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4.11 Transportation

The Project will increase traffic in the LSA during construction and operations. Traffic is a VEC for the purposes of the EIA to meet the requirements of the Terms of Reference.

4.11.1 Boundaries

4.11.1.1 Spatial Boundaries

The transportation analysis addresses the Project’s effects on Control Section (CS) 68 of Highway 2, which is between Highway 49 at Rycroft and Highway 64 southwest of Fairview, and which includes the Dunvegan Bridge crossing of the Peace River near the Project. This section of Highway 2 is in the Municipal District (MD) of Fairview, Birch Hills County and the County of Grande Prairie. The northern portion of this section of highway will be used by traffic traveling south to the project site from the Town of Fairview, while the southern portion will be used by traffic traveling north from the City of Grande Prairie.

The analysis also includes the access roads to the Project on the north and south sides of the Peace River to the west of Highway 2, which link the project site to the highway. All project traffic traveling from the access road on the south side of the project site to the access road on the north side will cross the Peace River by Highway 2 and the Dunvegan Bridge. The access roads are in the MD of Fairview and the counties of Saddle Hills and Birch Hills.

Finally, the analysis addresses the Project’s effect on the Shaftesbury ferry and ice bridge crossing, where Highway 740 crosses the Peace River. The Shaftesbury crossing is at the boundaries of the MD of Peace No. 135 and Birch Hills County.

4.11.1.2 Temporal Boundaries

During construction, all project-related effects on transportation activities will occur during a three-year construction period and will therefore be temporary. During operations, project-related transportation effects will occur during the 100-year life of the Project. Given the length of this period, the transportation effects of the Project during operations are considered to be permanent. Transportation effects from upset events and accidental incidents could occur at anytime throughout the life of the Project. If and when such events do occur, they are expected to be temporary.

4.11.1.3 Administrative Boundaries

Highway 2 is maintained by the Province of Alberta. The access roads on the north and south sides of the Peace River, which link the project site to Highway 2, cross both privately owned and Crown Land. The public portions of the access roads are maintained by the local municipalities, while the private portions are maintained by the local landowners. The ferry and ice bridge at Shaftesbury are maintained by the Province of Alberta.
4.11.4 Technical Boundaries

Traffic volumes on the section of Highway 2 that provides access to the project site (CS 68) are based on counts at a point on the highway approximately 10 km south of the Dunvegan Bridge. Since the traffic volumes recorded at that point are comparable to volumes recorded at a point on the highway approximately 10 km to the north of the bridge, they provide a good indication of Highway 2 traffic volumes near the project site. The traffic volume and collision data is from Alberta Infrastructure and Transportation (AIT, Internet site).

4.11.2 Description of Existing Conditions

4.11.2.1 Site Access

The proposed project site is approximately 2 km west of the Dunvegan Bridge where Highway 2 crosses the Peace River. Highway 2 is a paved two-lane highway that connects the northern and southern halves of the Province of Alberta. As the highway approaches to bridge in the Peace River valley, it widens into three lanes to permit traffic climbing up out of the valley to pass slow-moving vehicles. On both the north and south sides of the river, the highway approaches to the bridge involve substantial curves.

On the north side of the Peace River, the project site is linked to Highway 2 by a road that is on a combination of titled land, Crown Land, and municipal road allowances. This road passes through Maples park. On the south side of the river, the project site is linked to Highway 2 by a road that is on a combination of titled and Crown Land. These roads are used by local landowners year-round and by recreational users and tourists visiting the Dunvegan area and using the Peace River for recreational activities from April to October. The access road on the south side of the river is currently used by recreation users wishing to gain access to a boat ramp.

4.11.2.2 Traffic Volumes on Highway 2

Table 4.11-1 presents traffic volumes from 2000 to 2004 on Control Section 68 (CS 68) of Highway 2 near the Project. This section covers 34 km between Highway 49 to the south of the Peace River and Highway 64 to the north of the river. The table shows that traffic on the selected section of Highway 2 increased by a total of 11.9 percent from 2000 to 2004, for an average annual increase of 2.3 percent.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Change (%)</th>
<th>Average Annual Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
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<tr>
<td>2003</td>
<td></td>
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<tr>
<td>2004</td>
<td></td>
<td></td>
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<tr>
<td>2000–2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000–2004</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.11-1: Average Annual Daily Traffic on Control Section 68 of Highway 2, from 2000 to 2004

