td>
</tr>
<tr>
<td>Wilder Creek</td>
<td>Have allowed acquaintances to hunt, horseback ride, hike, and use ATVs and snowmobiles on the property; people are supposed to ask for access, but there is a lot of unauthorized access. There is significant recreational use allowed including hunting, fishing, horse riding, ATVs, snowmobiling; trapping is not allowed.</td>
</tr>
<tr>
<td>Fort St. John (near Site C dam site)</td>
<td>Allows occasional access for fishing, riding, ATVs, snowmobiling occurs but is not authorized. Hunting occurs with and without permission.</td>
</tr>
</tbody>
</table>

**NOTE:**

1. ATV – all-terrain vehicle
25.3.5 Outdoor Recreation Use Levels

Table 25.11 summarizes recreation participation levels by month and activity for 2008 to 2009. The most common activities on the Peace River between Hudson’s Hope and the Alberta border were camping, jet boating, and fishing.

Table 25.11 Number of Participants, by Month and by Activity, 2008 to 2009

<table>
<thead>
<tr>
<th>Activity</th>
<th>All</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camping</td>
<td>2,591</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>213</td>
<td>630</td>
<td>751</td>
<td>647</td>
<td>328</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Jet boating</td>
<td>2,104</td>
<td>0</td>
<td>0</td>
<td>101</td>
<td>121</td>
<td>277</td>
<td>751</td>
<td>575</td>
<td>206</td>
<td>60</td>
<td>13</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td>926</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>45</td>
<td>121</td>
<td>189</td>
<td>240</td>
<td>201</td>
<td>104</td>
<td>18</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Shoreline leisure</td>
<td>620</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>113</td>
<td>320</td>
<td>129</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picnicking</td>
<td>485</td>
<td>0</td>
<td>0</td>
<td>23</td>
<td>82</td>
<td>113</td>
<td>112</td>
<td>101</td>
<td>39</td>
<td>15</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>243</td>
<td>5</td>
<td>0</td>
<td>14</td>
<td>29</td>
<td>113</td>
<td>48</td>
<td>14</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td>194</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>48</td>
<td>101</td>
<td>32</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunting</td>
<td>131</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>84</td>
<td>42</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boating</td>
<td>129</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>76</td>
<td>32</td>
<td>14</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hiking</td>
<td>75</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>25</td>
<td>16</td>
<td>14</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canoeing</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>25</td>
<td>0</td>
<td>14</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife viewing</td>
<td>35</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birding</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kayaking</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rock/fossil hunting</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7,619</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>197</td>
<td>689</td>
<td>1,574</td>
<td>2,318</td>
<td>1,810</td>
<td>855</td>
<td>147</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>People interviewed</td>
<td>5,722</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>178</td>
<td>485</td>
<td>1,259</td>
<td>1,598</td>
<td>1,438</td>
<td>644</td>
<td>91</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Source: LGL (2010)

Table 25.12 indicates that the most frequently used launch for accessing the Peace River was at the Peace Island Park. Access occurred in early spring to late fall, with a peak in activity in July and August. Of the participants who accessed the river from Peace Island Park, 10% travelled passed the Site C dam site location by moving into Hudson’s Hope to the proposed Site C dam site river strata, or Peace Canyon Dam to Hudson’s Hope river strata. Another 30% travelled into the Pine River (LGL 2010).
Table 25.12  Number of Participants, by Month and by River Access Site, 2008 to 2009

<table>
<thead>
<tr>
<th>Activity</th>
<th>All</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peace Island Park</td>
<td>3,263</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>85</td>
<td>136</td>
<td>705</td>
<td>959</td>
<td>935</td>
<td>386</td>
<td>40</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Clayhurst</td>
<td>524</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>78</td>
<td>126</td>
<td>144</td>
<td>101</td>
<td>45</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Alwin Holland Park</td>
<td>428</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>68</td>
<td>76</td>
<td>64</td>
<td>158</td>
<td>45</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lynx Creek RV Park</td>
<td>410</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>107</td>
<td>88</td>
<td>96</td>
<td>72</td>
<td>39</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lynx Creek Launch</td>
<td>352</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>21</td>
<td>29</td>
<td>88</td>
<td>112</td>
<td>43</td>
<td>52</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hudson’s Hope Launch</td>
<td>171</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>32</td>
<td>39</td>
<td>13</td>
<td>64</td>
<td>14</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Halfway River Bridge</td>
<td>147</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>13</td>
<td>32</td>
<td>58</td>
<td>6</td>
<td>18</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Twidwell Bend</td>
<td>145</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>80</td>
<td>29</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sukunka Road</td>
<td>127</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>113</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>East Pine</td>
<td>90</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>13</td>
<td>32</td>
<td>14</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Highway 29 bridge</td>
<td>85</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>24</td>
<td>38</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Farrell Creek Mouth</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,748</strong></td>
<td><strong>10</strong></td>
<td><strong>4</strong></td>
<td><strong>2</strong></td>
<td><strong>178</strong></td>
<td><strong>516</strong></td>
<td><strong>1,273</strong></td>
<td><strong>1,599</strong></td>
<td><strong>1,424</strong></td>
<td><strong>637</strong></td>
<td><strong>91</strong></td>
<td><strong>13</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>People interviewed</strong></td>
<td><strong>5,722</strong></td>
<td><strong>10</strong></td>
<td><strong>3</strong></td>
<td><strong>2</strong></td>
<td><strong>178</strong></td>
<td><strong>485</strong></td>
<td><strong>1,259</strong></td>
<td><strong>1,598</strong></td>
<td><strong>1,438</strong></td>
<td><strong>644</strong></td>
<td><strong>91</strong></td>
<td><strong>13</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

**NOTE:**

Source: LGL (2010)

25.3.6  Regional Tourism Visitor Levels

The latest study of visitors to Northeast B.C. was conducted by the Northern Rockies Alaska Highway Tourism Association (NRAHTA) in 2005. It indicated that approximately 50% of overnight travellers to Northeast B.C. were from B.C., while the remainder were from Alberta and the U.S. The majority of travellers were over 55 years of age and less than 15% travelled with children. Close to 50% were travelling to or from Alaska, while 15% were destined for Northeast B.C. Travelers destined for Northeast B.C. were more likely to be visiting friends and relatives or on business rather than for leisure purposes (NRAHTA 2005).

The natural environment is an important travel motivator for visitors to the Northeast, and sixty per cent stated that key motivators were the desire to see wild places and to have new experiences. Popular activities while in the Northeast were visiting a park, walking, hiking or cycling, and going shopping (NRAHTA 2005).
Fort St. John hosted 176,300 visitors in 2007, while another 47,000 visited other communities or rural areas in the North Peace, including Hudson’s Hope and Taylor (Bass 2009). Eighty-one per cent of visitors stayed in commercial accommodations, and the remainder stayed with friends and relatives. More than 40% of all visitors in 2007 had business as a primary trip purpose, 17.9% were visiting friends and relatives, and the remaining 40% were leisure visitors. Total visitor spending was estimated at $64 million in Fort St. John and $9.2 million in the remainder of the North Peace, for a cumulative total of $73.2 million. The North Peace is defined as the municipalities of Fort St. John, Hudson’s Hope and Taylor, as well as areas B and C of the Peace River Regional District. Business visitors accounted for 72.6% of this spending (Bass 2009). Fort St. John, Taylor, and Hudson’s Hope each operate a Tourism BC-approved visitor centre providing visitor counselling, travel information and literature, community information, itinerary planning and, in some cases, accommodation reservations. Total attendance at these visitor centres was 22,546 in 2010. Attendance increased 8% in the previous 10 years. Attendance declines in Hudson’s Hope were offset by increased attendance at Taylor and Fort St. John. Visitor centre attendance in the South Peace visitor centres (Dawson Creek, Pouce Coupe, Chetwynd, and Tumbler Ridge) has declined over the last 10 years. Over 90% of visitors in the South Peace used the centres in the May to September period (Tourism BC 2011).

25.4 Effects Assessment

25.4.1 Effects Assessment – Construction – Changes in Outdoor Recreation and Tourism Infrastructure

This section assesses construction effects of the Project on outdoor recreation infrastructure and on tourism infrastructure.

25.4.1.1 Outdoor Recreation Infrastructure

The potential of the Project to adversely affect outdoor recreation infrastructure during construction is assessed by taking into account the potential for the Project to result in changes to the following key aspect:

- Managed and unmanaged outdoor recreation sites, trails, parks, and the Peace River Boudreau Lake proposed protected area using spatial analysis

Changes to the following indicators are used to describe potential effects on this key aspect:

- Outdoor recreation features and amenities
- Recreation activities undertaken on the land base

These key indicators are discussed below.

The following managed recreation sites would be affected and rendered unusable as a result of Site C reservoir inundation:

- Hudson’s Hope boat launch
- Lynx Creek boat launch
- Lynx Creek RV park
The Gates Campsite
Hawk Island Campsite
Halfway River Bridge boat launch
Rotary Campsite
Beaver House Campsite
Waterfalls Trail
Limestone Campsite
Island’s End Campsite
Eagle Nest Campsite
Birch Camp Campsite

The shoreline of Alwin Holland Park would also be inundated. In total, 14 managed and 14 unmanaged (informal) recreation sites would be affected by the Project. All except Alwin Holland Park would be rendered unusable by the Site C reservoir clearing and flooding. A campground on private property west of Cache Creek would be affected by the Highway 29 realignment. The Project would not affect registered recreation trails.

Table 25.13 shows the area of Use, Recreation, and Enjoyment of the Public (UREP) reserves that would be affected due to Project activities. The Site C dam site, transmission line, and quarried and excavated materials sites would not affect UREP reserves. Access road development during construction would affect 3 ha of UREP reserves. The clearing and filling of the Site C reservoir would affect 111 ha (or 29%) of the area of UREP reserves in the Project activity zone.
**Table 25.13  UREP Reserves in Project Activity Zone and Within the Reservoir Impact Lines.**

<table>
<thead>
<tr>
<th>Crown Lands File Number</th>
<th>Location</th>
<th>Tenure Area in PRRD</th>
<th>Five-Year Beach Line&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Site C Dam Site Area&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Transmission Line&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Construction Access Roads&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Quarried &amp; Excavated Materials&lt;sup&gt;e&lt;/sup&gt;</th>
<th>Five-Year Beach Line to Outermost Impact Line&lt;sup&gt;f&lt;/sup&gt;</th>
<th>Total % of Tenure Area in PRRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>118450</td>
<td>Halfway-Peace</td>
<td>17.1</td>
<td>16.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>16.4</td>
<td>95.9</td>
</tr>
<tr>
<td>194508</td>
<td>Peace River</td>
<td>3.4</td>
<td>3.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>3.3</td>
<td>97.1</td>
</tr>
<tr>
<td>263815</td>
<td>Hudson’s Hope</td>
<td>219.7</td>
<td>1.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
<td>8.1</td>
</tr>
<tr>
<td>308767</td>
<td>Hudson’s Hope</td>
<td>48.5</td>
<td>15.1</td>
<td>0.0</td>
<td>0.0</td>
<td>2.8</td>
<td>0.0</td>
<td>0.7</td>
<td>18.6</td>
</tr>
<tr>
<td>8000190</td>
<td>Bear Flat</td>
<td>49.0</td>
<td>31.8</td>
<td>0.0</td>
<td>0.0</td>
<td>&lt;0.1</td>
<td>0.0</td>
<td>8.7</td>
<td>40.5</td>
</tr>
<tr>
<td>8001879</td>
<td>Bear Flat</td>
<td>43.1</td>
<td>43.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>43.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>380.8</strong></td>
<td><strong>110.7</strong></td>
<td><strong>0.0</strong></td>
<td><strong>0.0</strong></td>
<td><strong>2.8</strong></td>
<td><strong>0.0</strong></td>
<td><strong>16.5</strong></td>
<td><strong>130.0</strong></td>
</tr>
</tbody>
</table>

**NOTES:**

<sup>a</sup> Five-Year Beach Line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

<sup>b</sup> Site C dam site and substation construction areas and restricted access zones as described in Volume 1 Section 4 Project Description

<sup>c</sup> Transmission line corridor and one-time clearing areas as described in Volume 1 Section 4 Project Description

<sup>d</sup> Permanent and temporary roads, Highway 29 realignment as described in Volume 1 Section 4 Project Description

<sup>e</sup> Off-site construction material sources as described in Volume 1 Section 4 Project Description

<sup>f</sup> Five-Year Beach Line to outermost impact line including the stability impact line, landslide-generated wave impact line, or flood impact line as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

<sup>10</sup> PRRD – Peace River Regional District

<sup>11</sup> UREP – Use, Recreation, and Enjoyment of the Public

<sup>12</sup> Totals may not add up due to rounding

<sup>13</sup> Source: Hillcrest Geographics (2012)
The Project would decrease the land base and increase both the water area and public access to the water within the Peace River Boudreau Lake proposed protected area. The Site C reservoir would be available for recreational opportunities in line with protected area objectives.

Table 25.14 shows that 6,646.8 ha (28%) of the Peace River Boudreau Lake proposed protected area would be affected by construction activities. Almost 15% of the proposed protected area would be within the defined by Five-Year Beach Line to outermost impact line (3,522.7 ha), but outdoor recreation activities within this area will continue to be permitted during construction and operations of the Project.

### Table 25.14 Peace River Boudreau Lakes Proposed Protected Area in Project Activity Zone and Within the Reservoir Impact Lines

<table>
<thead>
<tr>
<th>PRB Area</th>
<th>Five-Year Beach Line</th>
<th>Site C Dam Site Area</th>
<th>Transmission Line</th>
<th>Construction Access Roads</th>
<th>Quarried &amp; Excavated Materials</th>
<th>Five-Year Beach Line to Outermost Impact Line</th>
<th>Total</th>
<th>% of PRB Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23,789.6</td>
<td>6,408.9</td>
<td>215.7</td>
<td>0.0</td>
<td>22.2</td>
<td>0.0</td>
<td>3,522.7</td>
<td>10,169.5</td>
<td>42.7</td>
</tr>
</tbody>
</table>

**NOTES:**

- a Five-Year Beach Line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines
- b Site C dam site and substation construction areas and restricted access zones as described in Volume 1 Section 4 Project Description
- c Transmission line corridor and one-time clearing areas as described in Volume 1 Section 4 Project Description
- d Permanent and temporary roads, Highway 29 realignment as described in Volume 1 Section 4 Project Description
- e Off-site construction material sources as described in Volume 1 Section 4 Project Description
- f Five-Year Beach Line to outermost impact line including the stability impact line, landslide-generated wave impact line, or flood impact line as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines.

The following public access restrictions would be in place on the Peace River during construction:

- Boat passage would be permanently restricted at the Site C dam site beginning in Year 1 of construction. Restrictions would occur on either side of the Site C dam site construction zone, including approximately 3 km upstream and downstream of the Site C dam site.
- Due to a debris collection boom, estimated placement two years after the construction activities begin, boat access on the Peace River would be restricted approximately 12 km from the Site C dam site in the vicinity of Wilder Creek.
- Boat access to the Peace River upstream of Wilder Creek would be permitted through the final six years of construction. However, temporary restrictions would occur throughout the Site C reservoir during periods when specific project activities
(e.g., vegetation clearing and Hudson’s Hope Shoreline Protection construction) would take place.

- It is expected that both the Lynx Creek and Halfway River boat launches would remain open during construction with only temporary closures; however, debris hazards would be expected, based on progress with clearing activities.

The loss of boat launch sites and loss or restricted access in the Site C reservoir would result in users taking one or more of the following actions:

- Seek out alternative or substitute recreation areas for the same activity that is affected
- Engage in different outdoor recreation activities that are not affected by the Project
- Reduce or eliminate participation in the recreational activity that is affected

For example, during construction, Peace Island Park could experience an increase in visitor numbers as access restrictions are placed on other access points and campsites along the river upstream of the park and the Site C dam site. The activities that would be affected to a lesser extent by the Project are those where the Peace River is not a primary use area and where there is available capacity in the LAA to maintain opportunities for participation at a similar cost and without any substantive diminishment in carrying capacity. This would include almost all of the activities identified in the LGL study (2010), except for jet boating and camping.

Discussions with ATV and snowmobile groups suggest that the effects on their activities would be minimal. Similarly, users such as cross-country skiers, motor bikers, and mountain bikers who are seeking a trail experience would conduct the majority of their use outside the LAA, as there are no designated trails within the LAA. Spatial analysis results indicate that there are no registered recreation trails in the LAA.

During Project construction it is expected that there would be adverse effects on outdoor recreation activities on the Peace River. Participation in river-based recreation activities may be reduced, or may be displaced to alternative areas such as the Pine River, or the Peace River downstream during periods of restricted use during construction activities.

25.4.1.2 Tourism Infrastructure

The potential of the Project to adversely affect tourism infrastructure during construction is assessed by taking into account the potential for the construction of the Project to result in changes to the following key aspect:

- Visitor centres, tourist accommodations, and tourist attractions

Changes to the following indicators are used to describe potential effects:

- Tourism features and amenities
- Commercial outdoor recreation interests

25.4.1.2.1 Tourism Features and Amenities

Physical changes to the landscape that would occur during construction would alter the tourism setting, and would change access and use on the Crown land base and on the Peace River and its tributaries. These changes could affect tourism businesses that use
sites or infrastructure within the Project activity zone and the area within the reservoir impact lines, as well as tourists who would use areas within or nearby the Project activity zone on a self-guided basis. The GIS analysis indicated that were no tourism features or amenities on Crown land in permanently occupied areas of the Project activity zone (Hillcrest 2012). Table 25.15 indicates there are no existing tourism features or amenities on Crown land that would be temporarily occupied by Project construction, and one feature and one facility within the area between the Five-Year Beach Line and the outermost impact line, where tourism activity could continue. As there are no permanent loss of tourism features and amenities, adverse effects on visitor centres, tourist accommodations, tourist attractions, or regional visitor levels in the LAA are not anticipated.
Table 25.15  Tourism Indicators on Crown Land in the Project Activity Zone and Within Reservoir Impact Lines

<table>
<thead>
<tr>
<th>Indicator</th>
<th>5-Year Beach Line a</th>
<th>Site C Dam Site Area b</th>
<th>Transmission Line c</th>
<th>Construction Access Roads d</th>
<th>Quarried &amp; Excavated Materials e</th>
<th>5-Year Beach Line to Outermost Impact Line f</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Tourism Facilities (count)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Tourism Features (count)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Commercial Recreation Tenures (ha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lease</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Licence</td>
<td>0.0</td>
<td>0.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Reserve/Notation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total Land Act Tenures (ha)</td>
<td>0.0</td>
<td>0.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Commercial Recreation Tenure Applications (ha)</td>
<td>3524.5</td>
<td>65.9</td>
<td>0.8</td>
<td>0.0</td>
<td>0.0</td>
<td>5.9</td>
<td>3597.1</td>
</tr>
</tbody>
</table>

NOTES:

a  Five-Year Beach Line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the proposed reservoir as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

b Site C dam site and substation construction areas and restricted access zones as described in Volume 1 Section 4 Project Description
c  Transmission line corridor and one-time clearing areas as described in Volume 1 Section 4 Project Description

d  Permanent and temporary roads, Highway 29 realignment as described in Volume 1 Section 4 Project Description
e  Off-site construction material sources as described in Volume 1 Section 4 Project Description

f  Five-Year Beach Line to outermost impact line including the stability impact line, landslide-generated wave impact line, or flood impact line as defined in Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports, Part 2 Preliminary Reservoir Impact Lines

totals may not add up due to rounding

Source: Modified from Hillcrest Geographics (2012)

25.4.1.2.2  Commercial Outdoor Recreation Interests

There is one commercial recreation Land Act tenure for a hunting camp (area of 0.9 ha) in the Site C dam site area, as seen in Table 25.15. This operator would not be able to carry on business at this location. There is an application for a commercial recreation tenure in the Site C reservoir area. The Site C reservoir portion represents approximately 22% of the applicants requested tenure area.

As noted in Section 25.3.3, there is a commercial recreation operator situated in Fort St. John who uses the Peace River, but does not have tenure of any kind. This operator could operate in the early years of construction but would eventually be unable to conduct tours in the same way as in the past.
There are two other tourism facilities operating on private land that would also be affected by the Project.

- A campground is located near Bear Flat above the Site C maximum normal reservoir level but within the reservoir impact lines. A portion of the property would be directly affected by the highway realignment at Cache Creek. During the property acquisition phase of the project, BC Hydro will enter into an agreement with the owner for the land or rights required and the disturbance damages and costs related to the acquisition (see Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements). The Bear Flat campground is reported as being an important gathering site for a variety of Treaty 8 First Nations gatherings, including Elders camps, Youth and Elders camps, and Treaty 8 meetings (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012). The Nenan Dane-zaa Deh Zona Child and Family Services Society (NENAN), a social services organization for Aboriginal people in the Peace River Regional District, holds an annual Youth and Elders gathering at the campground. According to NENAN, this area was chosen due to its “profound significance as Treaty 8 people have gathered, camped, hunted, and practiced ceremony here since time immemorial” (T8FNs Community Assessment Team and The Firelight Group Research Cooperative 2012). Potential effects on Aboriginal traditional use of lands are discussed in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes.

- Lynx Creek RV Park is located on BC Hydro-owned land at Lynx Creek. The current operator is leasing this land.

The above changes to commercial outdoor recreation interests would have localized effects on individual operators. As noted in Section 25.3.6, the majority of existing travellers are either on business trips, passing through to other destinations or visiting friends and relatives. The travel motivations of these groups would not change with the Project.

The Project is not expected to have an adverse effect on visitor centres, tourist accommodations, tourist attractions, or regional visitor levels in the LAA.

25.4.2 Effects Assessment – Operations – Changes in Outdoor Recreation and Tourism Infrastructure

25.4.2.1 Outdoor Recreation Infrastructure

The potential to adversely affect outdoor recreation infrastructure during operations is assessed by taking into account the potential for the operation of the Project to result in changes to the following key aspect:

- Managed and unmanaged outdoor recreation sites, trails and parks, using spatial analysis

Changes to two key indicators are used to describe potential changes in recreation and tourism infrastructure during operations:

- Outdoor recreation features and amenities
- Recreation undertaken on the land base
During operations of the Site C reservoir it would be expected that new recreation infrastructure would be built over time, in addition to those provided by BC Hydro, as the Site C reservoir would become a recreation destination. Based on the current experience in the region, it would be expected that future new recreation amenities or services would be provided by a mix of community, private, and local or provincial government groups. Coordinated planning for the reservoir can help to develop a vision and plan for recreation on and near the reservoir. The land ownership surrounding the reservoir is a mix of municipal, private and crown land.