Table 4.11-2 provides a breakdown of the weighted average annual daily traffic (WAADT) on CS 68 of Highway 2 by vehicle type for 2004. The table shows that 81 percent of traffic is comprised of passenger vehicles and 15 percent of trucks.
Table 4.11-2: Weighted Average Annual Daily Traffic by Vehicle Type on Control Section 68 of Highway 2, 2004

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Average Number of Vehicles Daily</th>
<th>Portion of Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger vehicle</td>
<td>2130</td>
<td>81</td>
</tr>
<tr>
<td>Recreation vehicle</td>
<td>95</td>
<td>4</td>
</tr>
<tr>
<td>Bus</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Single unit truck</td>
<td>158</td>
<td>6</td>
</tr>
<tr>
<td>Tractor-trailer truck</td>
<td>248</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>2640</td>
<td>100</td>
</tr>
</tbody>
</table>

Truck traffic on Highway 2 is influenced by the hauling of logs and processed lumber. Since the closing of its Hines Creek operations, Canfor has shifted from hauling processed lumber south to markets, to hauling logs to Grande Prairie. This change has shifted Canfor’s haulage from a year-round operation to one that is concentrated in winter.

4.11.2.3 Traffic Collisions on Highway 2

Table 4.11-3 presents the number of traffic collisions and the overall traffic collision rate per 100 million vehicle kilometres for CS 68 of Highway 2 near the Project, from 2000 to 2004. All traffic data used is provided by AIT. The table shows that the average collision rate on Highway 2 near the Project from 2000 to 2004 was 183 per 100 million vehicle kilometres. This is substantially higher than the 2004 provincial collision rate of 109 per 100 million vehicle kilometres. An estimated 66 percent of all collisions on CS 68 involve animals, which is higher than the provincial average of 52 percent.

Table 4.11-3: Collision Rates* for Control Section 68 of Highway 2 from 2000 to 2004

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>150</td>
<td>163</td>
<td>179</td>
<td>222</td>
<td>200</td>
<td>183</td>
</tr>
</tbody>
</table>

Notes:
* Rates per 100 million vehicle kilometres.

4.11.2.4 Dunvegan Bridge

The 4-km stretch of highway that includes the Dunvegan Bridge and its approaches accounts for 12 percent of the length of CS 68 of Highway 2, but 36 percent of all collisions, indicating that the bridge and its approaches are a hotspot for collisions. Relative to the overall CS 68, collisions near the bridge are less likely to involve animals and more likely to take place in foggy or icy conditions.

Ice fog is a common occurrence in cold regions where there is a supply of water vapour and where vertical mixing of the air is limited. The supply of water vapour arises from a body of water, and the limited vertical mixing usually results from calm conditions at the water surface. Ice fog develops when the relative humidity approaches or exceeds 100 percent, either when the evaporation rate exceeds the upward vapour diffusion rate or when the air temperature drops below the dew point temperature.

At the Dunvegan Bridge, fog events usually occur because of radiative cooling at night. Therefore, extensive fog that could affect visibility on the bridge usually occurs early in clear mornings when the air
temperature is at its daily minimum, relative humidity is at its daily maximum, and the conditions are completely calm. The tendency for fog to develop increases with an increase in the ambient humidity because less evaporation (or temperature reduction) is required to bring the vapour concentration up to a point where a reduction in air temperature will saturate the air above the water surface.

The most common cause of severe ice problems on roadways is freezing rain. However, ice can also form in fog conditions when the road surface temperature is below freezing. Such ice generally forms on cold, clear winter mornings when conditions are also conducive to fog formation. In these conditions, fog droplets (or ice particles in the case of ice fog) could freeze to the surface of the bridge deck, causing ice buildup.

### 4.11.2.5 Shaftesbury Crossing

Shaftesbury crossing on the Peace River, at Highway 740 approximately 80 km downstream from the Project, is serviced by a ferry and an ice bridge. Residents on the south side of the river, particularly those living between the crossing itself and the Tangent area, use the crossing to travel to and from the Towns of Peace River and Grimshaw to obtain goods and services. Other users include some commercial and tourism traffic, mostly during the summer ferry season.