During the early years of operations, public access restrictions would be in place for safety reasons, which would limit the recreation activities that take place on the Site C reservoir and water shoreline while debris and slope stability management and monitoring are undertaken.

The following public access approach applies to the Site C reservoir:

- Shoreline use along the reservoir is expected to be available near Hudson’s Hope shortly after reservoir filling, with additional areas opened for use based on monitoring of slope conditions
- Boat access restricted permanently at the Site C dam site for safety reasons
- A recommended one-year navigation use restriction after the Site C reservoir filling by prohibiting BC Hydro boat launch access and posting signage advising of public safety hazards
- Construction of reservoir boat launches and recreation areas would begin after the first year, pending evaluation of public safety hazards
- Areas would be opened based on monitoring of reservoir conditions related to slope stability and debris management
- A Site C reservoir debris boom would be installed at Wilder Creek and may be in place for several years during the freshet in June through July or August, depending on the amount of debris accumulation and the speed at which the Site C reservoir is cleared of debris after inundation.

BC Hydro’s would seek input from Transport Canada and local authorities on the proposed approach to managing Site C reservoir boating access during these early years.

As access restrictions are lifted, the operation of the reservoir would result in a beneficial change to outdoor recreation activities, as it would support a wider variety of summer boating than on the river today, such as house boating and sailing as well as enabling snowmobiling and ice fishing during the winter. It is expected that the proposed normal Site C reservoir operating regime of between 460 m to 461.8 m would be conducive to recreation use and boating, based on experience in other BC Hydro reservoirs.

Reservoir shoreline areas would be opened based on monitoring of slope conditions. Recreation sites downstream of the Site C dam site, notably Peace Island Park, would see increased use due to displaced demand until the Site C reservoir is fully available.

Activities that would increase in use are camping, hiking, lake boating (with a wider range of craft than is the case with the river), canoeing, and kayaking, as well as wind-dependent sports like windsurfing. Local users and groups could create informal
recreation sites along the Site C reservoir, as they do today along the river shorelines. Feedback obtained in Stage 2 public consultation showed that 58% of respondents were at least somewhat likely to use the Site C reservoir for recreation if there was access, and that the most likely uses were day use, camping, hiking and fishing (Kirk & Co. Consulting Ltd. and Synovate Ltd. 2009). Participation in nature observation could increase if access to the Site C reservoir was better than it is now to the river, but many outdoor recreation participants have stated a preference for a natural river setting over a reservoir setting by indicating a lower value for the latter.

After the early reservoir years and over the long-term operation of the Site C reservoir is expected to have a beneficial effect, resulting from an expected increase in formal and managed outdoor recreation infrastructure that would support a variety of recreation activities on the Site C reservoir.

25.4.2.2 Tourism Infrastructure

The potential of the Project to adversely affect tourism infrastructure during operation is assessed by taking into account the potential for the construction of the Project to result in changes to the following key aspect:

- Visitor centres, tourist accommodations, tourist attractions, and regional visitor levels

Changes to the following indicators are used to describe potential effects:

- Tourism features and amenities
- Commercial outdoor recreation interests

25.4.2.2.1 Tourism Features and Amenities

As with outdoor recreation, tourism would be affected by access restrictions to the Site C reservoir during the early years of operations due to debris and slope stability. However, over time, new tourism activities would emerge at the Site C reservoir and the Site C dam site. The International Commission on Large Dams has stated that tourism is often one of the major benefits of large dams due to the attractiveness of reservoirs (ICOLD 1999). Visitors who would normally have used the river area would be able to have a similar experience on the Site C reservoir in terms of hiking, camping, wildlife viewing, and nature observation. The following would contribute to new tourism features and amenities:

- The improved infrastructure as outlined in the Outdoor Recreation Mitigation Plan (Volume 3 Appendix E Outdoor Recreation Mitigation Plan)
- Easier access to the south bank of the Peace River as compared to the baseline
- As noted in the Navigation assessment (Volume 3 Section 26 Navigation), by limiting normal Site C reservoir operating ranges (maximum of 1.8 m), instituting debris management, and implementing infrastructure and access improvements, the navigability and tourism use of the Site C reservoir would be enhanced
- Improved road conditions along the realigned Highway 29 would reduce travel times, and improve road safety conditions for visitors due to expanded passing lanes and reduced highway slopes
• The potential for new products such as houseboat trips, canoeing, camping, and hiking due to enhanced navigability and new infrastructure
• Opportunities for Fort St. John to market the Site C reservoir in the same way that the District of Hudson’s Hope markets the recreation opportunities on both Williston and Dinosaur reservoirs

Visitors who would have come to the region in the absence of the Project would continue to do so in the presence of the Project. The activities they elect to pursue and their overall experience would be different, as tourism features and amenities would have changed.

The Project is not anticipated to have an adverse effect on visitor centres, tourist accommodations, tourist attractions, and regional visitor levels.

25.4.2.2.2 Commercial Outdoor Recreation Interests

Project operations would not generate incremental effects on commercial outdoor recreation interests. Prospective operators would continue to have access to Crown land for outdoor recreation tenures and would be able to develop new products on the Site C reservoir, in accordance with the regulations.

Adverse effects on visitor centres, tourist accommodations, tourist attractions, and regional visitor levels are not anticipated.

25.4.3 Mitigation Measures – Changes in Outdoor Recreation and Tourism Infrastructure

25.4.3.1 Outdoor Recreation

BC Hydro has developed an Outdoor Recreation Mitigation Plan for the Project (Volume 3 Appendix E Outdoor Recreation Mitigation Plan). The plan specifies opportunities for recreation infrastructure on the Site C reservoir, and provides direct support to other recreation providers in the region. The following mitigation measures will be implemented by BC Hydro to address effects and to enhance benefits to outdoor recreation and tourism infrastructure during Project construction and operations:

• Developing a Public Safety Management Plan that will identify public communications procedures for public safety hazards, and access restrictions and closures during construction and operation of the Site C reservoir (Volume 5 Section 35 Summary of Environmental Management Plans)
• Establishing and operating three new permanent Site C reservoir launches and day use sites (Cache Creek and Lynx Creek trailer launches and a small craft launch at the Hudson’s Hope Shoreline Protection) to replace flooded boat launch areas
• Providing funds to the District of Hudson’s Hope for the enhancement of Alwin Holland Park or other community shoreline recreation areas
• Providing a Community Recreation Site Fund to support development of new shoreline recreation within the Peace River and tributaries through to the Alberta border, as well as the Site C reservoir
• Providing technical support to outdoor recreation providers that require access to the Site C reservoir to assist with their development along, or adaptation to, new shoreline conditions

• Funding the development of a B.C. Peace River/Site C Reservoir Navigation and Recreation Opportunities Plan

These mitigation measures will partially mitigate effects on outdoor recreation and tourism infrastructure, but do not mitigate the effects of the loss of 28 managed and unmanaged sites (and associated access closures and restrictions) that occur over the construction period and the early years of operation.

Once operational, the Site C reservoir would create new recreation opportunities and a changed navigation environment. To support long-term planning for the new environment, BC Hydro will fund the development of Navigation and Recreation Opportunities Plan. The planning process will enable interest groups like the Peace Country River Rats and local communities, including Hudson’s Hope, Fort St. John, and Taylor to understand, plan for, and optimize new recreation opportunities created as a result of the Project. The involvement of Aboriginal groups is also supported. Plan objectives are described in Volume 3 Section 26 Navigation.

25.4.3.2 Tourism

Mitigation applied to address Project effects on outdoor recreation infrastructure is also relevant to address effects on tourism infrastructure. Other mitigation measures to address project effects on tourism include the following:

• BC Hydro will enter into agreements with the owners of the campground at Cache Creek and the hunting camp near the Site C dam site. Where it is both physically and economically feasible, the costs to relocate facilities will be included in the agreements.

• A north bank Site C dam site public viewpoint will be provided during the construction and operational phases at a site to be determined during the final design phase

• In addition to the above-noted outdoor recreation mitigation, the Outdoor Recreation Mitigation Plan for the Project (Volume 3 Appendix E Outdoor Recreation Mitigation Plan) will provide technical support to outdoor recreation providers that require access to the Site C reservoir (such as RV parks, campgrounds, and marinas operated by the private sector, and local, regional, or provincial governments) to assist with their development along, or adaptation to, new shoreline conditions.

• Tourism will also benefit from mitigation outlined in Volume 4 Section 32 Heritage Resources, which includes funding to support local museums for interpretive programs or facilities, and a renewed interpretive program at the G.M. Shrum Generating Station
25.4.4 Effects Assessment – Construction – Changes in Outdoor Recreation Use Levels and Regional Tourism Visitor Levels

25.4.4.1 Outdoor Recreation Use Levels

The potential for construction to adversely affect demand for outdoor recreation was assessed by taking into account the potential for the construction of the Project to result in changes to outdoor recreation use and outdoor recreation use levels.

Up to 2,000 direct workers would be required at the peak of construction in Year 5. The majority would reside in an on-site work camp and the remainder would reside in nearby communities (Volume 4 Section 28 Population and Demographics). People who take up residency in nearby communities for construction employment opportunities would be expected to remain in the region for the duration of the construction phase (in-migrants who remain in the region after construction would do so because of economic or social reasons not associated with the Project).

Table 25.16 shows the estimated range in use levels for outdoor recreation attributable to the direct construction workforce, as well as in-migrants taking up indirect and induced employment opportunities. The assumptions used to estimate demand are based on a study of mobile workers, and a survey of residents in the Peace River Regional District (PRRD) and questions regarding their likelihood of recreating on the Site C reservoir (Nichols Applied Management 2007; Kirk & Co. Consulting Ltd. and Synovate Ltd. 2009). It is assumed that change in use levels would be comparable to what other large development projects have generated in the region. Camp workers could engage in the recreation activities supported in the region, including fishing, hunting, all-terrain vehicle use, snowmobiling, hiking, and camping. Participation levels in these activities would be low relative to the local population, due to limited free time as a result of working extended shifts, access to recreation facilities at the camp, and limited options for storing or transporting large or specialized outdoor recreation equipment.

Based on estimates of population change as a result of direct construction jobs as well as indirect and induced employment opportunities, the number of outdoor recreationists would increase through the first two years of construction, remain stable in Year 3, and increase again in Years 4 and 5 of construction. The number of outdoor recreationists would stabilize for the in-migrant population and decline among the camp worker population after Year 6, as construction workers would be expected to return to their home communities, resulting in a decrease in use levels. No incremental increase in outdoor recreation use would be expected after Year 5 of construction, when the size of the workforce would start to decline.

The in-migrant population would increase recreation use in nearby municipalities and elsewhere in the PRRD. The average annual change in the range of new recreationists would be 110 to 197 (not including when the number of recreationists would decrease in Years 6, 7 and 8). This increase in the number of recreationists would be 6 to 10% of the people interviewed in LGL (2010) who were participating in activities between Peace Canyon Dam and Site C (1,983) and 0.2 to 0.3% of the 2011 population of the PRRD (64,280).

Overall the Project is expected to result in a moderate increase in outdoor recreation use levels and is not anticipated to place undue strain on existing recreation infrastructure in the PRRD.
### Table 25.16  Potential Change in Outdoor Recreation Users in the PRRD

<table>
<thead>
<tr>
<th>Workforce and Population Assumptions</th>
<th>Year of Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>8–20% of camp workers would engage in outdoor recreation activities</td>
<td>12 – 29</td>
</tr>
<tr>
<td>Average Range (selected years)</td>
<td>134 – 235</td>
</tr>
<tr>
<td>Average range for years with increasing population</td>
<td>(-21) – 79</td>
</tr>
<tr>
<td>Average range</td>
<td>110 – 197</td>
</tr>
</tbody>
</table>

### NOTES:
2. The participation rates for in-migrants are considered conservative because surveys asking participants about their recreation intentions will always be higher than actual participation rates.
5. PRRD – Peace River Regional District.

### 25.4.4.2 Tourism Visitor Levels

This section assesses the potential of Project construction to adversely affect tourism as a result of changes to regional tourism visitor levels.

The Project workforce would induce a population effects during construction, which would in turn stimulate tourism. The increased population attributable to the Project would draw in more visitors because, as noted in the baseline, approximately 18% of all visitors to the region are visiting friends and relatives. Business travel would also increase. The effects on regional tourism visitor levels would be positive throughout construction. Accommodation and food services, transportation, retail trade, and other services would experience increased demand. Industry’s response would be to accommodate this demand by increasing the utilization of existing capacity, improved productivity, and possibly through price increases. Once the peak worker demand is reached in Year 6, all effects would begin to reverse.

Overall, an increase in population would increase visitor numbers and tourism activity, resulting in a beneficial project effect.
25.4.5 Mitigation Measures – Changes in Outdoor Recreation Use Levels and Regional Tourism Visitor Levels

Project effects on outdoor recreation use levels are expected to be beneficial and not require mitigation. However, mitigation proposed for changes in recreation and tourism infrastructure (Section 25.4.3) will enhance outdoor recreation benefits by replacing and improving outdoor recreation infrastructure that is lost due to the Project. BC Hydro will also work with the private sector and local governments to develop new RV sites (per mitigation described in Volume 4 Section 29 Housing).

Project effects on tourism are expected to be beneficial and not require mitigation. However, mitigation proposed in the housing assessment (Volume 4 Section 29 Housing) will enhance tourism benefits by avoiding shortages in hotel, motel, and campground availability that might inconvenience leisure travellers.

25.5 Summary of Effects Assessment and Mitigation Measures

A summary of potential effects and mitigation measures are shown for outdoor recreation and tourism in Table 25.17.

Table 25.17 Project Effects and Mitigation Measures on Outdoor Recreation and Tourism

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Construction  | Changes in outdoor recreation and tourism infrastructure | • Establish and operate three new permanent Site C reservoir launches and day use sites (Cache Creek and Lynx Creek trailer launches and Hudson’s Hope Shoreline Protection small craft launch) to replace flooded boat launch areas  
• Develop a Public Safety Management Plan that will identify public communications procedures for public safety hazards, and access restrictions and closures during construction of the Site C dam  
• Provide funds to the District of Hudson’s Hope for enhancement of Alwin Holland Park or other community shoreline recreation areas  
• Provide a Community | These mitigation measures are expected to be effective, as they are common approaches in response to large hydroelectric dam construction on navigable water bodies.  
A residual adverse effect is expected due to temporary losses of recreation and tourism access and infrastructure during construction. | BC Hydro and those provided funds from BC Hydro to groups and municipalities to permit and build new infrastructure or to provide interpretive programs. Tourism operators that are provided technical support from BC Hydro. |
<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Effects</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Operations    | Changes in outdoor recreation and tourism infrastructure | • Develop a Public Safety Management Plan that will identify public communications procedures for public safety hazards, and access restrictions and closures during operation of the Site C dam  
• Fund the development of a B.C. Peace River/Site C Reservoir Navigation and Recreation Opportunities Plan | A Public Safety Management Plan is considered a common approach to addressing effects of public safety hazards, access restrictions and closures. While BC Hydro will be providing funds to for the development of a Navigation and Recreation Opportunities Plan, BC Hydro will not be responsible for implementation or monitoring the effectiveness of this plan. The residual effect of Project operations on recreation and tourism infrastructure is expected to be beneficial. | BC Hydro and those groups(s) including government, community, or First Nations provided funds by BC Hydro to support development of the Navigation and Recreation Opportunities Plan. |
| Construction  | Change in outdoor recreation and tourism use levels | • Work with the private sector and local government to develop new RV sites (Volume 4 Section 29 Housing)  
• Implement on-site workforce housing (Volume 4 Section 29 Housing) | Project effects on recreation and tourism are expected to be beneficial and not require mitigation. The mitigation proposed is expected to be an effective way to enhance tourism benefits by avoiding shortages in hotel, motel and campground (e.g., RV sites) availability that might inconvenience leisure travellers. | BC Hydro, local government and private business owners |
In summary, with mitigation, there would be a residual adverse effect on outdoor recreation and tourism infrastructure during construction. Construction activities, specifically, Site C reservoir preparation and filling during latter part of construction, would result in 14 managed and 14 unmanaged recreation sites being permanently unusable. One campground on private property west of Cache Creek would be directly impacted by the Highway 29 realignment. The current shoreline of Alwin Holland Park would also be unusable for a short time during Site C reservoir filling; however, funds will be provided to the District of Hudson’s Hope for improvements to shoreline access. The Project would also directly affect one tourism facility on private property and one hunting camp at the Site C dam site. Use levels in Peace Island Park would be expected to increase during construction, as access to other recreation sites on the Peace River would be restricted where major construction activities are taking place. Mitigation will eventually replace and enhance outdoor recreation infrastructure in the LAA; however, access restrictions on the Site C reservoir during construction would represent a residual adverse effect on outdoor recreation.

The visitor and recreation user experience along the Peace River between Hudson’s Hope and Bear Flat would be altered, as construction would transform the setting from a river to a Site C reservoir. The use of the Peace River would be restricted, the viewscapes would be altered from the agricultural-natural setting that now exists, and some outdoor activities would no longer be undertaken.

No commercial recreation tenures issued through government’s Adventure Tourism policy would be affected. After discussions with the private property owners and the one commercial recreation business with Crown tenure, where appropriate, BC Hydro will enter into agreements as outlined in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements, and no residual effects on tourism businesses are anticipated.

In the initial years of operation, access to some parts of the Site C reservoir would be restricted for safety reasons; however, access to other sections of the Site C reservoir, such as the west end of the Site C reservoir, would be available for recreation and visitor use soon after reservoir filing. Proposed mitigation provides for enhanced water-based recreation potential. While use would be restricted on some parts of the Site C reservoir during the initial years of operation, usage levels of Peace Island Park would likely increase as users seek nearby recreational opportunities. Overall, effects on recreation and tourism infrastructure during operations would be positive, as new infrastructure would be in place after the initial period of debris clearing and slope stability monitoring. Water-based recreation opportunities are expected to increase on the Site C reservoir compared to the base case, as a result of greater potential for access by a variety of boats.

During construction, there would be a beneficial effect on outdoor recreation use levels and regional tourism visitor levels, as new demand and spending on outdoor recreation and tourism infrastructure services is generated by the Project. Business travel would increase, as would the volume of visitors coming to the area to stay with friends and relatives.

### 25.5.1 Other Mitigation Options Considered

There were no other mitigation measures considered by BC Hydro for effects on Outdoor Recreation and Tourism.
25.6 Residual Effects

25.6.1 Characterization of Residual Effects

The potential for residual effects on Outdoor Recreation and Tourism is evaluated based on the consideration of attributes presented in Table 25.18.

<table>
<thead>
<tr>
<th>Table 25.18 Characterization Criteria for Residual Outdoor Recreation and Tourism Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Direction</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Magnitude</td>
</tr>
<tr>
<td>Geographical Extent</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Frequency</td>
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<td></td>
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<tr>
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<td>Duration</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Reversibility</td>
</tr>
<tr>
<td>Context</td>
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</tbody>
</table>
During construction, the adverse effect on outdoor recreation and tourism infrastructure would be low in magnitude, as tourists and recreation users would either continue using the river during construction or recreate elsewhere in the region. Effects would be long term (i.e., until after the first year of operation) and continuous, but reversible. The context is one of resilience because the Peace River Regional District (PRRD) can accommodate the construction of new infrastructure to replace the lost infrastructure, and the loss of some unmanaged recreational opportunities would be replaced by others outside the LAA. The probability of an effect and the level of confidence are both high, as the location of recreation infrastructure that would be affected by the Project is well known.

The characterization of the residual effects is summarized in Table 25.19.
### Table 25.19 Characterization Criteria for Residual Outdoor Recreation and Tourism Effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Phase</th>
<th>Residual Environmental Effect</th>
<th>Direction</th>
<th>Magnitude</th>
<th>Geographic Extent</th>
<th>Duration and Frequency</th>
<th>Reversibility</th>
<th>Social Context</th>
<th>Level of Confidence</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in recreation and tourism infrastructure</td>
<td>Construction</td>
<td>Decrease (adverse)</td>
<td>Low</td>
<td>local</td>
<td>Long-term and continuous</td>
<td>Reversible</td>
<td>Resilient</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
25.6.2 Standards of Thresholds for Determining Significance

A residual adverse effect is anticipated for outdoor recreation and tourism infrastructure as a result of construction activities. All of the residual effects criteria were taken into consideration in the determination of significance, as described above in Section 25.6.1. Particular consideration was given to magnitude, duration, geographic extent and context. Outdoor recreation and tourism use is widespread across the region due to opportunities created through the placement of transportation, parks and activity infrastructure. Outdoor recreation and tourism infrastructure should consider the availability of outdoor recreation and tourism infrastructure in this context. Therefore, a significant effect would be expected if the Project alters access to recreation and tourism infrastructure in a way that reduces recreation use below baseline case conditions (magnitude) in the PRRD (geographic extent) over the long term (duration) and proposed mitigation would not offset changes to baseline case conditions (context).

25.6.3 Determination of Significance of Residual Effects

BC Hydro will provide replacement boat launches and day use areas in the Site C reservoir, and will implement a number of measures to support other community groups and the District of Hudson’s Hope in developing new reservoir recreation infrastructure and sites. The adverse effect on recreation infrastructure will be low in magnitude, and will affect site-specific areas within the local assessment area. For short periods during construction, or while new infrastructure is being developed, some recreation opportunities will be reduced; however, over the long term, the outdoor recreation experiences and opportunities available to residents and visitors would not be less than the baseline, but in fact would be increased, as the reservoir would provide new recreation opportunities. Recreation users are expected to make use of other recreation areas in the PRRD during construction and will have access to new opportunities with the reservoir in place. The residual effect on recreation and tourism during construction is therefore not significant (Table 25.20).
### Table 25.20 Summary of Assessment of Potential Significant Residual Adverse Effects

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Adverse Effect</th>
<th>Key Mitigation Measures</th>
<th>Significance Analysis of Residual Effects</th>
</tr>
</thead>
</table>
| Outdoor Recreation and Tourism   | Construction  | Changes in outdoor recreation and tourism infrastructure | • Establish and operate three new permanent Site C reservoir launches and day use sites (Cache Creek and Lynx Creek trailer launches and Hudson’s Hope Shoreline Protection small craft launch) to replace flooded boat launch areas  
  • Develop a Public Safety Management Plan that will identify public communications procedures for public safety hazards, and access restrictions and closures during construction and operation of the Site C reservoir  
  • Provide funds to the District of Hudson’s Hope for enhancement of Alwin Holland Park or other community shoreline recreation areas  
  • Provide a Community Recreation Site Fund to support development of new shoreline recreation sites on the Site C reservoir and on the Peace River and tributaries between Site C and the Alberta border  
  • Provide technical support to outdoor recreation providers that require access to the Site C reservoir to assist with their development along, or adaptation to, new shoreline conditions  
  • Fund the development of a B.C. Peace River/Site C Reservoir Navigation and Recreation Opportunities Plan  
  • Establish a north bank Site C dam site public viewpoint | Not significant |

### 25.7 Cumulative Effects Assessment

#### 25.7.1 Screening of Cumulative Effects

A screening of the Project’s potential contribution to the cumulative effects of past, current, and announced future projects was done per the procedures described in
Volume 2 Section 10 Effects Assessment Methodology. The screening process establishes two conditions to warrant further assessment. These conditions are:

- The Project results in a residual effect
- The effect is likely to act in a cumulative fashion with those of other projects and activities (i.e., spatial and temporal overlap)

Other projects that are expected to interact with outdoor recreation and tourism residual effects are listed in Table 25.21. A full project inclusion list is included in Volume 2 Section 10 Effects Assessment Methodology.

### Table 25.21 Projects that could Interact with Outdoor Recreation and Tourism Residual Effects

<table>
<thead>
<tr>
<th>Site C Clean Energy Project Residual Effect</th>
<th>Other Project (name Project)</th>
<th>Description of Project</th>
<th>Potential Overlap with Site C</th>
<th>Potential Cumulative Effect Interaction with Outdoor Recreation and Tourism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term (i.e., during the construction period and first year of operation) decrease in outdoor recreation and tourism infrastructure</td>
<td>Montney Gas Play</td>
<td>Shale rock deposits containing large quantities of natural gas</td>
<td>Potential for oil and gas development to continue near the Site C dam site and within impact lines</td>
<td>No: may result in increased access in the LAA; not expected to result in adverse residual cumulative effects on outdoor recreation infrastructure</td>
</tr>
<tr>
<td>All other reasonably foreseeable projects in the RAA</td>
<td>Underground and surface mines; pipelines; waste management projects; wind projects</td>
<td>Temporal overlap is unknown; none of the projects are within the LAA</td>
<td>No: not expected to contribute to residual adverse effects on outdoor recreation infrastructure in the LAA (no spatial overlap)</td>
<td></td>
</tr>
<tr>
<td>Land tenure</td>
<td>Applications for oil, gas, water, range and other land tenures; forest harvest plans</td>
<td>Temporal overlap is unknown; some overlap with Project activity zone</td>
<td>No: land tenure applications represent a continuation of existing multiple use patterns and levels</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

- Further information is available in Volume 2 Section 11.3 Land Status, Tenure, and Project Requirements

The only registered active project that would overlap spatially with the Project in the LAA is the Montney Gas play. The Montney Gas play is expected to have a positive effect on road and trail access in the LAA over time. Therefore, no residual adverse cumulative effects are expected on recreation and tourism infrastructure in the LAA.

Applications for Land Act tenures, new oil and gas facilities, and forestry harvest plans and tenures would overlap spatially with the Project activity zone and reservoir impact lines, but these would represent a continuation of existing baseline conditions. Oil and gas facilities as approved by the Oil and Gas Commission are already included in the consideration of the Montney Gas play. Range tenures issued by B.C. Ministry of Forests, Lands and Natural Resource Operations represent a continuation of grazing activity for the region’s livestock sector. Similarly, harvesting plans are typical licences to
cut regularly issued under the terms of a licensee’s forest tenure. Outdoor recreation and
tourism already interacts with these activities and therefore, no residual effect is
anticipated in the LAA.

Population changes in the RAA due to the workforce requirements of reasonably
foreseeable projects could increase demand for recreation in the LAA during the
construction and operations phases of the Project. However, population projections for
the region that were used in the assessment on demand for recreation consider the
population effects of reasonably foreseeable projects. Therefore, the assessment of
residual project effects considered the cumulative population effects of reasonably
foreseeable projects during the construction and operations phases of the Project.
Based on this, further assessment of cumulative effects of changes in recreation use
levels and tourism visitor levels was not carried out.

25.8 Monitoring and Follow-Up

As the level of confidence in residual effects predicted for outdoor recreation and tourism
is high there are no monitoring or follow-up programs proposed for this VC.
References

Literature Cited


Internet Sites


Personal Communications


26 NAVIGATION

26.1 Approach

Navigation, including water-based navigation (navigation) and air navigation (aviation), would be affected by Project-caused changes to navigability and navigation use of water bodies, to aviation routes or visibility, or to operation of the ferry and ice bridge crossings of the Peace River at Shaftesbury and Tompkins Landing in Alberta. The assessment considers these changes and the potential effects to water and air navigation.

26.1.1 Regulatory and Policy Setting

Navigation on waterways in Canada is governed by the Navigable Waters Protection Act (NWPA), amended March 12, 2009 to enable regulators to focus on waterways of navigation value and on “works” that may interfere substantially with navigation (Transport Canada 2012). Review under the NWPA is based on protecting the public right to navigate; although not specifically defined, this is a right that has developed over time through common law. If the waters are navigable, then the public has the right to navigate. In some cases, gaining approval to restrict the public's right to navigate requires an Act of Parliament.

The works that are subject to approval under the NWPA include:

- Any man-made structure, device, or thing – temporary or permanent
- Any dumping of fill in a navigable water
- Any excavation of materials from the bed of a navigable water

Works also include all types of other construction, permanent or temporary, related to the main project. Examples include any bridge, boom, dam, wharf, dock, pier, tunnel or pipe, telegraph, power cable, or wire (Transport Canada 2012).

The construction of the Project would interfere with navigation and is reviewable under subsection 5(1) (2) of the NWPA.

Aviation in Canada is regulated by both Nav Canada and Transport Canada. Nav Canada’s mandate is to ensure the safe and efficient movement of aircraft within Canadian air space and the integrity of infrastructure, including communication, navigation, and surveillance equipment; published flight information; aviation weather services; airport control; and advisory services (Nav Canada 2012a). Transport Canada is responsible for regulatory requirements such as orders regarding the marking and lighting of hazards to aviation, aerodrome standards and recommended practices, and registered airport zoning.

This assessment considered Project effects on aviation specific to the North Peace Regional airport located 9 km east of the City of Fort St. John. The review was based on potential land use effects as outlined in the document Land Use in the Vicinity of Airports (Transport Canada 2005) and potential changes in the hours of poor visibility (fog) that could affect aviation.
26.1.2 Key Issues and Identification of Potential Effects

Issues, concerns, and interests identified during consultation with government, Aboriginal groups, and the public guided the scope of the navigation and aviation assessment (see Volume 1 Section 9 Information Distribution and Consultation). Determination of key issues related to navigation is based on consultations with regulators regarding technical requirements necessary to be compliant to regulations, regional governments, local governments, and local stakeholders, including the Peace Country River Rats. Aviation interviews and discussions included North Peace Regional airport and regulators, including Transport Canada and Nav Canada. More details are provided in Section 26.2.2 Interviews.

Navigation issues were identified, including defining the navigability of the Site C reservoir, future navigation use opportunities of the Site C reservoir, and ensuring project components are designed to address NWPA regulations and vessel clearance requirements. Construction issues such as diversion and channelization, debris management, Site C reservoir clearing, temporary bridges, and Site C reservoir filling were identified. Operational issues were related to the Site C reservoir stabilization and sedimentation, downstream flows, and river geomorphology. The effect of the Project on the Shaftesbury and Tompkins Landing ice bridges was raised as an issue. The need for navigation safety management was identified during the consultation.

Aviation issues included potential land use changes near North Peace Regional airport resulting from construction, a potential increase in hours of poor visibility (fog and heavy fog), and potential risks to aircraft caused by obstacles such as structures and overhead wires.

In Table 26.1, key issues have been organized according to the following key aspects of the project’s potential effect on navigation and aviation:

- Change in navigability and navigational use
- Change or presence of navigational hazards in the waterway
- Changes that result in restrictions to navigation, their rationalization, and the approach to public and navigational safety use
- Changes associated with visibility of structures and overhead wiring on aviation
- Changes on microclimate on aviation
- Changes to Shaftesbury and Tomkins Landing ice bridges

The key issues and the approaches to addressing the issues are outlined in Table 26.1.
### Table 26.1 Key Issues: Navigation and Aviation

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigability and navigation use</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Navigability of the Site C reservoir and future use opportunities | - Issue resulted in a literature review to determine factors that support navigability and navigation use of reservoirs.  
- A benchmark review of BC Hydro’s reservoirs in relation to navigability and navigational use was undertaken. Results identified key criteria and key factors that support navigability of, and navigation use of, reservoirs.  
- Criteria and factors were subsequently used to determine the navigability of the Site C reservoir and the identification of appropriate mitigation measures. |
| Vessel clearances to support navigation for Highway 29 bridges | - Issue resulted in the review and identification of the types of vessels and their design characteristics (e.g., height, beam, draft) that currently, or have the potential to, navigate the Site C reservoir.  
- Vertical, horizontal, and draft requirements were identified, project components (e.g., bridges, transmission lines were identified, and retention of existing bridge segments within inundated areas) was evaluated as to whether the vertical, horizontal, and draft clearances for current and future vessels potentially using the Site C reservoir would be accommodated.  
- NWPP regulations are referenced to ensure compliance to regulations. |
| Aboriginal group (Dene Tha’) concern with potential effects on boat passage | - Section 26.4 Effects Assessment assesses issues associated with boat passage at the dam site. |
| Potential that the Site C reservoir would result in increased access and increased boat traffic on waterways (Treaty 8 Tribal Association, Saulteau First Nations) | - Changes to access and boat traffic are discussed in Section 26.3 and assessed in Section 26.4.  
- The effect of changes to access and boat traffic on Aboriginal land and resource use is discussed in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes. |
| Potential decreased boating safety associated with making the Peace River Valley into a recreational reservoir and increasing powerboat traffic (Treaty 8 Tribal Association) | - Changes to access and boat traffic are discussed in Section 26.3 Navigation Baseline Description and assessed in Section 26.4 Navigation Effects Assessment (Volume 3 Section 26 Navigation).  
- Transport Canada is responsible for oversight of boater safety regulations on navigable waters. |
| Potential that the Site C reservoir and boat launches would increase boating access to the upper reaches of the Halfway and Moberly Rivers (Treaty 8 Tribal Association) | - The effect of changes to access and boat traffic on Aboriginal land and resource use is discussed in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes.  
- Changes to existing boat launch locations, inclusive of the closure of the existing Halfway River boat launch, are assessed in Section 26.4. |

**Hazards to and interferences with navigation**

| Diversion and channelization | Issues related to hazards to and interferences with navigation caused by diversion and channelization activities were assessed (Volume 2 Appendix D Surface Water Regime Technical Memos). |
## Key Issues Approach to Addressing Key Issues

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debris management</td>
<td>- Floating debris and management (debris boom locations and debris traps) as outlined in the Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan were assessed in relation to hazards and interferences to navigation.</td>
</tr>
<tr>
<td>Site C reservoir clearing and temporary bridges</td>
<td>- Issues associated with Site C reservoir clearing and the temporary bridges required by clearing activities (Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan) were assessed in relation to hazards and interferences to navigate.</td>
</tr>
<tr>
<td>Site C reservoir filling</td>
<td>- Issues associated with navigation hazards and interferences created by Site C reservoir filling were assessed based on a review of Volume 1 Appendix B Reservoir Filling and Commissioning Plan.</td>
</tr>
<tr>
<td>Site C reservoir stabilization</td>
<td>- Issues associated with Site C reservoir stabilization were assessed in relation to potential hazards and interferences to navigation based on Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports.</td>
</tr>
<tr>
<td>Site C reservoir sedimentation</td>
<td>- Issues associated with Site C reservoir sedimentation were reviewed in the context of potential creation of hazards to or interferences with navigation based on a review of Volume 2 Appendix I Fluvial Geomorphology and Sediment Transport Technical Data Report.</td>
</tr>
<tr>
<td>Downstream flows and river geomorphology</td>
<td>- Issues associated with the effect of downstream flows and river geomorphology on navigation and navigational use were identified and assessed based on Volume 2 Appendix D Surface Water Regime Technical Memos.</td>
</tr>
<tr>
<td>Navigation use restrictions</td>
<td>- Issues associated with managing public safety throughout construction and early years of operations were assessed and the identification of a Public Safety Management Plan (Volume 5 Section 35 Summary of Proposed Environmental Management Plans) and establishment of boater communication protocols were identified.</td>
</tr>
<tr>
<td>Visibility of structures and overhead wires (aviation)</td>
<td>- Issues identified the need to study the microclimatic effects of the proposed Site C reservoir and potential increase in the annual hours of fog and heavy fog in relation to airport operations.</td>
</tr>
<tr>
<td>Microclimatic changes (aviation)</td>
<td>- Transport Canada and Nav Canada regulations were identified associated with determining potential obstructions to aviation.</td>
</tr>
<tr>
<td></td>
<td>- Regarding proposed land uses in proximity to airports Transport Canada’s document TP 1247 Land Use in the Vicinity of Airports was utilized. This document outlines the specific protection requirements to protect obstacle limitation surfaces used in airport operations.</td>
</tr>
<tr>
<td></td>
<td>- The Aeronautical Obstruction form has been identified and referenced in the assessment to deal with visibility and obstructions to aviation resulting from a construction project.</td>
</tr>
<tr>
<td></td>
<td>- To assess potential effects, an assessment was completed regarding the distance between the North Peace Regional airport and the crest of the Site C dam site, also noting the vertical elevation difference between the airport and the dam crest.</td>
</tr>
<tr>
<td></td>
<td>- Volume 2 Appendix K Microclimate Technical Data Report provides technical details on the results.</td>
</tr>
</tbody>
</table>
### Key Issues Approach to Addressing Key Issues

**Shaftesbury and Tompkins Landing ice bridges**

Changes to ice bridges and ferry operations required for the transport of people, goods, and access to traditional hunting grounds (Duncan’s First Nation, Beaver First Nation, Little Red River Cree First Nation, Paddle Prairie Métis Settlement Society)

- Issues associated with the timing of ice formation at the Shaftesbury and Tompkins Landing ferries were assessed based on the results of Volume 2 Appendix G Downstream Ice Regime Technical Data Report.

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Potential project interactions with navigation and aviation are summarized in Table 2 in Volume 2 Appendix A Project Interactions Matrix. As defined in Volume 2 Section 10 Effects Assessment Methodology, a “2” ranking is assigned where an interaction may result in an adverse effect and mitigation measures are not well understood to be effective. These interactions were taken forward through the effects assessment. Project interactions with a ranking of “2” are summarized in Table 26.2 below.

**Table 26.2 Interactions of the Project with Navigation and Aviation**

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Changes to Navigability and Navigation Use of defined Navigable Waters</td>
</tr>
<tr>
<td></td>
<td>Potential Navigation Hazards in Waterways</td>
</tr>
<tr>
<td></td>
<td>Navigation Use Restrictions</td>
</tr>
<tr>
<td></td>
<td>Micro-climatic Changes on Aviation Use</td>
</tr>
<tr>
<td></td>
<td>Aviation Use and Visibility of Structures and Overhead Wires</td>
</tr>
<tr>
<td></td>
<td>Changes to Operation of Shaftesbury, Tompkins Landing Ferry and Ice Bridges</td>
</tr>
<tr>
<td><strong>CONSTRUCTION</strong></td>
<td></td>
</tr>
<tr>
<td>Dam and Generating Station</td>
<td>✔</td>
</tr>
<tr>
<td>Reservoir Preparation and Filling</td>
<td></td>
</tr>
<tr>
<td>Upgrades to existing licensee roads,</td>
<td>✔</td>
</tr>
<tr>
<td>winter construction</td>
<td></td>
</tr>
<tr>
<td>Water Management during Confinement</td>
<td>✔</td>
</tr>
<tr>
<td>Water Management during Diversion</td>
<td>✔</td>
</tr>
<tr>
<td>Water management during Site C</td>
<td>✔</td>
</tr>
<tr>
<td>reservoir filling</td>
<td></td>
</tr>
</tbody>
</table>
### Key Aspects

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Changes to Navigability and Navigation Use of defined Navigable Waters</th>
<th>Potential Navigation Hazards in Waterways</th>
<th>Navigation Use Restrictions</th>
<th>Micro-climate Changes on Aviation Use</th>
<th>Aviation Use and Visibility of Structures and Overhead Wires</th>
<th>Changes to Operation of Shaftesbury, Tompkins Landing Ferry and Ice Bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Management during Commissioning</td>
<td>✓</td>
<td>✓</td>
<td>❇</td>
<td>❇</td>
<td>❇</td>
<td>❇</td>
</tr>
</tbody>
</table>

**OPERATIONS**

| Site C Reservoir and Generating Station Operations | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

**NOTE:**

Only project interactions ranked as “2” in Volume 2 Appendix A Project Interactions Matrix, Table 2 are carried forward to this table. A ✓ indicates that a project component or activity may interact with navigation or aviation.

In Table 26.2, interactions are considered at the component level for the dam and generating station construction, and for the Site C reservoir and generating station operations. Specific interactions are considered at a sub-component level within Site C reservoir preparation and filling.

Other interactions were considered, but were not carried forward because the activity was unlikely to contribute to an effect. The interactions were either given a ranking of “0” (indicating no interaction) or a ranking of “1”. Further analysis and evaluation of interactions ranked “1” or “0” is not required in the environmental assessment as discussed in the following section.

#### 26.1.3 Standard Mitigation Measures and Effects Addressed

The standard mitigation measures described in this section are the measures that reduced the interactions to a ranking of “1” in Table 1 in Volume 2 Appendix A Project Interactions Matrix. The ranking of “1” was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. These mitigation measures will be employed to ensure that effects to navigation and aviation will be fully avoided or mitigated.

For other construction activities, a “1” ranking was assigned to Hudson’s Hope shoreline protection, transmission tower installation, and conductor stringing. For operational activities, Hudson’s Hope shoreline protection maintenance was assigned a “1”. All other project activities and works listed in Volume 2 Appendix A Project Interactions Matrix, Table 1 were ranked as “0” because the activities do not interact with navigation or aviation.

#### 26.1.3.1 Standard Measures – Navigation

The proposed Highway 29 bridge crossings as detailed in Volume 1 Section 4 Project Description were designed in consideration of future navigation use of the reservoir,
including crossings at Lynx Creek (Figure 26.1), Farrell Creek (Figure 26.2), Halfway River (Figure 26.3), and Cache Creek (Figure 26.4). Preliminary specifications for vessel clearances for bridge design were identified (BC Hydro 2013 in Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 5 Outdoor Recreation and Tourism, and Navigation), and further research on a variety of vessel types likely to use the Site C reservoir confirmed that a navigation envelope that accommodates 1.5 m of draft, 25 m horizontal clearance, and 8 m vertical clearance would support future navigation use.

The replacement Highway 29 bridges would not cause an adverse effect on navigability or navigational use, nor create a hazard to or interference with navigation. Highway 29 bridge crossings are not considered further in the assessment.

A description of the Project transmission lines is included in Volume 1 Section 4 Project Description. The NWPA Aerial Cables (Power and Communications) regulations (TP 14596) provides specific standards and criteria under which Transport Canada considers aerial cables (power and communications) projects to be minor works that do not require an application under the NWPA (Transport Canada 2009). These criteria are based on the terms and conditions outlined in Section 5 of the Minor Works and Waters Order (Transport Canada 2009). Based on a review of the standards and criteria, the majority of creek crossings would not require an application under the NWPA, as they are considered minor works. Two crossings, the Peace Canyon crossing and the Moberly River crossing, are deemed navigable (due in part to the width of the crossings) and would likely require approval from Transport Canada’s Navigable Waters Protection Program. Safe navigation clearances (defined as the vertical clearance under the conductor at maximum sag, less allowance for electrical flash and allowance for suspension marker spheres) have been determined for the Peace Canyon crossing (safe navigational clearance of 37 m) and the Moberly River (safe navigational clearance of 13 m).

The transmission line clearances would not cause an adverse effect on navigability or navigational use, nor create a hazard to or interference with navigation. Transmission line clearances are not considered further in the assessment.

26.1.3.2 Standard Measures – Aviation

Project interactions with aviation that are well understood are based on avoiding intrusion to obstacle limitation surfaces. Obstacle limitation surfaces are established to protect aviation by restricting land use developments in proximity to airports. The Project’s distance from, and variation in elevation above sea level to, the North Peace Regional airport is considered.

Transport Canada’s document entitled Land Use in the Vicinity of Airports (TP 1247) outlines specific protection requirements used in the assessment of potential land use development effects on airports. Development applications and projects planned near airports must consider implications on airport operations. Obstacle limitation surfaces that establish the limit to which objects may project into an airport’s airspace and still ensure that aircraft operations would be conducted safely are established to provide a satisfactory level of safety. The outer obstacle limitation surface represents a common plane established at a constant elevation above the assigned elevation extending at least 4 km from the reference point. This requires protection by the enactment of zoning regulations or legal instruments. Such regulations or legal instruments prohibit the
erection of structures that would violate any of the defined plane surfaces (Nav Canada, Supervisor Land Use Office 2012, pers. comm.).

Throughout construction, the Project would not affect the North Peace Regional airport from a land use perspective, as construction activities and resultant operations are outside the airport boundary and the established obstacle limitation surface (Nav Canada 2012b). The use of cranes and blasting is not anticipated to adversely affect airport operations during Project construction. BC Hydro will be required to submit a Land Use Proposal Submission and Aeronautical Obstruction form to obtain an approval prior to construction. The land use interaction is well understood and controlled by regulation and legal instruments; therefore, this interaction is not ranked as a “2” and there is no need to carry it forward to the effects assessment. Figure 26.9 illustrates the general location of the North Peace Regional airport in relation to the Project.

### 26.1.4 Selection of Key Indicators

The key indicators for the navigation (water and air) VC are presented in Table 26.3.

#### Table 26.3 Key Indicators for Navigation and Aviation

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicator</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes to navigability and navigation use of defined navigable waters</td>
<td>Defined existing navigable waters using the methodology outlined in the River Classification System established for rivers in B.C. Current navigation use (e.g., vessel/boat traffic) of the defined navigable waters for transportation, recreation, and commercial purposes</td>
<td>Determination of navigability provides a baseline to evaluate potential effects to navigability and navigation use. Current navigation use necessary to evaluate potential effects to navigability and navigation use.</td>
</tr>
<tr>
<td>Potential navigation hazards in waterways</td>
<td>Identification of navigation hazards</td>
<td>Identification of navigation hazards supports evaluation of potential effects associated with navigation hazards in waterways.</td>
</tr>
<tr>
<td>Navigation use restrictions</td>
<td>Current navigation use (e.g., vessel/boat traffic) of the defined navigable waters for transportation, recreation, and commercial purposes</td>
<td>Current navigation use evaluated in relation to potential project effects associated with navigation use restrictions.</td>
</tr>
<tr>
<td>Microclimate changes on aviation use at the North Peace Regional airport</td>
<td>Air navigation routes and current aviation visibility</td>
<td>Air navigation routes and visibility at North Peace Regional airport provides a baseline to evaluate potential microclimate effects.</td>
</tr>
<tr>
<td>Aviation use and visibility of structures and overhead wiring</td>
<td>Air navigation routes</td>
<td>Air navigation routes evaluated in relation to potential effects to aviation (e.g., visibility of structures and overhead wiring).</td>
</tr>
<tr>
<td>Changes to operation of ice bridges</td>
<td>Operating information for ferries and ice bridges at Shaftesbury and Tompkins Landing</td>
<td>Ice bridge operating information provides a baseline to evaluate potential effects.</td>
</tr>
</tbody>
</table>
26.1.5 Spatial and Temporal Boundaries

26.1.5.1 Spatial Boundaries

The Local Assessment Area (LAA) and Regional Assessment Area (RAA) in the EIS Guidelines for the assessment of the VC of navigation is the Project activity zone and the Peace River downstream to Peace Island Park, and the locations of the Shaftesbury and Tompkins Landing ice bridges. The areas used for reporting in this assessment were updated from the originally proposed spatial boundaries in the EIS Guidelines based on assessment of navigation for water-based navigation (navigation) and air navigation (aviation).

A navigable water is defined in the NWPA as any water body, natural or man-made, capable of carrying a water-borne vessel. This includes waters capable of being used for commerce, transportation, or recreation, and there is no limit on the size of stream considered navigable (Transport Canada 2012).

Determination of spatial boundaries are based on areas within a navigable water up to the ordinary high-water mark, defined as the visible high-water mark of any lake, stream, or other body where the presence and action of the water are common and usual (DFO 2012).

The Project activity zone consists of all areas in which Project components affect navigable waters up to the ordinary high-water mark, and extends from the Peace Canyon Dam downstream to Peace Island Park.

The upstream extent of the LAA and RAA is the Peace Canyon Dam, and the downstream extent is the Peace Island Park.

The LAA and RAA are both equal to the Project activity zone, but they also contain the site-specific inclusion of the Shaftesbury and Tompkins Landing ice bridge crossings.

The aviation LAA represents the area in which potential adverse effects are assessed from a land use perspective, defined as the extent of the obstacle limitation surfaces of airports as defined by Transport Canada. The RAA includes the area from North Peace Regional airport to the crest of the proposed Site C dam at the construction site.

Spatial boundaries are specified below in Table 26.4 and illustrated in Figure 26.5.

Table 26.4 Spatial Assessment Area for Navigation and Aviation

<table>
<thead>
<tr>
<th>Navigation Aspect</th>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation</td>
<td>Project activity zone downstream to Peace Island Park, and the Shaftesbury and Tompkins Landing ice bridge crossings</td>
<td>Project activity zone downstream to Peace Island Park, and the Shaftesbury and Tompkins Landing ice bridge crossings</td>
</tr>
<tr>
<td>Aviation</td>
<td>North Peace Regional airport and the associated obstacle limitation surfaces</td>
<td>Area from North Peace Regional airport to the crest of the proposed Project construction site</td>
</tr>
</tbody>
</table>
26.1.5.2 Temporal Boundaries

The temporal boundary for the assessment is the Project construction and operations phases. The timing of the construction and operations phases, including construction and operations components and specific component activities, is described in Volume 1 Section 4 Project Description. The detailed schedules for the project components are also included within Volume 1 Section 4 Project Description, which provides specific information pertaining to the Site C dam, generating station, and spillway construction schedule, including river channelization, diversion, and reservoir filling.

26.2 Information Sources and Methods

26.2.1 Literature Review

Background reports, published regulations related to navigation and airport operations, interviews with local stakeholders, and field investigations were reviewed in compiling the baseline information. Information was obtained from the following technical data reports (also identified in Table 26.1) in the preparation of this assessment:

- 2012 Peace River (Project dam site) vessel transit survey (Renegade Construction Inc. 2012)
- Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan
- Volume 2 Appendix D Surface Water Regime Technical Memos
- Volume 3 Appendix E Outdoor Recreation Mitigation Plan
- Volume 2 Appendix G Downstream Ice Regime Technical Data Report
- Volume 2 Appendix I Fluvial Geomorphology and Sediment Transport Technical Data Report
- Volume 2 Appendix K Microclimate Technical Data Report
- Land Use in the Vicinity of Airports Guidelines (Transport Canada 2005)

26.2.2 Interviews

Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 1 Land and Resource Use Assessment Interview Methodology outlines details on the interview method used as part of those interviews. Navigation interviews were held with representatives of the Navigable Waters Protection Program and with local government representatives from nearby communities, including the Peace River Regional District (PRRD), City of Fort St. John, District of Taylor, and District of Hudson’s Hope.

Interviews were held with representatives of the Peace Country River Rats, who represent recreational boaters on the Peace River. The membership of the organization has over 300 boats, and it is estimated that between two to five people participate in activities in each boat. The total number of recreational enthusiasts represented by Peace Country River Rats is estimated to range from 600 to 1,500 persons.

Aviation interviews were held with Transport Canada, NAV Canada, and the North Peace Regional airport.
26.2.3 **Field Investigations**

Field investigations were undertaken April 16 to April 18, 2012 to view the entire length of the Peace River; to identify baseline conditions, including the location of existing boat launches and recreational access points; and to ascertain the extent of proposed inundation on the Peace River and tributaries such as the Moberly and Halfway rivers, and Lynx, Farrell, and Bear creeks.

During the summer months of 2012, for the period of June 21, 2012 to September 7, 2012, vessel transits of the construction site were tracked providing additional insight into the number of transits past the dam site (Renegade Construction Inc. 2012).

The Peace River Angling and Recreational-Use Creel Survey Study 2008–2009 Final Report (LGL 2010) was undertaken to develop a baseline of current recreational use on the Peace River. Field surveys were completed in 2008–2009 (LGL 2010) to develop an understanding of outdoor recreation sites, features, and amenities, as well as use levels and activities. The survey objectives also included completion of an angler and creel survey. This study identified current use of the Peace River for boating, including key launch locations and routes.

26.2.4 **Mapping and Modelling**

Recreation sites, boat launches, highway access points, Hudson’s Hope shoreline protection construction, transmission line construction, and the extent of inundation were referenced and mapped to illustrate baseline conditions and to undertake the effects assessment. Navigational sites of interest and potential enhancement areas were identified, based on the expected normal Site C reservoir operating level.

Proposed changes in downstream flows were also mapped in relation to navigability and navigational use.

26.2.5 **Aboriginal Community and Traditional Knowledge**

Aboriginal community and traditional knowledge related to the navigation VC were gained through review of results of BC Hydro’s consultation with Aboriginal groups and through review of First Nations community baseline studies prepared and submitted to BC Hydro by the following Aboriginal groups: Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations, through the Treaty 8 Tribal Association, as well as Duncan’s First Nation. Information and concerns raised in those studies are identified in Table 26.1.

Blueberry First Nations, Saulteau First Nations, McLeod Lake Indian Band, and Horse Lake First Nation are undertaking community baseline studies. BC Hydro had not received community baseline information from them at the time of writing. Should information be received that pertains to the navigation VC, it will be incorporated during the EIS review period.

First Nations community baseline reports are provided in Volume 3 Appendix B First Nations Community Baseline Reports.

BC Hydro’s approach to integrating community-based social and economic information is described in Volume 3 Appendix B First Nations Community Baseline Reports, Part 1 Approach to Gathering and Integrating Community Baseline Information.
26.3 Baseline Conditions

26.3.1 River Classification: Peace River
Smith (2005) provides a river classification for the whitewater rivers in the Canadian Rockies based in part on the internationally recognized American Whitewater Association river classification system. The river classification system is used to determine the level of difficulty associated with navigating waterways. The classification system is based on a difficulty scale, ranging from class one waterways (the least difficult) to class six waterways (the most difficult). Most rivers have varying degrees of difficulty based upon water levels. The classification system is not an exact science, and classifications of rivers and rapids may vary with fluctuating water levels. The Peace River downstream of the Dinosaur reservoir is classified as a class one waterway, with some specific locations classified as class two. The definitions are as follows:

- Class One (easy): Fast moving water with riffles and small waves. The river has few obstructions, which are all obvious and easily missed with a little training. The risk to swimmers is slight and self-rescue is easy.

- Class Two (novice): Straightforward rapids with wide, clear channels that are evident throughout scouting. Occasional manoeuvring may be required, but rocks and medium-sized waves are easily missed by trained paddlers. Swimmers are seldom injured and group assistance, while helpful, is seldom needed.

26.3.2 Current Navigational Use for Transportation, Recreation, and Commercial Purposes
Current navigational use of the Peace River in the vicinity of the Project is predominantly used by the public for recreational use, and by Aboriginal people. There is no known ongoing non-recreational commercial navigation on the waterway.

Current navigational use of the Peace River at Shaftesbury and Tompkins Landing is for public ferry operations in the ice-free periods and for ice bridges during ice cover periods. These crossings are operated by the Alberta Ministry of Transportation as part of the public highways system.

Aboriginal groups have identified the historic and current importance of the Peace River and its tributaries for traditional use activities and transport, and for its cultural significance (Volume 3 Appendix B First Nations Community Baseline Reports, Part 7 Community Baseline Report and EIS Integration Summary Table for Doig River First Nation, Halfway River First Nation, Prophet River First Nation, and West Moberly First Nations and Part 3 Community Baseline Report and EIS Integration Summary Table for Duncan’s First Nation). Aboriginal historical and current navigational use of the Peace River is discussed further in Volume 3 Section 19 Current Use of Lands and Resources for Traditional Purposes.

The Peace River Angling and Recreational-Use Creel Survey Study 2008–2009 Final Report (LGL 2010) (the recreational survey) provided insight into current recreational use on the Peace River. The recreational survey identified navigation activities, such as jet boating, fishing (whether vessels were used is not defined), boating, kayaking, and canoeing (Figure 26.6). Jet boating occurred most frequently, particularly on the Pine River, a tributary to the Peace River located downstream of the proposed dam site. Jet
boating also occurred in the Peace River from immediately downstream of the dam site to Clayhurst, near the Alberta border and, to a lesser extent, upstream of the dam site to Hudson’s Hope. Boating and canoeing were also identified as navigational activities throughout the local assessment area, although boating in this area comprises a small percentage of the overall boating activity. Kayaking occurs between Peace Canyon Dam and Hudson’s Hope. Figure 26.7 provides a summary of key recreation activities by location.

Peace Island Park boat launch, which provides access to the Pine River and the Peace River below the dam site, was the most utilized point of access. The recreational survey also identified Hudson’s Hope, Lynx Creek, Lynx Creek RV Park, and Halfway River Bridge boat launches as access sites located upstream of the dam site and accessible via Highway 29. Figure 26.8 provides a summary of recreational access points.

The Peace Country River Rats confirmed that a survey of membership was undertaken to ascertain whether members had concerns associated with the proposed Project (survey undertaken in 2010). The results indicated that approximately 80% of the members were “neutral” regarding the proposed Project. Key areas of current use were identified by Peace Country River Rats as the Pine River (a tributary of the Peace River), due to its proximity to Peace Island Park and warmer temperatures promoting swimming in the summer. Upstream, the predominant destination is the Halfway River (another tributary of the Peace River). Interest downstream of the Site C dam site was also noted. Peace Country River Rats also considered the creation of the Site C reservoir a benefit that had the potential to increase Peace River boating use fourfold.

Throughout the summer of 2012, water-based vessel transits past the Site C dam site (June 21, 2012 through September 7, 2012) were counted (Renegade Construction Inc. 2012). A vessel transit was a boat that travelled past the dam site in one direction. The period of the survey was chosen to represent peak periods of use, and all transits were assumed to have originated and concluded from Peace Island Park based on the findings of the recreational survey. A total of 212 transits were observed during the 79-day survey period. Of that total, 108 transits occurred on weekends and 104 transits occurred Monday through Friday. By definition, one vessel trip would include the transit upstream and the return downstream transit. The number of total vessel trips is half of the total transits (e.g., 212 transits equates to 106 vessel trips). Therefore, the total number of vessel trips that occurred throughout the 79-day survey was 106, or approximately 1.3 vessel trips per day averaged over the peak recreation season, or 0.3 per day if averaged over the year.

No commercial or transportation specific transits were observed during the survey period.

26.3.3 Shaftesbury and Tompkins Landing Ferries and Ice Bridges

The Shaftesbury and Tompkins Landing ferries and ice bridges are part of the Province of Alberta’s transportation network. The Peace River can be crossed at these locations via ferry operations during the ice-free periods and via ice bridges during the ice cover periods. Ice bridges, similar to the ferries, are considered part of the transportation network when operational. Once the Alberta Ministry of Transportation determines that the ice has enough depth and stability to support vehicles, the ice bridges become operational. The Duncan’s First Nation have indicated that community members use the Shaftesbury River crossing in winter and summer seasons to access hunting grounds.
(Volume 3 Appendix B First Nations Community Baseline Reports). Other Aboriginal
groups have also indicated to BC Hydro that they have concerns regarding use of these
ice bridges for travel.

The Shaftesbury Ferry is located on Highway 744, upstream of the Town of Peace River
in Alberta. The Shaftesbury Ferry crossing is 325 m in length. The tug propulsion ferry is
22.56 m in length, with a beam of 12.12 m, a draft of 1.22 m, and a load capacity of
38,000 kg supporting two crew members, 46 passengers, and eight mid-sized cars. The
ferry operating season is generally between early April and late November. The ice
bridge is established after freeze-up, which generally occurs between November 9 and
January 5, with breakup occurring between March 21 and May 7 (Alberta Ministry of
Transportation 2012a).

The Tompkins Landing Ferry crossing is located on Highway 697 upstream of La Crete,
Alberta, and is 680 m in width. The ferry has a load capacity of 95,000 kg, a length of
33.4 m, a beam width of 32 m, and a hull depth of 1.52 m. Carrying capacity includes
two crew members, 60 passengers, and 14 mid-sized cars. Freeze-up at the ferry
crossing occurs from November 9 to December 19, with breakup occurring between
April 20 and May 15 (Alberta Ministry of Transportation 2012b).

26.3.4 Air Navigation Routes and North Peace Regional Airport

The North Peace Regional airport, located near Fort St. John, is the major airport in the
region, and the only airport near the Project activity zone. It has two runways within the
airports’ legal boundaries. Navigational aids at the airport include the recently upgraded
Instrument Landing System by Nav Canada. The airport is about 12 km from the Site C
dam site. The elevation of the airport is 218 m higher than the Site C dam site
(Figure 26.9).

The hours of normal fog (visibility less than 1,000 m) and heavy fog (visibility less than
500 m) respectively for the airport are outlined in the Microclimate Report (Volume 2
Appendix K Microclimate Technical Data Report). Baseline data were collected at a
series of climate stations installed by BC Hydro in the Peace River valley within the LAA,
and climate data were obtained from the existing station at the airport.

The data show that the greatest number of hours of fog and heavy fog currently occur
during the fall and winter months at all locations. The airport currently experiences
approximately 1,575 hours of fog and 1,500 hours of heavy fog per year.

26.4 Effects Assessment

26.4.1 Effects Assessment – Changes to Navigability and Navigation Use –
Construction

26.4.1.1 Site C Dam, Generating Station, and Spillways

At the start of construction of the Site C dam, generating station, and spillways
(Volume 1 Section 4 Project Description) BC Hydro would seek a restricted navigation
zone on the Peace River within an area extending from approximately 3 km upstream to
3 km downstream of the dam site (Figure 26.13). Site C dam site construction activities
would occur within the restricted zone. Debris booms would be placed, to catch woody
debris, within this restricted navigation zone on the Peace River above the dam site, at
the mouth of the Moberly River and, in construction Year 2, a boom above this zone at
Wilder Creek. There would also be temporary bridges constructed across the Peace
River and at the mouth of the Moberly River, within the restricted navigation zone
(Figure 26.13).

After filling of the reservoir, the Site C dam site restricted navigation zone would be
limited to a permanent upstream forebay safety boom and a 3 km downstream restricted
navigation zone (Figure 26.14). After reservoir filling, temporary debris booms would be
placed at the mouth of the Moberly River and across the reservoir 12 km upstream at
Wilder Creek (Figure 26.14).

The construction and operation of the dam and the associated restricted access zones
would be a permanent barrier to navigation.

As water-based navigation within the restricted navigation zones would no longer be
permissible, there would be an adverse effect on navigability and navigational use at this
location.

26.4.1.2 Water Management During Confinement and Diversion

Section 11.4 Surface Water Regime in Volume 2 Section 11 Environmental Background
provides details on the effect of confinement and diversion works on both upstream and
downstream flows throughout construction. Upstream headponding would occur during
river channelization and diversion due to reduced flow capacity at the Site C dam site,
the extent of which will exceed beyond the upstream 3 km Site C dam site closure zone
during the river diversion phase, noted above. Fluctuations in water levels upstream of
the dam site would occur due to headpond level fluctuation. There would be limited
difference in water level fluctuation downstream compared to baseline.

Overall, fluctuations in water levels during confinement and diversion are not expected to
have an adverse effect on navigability and navigation use.

26.4.1.3 Site C Reservoir Filling

The Site C reservoir would be filled over a period of approximately three months
(Volume 1 Appendix B Reservoir Filling). A minimum downstream flow of 390 m$^3$/s would
be maintained, which would be sufficient to support river navigation downstream of the
dam site. On the reservoir there would be rising water levels, and mobilization of
shoreline woody debris, which could have an adverse effect on navigability and
navigation use.

While filling is expected to occur in the fall, which would avoid the peak navigational use
periods, the actual filling schedule will be affected by the construction schedule.
Depending upon the timing of filling during the year, there may be a temporary adverse
effect on navigability and navigation use upstream during Site C reservoir filling.

Site C reservoir filling will not affect navigation downstream; temporary upstream
adverse effects on navigation would be expected depending on when during the year the
filling occurs.

26.4.1.4 Access to Water-Based Navigation

There are a number of reservoir preparation activities, including clearing, Highway 29
realignment, and Hudson’s Hope shoreline protection construction. Boat launches
located at Lynx Creek, Halfway River, and Hudson’s Hope, as well as other unmanaged
and recreational access points, would remain operational until such time as construction
activities restrict access.

Access to the boat launch at Hudson’s Hope ferry landing would be unavailable once the
Hudson’s Hope shoreline protection construction starts in Year 5. Access to the Lynx
Creek and Halfway River boat launches may be affected by Highway 29 construction
and clearing activities; however, BC Hydro and its contractors will seek to minimize
these temporary disruptions to boating access points, and to maintain access points to,
and navigable use of, the Peace River during construction.

After reservoir filling is completed near the end of construction Year 7, all existing boat
launches within the Site C reservoir area, including Halfway River, Lynx Creek, Hudson’s
Hope ferry landing, would become permanently unavailable. Until the new boat launches
are opened for use on the reservoir, there would be an adverse effect on access to
water-based navigation.

Figures 26.12 and 26.13 illustrate expected areas and periods of restricted navigation
during construction.

Downstream of the Site C dam site, the ability to navigate and the provision of access
will be unaffected by the Project during construction. Adverse effects on water-based
access to navigation would result during construction.

26.4.2 Effects Assessment – Changes to Navigability and Navigation Use –
Operations

26.4.2.1 Site C Reservoir Sedimentation

Navigability of waterways can be affected by sedimentation. For example, in
summer 2011, a very high inflow event changed river morphology in the Halfway and
Moberly rivers, which changed the locations of natural river bars and depths, and
therefore changed navigation conditions. Sedimentation as a result of the Project is
considered in the context of ongoing natural changes that would be expected to occur
regardless of the Project.

The Site C reservoir sedimentation study (Volume 2 Appendix I Fluvial Geomorphology
and Sediment Transport Technical Data Report) evaluated the morphological changes
due to sedimentation in the Site C reservoir over 10-year and 50-year periods. The
Site C reservoir sediment modelling confirmed that sedimentation would occur in all of
the tributaries, especially the Halfway River.

Over the 50-year period evaluated in the study, a navigational channel with adequate
depth clearance would be retained, enabling vessels to transit the reach of the Halfway
River influenced by the Site C reservoir.

Overall, sedimentation of the Site C reservoir and tributaries are not expected to affect
navigability and navigation use.

Water Management, Depth, and Channelization during Operations

Peace River flows are regulated by the existing upstream hydroelectric facilities at the
G.M. Shrum and Peace Canyon generating stations, which came into operation in the
early 1960s and 1980s, respectively. Today there are flow variations downstream of the
Peace Canyon Dam, which are not dampened by tributary inflows until the Halfway
River. The Peace River in this reach is currently navigable. A third hydroelectric facility on the same river would shift the point of flow regulation from Peace Canyon Dam to the Site C dam site.

At Taylor, approximately 20 km downstream of the Site C dam site, high flows would occur more frequently and there would be an increase in the variability of water levels given its proximity to the point of regulation, similar to what is currently experienced in the vicinity of Hudson’s Hope. Considering that the operation of Site C would be passing flows from Peace Canyon, and considering that there is a higher absolute minimum flow from Site C of 390 m$^3$/s, it would be expected that navigation conditions would be similar to those experienced in the vicinity of Hudson’s Hope today. Inflow from the Pine River, upstream of Taylor and Peace Island Park, would dampen the flows from Site C. Further downstream on the Peace River, the addition of flows from tributaries continues to reduce flow variability, until at the Town of Peace River, Alberta, which is approximately 300 km downstream of the Site C dam site, where the influence of the Project on flows and water levels is expected to be minimal. See Section 11.4 Surface Water Regime in Volume 2 Section 11 Environmental Background for further discussion on water management during operations.

Overall, water management during operations is not expected to affect navigability and navigation use.

Figures 26.10 and 26.11 illustrate water depths and river channelization in the Peace River downstream of the Site C dam site to Taylor at the proposed minimum flow from Site C of 390 m$^3$/s.

Based on the 390 m$^3$/s minimum flows modelled downstream of the Site C dam site, there would be adequate water depth and a continuous channel to accommodate navigation (Volume 2 Appendix D Surface Water Regime Technical Memos). Changes in river flows due to the Project are not expected to influence the downstream erosion and deposition patterns; therefore, no incremental changes to the dynamic baseline patterns are predicted (Section 11.8 Fluvial Geomorphology and Sediment Transport in Volume 2 Section 11 Environmental Background).

Overall, from the point of regulation downstream to Taylor, no effects to navigability and navigation use are anticipated.

### 26.4.3 Mitigation Measures – Changes to Navigability and Navigation Use

The construction and operation of the dam, and the associated restricted navigation zones, would be permanent. Several key mitigation measures that support navigability and navigation use will be implemented during the Project construction and operations phases on the new reservoir.

The construction and operations Public Safety Management Plans represent the key tools that will be used to communicate with the boating public about changes to navigability and navigation use, and about hazards and navigation restrictions. The Public Safety Management Plans and supporting boater communication protocols will be based on established marine communication plans developed for other major infrastructure projects throughout B.C. which included input from the Navigable Waters Protection Program, local user groups and Aboriginal groups’ involvement.
During construction, water-based navigation within the restricted navigation zones at the Site C dam site would no longer be permissible. The construction Public Safety Management Plan will inform users of access changes to water-based navigation and will identify alternative access points and areas where navigation is permitted. Signage for public safety around dams will be developed in accordance with the Guidelines for Public Safety Around Dams (CDA 2011) adopted by BC Hydro.

Areas upstream and downstream of this affected reach, including the Halfway River, the Peace River, Peace Island Park, and the Pine River (a key destination of users downstream of the Site C dam site), would be unaffected by the Project and would provide alternative boating recreation areas.

During the Project operations phase, the Site C reservoir would offer new recreation opportunities and a changed navigation environment. BC Hydro will fund the development of a Navigation and Recreation Opportunities Plan. This plan will enable the local communities, including Hudson’s Hope, Fort St. John, and Taylor, and Aboriginal groups to plan for recreation opportunities created by the Site C reservoir.

BC Hydro proposes that the planning process commence in the initial years of Site C reservoir operations, to provide an opportunity for the communities and Aboriginal groups to experience and develop a vision for recreation and boating over the long term.

Volume 3 Appendix E Outdoor Recreation Mitigation Plan provides further detail on the Site C Outdoor Recreation mitigation plans, which are largely relevant to navigation during operations. Mitigative measures relevant to navigability and navigation use include:

- Development of three boat launches along the Site C reservoir to replace the Halfway River and Lynx Creek boat launches and the Hudson’s Hope ferry landing boat launch. The new boat launches, complete with upgraded amenities, will be located at Hudson’s Hope, Lynx Creek, and Bear Flat (Figure 26.14).

- BC Hydro will provide a Community Recreation Site Fund to support development of new shoreline recreation within the Peace River and tributaries through to the Alberta border as well as the Site C reservoir.

- BC Hydro will provide technical support to outdoor recreation providers that require access to the Site C reservoir (such as RV parks, campgrounds, and marinas operated by the private sector, as well as local, regional, or provincial governments) to assist with their development along, or adaptation to, new shoreline conditions.

Replacement and use of Lynx Creek, Bear Flat, and Hudson’s Hope boat launches will occur during the first or second year after Site C reservoir filling, based on evaluation of reservoir conditions and public safety.

26.4.4 Effects Assessment – Potential Navigation Hazards in Waterways – Construction

26.4.4.1 Debris Management

Floating debris can be a boating safety concern. The Project clearing plan proposes a debris management plan that will be initiated during the construction phase to collect floating debris from the Peace River upstream of the dam site. The Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan provides further
information on proposed debris management and on the use of temporary bridges for clearing access.

During Year 1, a debris boom would be deployed above the Site C dam site and at the mouth of the Moberly River, both of which are within the dam site restricted navigation zone. During Years 2 to 7 of construction, the upstream extent of the restricted navigation zone would be extended with a debris boom and trap deployed near Wilder Creek. The Peace River upstream of the Wilder Creek debris boom would remain open to navigation throughout Years 2 to 7. Refer to Figure 26.12 for the location of the debris booms.

Overall, debris management during construction will be managed, and adverse effects are not anticipated.

26.4.5 Effects Assessment – Potential Navigation Hazards in Waterways – Operations

26.4.5.1 Submerged Vegetation and Debris Management

Based on the normal operating level of the Site C reservoir of between 460 m and 461.8 m, trees that have an elevation exceeding 455 m would be topped or removed (Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan). Removal of vegetation above 455 m would eliminate submerged boating hazards.

The proposed advance clearing of vegetation within areas predicted to erode within five to 10 years would remove vegetation that would otherwise fall into the Site C reservoir and become floating debris. This management measure will reduce the recruitment of floating debris on the reservoir, and therefore will reduce the navigational hazards during early Site C reservoir operations. Clearing of this shoreline area will also facilitate shoreline use, including boat access.

BC Hydro will implement an ongoing debris management program during operations immediately following reservoir filling that will include various measures, including the potential use of debris booms at strategic locations throughout the Site C reservoir. The debris boom placements are proposed at Wilder Creek and the confluence of the Moberly River embayment, with deployment for several years during freshet (approximately June through August), depending on the amount of debris accumulations and the duration of reservoir clearing. A permanent debris and dam safety boom will be placed directly upstream of the Site C dam site. Refer to Figure 26.14 for the location of the debris booms.

Refer to Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan for further information on the reservoir clearing and debris management strategy.

Removal of the submerged forest canopy to the 455 m elevation, advanced removal of shoreline vegetation, and debris management would be beneficial to water-based navigation on the reservoir over the long term.
26.4.6 Mitigation Measures – Potential Navigation Hazards in Waterways – Operations

26.4.6.1 Public Safety Management Plan

The operations phase Public Safety Management Plans and supporting boater communication protocols would communicate navigational hazards to boaters (see Volume 5 Section 35 Summary of Environmental Management Plans). Signage as required will be provided in accordance with the Guidelines for Public Safety Around Dams (CDA 2011).

26.4.7 Effects Assessment – Navigation Use Restrictions – Construction

26.4.7.1 Vegetation Clearing and Temporary Bridges

Site C reservoir clearing activities are expected to take place over a four-year period. The majority of the clearing would be done during the winter months; however, scheduling issues may require clearing activities to occur during other periods. Navigation use restrictions would be implemented around active clearing areas as necessary to ensure boater safety. Refer to Volume 1 Appendix A Vegetation, Clearing, and Debris Management Plan for a further discussion on the Site C reservoir clearing schedule and clearing access.

To undertake clearing, the Site C reservoir would be accessed using temporary roads and bridges and using helicopters. Crossings may include the installation of temporary bridges or snow crossings. Depending on the length of span, abutment bridges or piling bridges may be used. Snow-crossing construction involves placing a box culvert over a drainage, whereupon it is covered by snow, ice, or gravel. Crossings would typically be sited in areas not commonly used for navigation, such as side channels.

Construction phase navigation use restriction areas and proposed temporary bridge crossings are illustrated on Figures 26.12 and 26.13.

Adverse effects on water-based navigation would result from vegetation clearing.

26.4.8 Effects Assessment – Navigation Use Restrictions – Operations

26.4.8.1 Site C Reservoir Stabilization and Debris Management

Potential erosion areas, potential slope stability areas of concern (preliminary stability impact line), and the potential for landslide-generated waves resulting from such slope stability concerns (preliminary wave impact line) represent potential areas in which public safety and navigational use could be affected (Volume 2 Appendix B Geology, Terrain Stability, and Soil Reports). Specific areas include:

- The mouth of Lynx Creek
- The mouth of Farrell Creek
- The mouth of Halfway River opposite the historical Attachie Slide area

Figure 26.14 illustrates these areas and a recommended one-year post-filling Site C reservoir navigational restriction due to anticipated shoreline erosion and landslide potential. Site C reservoir navigation access is anticipated after the second year, based
on monitoring of reservoir conditions related to slope stability and debris management. Site C reservoir areas downstream of Wilder Creek and the Moberly River embayment could be restricted for a slightly longer period due to anticipated ongoing debris management activities.

The restricted access to the new reservoir would adversely affect water-based navigation during the early years of the Site C reservoir. The Peace River and areas downstream of the Site C dam site, including the Pine River and the Peace Island boat launch, would remain unaffected by the Project.

26.4.9 Mitigation – Navigation Use Restrictions

The Public Safety Management Plans and supporting boater communication protocols represent the key communication tools utilized to address adverse effects throughout construction and the early years of operations. In addition to addressing navigational restrictions outlined, the plan will also address identified hazards and interferences to navigation as well as changes to navigability and navigation use.

The Public Safety Management Plans and supporting boater communication protocols will be based on current BC Hydro safety practices and on input from Transport Canada, based on their experience with other navigation restrictions. Refer to Volume 5 Section 35 Summary of Proposed Environmental Management Plans for further discussion of the Public Safety Plans to be developed for Project construction and operations.

26.4.10 Effects Assessment – Changes in Microclimate on Aviation – Operations

The potential for increases in fog frequency and density were assessed in relation to microclimate changes, due to changes in downstream water temperature, for the North Peace Regional airport. The microclimate study evaluated how the Project might influence the local climate (Volume 2 Appendix K Microclimate Technical Data Report), with a focus on changes in fog as it relates to aviation visibility. The technical report calculated resultant changes in poor visibility hours (fog) based on the Weather Research and Forecasting Numerical Model.

Visibility, as classed into various ranges from less than 500 m to greater than 20 km, was examined to determine the potential for change at the North Peace Regional airport as a result of the Site C reservoir (Table 26.5). The combined total number of clear hours with visibility greater than 20 km, and hours with visibility 10 km to 20 km was predicted to be reduced by 15 hours over the year. The number of hours with visibility in the range of 1 km to 10 km was predicted to increase by eight hours over the year.

The number of hours of poor visibility (heavy fog, less than 500 m) was predicted to increase by six hours per year with the Project, with the greatest seasonal increase occurring in fall, with 16 hours of fog and 14 hours of heavy fog predicted.

The results reflected a small percentage change from the baseline, and the base quantities of temperature and moisture (upon which fog is determined) do not show statistically significant changes beyond 1 km of the reservoir. The North Peace Regional airport is approximately 12 km from the reservoir.
### Table 26.5  Predicted Changes in Visibility at North Peace Regional Airport

<table>
<thead>
<tr>
<th>Seasons</th>
<th>Visibility</th>
<th>Clear</th>
<th>Moderate</th>
<th>Poor</th>
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<tr>
<td></td>
<td>&gt; 20 km</td>
<td>10–20 km</td>
<td>5–10 km</td>
<td>1–5 km</td>
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<tr>
<td>Spring</td>
<td>Baseline Case</td>
<td>1,914</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Future Case with the Project</td>
<td>1,919 (+5)</td>
<td>9 (0)</td>
<td>9 (-7)</td>
</tr>
<tr>
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<td>10</td>
</tr>
<tr>
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<td>Future Case with the Project</td>
<td>1,977 (-3)</td>
<td>5 (-3)</td>
<td>14 (4)</td>
</tr>
<tr>
<td>Fall</td>
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<td>7</td>
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<td>7 (-2)</td>
<td>6 (-1)</td>
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<td>2 (0)</td>
<td>7 (-1)</td>
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<td>Year</td>
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<td>41</td>
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<tr>
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<td>Future Case with the Project</td>
<td>7,014 (-10)</td>
<td>23 (-5)</td>
<td>36 (-5)</td>
</tr>
</tbody>
</table>

**NOTE:**
Shown are hours per year within each visibility class. The change is given in brackets.

The Project is not expected to have an adverse effect on aviation visibility due to changes in fog conditions at the North Peace Regional airport.

### 26.4.11 Visibility of Structures and Overhead Wiring, and Proposed Temporary Aviation Restrictions – Construction

Aviation Project interactions associated with visibility of structures and overhead wiring are based on adhering to Transport Canada’s document entitled Land use in the Vicinity of Airports (TP 1247) (Nav Canada 2012a). The Project’s distance from, and variation in elevation above sea level to, the North Peace Regional airport is considered.

Development applications and projects planned near airports must consider implications on airport operations. Obstacle limitation surfaces that establish the limit to which objects may project into an airport’s airspace and still ensure that aircraft operations would be conducted safely are established to provide a satisfactory level of safety. The outer obstacle limitation surface represents a common plane established at a constant elevation above the assigned elevation extending at least 4 km from the reference point. This requires protection by the enactment of zoning regulations or legal instruments. Such regulations or legal instruments prohibit the erection of structures which would violate any of the defined plane surfaces (Transport Canada 2005).

Throughout construction, the Project would not affect the North Peace Regional airport from a land use perspective, as construction activities and resultant operations would be...
outside the airport boundary and the standard obstacle limitation surface (Transport
Canada 2005). The use of cranes and blasting is not anticipated to adversely affect
airport operations during Project construction, based on a review of the Aeronautical
Obstruction form requirements (Nav Canada 2012b) and on the vertical difference
between the Site C dam crest and the airport.

This interaction is well understood and regulated, and can be avoided through the
application of standard procedures. This topic is addressed in Section 26.1.3, Standard
Mitigation Measures and Effects Addressed, and was not considered further in the
effects assessment.

26.4.12    Effects Assessment – Shaftesbury and Tompkins Landing Ice Bridges
and Ferries – Operations

At Shaftesbury crossing, the analysis of changes to ice formation downstream of the
Project has identified a potential for a shift in the relative operating periods of the
Shaftesbury Ferry versus the ice bridge. On average, the ferry operations may extend
four days longer into the fall, with a maximum extension of two weeks in some years
(Volume 2 Appendix G Downstream Ice Regime Technical Data Report).

This would result in a delay in the installation of the Shaftesbury ice bridge by about
two days on average relative to existing conditions, with a range of year-to-year delays
of 0 to 14 days. With the Project, the average duration of operations of the Shaftesbury
ice bridge would be reduced to 71 days, compared to 75 days under existing conditions.
The Project would not affect total number of crossing days considering both ferry and ice
bridge operations.

The Project would not affect ice bridge or ferry operations at Tompkins Landing.
Modelling results showed no Project-related change in the timing of freeze-up and
breakup at km 694, the location of the Tompkins Landing Ferry.

As the total number of crossing days at the Shaftesbury and Tompkins Landing are not
expected to change, there would be no adverse effect on navigation at these locations.

26.5    Effects Assessment and Mitigation Measures

This assessment evaluated six potential effects to the navigation VC:

- Changes to navigability and navigation use of defined navigable waters
- Potential navigation hazards in waterways
- Navigation use restrictions
- Microclimate changes on aviation use at North Peace Regional airport
- Aviation use and visibility of structures and overhead wiring
- Changes to operation of ice bridges

26.5.1    Effects and Mitigation Measures

The communication of navigational restrictions, per the Public Safety Management Plan
and supporting boater communications, will mitigate potential effects associated with
hazards to navigation and restrictions to navigation at the Site C dam site. Effective
boater communications will provide useful information that will help boaters to plan their
trip; will clearly articulate any restrictions, interferences, or public safety issues to
boaters and the public; and will provide information about alternative boating areas or
launches, when restrictions are in place.

Navigational use of the Peace River upstream of the Site C dam site will continue during
construction, and the Lynx Creek and Halfway River boat launches will remain open to
public use, provided they do not pose a conflict to construction activities. Throughout
construction, the Peace River downstream of the Site C dam site will remain accessible
and navigable at all times.

During Project operations, BC Hydro will monitor the reservoir shoreline conditions, will
undertake debris management, and will open the boat launches and reservoir to public
use as soon as conditions safely allow.

Also during Project operations, to facilitate the anticipated increase in use and
accommodate new boating and navigational opportunities, BC Hydro will fund a
Navigation and Recreation Opportunities Plan for the Site C reservoir. The plan will
facilitate local and regional governments' involvement to plan for and optimize the
benefits anticipated to be created as a result of the Site C reservoir.

With mitigation, the Project will have a residual adverse effect on navigability and
navigational use at the Site C dam site, due to the permanent restriction of navigation at
the dam site.

Potential effects and mitigation measures for the navigation VC are summarized in
Table 26.6.
### Table 26.6 Project Effects and Mitigation Measures on Navigation

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation</td>
<td>Construction</td>
<td>Changes to navigability, navigational use, and access</td>
<td>A boater communications plan, as part of the Public Safety Management Plan, will provide recreational boaters with information about restricted navigation zones at the dam site, and any temporary navigation or boat launch access closures associated with active work areas for reservoir clearing, Highway 29 relocation, and Hudson’s Hope shoreline protection construction. This will support boater trip planning and safety during the Project construction period. Develop three boat launches along the Site C reservoir accessible via Highway 29 to support navigability and navigational use. BC Hydro proposes to fund community groups to support re-establishment of recreational sites on the Site C reservoir and downstream, and to re-establish and create new use patterns and access. BC Hydro will provide technical support to outdoor recreational providers to facilitate further public and private sector investment opportunities associated with the use of the Site C reservoir and downstream. BC Hydro will fund the development of a Navigation and Recreation Opportunities Plan intended to enable the local communities to plan for boating and recreation opportunities created by the Site C reservoir.</td>
<td>Boaters will be able to plan effectively with the information provided in a boater communications plan. Mitigation supports future use opportunities, and expansion of activities and areas in which one can navigate. Access to the Site C reservoir is improved, and amenities are enhanced. The development and implementation of the Navigation and Recreation Opportunities Plan represents a significant Project enhancement and an innovative approach to optimizing opportunities.</td>
<td>BC Hydro and its contractors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential navigation hazards in waterways</td>
<td>None required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navigation use restrictions</td>
<td>BC Hydro’s Public Safety Management Plan and supporting boater communication protocols, inclusive of adhering to the Canadian Dam Association Guidelines for Public Safety Around Dams, will address navigability and navigational use, and the identification of potential hazards and interferences in waterways. Areas that remain open to navigation and are accessible during construction (inclusive of boat launches and other public access) will be communicated to users and the public at large.</td>
<td>The implementation of the BC Hydro Public Safety Management Plan and supporting boater communication protocols will mitigate potential navigational restrictions throughout construction and in the early years of the Site C reservoir operations. No residual adverse effects are anticipated</td>
<td>BC Hydro and its contractors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table: Mitigation Measures for Navigation

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation</td>
<td>Operations</td>
<td>Changes to navigability, navigational use, and access</td>
<td>A boater communications plan, as part of the Public Safety Management Plan, will provide recreational boaters with information about any temporary navigation restrictions or public safety concerns during the early years of Site C reservoir operations. See also mitigation implemented in the construction phase.</td>
<td>Continuation of communication of navigational risks, per the Public Safety Management Plan and boater communication protocols, throughout the early years of the Site C reservoir operations fully mitigates the effect. No adverse residual effects are anticipated.</td>
<td>BC Hydro</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential navigational hazards in waterways</td>
<td>The operations phase Public Safety Management Plans and supporting boater communication protocols will communicate navigational hazards to boaters. Signage, as required, will be provided in accordance with the Guidelines for Public Safety Around Dams.</td>
<td>Continuation of communication of navigational risks, per the Public Safety Management Plan and boater communication protocols, throughout the early years of the Site C reservoir operations fully mitigates the effect. No adverse residual effects are anticipated.</td>
<td>BC Hydro</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Navigation use restrictions</td>
<td>BC Hydro’s Public Safety Management Plan and supporting Boater Communication Protocols will continue throughout the early years of the Site C reservoir operations.</td>
<td>Continuation of communication of navigational restrictions, per the Public Safety Management Plan and boater communication protocols, fully mitigates the effect. No adverse residual effects are anticipated.</td>
<td>BC Hydro</td>
</tr>
</tbody>
</table>

### Additional Notes:
- BC Hydro: BC Hydro’s Public Safety Management Plan and supporting Boater Communication Protocols will continue throughout the early years of the Site C reservoir operations.
- Continuation of communication of navigational risks, per the Public Safety Management Plan and boater communication protocols, throughout the early years of the Site C reservoir operations fully mitigates the effect. No adverse residual effects are anticipated.
### 26.5.2 Other Mitigation Options Considered

The option for a new boat launch closer to Fort St. John was considered; however, issues related to topography and private land ownership were barriers. Of the three proposed new BC Hydro reservoir boat launches, the closest launch will be located 30 km from Fort St. John at Bear Flat.

### 26.6 Residual Effects

#### 26.6.1 Characterization of Residual Effects

The residual effects are characterized according to Table 8.3 of the EIS Guidelines. The definitions of the criteria are provided in Table 26.7. The residual effects on navigation and aviation were characterized by considering the key aspects described in Section 26.4.

#### Table 26.7 Characterization Criteria for Residual Navigation and Aviation Effects

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
<th>Quantitative Measure or Definition of Qualitative Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
<td>This refers to the ultimate long-term trend of the environmental, social, economic, heritage, or health (e.g., increase, decrease, or neutral).</td>
<td><strong>Adverse</strong>: condition of the VC is worsening in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Positive</strong>: condition of the VC is improving in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Neutral</strong>: condition of the VC is unchanged in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td>Magnitude</td>
<td>This refers to the amount of change in a key indication or variable relative to baseline case (low, moderate, high). Consideration is given to such factors such as the uniqueness of the effect and comparison to natural or background variation.</td>
<td><strong>Low</strong>: effect is negligible from baseline conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Moderate</strong>: effect would cause an increase with regard to baseline, but is within historical norms</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>High</strong>: effect results in changes beyond historical norms</td>
</tr>
<tr>
<td>Geographical Extent</td>
<td>The geographic area in which an environmental, economic, social, heritage, or health effect of a defined magnitude occurs.</td>
<td><strong>Site-specific</strong>: the expected measurable changes are within the Project activity zone</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Local</strong>: the expected measurable changes are within the LAA</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Regional</strong>: the expected measurable changes are within the RAA</td>
</tr>
<tr>
<td>Frequency</td>
<td>The number of times during a project or a specific project phase that an environmental, economic, social, heritage, or health effect may occur.</td>
<td><strong>Once</strong>: occurs once</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Continuous</strong>: occurs on a regular basis and at regular intervals</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Sporadic</strong>: occurs rarely and at irregular intervals</td>
</tr>
<tr>
<td>Duration</td>
<td>The period of time required until the VC</td>
<td><strong>Short-term</strong>: effect is limited to &lt; 1 year</td>
</tr>
</tbody>
</table>
### Criterion Description: Qualitative Categories

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
<th>Quantitative Measure or Definition of Qualitative Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversibility</td>
<td>This refers to the degree or likelihood to which the existing baseline conditions can be regained after factors causing the effect are removed. Effects can be reversible or irreversible.</td>
<td>Effect <strong>reversible</strong> with reclamation and/or over time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Effect <strong>permanent</strong> and cannot be reversed with reclamation and/or over time</td>
</tr>
<tr>
<td>Context</td>
<td>This refers to the extent to which the area within which an effect may occur has already been adversely affected by human activities, is ecologically fragile, and has little resilience and resistance to imposed stresses.</td>
<td><strong>Resilient:</strong> the area is resilient to change because new infrastructure and opportunities can replace the existing ones</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Not resilient:</strong> the area has little resilience to change, as new infrastructure and opportunities could not overcome changes to the baseline</td>
</tr>
<tr>
<td>Level of Confidence</td>
<td>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.</td>
<td><strong>Low:</strong> Low certainty and understanding of effect results in concerns regarding effectiveness of mitigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Moderate:</strong> Moderate certainty and understanding of effect results in a number of concerns regarding effectiveness of mitigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>High:</strong> High certainty and understanding of effect confirms certainty and effectiveness of mitigation</td>
</tr>
<tr>
<td>Probability</td>
<td>The likelihood that an adverse effect would occur</td>
<td><strong>Low:</strong> effect is unlikely to occur</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>High:</strong> effect is almost certain to occur</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Unknown:</strong> likelihood is unknown</td>
</tr>
</tbody>
</table>

During construction and operation, the magnitude of the adverse effect on navigability of the Peace River, due to the restriction in access past the dam site, would be low, as boaters would still be able to access both the areas upstream and downstream of the dam site from launches in these locations. The baseline information shows that navigation use in the LAA is recreational, that vessel transits generally originate from and return to the same boat launch, and that the key point of current access is the Peace Island Park boat launch. The vessel transit count in 2012 identified an average of 1.3 vessel transits per day past the dam site during the peak recreation season, whereas the outdoor recreation assessment identifies that as many as 100 boats per day may be elsewhere, on other reaches of the Peace River or on local tributaries. With the Project, boaters who are destined for upstream areas would still be able to access these areas using the new boat launches on the reservoir. Boaters destined for downstream areas would still be able to access these areas using the Peace Island or Clayhurst boat launches.
The social context is one of resilience, in that boaters will be able to adapt to new conditions by planning for their trip in a manner that would not require transit past the dam site in order to reach either upstream or downstream destinations. The mitigation measures proposed would provide enhanced access, facilities, and opportunities for recreation on the Site C reservoir. The Bear Flat boat launch would be 30 km from Fort St. John, which would be closer than the current site at Halfway River, and will have enhanced amenities such as parking and day use areas. All three reservoir launches would provide access to boating destinations upstream such as Halfway River and Hudson’s Hope. In addition, the key destinations downstream, such as the Pine River and the Peace River to Clayhurst, remain accessible via the Peace Island and Clayhurst boat launches, maintaining and providing for a further variety and a choice of experience for users, including a riverine environment in which to navigate. These opportunities are described in Section 26.4.3.

Geographic context of the effects would be site-specific, only affecting transit past the dam site. All other navigation considerations within the LAA were deemed to have no residual adverse effects. The dam, as a permanent structure, would result in far future, continuous, and permanent change to navigability. The probability of an adverse effect on navigability, and the level of confidence in this assessment, is high.

Table 26.8 summarizes residual effects on navigation and aviation.
Table 26.8  Characterization of Residual Navigation and Aviation Effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Phase</th>
<th>Residual Environmental Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direction</td>
<td>Magnitude</td>
</tr>
<tr>
<td>Changes to navigability and navigation use</td>
<td>Construction</td>
<td>Decrease (adverse)</td>
</tr>
</tbody>
</table>
26.6.2 Standards or Thresholds for Determining Significance

All of the residual effects criteria were taken into consideration in the determination of significance, as described above in Section 26.6.1. Particular consideration was given to magnitude, geographic context, duration, and social context, since together they are the key criteria for understanding change in relation to navigability and navigation use, and how area users would experience or adapt to change in relation to the Project.

Specifically:

- Magnitude is an important factor in identifying the extent to which navigability and navigation use would continue to be available upstream and downstream of the dam site.
- Geographical extent is an important factor in identifying the area of navigability and the navigation use that would be affected.
- Duration is an important factor in identifying the length of time for which navigability and navigation use would be affected, and whether the change would be considered permanent.
- Social context was considered in relation to the future navigation environment and ability for people and communities to adapt to changes (resiliency) through new infrastructure and navigational opportunities.

Significant adverse residual effects on navigation would occur if the following thresholds combined were exceeded:

- Magnitude is moderate or high.
- Geographical extent is local or regional.
- Duration is long term or far future.
- Social context is not resilient.

26.6.3 Determination of Significance of Residual Effects

When the above residual effects criteria are considered in combination, the magnitude of the effect is low, the geographical extent is site-specific, and the duration is generally far future (i.e., while new infrastructure is being developed, some navigation opportunities will be reduced; however, over the far future, navigation experiences and opportunities would not be less than the baseline, but in fact would be expanded to include new types of navigable uses on the reservoir). With the Project being located in a resilient social context, it is assumed that people and communities will be able to adapt to these changes in navigation experiences and opportunities.

Considering all aspects of the navigation VC, and implementation of the mitigation measures, the Project’s net effect on navigation is considered not significant (Table 26.9).
### Table 26.9 Summary of Assessment of Potential Significant Residual Adverse Effects

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Adverse Effects</th>
<th>Key Mitigation Measures</th>
<th>Significance Analysis of Residual Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation</td>
<td>Construction</td>
<td>Changes to navigability and navigation use</td>
<td>A boater communications plan, as part of the Public Safety Management Plan, would enable trip planning and safety for boaters’ recreational boating activities in consideration of the restricted navigation zones at the dam site, and of any temporary navigation or boat launch access closures associated with active work areas for reservoir clearing, Highway 29, and Hudson’s Hope shoreline protection construction. Development of three boat launches, accessible via Highway 29, along the Site C reservoir provides more accessible, improved boat launch facilities that would support navigability and navigational use. BC Hydro proposed funding to community groups to re-establish recreational sites on the Site C reservoir and downstream, and will re-establish and create new use patterns and access. BC Hydro provision of technical support to outdoor recreational providers facilitates further public and private sector investment opportunities associated with the use of the Site C reservoir and downstream. BC Hydro will fund the development of a Navigation and Recreation Opportunities Plan intended to enable the local communities to plan for boating and recreation opportunities created by the Site C reservoir.</td>
<td>Not significant</td>
</tr>
</tbody>
</table>
26.7 Cumulative Effects Assessment

26.7.1 Screening of Cumulative Effects

A screening of the Project’s potential contribution to the cumulative effects of past, current, and announced future projects was done according to the procedures described in Volume 2 Section 10 Effects Assessment Methodology. The screening process establishes two conditions to warrant further assessment. These conditions are:

- The Project results in a residual effect
- The effect is likely to act in a cumulative fashion with those of other projects and activities (i.e., spatial and temporal overlap) within the RAA

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 combined with the Project on water-based navigation.

26.8 Monitoring and Follow-Up

As described in Volume 5 Section 35 Summary of Environmental Management Plans, BC Hydro will commit to regular monitoring of shoreline conditions during the early years of Site C reservoir operations. Monitoring program results would support implementation of prescribed Public Safety Management Plan boater communication protocols related to managing for navigation hazards and public safety within the Site C Reservoir.

BC Hydro will be responsible for the implementation of proposed mitigation measures, including mitigation identified in the Volume 3 Appendix E Outdoor Recreation Mitigation Plan.
References

Literature Cited


Internet Sites


Personal Communications

27 VISUAL RESOURCES

27.1 Approach
As the Project would introduce permanent, visible features to the landscape, visual resources would be affected within and around the Project activity zone. The key indicators for this effect are the visibility of Project components from selected receptor sites and predicted scenic values. Receptor sites are locations specifically selected to assess the Project effects from a large number of baseline viewpoints. The methods for compiling the baseline and undertaking the assessment are adapted from the Visual Landscape Inventory: Procedures and Standards Manual (B.C. Ministry of Forests, Lands and Natural Resource Operations 1997) and Visual Impact Assessment Guidebook (BCMOF 2001). The Visual Landscape Inventory, a comprehensive description of the visual landscape in B.C., is used as an input to formulate the baseline conditions. Geographic information system (GIS)-based visibility analysis and photomontages are used to assess the key indicators.

27.2 Regulatory and Policy Setting
The assessment was prepared in accordance with Section 16.9 of the Site C Clean Energy Project Environmental Impact Statement Guidelines (Minister of Environment of Canada and the Executive Director of the BCEAO 2012) (EIS Guidelines). A provincial policy for the management of visual resources in forestry exists pursuant to the Forest and Range Practices Act; however, there are no specific policies for other resources or projects.

27.2.1 Key Issues and Identification of Potential Effects
As described in the EIS Guidelines, there is the potential for adverse effects on visual resources due to changes in the following as a result of the Project:

- Visibility of Project components from selected receptor sites
- Predicted scenic values using photomontages and assessed according to the Visual Impact Assessment Guidebook (BCMOF 2001)

As described in Section 27.3, the above two potential effects are combined into the assessment of potential effects on visual resources.

There is the potential for adverse effects on visual resources, since construction of the Site C dam site, construction of the transmission line, Highway 29 realignment, clearing of vegetation, construction of Hudson’s Hope shoreline protection, filling of the Site C reservoir, construction of access roads, and construction of worker accommodations are anthropogenic disturbances, and would alter the viewscapes from receptor sites in and around the Peace River valley.

Issues, concerns, and interests identified during consultation with the public, Aboriginal groups, and government agencies guided the scope of the visual resources assessment (see Volume 1 Section 9 Information Distribution and Consultation). The key issues identified and the approaches used to address issues are outlined in Table 27.1.
Table 27.1  Key Issues: Visual Resources

<table>
<thead>
<tr>
<th>Key Issues</th>
<th>Approach to Addressing Key Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>General visual impacts and changes to aesthetics</td>
<td>Photomontages were prepared to communicate altered views and river landscape</td>
</tr>
<tr>
<td></td>
<td>A visibility analysis was conducted to show where the Project would be visible from</td>
</tr>
<tr>
<td></td>
<td>Effects on visual resources were assessed</td>
</tr>
<tr>
<td>Loss of river landscape, including islands</td>
<td>Photomontages were prepared to communicate altered views and river landscape after the filling of the Site C reservoir</td>
</tr>
<tr>
<td>Vegetation removal on river islands</td>
<td>Photomontages were prepared to communicate altered views during and after vegetation removal</td>
</tr>
<tr>
<td>Loss of scenic view opportunities</td>
<td>Receptor sites were selected at scenic view locations</td>
</tr>
<tr>
<td>Loss of visual cultural referents in the form of the visual landscape</td>
<td>Photomontages were prepared to communicate altered views and river landscape</td>
</tr>
<tr>
<td></td>
<td>A visibility analysis was conducted to show where the Project would be visible from</td>
</tr>
</tbody>
</table>

Potential Project interactions with VCs are summarized in Volume 2 Appendix A Project Interactions Matrix, Table 2. As defined in Volume 2 Section 10 Effects Assessment Methodology, a “2” ranking is assigned where an interaction may result in an adverse effect and the nature of the effect and/or the effectiveness of mitigation measures is uncertain. These interactions were taken forward through the effects assessment.

Project interactions with a ranking of “2” are set out in Table 27.2.

Table 27.2  Interactions of the Project with Visual Resources

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Key Aspects</th>
<th>Changes in Visual Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam and Generating Station</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Reservoir Preparation and Filling</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Transmission System</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Quarried and Excavated Material Source Development</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Construction Access Road Development</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Worker Accommodation</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir and Generating Station</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

NOTE: A ✓ indicates that an activity is likely to contribute to the effect.

27.2.2  Standard Mitigation Measures and Effects Addressed

A “1” ranking was given where an adverse effect may result from an interaction, but standard mitigation measures to avoid or minimize the potential effects are available and well understood to be effective, and any residual effect is negligible. There are no standard mitigation measures for visual resources and therefore no “1” rankings were.
given. All Project activities listed in Table 27.2 are carried through to the effects assessment.

All other Project activities and works listed in Table 2 of Volume 2 Appendix A Project Interaction Matrix were ranked as “0” because the activities do not interact with visual resources, or “n/a” if the interaction is more appropriately evaluated at the Project component level.

27.2.3 Selection of Key Indicators

The predicted visibility of the Project components at receptor sites and the predicted scenic values were selected as key indicators. Figure 27.3 shows the five receptor sites that were selected as representative of the visual landscape in the Peace River valley. Photographs from the receptor sites showing the river valley and its southern slopes are included in Figures 27.4 to 27.8. Information regarding baseline scenic values was acquired from the Visual Landscape Inventory (B.C. Ministry of Forests, Lands and Natural Resource Operations 2012a). A list of key indicators, including the rationale for selection, is provided in Table 27.3.

Table 27.3 Key Indicators for Visual Resources

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Key Indicators</th>
<th>Rationale for Selection of the Key Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in visual</td>
<td>Representative visual receptor sites, considering provincial Visual Landscape</td>
<td>Visual resources and public viewpoints as identified may be affected where Project components are visible</td>
</tr>
<tr>
<td>resources</td>
<td>Inventory sites, and sites identified during field reconnaissance, that offer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>views of the proposed Site C reservoir and dam site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public viewpoint of the river from Hudson’s Hope, and from near the proposed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site C dam site</td>
<td></td>
</tr>
</tbody>
</table>

27.2.4 Spatial and Temporal Boundaries

27.2.4.1 Spatial Boundaries

The Local Assessment Area (LAA) in the EIS Guidelines for the assessment of the VC of visual resources is the Site C reservoir and dam site as viewable from Visual Landscape Inventory viewpoints. The Regional Assessment Area (RAA) in the EIS Guidelines is the Visual Landscape Inventory viewpoints within or adjacent to the Project activity zone. The area used for reporting in this assessment was updated from the spatial boundaries in the EIS Guidelines. The spatial boundaries for the assessment of Project effects on visual resources were determined and defined by the:

- Project description (dimensions)
- Natural characteristics of the VC

The dimensions of the built structures at the proposed Site C dam site were selected as a reference to determine the size of the LAA. The Site C dam site contains the largest features that would be immediately recognizable as anthropogenic additions to the landscape. Based on the dimensions of these features, it was determined that, at a
distance of 8 km, the largest Project components would be predicted to appear small
enough to present a negligible effect on visual resources, even under optimal viewing
conditions. The LAA is therefore defined as the Site C reservoir, Site C dam site, and
transmission corridor (Project components that would contain the largest or tallest visible
features) plus an 8 km buffer, as well as the sites for quarried and excavated materials
and worker accommodation (Project components that would contain smaller features),
plus a 1 km buffer. The LAA used in this assessment includes the area defined in the
EIS Guidelines, but is larger and therefore more conservative.

The RAA is identical in extent to the LAA defined above, including Visual Landscape
Inventory viewpoints within or adjacent to the Project activity zone.

The LAA and RAA are shown in Figure 27.1 and summarized in Table 27.4.

Table 27.4 Spatial Assessment Areas for Visual Resources

<table>
<thead>
<tr>
<th>Local Assessment Area</th>
<th>Regional Assessment Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site C reservoir, Site C dam site, and transmission corridor, plus an 8 km buffer as well as the sites for quarried and excavated materials and worker accommodation, plus a 1 km buffer.</td>
<td>LAA and Visual Landscape Inventory viewpoints within or adjacent to the Project activity zone.</td>
</tr>
</tbody>
</table>

27.2.4.2 Temporal Boundaries

The visual resources assessment assessed potential Project effects during the
construction and operational phases of the Project. The Project's effects on visual
resources would begin during Site C dam construction and vegetation clearing, and
would continue during Site C reservoir filling (Years 1 to 8) and throughout Site C
reservoir and dam operations (Year 8 through the life of the Project).

27.3 Information Sources and Methodology

The methods for compiling the baseline and undertaking the assessment are adapted
from the B.C. Ministry of Forests, Lands and Natural Resource Operations manuals and
guidelines. Methods are summarized below and detailed in the following sections.

To formulate the baseline, Visually Sensitive Areas and baseline viewpoints in the LAA
were identified from the Visual Landscape Inventory. Visually Sensitive Areas are areas
of specific concern for visual resources with established ratings for Existing Visual
Conditions. Photographs taken from baseline viewpoints serve as an inventory of the
existing landscape in the LAA. Additional baseline viewpoints were added where a
potential line of sight existed to the Project. Geo-referenced photos were collected from
the baseline viewpoints. The description of baseline conditions included, among other
features of the visible landscape, the level of existing visual disturbances in the LAA.

To assess the key indicators, five receptor sites were selected from the baseline
viewpoints (see Figure 27.3). For these receptor sites, a GIS-based visibility analysis
was conducted and photomontages of the Project were created, taking into account the
dimensions of the Project components and the topography of the existing landscape
(see Figures 27.4 to 27.8). With input from these photomontages (where possible),
changes in scenic values were assessed based on whether the management objectives
of the Visually Sensitive Areas (Established Visual Quality Objectives) into which the
Project components would fall were met, and whether the introduced anthropogenic disturbances would exceed existing levels of disturbances in the LAA.

27.3.1 Literature Review

The following information on visual resources was used to support the formulation of the baseline, and to assist with assessing effects:

- Project description and Project-related information (BC Hydro 2012a, 2012b)
- Provincial Visual Landscape Inventory, which constitutes a comprehensive baseline assessment of the visual landscape in the Peace River valley
- Peace River Site C Hydro-Electric Development Recreation Impact Assessment (Edwin, Reid & Associates 1979)

The Visual Landscape Inventory includes information on the conditions, characteristics, and sensitivity of the visual landscape in B.C., and provides information on scenic values for this assessment. Specifically, the Visual Landscape Inventory delineates Visually Sensitive Areas, defined as areas where changes to the visual landscape could potentially give rise to stakeholder concerns. Among other criteria, the Visual Landscape Inventory provides ratings for Existing Visual Conditions for each Visually Sensitive Area. The Existing Visual Conditions rating is a measure of how much an area has been altered by visible anthropogenic disturbances. The ratings are classified into six levels of landscape alteration, based on the scale of disturbance and compatibility of the disturbance with natural conditions (see Table 27.5).

Table 27.5 Visual Landscape Inventory Existing Visual Conditions Ratings

<table>
<thead>
<tr>
<th>Existing Visual Conditions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preserved</td>
<td>No visible anthropogenic disturbances</td>
</tr>
<tr>
<td>Retained</td>
<td>Anthropogenic disturbances are not visually evident</td>
</tr>
<tr>
<td>Partially Retained</td>
<td>Anthropogenic disturbances are visible, but remain subordinate</td>
</tr>
<tr>
<td>Modified</td>
<td>Anthropogenic disturbances are visually dominant, but have characteristics that appear natural</td>
</tr>
<tr>
<td>Maximally Modified</td>
<td>Anthropogenic disturbances are dominant and out of scale, but appear natural in the background</td>
</tr>
<tr>
<td>Excessively Modified</td>
<td>Anthropogenic disturbances are excessive and greatly out of scale</td>
</tr>
</tbody>
</table>

NOTE: Source: BCMOF (1997)

In addition to providing a general description of the visual landscape, the Existing Visual Conditions rating in the Visually Sensitive Areas serves as an input to the baseline description of the existing landscape for this assessment. The Visual Landscape Inventory was obtained from the Recreation Resources Inventory Online BC (B.C. Ministry of Forests, Lands and Natural Resource Operations 2012a) on June 1, 2012. The Peace River Site C Hydro-Electric Development Recreation Impact Assessment (Edwin, Reid & Associates 1979) provided information on what locations and viewpoints had previously been regarded as important for visual resources.
27.3.2 Field Investigations

A site visit was conducted on May 15, 2012 to collect photographs of the existing landscape from baseline viewpoints. Baseline viewpoints for this study were selected from viewpoints previously defined in the Visual Landscape Inventory, along with other locations with views of the Peace River valley that were readily accessible to the public. According to the Visual Landscape Inventory, there are eight major viewpoints and 27 minor viewpoints within the LAA. Major viewpoints are defined as locations with a higher number and frequency of visitors, longer duration of viewing, and easier access (BCMOF 1997). Examples in the LAA are highway pullouts or viewpoints. Four major viewpoints were predicted to have a line of sight to the proposed Site C reservoir. A number of minor viewpoints are located either on the Peace River or within the extent of the proposed Site C reservoir and would be submerged by the Site C reservoir. Of the remaining minor viewpoints, five are predicted to have a line of sight to the Project. Based on line of sight, four major and five minor viewpoints from the Visual Landscape Inventory were identified as baseline viewpoints for this study, and were visited during the photo survey. These sites also include the viewpoints used in the 1979 recreation impact assessment (Edwin, Reid & Associates 1979). In addition, three more baseline viewpoints with views of the Peace River valley were added. These baseline viewpoints are located at the south end of 100th Street in Fort St. John, at the community of Old Fort on Old Hope Road along Highway 29, and at a viewpoint above Hudson’s Hope.

One or more photographs at the location of every baseline viewpoint were taken in the direction of the proposed Project (Site C dam site or reservoir), with a combined field of view large enough to show all visible Project components predicted to be visible (see Figures 27.4 to 27.8). The details of the photographs (e.g., location, bearing, focal length, time, and date) were recorded in the field to allow for an accurate representation of the photo geometry when modelling the Project components. Details of reference objects (landscape features such as trees, or objects added to the view such as flags) were also recorded to allow for the verification of camera geometry details (e.g., bearing and tilt). For each baseline viewpoint, the photos covered the complete Project activity zone (BC Hydro 2012), as visible from the baseline viewpoint, in a panoramic image. Baseline viewpoint site information is summarized in Table 27.6. Baseline viewpoints are also shown in Figure 27.2.
Table 27.6  Baseline Viewpoints

<table>
<thead>
<tr>
<th>Baseline Viewpoint</th>
<th>Location</th>
<th>VLI(^a) Viewpoint Type</th>
<th>Easting</th>
<th>Northing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fort St. John, End of 100th Street</td>
<td>N/A</td>
<td>633552.5</td>
<td>6231419.5</td>
</tr>
<tr>
<td>2</td>
<td>Old Fort</td>
<td>Major</td>
<td>634837.2</td>
<td>6230991.3</td>
</tr>
<tr>
<td>3</td>
<td>Old Hope Road</td>
<td>N/A</td>
<td>621933.5</td>
<td>6235825.9</td>
</tr>
<tr>
<td>4</td>
<td>Highway 29, overlooking Bear Flat</td>
<td>Minor</td>
<td>609732.4</td>
<td>6239206.8</td>
</tr>
<tr>
<td>5</td>
<td>Highway 29, overlooking Attachie</td>
<td>Major</td>
<td>598972.8</td>
<td>6233907.4</td>
</tr>
<tr>
<td>6</td>
<td>Highway 29, 5 km west of Attachie</td>
<td>Minor</td>
<td>591826.4</td>
<td>6228535.3</td>
</tr>
<tr>
<td>7</td>
<td>Highway 29, 8 km west of Attachie</td>
<td>Minor</td>
<td>589174.6</td>
<td>6227318.5</td>
</tr>
<tr>
<td>8</td>
<td>Highway 29, east of Farrell Creek</td>
<td>Minor</td>
<td>586559.3</td>
<td>6224175.3</td>
</tr>
<tr>
<td>9</td>
<td>Highway 29, west of Farrell Creek Bridge</td>
<td>Minor</td>
<td>575181.8</td>
<td>6219510.8</td>
</tr>
<tr>
<td>10</td>
<td>Hudson’s Hope, Canyon Drive</td>
<td>Major</td>
<td>566285.2</td>
<td>6209341.0</td>
</tr>
<tr>
<td>11</td>
<td>Highway 29, south of Hudson’s Hope</td>
<td>N/A</td>
<td>565071.8</td>
<td>6203757.5</td>
</tr>
<tr>
<td>12</td>
<td>Hudson’s Hope, Peace Canyon Road</td>
<td>Major</td>
<td>563000.1</td>
<td>6205142.8</td>
</tr>
</tbody>
</table>

NOTE:
\(^a\) VLI – Visual Landscape Inventory: Procedures and Standards Manual (BCMF 1997)

27.3.3  Baseline Methodology

A GIS-based visibility analysis was conducted to determine which potential receptor sites and areas in the LAA would have a line of sight to the Project. Separate analyses were conducted for the Site C dam site, the Site C reservoir, and the transmission line. The visibility analysis used Digital Terrain Models or Digital Surface Models to calculate potential lines of sight. A 1 m resolution full feature Light Detection and Ranging Digital Surface Model was used for the Peace River valley, and a 20 m resolution Digital Terrain Model (NTDB 2012) was used for the remainder of the LAA. Digital Surface Models allow for the calculation of a Zone of Visual Influence, while Digital Terrain Models result in a Zone of Theoretical Visibility.

The Zone of Visual Influence is the area from which the Project components are predicted to be visible based on the analysis of a Digital Surface Model. A Digital Surface Model includes topography, as well as all natural and anthropogenic structures, and can therefore be used, together with Project components modelled in three dimensions, to predict visibility. Grid-based Digital Surface Models derived from Light Detection and Ranging full-feature data with a standard resolution and accuracy (1 m grid cell resolution and 0.25 m vertical accuracy) have been found to predict visibility with more than 90% accuracy (Berry 2004).

While allowing for a relatively accurate prediction of visibility from the surface, Zone of Visual Influence analysis based on Digital Surface Models alone tends to overestimate the area in which potential receptors may be affected by a project, since the results include surface areas such as building roofs and tree canopies that are not generally accessible. Thus, the analysis might predict a Project to be visible from the top of the tree canopies of a forest, but observers standing on the ground would find their views blocked by the trees. To account for these overestimations, areas of the Digital Surface Model with structures of sufficient height to block the lines of sight of an observer located within these structures are removed from the Zone of Visual Influence.
In some cases, natural and anthropogenic structures on the topography that are included might not actually block lines of sight. Examples include single trees or small clumps of trees that allow for lines of sight under or through their canopies. In such cases, the analysis has the potential to underestimate visibility.

The Zone of Theoretical Visibility is the area from which the Project components may theoretically be visible. The Zone of Theoretical Visibility is derived by taking into account the screening afforded by landforms and major vegetated areas. Using a Digital Terrain Model representing the topography of the area, Project components modelled in three dimensions and the heights of major vegetated areas are used as input. Vegetation heights were obtained from the Vegetation Resources Inventory (B.C. Ministry of Forests, Lands and Natural Resource Operations 2012b). The results represent a worst-case scenario, depicting a bare ground situation that takes into account only major visual barriers created by landforms or major vegetated areas.

Zone of Theoretical Visibility analysis tends to overestimate visibility for a different reason than that estimated by Zone of Visual Influence analysis. In reality, considerable screening at eye level is afforded by additional intervening vegetation, buildings, and structures, particularly those adjacent to the Project site and to potential receptors. For areas with little vegetation and few built structures, visibility overestimation is low. For more complex landscapes, the Zone of Theoretical Visibility analysis has been found to overestimate visibility by up to 50% (Berry 2004). The accuracy of the Zone of Theoretical Visibility analysis is influenced by the accuracy and resolution of the input Digital Terrain Model as well as the GIS algorithms used. The influence of Digital Terrain Model accuracy on the accuracy of the analysis results is considered to be larger than the influence of resolution (Dodd 2001; Riggs and Dean 2007). For Digital Terrain Models of a resolution of 10 m or less, the influence of increased resolution on the accuracy of visibility prediction has been shown to be minimal (Kedzior 2007).

The results of the visibility analyses were used in the effects assessment to determine which parts of the LAA are predicted to have a line of sight to the Project; these results are shown in Figure 27.3.

### 27.3.4 Effects Assessment Methodology

In order to assess Project effects on visual resources in consideration of all anthropogenic disturbances, the Visual Impact Assessment Guidebook (B.C. Ministry of Forests, Lands and Natural Resource Operations 2001) was used as a framework, and the methodology was updated to suit the Project as the Guidebook was written to address visual impacts of forestry activities only. To determine the effect on visual resources two key indicators, the changes in visibility from receptor sites and changes to scenic values, were assessed. To support the assessment of changes to scenic values, additional visual disturbances introduced by the Project to Visually Sensitive Areas (where the Project falls within such areas) were considered. Specifically, the total amount of anthropogenic visible Project disturbances in the affected Visually Sensitive Areas, including both baseline disturbances (recorded in the Existing Visual Conditions) and Project disturbances, were compared against the established visual quality objectives.

The visual quality objectives established by the Visual Landscape Inventory represent a management goal against which potential changes to the visual landscape are measured. One of five established visual quality objectives (EVQO) is assigned to every Visually Sensitive Area (the established visual quality objectives rating corresponds to...
the first five levels of the Existing Visual Conditions rating). For every established visual quality objectives rating, an acceptable level of visual disturbances is defined. Where this level of disturbance is not exceeded, the management goal is considered to be reached. Table 27.7 lists the established visual quality objectives and the associated amount of acceptable disturbance.

### Table 27.7 Established Visual Quality Objectives (EVQO) Rating and Acceptable Disturbance

<table>
<thead>
<tr>
<th>EVQO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preservation</td>
<td>No visible anthropogenic disturbances</td>
</tr>
<tr>
<td>Retention</td>
<td>Anthropogenic disturbances, if visible, are difficult to perceive</td>
</tr>
<tr>
<td>Partial Retention</td>
<td>Anthropogenic disturbances may be visible, but do not dominate</td>
</tr>
<tr>
<td>Modification</td>
<td>Anthropogenic disturbances may be visible and may dominate in the short term</td>
</tr>
<tr>
<td>Maximum Modification</td>
<td>Anthropogenic disturbances may dominate</td>
</tr>
</tbody>
</table>

**NOTE:**
Source: BCMOF 2001

Among the baseline viewpoints (see Section 27.3.2) that would have a line of sight to Project components, receptor sites for the effects assessment were selected. The receptor sites include representative views of the baseline landscape (including Visually Sensitive Areas), as well as the Project components. Artist renderings based on photomontages of the Project were prepared for each receptor site. The renderings supported the subsequent assessment as to whether the established visual quality objectives for the affected Visually Sensitive Areas were met. Where receptor sites for affected Visually Sensitive Areas do not exist, the assessment was based on the Project description. Where Project components are located within a Visually Sensitive Area and the established visual quality objectives are not met, scenic value is considered to be lowered by the Project.

The results of the visibility analysis – including how much of the land in the LAA would have lines of sight to individual Project components and what receptor sites the Project would be visible from – were used as supporting criteria to determine the magnitude of effect on visual resources.

Artist renderings were based on photomontages, which are composite images that superimpose rendered Project components over photos taken in the field. The Project components, which were modelled in a software called Visual Nature Studio, were based on the data provided by BC Hydro and included the Site C reservoir, areas likely to experience erosion, the realignment of Highway 29, and proposed bridges and causeways. The modelled and rendered Project components were superimposed over the photos and then artistically enhanced to look more realistic. Features blocking the view towards the Project (e.g., terrain or trees) were identified, reintroduced into the photo, and placed over the Project components. Panoramic images were created by combining several photomontages.

### 27.4 Baseline Conditions

The majority of the LAA is located within the boreal plains and reaches into the foothills of the Rocky Mountains in the southwest. Flat or gently undulating topography dominates large parts of the LAA. Prominent hills are found in the southwest, with Portage
Mountain (located 1 km west of the LAA) being one of the most noticeable topographical features (see Figure 27.2). The Rocky Mountains and foothills are increasingly visible as a backdrop west of the LAA. The valleys of the Peace River, Halfway River, Pine River, and various smaller creeks are cut into the plains. Within and on the edge of the valleys, slopes and steep bluffs dominate the views. Agricultural and urban uses determine the character of the landscape around Fort St. John and Charlie Lake. Open agricultural land and forested areas with fewer and smaller settlements are found on the plains north of the Peace River valley. On the plains south of the valley, the landscape is mainly dense forest.

The valley of the Peace River is approximately 3 km wide and, in most locations, situated approximately 60 m below the surrounding plain. The valley widens at the confluence with tributaries, including at Bear Flat and Attachie. Moderate to steep slopes form the sides of the valley. The southern slopes are almost entirely forested, with the exception of occasional rock outcrops and steeper eroded cliffs. The northern slopes are a mixture of wood and grasslands. Rock outcrops and cliffs are common. At the bottom of the valley, woodlands and agricultural lands can be found, with the latter covering most of the wider areas.

Highway 29 stretches along the Peace River within and above the valley. Smaller access roads and active farms are found throughout the valley. The town of Hudson’s Hope is located in the river valley at the southwestern end of the LAA. Approximately 5.5 km southwest of the town, Highway 29 crosses the river on a suspension bridge. Peace Canyon Dam, a hydroelectric power plant and the reservoir created by the dam (Dinosaur Reservoir) are situated approximately 900 m upstream of the bridge. Transmission lines cross the Peace River between the Peace Canyon Dam and the Highway 29 suspension bridge.

The level of anthropogenic disturbance in the LAA reflects a landscape with multiple historically developed uses, including urban and industrial uses around Fort St. John; residential uses around Charlie Lake and Hudson’s Hope; agricultural use; forestry, oil, and gas activity; and an existing hydroelectric plant and reservoir. Larger infrastructure features in the LAA include the Highway 97 and the North Peace Regional airport. There are numerous smaller access roads serving residences and agricultural land as well as forestry, oil, and gas activity.

Within the Visually Sensitive Areas, levels of disturbance vary. The Existing Visual Conditions range between “excessively modified” and “preserved”, encompassing the full range of Existing Visual Conditions ratings. The ratings for the Visually Sensitive Areas on the southern slopes of the Peace River valley, with the exception of the area around the Highway 29 bridge southwest of Hudson’s Hope, range between “retained” and “preserved”.

Due to the character of the landscape in the LAA, the areas of higher scenic value are found within the river valleys. Accordingly, the Visual Landscape Inventory determines Visually Sensitive Areas primarily on the southern slopes of the Peace River valley, as seen from Highway 29. The Visual Landscape Inventory also defines the valleys of the Halfway River and Pine River as visually sensitive. Other smaller areas of sensitive landscape can be found on the slopes of the foothills southwest of Hudson’s Hope, for example, on Portage Mountain.
The established visual quality objectives for the Visually Sensitive Areas within the LAA generally range between “modification” and “preservation”. The ratings for the Visually Sensitive Area on the southern slopes of the Peace River valley range between “partial retention” and “preservation”. Figure 27.3 shows the established visual quality objectives within the LAA. Figure 27.2 shows the Visually Sensitive Areas within the LAA and their Existing Visual Conditions.

Figure 27.3 shows the five receptor sites that were selected as representative of the visual landscape in the Peace River valley. Photographs from the receptor sites showing the river valley and its southern slopes are in Figures 27.4 to 27.8.

27.5 Effects Assessment

Potential effects on visual resources are assessed by taking into account the predicted changes to visual resources in consideration of:

• Visibility of Project components from selected receptor sites

• Predicted scenic values using photomontages and assessed according to the Visual Impact Assessment Guidebook (BCMOF 2001)

In the following sections, these key indicators are assessed together for each Project component for the construction and operation phases of the Project.

27.5.1 Construction Effects on Visual Resources

27.5.1.1 Site C Dam and Generating Station

The construction site, including facilities of various scales and types as well as modifications to landforms during construction, would be visible against the natural topography and vegetation of the Peace River valley. Assessment results indicate that the Site C dam would be visible from approximately 1,047 ha (area with a line of sight) within the LAA (Figure 27.3). This analysis takes into account the height of the Site C dam. Areas with a line of sight would be located on the south and north slopes of the Peace River valley approximately 10 km upstream and 10 km downstream from the Site C dam site. Agricultural lands and rural properties around Old Hope Road, approximately 10 km to the northwest of the Site C dam site, would also have a line of sight. The Site C dam would not be visible from the communities of Fort St. John, Charlie Lake, or Old Fort. However, other project components on the Site C dam site, such as access roads and the substation, may be visible from areas in Fort St. John and Old Fort.

There are no receptor sites that would have a line of sight to the Site C dam. However, if the site was viewed within the context of the Visually Sensitive Areas in the river valley, the visible disturbances due to construction of the Site C dam and generating station would be rated as acceptable for an established visual quality objective of “modification”, since these disturbances would dominate the views in the short term. The Visually Sensitive Areas on the slopes of the Peace River valley have established visual quality objectives higher (allowing for less disturbance) than “modification” (ranging between “partial retention” and “preservation”); therefore, the acceptable amount of disturbance (see definition in Table 27.7) would be exceeded. Due to this exceedance, scenic values are considered to be lowered, resulting in a predicted Project effect on visual resources.
27.5.1.2 Site C Reservoir Preparation – Vegetation Clearing

During the vegetation clearing for the Site C reservoir, portions of the Site C reservoir area (low-growing and non-merchantable vegetation) would remain largely undisturbed, and the outlines of the cuts would primarily follow the natural topography. However, the cleared areas would be noticeable as anthropogenic disturbances. Assessment results show that the cleared areas would be visible from approximately 7,618 ha (area with a line of sight) within the LAA (Figure 27.3). Areas with a line of sight would be located on the south and north slopes of the Peace River valley as well as on the slopes of the flooded tributaries of the Peace River. Other locations with a view of the cleared areas would include the open agricultural lands in Bear Flat and Attachie. Where Highway 29 overlooks the river valley, there would be lines of sight to the cleared areas. The Site C reservoir would not be visible from the communities of Fort St. John, Charlie Lake, or Old Fort, but it would be visible from Hudson’s Hope.

The affected views would include receptor sites 1 to 5 along Highway 29 looking towards the southern slopes of the valley. Figure 27.4 to Figure 27.8 show the Site C reservoir during the construction phase as seen from these receptor sites.

The resulting visible disturbances from Site C reservoir clearing would be rated as acceptable for an established visual quality objective of “modification” for all receptor sites, since they would dominate the views in the short term. Since the Visually Sensitive Areas on the southern slopes of the Peace River valley have established visual quality objectives higher than “modification” (ranging between “partial retention” and “preservation”), the acceptable amount of disturbance would be exceeded. Due to this exceedance, scenic values are considered to be lowered, resulting in a predicted Project effect on visual resources.

27.5.1.3 Site C Reservoir Preparation – Hudson’s Hope Shoreline Protection

Hudson’s Hope shoreline protection (see Volume 1 Section 4 Project Description), approximately 2.6 km long and 7 m wide, would be constructed along the Site C reservoir shoreline approximately 30 m below the community of Hudson’s Hope. The construction would include shoreline preparation, including removal of vegetation from approximately 9 ha along the north bank of the Peace River. The Hudson’s Hope shoreline protection would be noticeable as an anthropogenic modification to the existing natural landforms from the Site C reservoir, but would not be visible from Hudson’s Hope. Because the Hudson’s Hope shoreline protection would not be located in a Visually Sensitive Area and would not be visible from a receptor site, no Project effect on visual resources is predicted.

27.5.1.4 Site C Reservoir Filling

The Site C reservoir would replace the existing river, including a variety of islands and river channels, with a large homogenous water body. This effect could be considered either positive or negative by stakeholders, depending on the values placed on the existing river valley landscape. Figures 27.4 to 27.8 show the Site C reservoir as seen from receptor sites 1 to 5 in the early years of operation.

27.5.1.5 Transmission System

The commencement of construction of the transmission line will add visual features to the landscape. The transmission line would be visible from the Site C dam site on the
southern slopes of the Peace River valley and where it crosses the river immediately
south of the Peace Canyon Dam. The transmission line would also be visible from
Highway 29 where it crosses the right-of-way approximately 12 km southwest of
Hudson’s Hope.

For most of its length (approximately 90%), the transmission line would run through
forested areas, with the trees blocking views of the transmission towers and conductors.
The transmission line would pass through six Visually Sensitive Areas. Near the Site C
dam site, it would be located in a Visually Sensitive Area with an established visual
quality objective of "partial retention". It would also affect an area with an established
visual quality objective of "modification" where it crosses the Moberly River valley,
two Visually Sensitive Areas with an established visual quality objective of "partial
retention", and one Visually Sensitive Area with an established visual quality objective of
"retention" on the slopes of the Peace River valley south of Hudson’s Hope. The visible
disturbances due to transmission line construction would be rated as acceptable for an
established visual quality objective of "partial retention" since the disturbances would be
visible, but would not dominate the view of the Visually Sensitive Area. The acceptable
amount of disturbance would therefore be exceeded in at least one of the Visually
Sensitive Areas. Due to this exceedance, scenic values are considered to be lowered,
resulting in a predicted Project effect.

27.5.1.6 Highway 29 Realignment

The potentially affected views include the south and north slopes of the Peace River
valley and the open agricultural lands adjacent to the realignments, as well as locations
along Highway 29 looking down from high points towards Bear Flat and Attachie. These
targets are represented by receptor sites 1 and 2 (Figures 27.4 and 27.5).

The visible disturbances resulting from the Highway 29 realignment would be rated as
acceptable for an established visual quality objective of "partial retention" for both
receptor sites 1 and 2 since they would be visible, but would not dominate the views.
The realignment would affect only two Visually Sensitive Areas on the north shore of the
Peace River. One Visually Sensitive Area is located between Farrell Creek and
Hudson’s Hope with an established visual quality objective set to "modification". The
other Visually Sensitive Area stretches from Farrell Creek east along the north shore of
the Peace River to the Site C dam site and beyond. This Visually Sensitive Area has an
established visual quality objective set to "preservation". The acceptable amount of
disturbance would therefore be exceeded in at least one of the Visually Sensitive Areas.
Due to this exceedance, scenic values are considered to be lowered, resulting in a
predicted Project effect.

27.5.1.7 Quarried and Excavated Materials

Temporary riprap material required for Site C dam construction would be sourced from
an existing quarry northeast of Fort St. John (Wuthrich Site), which would be expanded
to accommodate Project needs. Permanent riprap is expected to be sourced from an
existing quarry 75 km southwest of Chetwynd (West Pine Quarry), which would also be
expanded. Till for the construction of the core of the earthfill Site C dam would be
sourced from a site south of Fort St. John known as the 85th Avenue Industrial Lands.
Construction materials would also be sourced from a site on the eastern slopes of
Portage Mountain (Portage Mountain Quarry), a site west of the intersection of upper
Jackfish Lake Road and the transmission right-of-way (Del Rio Pit) and, as required, on
the south side of the Peace River near Taylor (Area E). All sites would require clearing of
vegetation, removal of material, and potentially stockpiling of excess material. Portage
Mountain Quarry, West Pine Quarry, and Area E would be located within Visually
Sensitive Areas. The resulting visible disturbances would be rated as acceptable for an
established visual quality objective of “modification”, since they could dominate the views
in the short term. Since the affected Visually Sensitive Areas have established visual
quality objectives of ranging between “modification” and “partial retention”, the
acceptable amount of disturbance would be exceeded in at all sites. Due to this
exceedance, scenic values are considered to be lowered, resulting in a predicted Project
effect.

27.5.1.8 Construction Access Road Development

Existing roads on the north bank of the Peace River would be improved to provide
access to the Site C dam and generating station. On the south bank, Jackfish Lake
Road would be extended to the site along the Project access road. Temporary access
roads would also be required for the construction of the transmission line, Site C
reservoir preparation, and material source development.

The resulting visible disturbances from the construction of access roads would be rated
as acceptable for an established visual quality objective of “partial retention” for all
receptor sites since they would be visible, but would not dominate the views. Since some
of the affected Visually Sensitive Areas in the Peace River valley have established visual
quality objectives higher (allowing for less disturbance) than “partial retention”, the
acceptable amount of disturbance would be exceeded. Due to this exceedance, scenic
values are considered to be lowered, resulting in a predicted Project effect on visual
resources.

27.5.1.9 Worker Accommodation

Potential effects of worker accommodation for the Site C dam site on visual quality are
included in the assessment of the Site C dam and generating station (Section 27.5.1.1).
Two other small-scale camps may be located in the LAA, the regional housing southern
site in the vicinity of the upper Jackfish Lake Road area (north of Chetwynd) and the
regional housing northern site in the vicinity of Hudson's Hope. Exact camp locations
have not been determined; however, both sites would require clearing and grading, and
may house RV spaces and prefabricated camp units. Because it is not known whether
the regional worker accommodation would be located in a Visually Sensitive Area, it is
not possible to determine visibility from a receptor site; therefore, a Project effect on
visual resources cannot be predicted.

27.5.2 Effects of Operations on Visual Resources

27.5.2.1 Site C Dam and Generating Station

The Site C dam would have a visible gravel surface (matching the existing river gravel)
on the downstream side and riprap on the upstream side. The buttress, spillway, and
approach channel would have concrete surfaces. Other visible features would include
access roads, and auxiliary and administrative buildings. In scale, texture, and shape,
the Site C dam would stand out as a large industrial facility against the natural
topography and vegetation of the Peace River valley. The completed Site C dam would
be visible from approximately 1,047 ha (area with a line of sight) within the LAA (Figure 27.3). Areas with a line of sight would include the south and north slopes of the Peace River valley approximately 10 km upstream and 5 km downstream from the Site C dam site. Agricultural lands and rural properties around Old Hope Road approximately 10 km to the northwest of the site would also have a line of sight. The Site C dam would not be visible from the communities of Fort St. John, Charlie Lake, or Old Fort. However, other project components on the Site C dam site, such as access roads and the substation, may be visible from areas in Fort St. John and Old Fort.

There are no known receptor sites that would have a line of sight to the Site C dam site. However, if the site was viewed within the context of the Visually Sensitive Areas in the river valley, the resulting visible disturbances would likely be rated as acceptable for an established visual quality objective of “maximum modification”, since these disturbances would dominate the views. Because the Visually Sensitive Area on the slopes of the Peace River valley have established visual quality objectives higher than “modification” (ranging between “partial retention” and “preservation”), the acceptable amount of disturbance would be regarded as exceeded. Due to this exceedance, scenic values are considered to be lowered, resulting in a predicted Project effect of visual resources.

### 27.5.2.2 Site C Reservoir Operations

During Site C reservoir operations, erosion would be expected on the valley sides (Volume 2 Section 11.2 Geology, Terrain, and Soils), creating areas that could be perceived as anthropogenic disturbances. For the purpose of this assessment, it was assumed that not all areas within the erosion impact line (estimated erosion caused by the creation and operation of the reservoir over a period of 100 years) would appear eroded at the same time, as erosion progresses over time and some older eroded areas are successively revegetated. Furthermore, the natural context of the valley already shows visual evidence of progressive natural erosion.

Volume 2 Appendix B Geology, Terrain Stability, and Soil, Part 2 Preliminary Reservoir Impact Lines defines the 5-Year Beach Line as the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment of the Site C reservoir. This line is used to represent eroded areas after approximately five to 10 years of Site C reservoir operations, which has been described as the most active period of erosion after reservoir impoundment (see Figure 27.4 to Figure 27.8). While this scenario is included in the visual simulations to show erosion progression over time, for the purpose of this assessment, a scenario showing erosion within the erosion impact line is used (see Figure 1 to Figure 5 Reservoir Later Years of Operation in Volume 3 Appendix C Land and Resource Use Assessment Supporting Documentation, Part 6 Visual Resources Supporting Figures). Erosion disturbances within the erosion impact line would be expected to primarily occur within the Visually Sensitive Area on the southern slopes of the Peace River valley. The Site C reservoir and associated disturbances would be visible from approximately 7,618 ha within the LAA. Open areas (non-forested) on the slopes of the Peace River valley and on the slopes of the valleys of the flooded tributaries would have lines of sight to the Site C reservoir. Highway 29 would allow for expansive views of the Site C reservoir where it overlooks the valley. Views of the Site C reservoir outside the river valley would be limited to locations on the edge of the valley. The Site C reservoir would not be visible from the communities of Fort St. John, Charlie Lake, or Old Fort, but would be visible from the valley slopes above Hudson’s Hope.
The affected views would primarily include receptor sites 1 to 5 along Highway 29 looking towards the southern slopes of the valley (Figures 27.4 to 27.8).

The visible disturbances as a result of Site C reservoir operations would occur mainly due to erosion; however, it is acknowledged that erosion is a natural process that currently affects the Peace River valley (see baseline Figures 27.4 to 27.8). These visual disturbances would be rated as acceptable for established visual quality objectives between “maximum modification” and “partial retention” depending on the erosion patterns and receptor sites. Disturbances would be visible from all receptors sites and would dominate the views from receptor sites 1 and 2. Since the Visually Sensitive Areas on the southern slopes of the Peace River valley have established visual quality objectives ranging between “partial retention” and “preservation”, the acceptable amount of disturbance would be exceeded for Visually Sensitive Areas with established visual quality objectives of “retention” or “preservation” seen from receptor sites 1 and 2 (around Bear Flat and Attachie). Due to this exceedance, scenic values are considered to be lowered, resulting in a predicted Project effect of visual resources.

### 27.5.3 Mitigation Measures for Effects on Visual Resources

BC Hydro will implement the following mitigation measures to address potential Project effects on visual resources. These mitigation measures will address visibility of Project features from selected receptor sites as well as changes to scenic values.

- **Construction:**
  - Disturbed areas (from construction of Site C dam, generating station, and Site C reservoir; Highway 29 realignment; transmission line; temporary access roads) will be restored in accordance with the Project Soil Management, Site Restoration, and Revegetation Plan (Volume 5 Section 35 Summary of Proposed Environmental Management Plans)
  - The design of the Hudson’s Hope shoreline protection will consider options visually compatible with the natural landscape by adding cover soil and vegetation to the sides and top of the berm
  - Permanent Site C dam site buildings and other above-ground structures will be painted to blend in with the character of the surrounding environment where possible (some equipment will have specific high-visibility colour schemes due to safety requirements)
  - Where feasible, previously disturbed areas, or areas generally hidden from view, will be selected for the potential off-site workforce accommodation camps

### 27.6 Summary of Effects Assessment and Mitigation Measures

With the application of the above mitigation measures, there would be residual effects (due to predicted lower scenic values and Project visibility from receptor sites) during Project construction and operations, as summarized in Table 27.8.
1 Table 27.8 Project Effects and Mitigation Measures on Visual Resources

<table>
<thead>
<tr>
<th>Valued Component</th>
<th>Project Phase</th>
<th>Potential Effect</th>
<th>Mitigation Measures</th>
<th>Mitigation Effectiveness</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual resources</td>
<td>Construction</td>
<td>Changes to visual resources</td>
<td>After disturbance activities cease, disturbed surfaces in construction areas will be restored and re-vegetated in accordance with the Project Soil Management, Site Restoration, and Revegetation Plan. The shoreline protection in Hudson’s Hope will be naturally landscaped. Permanent Site C dam site buildings and other above-ground structures will be painted to blend in with the character of the surrounding environment where possible. Where feasible, previously disturbed areas, or areas generally hidden from view, will be selected for the potential off-site workforce accommodation camps.</td>
<td>The proposed measures are common in the mitigation of effects on visual resources and are likely to reduce (adverse) changes in scenic values. However, mitigation would be partial and residual effects would be expected.</td>
<td>BC Hydro and its contractors</td>
</tr>
<tr>
<td>Operations</td>
<td>Changes to visual resources</td>
<td>None proposed</td>
<td>Residual effects would be expected.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: N/A = not applicable

27.6.1 Other Mitigation Options Considered
There were no other mitigation measures considered by BC Hydro for effects on visual resources.

27.7 Residual Effects
27.7.1 Characterization of Residual Effects
The criteria to characterize residual effects to visual resources are described in Table 27.9.
Table 27.9  Characterization Criteria for Residual Visual Resources Effects

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
<th>Quantitative Measure or Definition of Qualitative Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
<td>The ultimate long-term trend of the visual resource effects</td>
<td><strong>Adverse:</strong> condition of the VC is worsening in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Positive:</strong> condition of the VC is improving in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Neutral:</strong> condition of the VC is unchanged in comparison to baseline conditions and trends</td>
</tr>
<tr>
<td>Magnitude</td>
<td>The amount of change in a key indicator or variable relative to baseline case</td>
<td><strong>Low:</strong> effect is such that the Project is visible from no receptor sites and scenic values are not lowered (i.e., acceptable amount of disturbance is not exceeded for any Visually Sensitive Area in the LAA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Moderate:</strong> effect is such that the Project is visible from receptor sites and scenic values are lowered (i.e., amount of acceptable visible disturbance is exceeded for one or more Visually Sensitive Areas), but the level of anthropogenic disturbance remains within the general (historical) level of existing visible disturbances in the LAA</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>High:</strong> effect is such that the Project is visible from receptor sites and scenic values are lowered (i.e., amount of acceptable visible disturbance is exceeded for one or more Visually Sensitive Areas) and the level of anthropogenic disturbance exceeds the general (historical) level of existing visible disturbances in the LAA</td>
</tr>
<tr>
<td>Geographical Extent</td>
<td>The geographic area in which visual resource effects occur</td>
<td><strong>Site-Specific:</strong> the expected measurable changes are localized to specific sites only</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Local:</strong> the expected measurable changes occur are within the LAA</td>
</tr>
<tr>
<td>Frequency</td>
<td>The number of times during a specific Project phase that visual resource effects may occur</td>
<td><strong>Once:</strong> occurs once</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Continuous:</strong> occurs on a regular basis and at regular intervals</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Sporadic:</strong> occurs rarely and at irregular intervals</td>
</tr>
<tr>
<td>Duration</td>
<td>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</td>
<td><strong>Short-term:</strong> effect is limited to &lt;1 year</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Medium-term:</strong> effect occurs &gt;1 year, but not beyond the construction of the Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Long-term:</strong> effect lasts beyond the construction phase and up to 10 years of the operations phase</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Far future:</strong> effect extends &gt;10 years for the life of the Project</td>
</tr>
<tr>
<td>Reversibility</td>
<td>The degree or likelihood to which existing baseline conditions can be regained after the factors causing the effect are removed</td>
<td><strong>Effect reversible</strong> with reclamation and/or over time</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Effect irreversible</strong> and cannot be reversed with reclamation and/or over time</td>
</tr>
</tbody>
</table>
### Criterion Description Quantitative Measure or Definition of Qualitative Categories

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
<th>Quantitative Measure or Definition of Qualitative Categories</th>
</tr>
</thead>
</table>
| Ecological and Social Context | The extent to which the area within which an effect may occur has already been adversely affected by human activities | **Disturbed**: area has been previously disturbed by human development or human development is still present  
**Undisturbed**: area relatively pristine or not adversely affected by human activity |
| Level of Confidence       | Scientific certainty one has in the review of project-specific data, relevant literature, and professional opinion | **Low**: assessment based on professional judgment and experience, but hampered by incomplete understanding of cause-effect relationships and or lack of data  
**Moderate**: assessment based on professional judgment and experience, including a reasonable understanding of cause-effect relationships and adequate data  
**High**: assessment based on professional judgment and experience, including a good understanding of cause-effect relationships and ample data |
| Probability               | The likelihood that an adverse effect will occur                            | **Low**: effect is unlikely to occur  
**High**: effect is almost certain to occur  
**Unknown**: likelihood is unknown |

The Project is predicted to be visible from receptor sites and to lower scenic values in some areas through an increase to the amount of visible anthropogenic disturbances in relation to base conditions during construction and operations. Change in the visible landscape from a river valley to a reservoir could be considered either a positive or negative change by stakeholders, depending on the values placed on the existing river valley landscape.

For the construction phase, the magnitude of effect (all Project components considered) is rated as moderate since the Project is predicted to be visible from receptor sites and scenic values are predicted to be lowered (i.e., visible disturbance would exceed the established visual quality objective for one or more Visually Sensitive Area), but the level of anthropogenic disturbances would not exceed the general (historical) level of visible disturbances in the LAA (see Section 27.4). The Peace River valley and the LAA have been exposed to a range of visible anthropogenic disturbances, including changes resulting from one other similar hydroelectric power plant (Peace Canyon Dam) and reservoir (Dinosaur Reservoir). The geographic extent of the effect is the LAA and therefore is considered local. The direction of the effect is considered adverse, as the level of anthropogenic disturbances is predicted to increase. The duration of effect would be medium term during construction. The effects would be irreversible, as the Site C reservoir, Site C dam site, Highway 29 realignment, and transmission line represent a permanent change to the visual landscape.

For the operations phase, the magnitude of effect (all Project components considered) is rated as moderate since the Project is predicted to be visible from receptor sites and scenic values are predicted to be lowered (i.e., visible disturbance would exceed the established visual quality objective for one or more Visually Sensitive Area), but the level of anthropogenic disturbances would not exceed the general (historical) level of visible disturbances in the LAA (see Section 27.4). The geographic extent of the effect is the LAA and therefore is considered local. The direction of the effect is considered adverse, as the level of anthropogenic disturbances is predicted to increase. The duration of...
effect would be long term during operations. The effects would be irreversible, as the
Site C reservoir and Site C dam site represent a permanent change to the visual
landscape.

For both the construction and operations phases, the capacity of the visual landscape to
accept change (context) is rated as disturbed, since a considerable amount of visible
anthropogenic disturbance already exists within other parts of the LAA, including the
Peace River valley (see Section 27.4 and Volume 1 Section 4 Project Description).

The degree of confidence in this assessment is moderate for the following reasons:

• Baseline landscape conditions are adequately characterized by the Visual
Landscape Inventory: Procedures and Standards Manual (B.C. Ministry of Forests,
Lands and Natural Resource Operations 1997) and the photo survey undertaken in
May 2012

• Modelling processes, such as visibility analysis and representation of anticipated
changes in the visible landscape through visual simulations, are well understood

• The B.C. Ministry of Forests, Lands and Natural Resource Operations’ assessment
approach for visual resources has been successfully used in numerous
environmental assessments in B.C.

• There is uncertainty in the prediction of stakeholders’ perceptions of effects on visual
resources

A summary of residual effects is outlined in Table 27.10.
Table 27.10  Characterization of Residual Visual Resources Effects

<table>
<thead>
<tr>
<th>Activity</th>
<th>Effect</th>
<th>Direction</th>
<th>Magnitude</th>
<th>Geographic Extent</th>
<th>Duration</th>
<th>Frequency</th>
<th>Reversibility</th>
<th>Context</th>
<th>Probability</th>
<th>Level of Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Changes to visual resources</td>
<td>Adverse</td>
<td>Moderate</td>
<td>Local</td>
<td>Medium Term</td>
<td>Continuous</td>
<td>Irreversible</td>
<td>Disturbed</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Operations</td>
<td>Changes to visual resources (shoreline erosion)</td>
<td>Adverse</td>
<td>Moderate</td>
<td>Local</td>
<td>Far future</td>
<td>Continuous</td>
<td>Irreversible</td>
<td>Disturbed</td>
<td>High</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
27.7.2 Standards of Thresholds for Determining Significance

The general level of existing visible disturbances in the LAA and all of the residual effects criteria were taken into consideration in the determination of significance, as described above in Section 27.7.1. Particular consideration was given to magnitude, duration, and frequency as the relevant criteria for determining significance. These criteria primarily determine how area users would experience the Project. Since visual resources are considered in the context of human perception of aesthetics, the experience of the visual landscape by observers is a key element of the assessment. Together, magnitude, duration, and frequency measure how much the Project would change the visible landscape and whether it would be a permanent change.

Social context and the general level of existing disturbances were also considered, as they provide an understanding of the existing visual environment and of the ability of and readiness for people and communities to adapt to changes in the visual landscape. Residual effects would be identified as significant if effects were rated as high magnitude, combined with long term in duration and continuous in frequency, and if the level of introduced visible disturbances would exceed the general level of existing visible disturbances in the LAA.

27.7.3 Determination of Significance of Residual Effects

While the effects of the Project are rated as long-term duration and high frequency, they are not rated a high magnitude, and are not predicted to exceed the general (historical) level of existing visible anthropogenic disturbances (including industrial developments) in the LAA. In addition, the social context illustrates an environment that has been previously disturbed by human development (as opposed to a pristine environment). Effects on visual resources are therefore not considered significant.

Table 27.11 summarizes the significance of residual effects.
### Table 27.11 Summary of Assessment of Potential Significant Residual Adverse Effects

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Potential Adverse Effect</th>
<th>Key Mitigation Measures</th>
<th>Significance Analysis of Residual Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Changes to visual resources</td>
<td>After disturbance activities cease, disturbed surfaces in construction areas will be restored and revegetated in accordance with the Project Soil Management, Site Restoration, and Revegetation Plan. The Shoreline Protection in Hudson's Hope will be naturally landscaped. Permanent Site C dam site buildings and other above-ground structures will be painted to blend in with the character of the surrounding environment where possible. Where feasible, previously disturbed areas, or areas generally hidden from view, will be selected for the potential off-site workforce accommodation camps.</td>
<td>Not significant</td>
</tr>
<tr>
<td>Operations and maintenance</td>
<td>Changes to visual resources (shoreline erosion)</td>
<td>N/A</td>
<td>Not significant</td>
</tr>
</tbody>
</table>

**NOTE:**
N/A = not applicable

### 27.8 Cumulative Effects Assessment

#### 27.8.1 Screening of Cumulative Effects

A screening of the Project’s potential contribution to the cumulative effects of past, current, and announced future Projects was done per the procedures described in Volume 2 Section 10 Effects Assessment Methodology. The potential residual adverse effects of the Project on visual resources include increases in the amount of visible anthropogenic disturbances in relation to base conditions during the construction and operations phases. Other projects 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 are listed in Table 27.12.
### Table 27.12 Potential Cumulative Effects to Visual Resources

<table>
<thead>
<tr>
<th>Site C Clean Energy Project Residual Effect</th>
<th>Other Project</th>
<th>Description of Project</th>
<th>Potential Overlap with Site C</th>
<th>Potential Cumulative Effect Interaction with Visual Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in the amount of visible anthropogenic disturbances</td>
<td>Spectra Energy Transmission North 2012 expansion</td>
<td>Expansion facilities of the west coast pipeline system to provide incremental firm transmission service from receipt points along the Fort Nelson mainline to the NOVA Gas Transmission Groundbirch pipeline within the Montney formation, 6 km north of Dinosaur Lake</td>
<td>After construction is completed, minimal visible disturbances are expected</td>
<td>No</td>
</tr>
<tr>
<td>Montney Gas Play</td>
<td>Shale rock deposit containing large quantities of natural gas; a high level of shale gas exploration and drilling activities are expected</td>
<td>Exploration and drilling activity will increase the amount of visible anthropogenic disturbances</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Land Tenure</td>
<td>Applications for oil, gas, water, range, and other land tenures Forest harvest plans</td>
<td>Land use activities will increase the amount of visible anthropogenic disturbances</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

The Montney Gas Play Project and land tenure applications are expected to affect visual resources in the RAA. Assessment of the cumulative effects of changes in visual resources is included in the sections below.

#### 27.8.2 Description of Cumulative Effects

Increased exploration and drilling activity associated with the Montney Gas Play in the RAA would likely introduce additional visible anthropogenic disturbances in the landscape throughout the RAA. This would include short-term disturbances such as the placement of temporary drilling equipment (rigs) and long-term changes such as clearing of vegetation and the construction of well pads and access roads. Activities associated with the Montney Gas Play are expected to be present in the long term.

Applications for Land Act tenures, new oil and gas facilities and forestry harvest plans and tenures would partially overlap spatially with the RAA. These activities would represent a continuation and, potentially an expansion, of existing land use activities (oil and gas exploration, forestry, and grazing) and would likely introduce additional visible anthropogenic disturbances in the landscape. These activities are expected to be present in the long term.
27.8.3 Cumulative Effects Mitigation Measures

It is assumed that proponents of exploration and drilling activities will minimize visual disturbances by entering road use agreements with other operators in the area.

27.8.4 Residual Cumulative Effects

Residual cumulative effects would be expected. The Project, together with other projects expected to occur in the RAA (as listed in Table 27.12), is predicted to increase the amount of visible anthropogenic disturbances in relation to base conditions.

27.8.5 Characterization of Residual Cumulative Effects

For both construction and operations, the magnitude of effect is rated as moderate since the amount of introduced visible disturbance would not exceed the general level of visible disturbances in the RAA. Changes would be considered within historical norms based on the Peace River valley and the RAA having been exposed to a range of visible anthropogenic disturbances, including changes resulting from one other similar hydroelectric power plant and oil and gas development. The geographic extent of the effect is the RAA and therefore is considered local.

The duration of effect would be medium term during construction and long term during operations.

The capacity of the visual landscape to accept change (context) is rated as medium, since a considerable amount of visible anthropogenic disturbance already exists within other parts of the RAA (similar extent as LAA), including the Peace River valley. With this existing context, some additional disturbances could be accommodated without changing the overall character of the visual landscape.

The probability of the effect to occur is rated high. Due to the lack of data regarding footprints and layouts of the reasonably foreseeable projects, the level of confidence in estimating this cumulative effect is low.

Residual cumulative effects on visual resources are summarized in Table 27.13.
### Table 27.13 Characterization of Residual Visual Cumulative Effects

<table>
<thead>
<tr>
<th>Activity</th>
<th>Effect</th>
<th>Direction</th>
<th>Magnitude</th>
<th>Geographic Extent</th>
<th>Duration</th>
<th>Frequency</th>
<th>Reversibility</th>
<th>Context</th>
<th>Probability</th>
<th>Level of Confidence</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Changes to visual resources</td>
<td>Adverse</td>
<td>Moderate</td>
<td>Local</td>
<td>Short Term</td>
<td>Continuous</td>
<td>Irreversible</td>
<td>Disturbed</td>
<td>High</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Operations</td>
<td>Changes to visual resources (shoreline erosion)</td>
<td>Adverse</td>
<td>Moderate</td>
<td>Local</td>
<td>Long Term</td>
<td>Continuous</td>
<td>Irreversible</td>
<td>Disturbed</td>
<td>High</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>
27.8.6 Determination of Significance of Residual Cumulative Effects

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.

27.9 Monitoring and Follow-Up

No monitoring or follow-up programs are proposed for visual resources.
References

Literature Cited


Internet Sites