The ferry is a tug and barge-style vessel, consisting of a wooden barge on two metal pontoons that is pulled across the river by a tug-boat, which faces upstream as it works its way across the current. The capacity of the ferry is four to six passenger vehicles or two large trucks with a maximum capacity of 38 tons (38.6 tonnes).

The operating season of the ferry is subject to considerable variation. The ferry is generally put into service after the ice cover breaks up and the ice shelf can be moved or removed. The decision to end the ferry service is determined by AIT using a combination of weather forecasts and recorded ice conditions in the river documented by the ferry operator. Threshold levels of floating ice traveling in the river (frazil) create unmanageable and unsafe ferry conditions prompting ferry service termination. Factors influencing the size and concentration of ice are air temperature, flow rate release by the Bennett Dam upstream and weather events such as snowfall. As the temperature drops, the frazil in the river forms larger and larger units and becomes lodged in the ferry pontoons, reducing its mobility and ability to steer. Sudden drops in temperature including snowfall events dramatically influence the formation of frazil in the river. Sudden increases of flow from the Bennett Dam upstream can cause large sheets of ice to break off upstream and float downstream reducing the ability of the ferry to cross the river. Typically, if a short period of cold weather requires ferry service to be stopped, the ferry will be parked until the weather warms again. When the cold weather forecast extends beyond a few days, the ferry is pulled from the river and stored for the remainder of the ice formation and breakup season. Removal of the ferry is accomplished using skids, winch tractors and cats. Due to the onerous removal procedure, once the ferry has been removed it is not returned to service until the spring, even if weather and river ice conditions improve (P. van de Ligt, pers. comm., November 30, 2005). The operational cost of the ferry estimated by AIT is approximately $250,000 per season.
The operating season of the ice bridge is also highly variable and depends on ice conditions. The ice bridge is constructed by the maintenance contractor for AIT (LaPrairie) when the ice front has moved past the crossing. The ice bridge takes approximately 7 to 10 days to build up to a capacity of three tons (3.05 tonnes) when it is opened for vehicle traffic. During winter commercial traffic is prohibited from using the crossing. Safety of the ice bridge is maintained by taking thickness measurements of the ice along with keeping weather forecast records indicating any sudden change in conditions. The cost of building and maintaining the ice bridge is approximately $20,000 per season.

Traffic counts on Highway 740 near the crossing indicate 320 vehicles per day on average. This compares with an estimated 2,750 vehicle movements per day on Highway 2, north of Nampa and just to the east of the Highway 740. No recent information is available on traffic on the ferry, but information from 1998 to 1999 indicates between 163 and 175 vehicle crossings per day during the operating season.

4.11.3 Potential Interactions, Issues and Concerns

The following issues were identified in the final ToR as concerns with respect to the transportation effects of the Project:

- the effect of project-related traffic on the local, regional, and provincial road system
- the types of vehicles used during construction and operations phases
- incremental traffic volume and seasonality of activity
- the transportation of hazardous materials during construction and operations
- the potential effect on existing and future bridge crossings on the Peace River and tributaries arising from any possible changes to the river regime, including hydrological and hydraulic effects on the existing Dunvegan Bridge and the Town of Peace River
- the potential for increased bridge-deck icing and fog at the Dunvegan Bridge due to winter open-water conditions near the Project
- the effects of the Project on the geotechnical stability of channel banks, bridge headslopes and approach embankments
- long-term fluvial geomorphologic changes and their effects on the bridge structure and water opening stability
- the possible effects on the operation of the Shaftesbury ferry and the ice bridge and the resulting effects on traffic along Secondary Highway 740 during the construction and operations phases of the Project
- the potential effects on other ferries and ice bridges further downstream from the Project
- the design and construction features that will be used to minimize the potential for the south access road to affect the slope stability of Highway 2 along Dunvegan Creek

Table 4.11-4 identifies the potential interactions between relevant project-related activities and the transportation VEC for each phase of the Project. Project-related activities interacting with past and present projects are considered as part of the Application Case. Project-related activities interacting with likely future projects are considered as the Cumulative Effects Case.
### Table 4.11-4: Project Environmental Effects Interaction Matrix: Transportation

<table>
<thead>
<tr>
<th>Project Activities and Physical Works</th>
<th>Local Traffic on Access Roads</th>
<th>Regional Traffic on Highway 2</th>
<th>Provincial Traffic</th>
<th>Dunvegan Bridge Safety</th>
<th>Shaftesbury Crossing Ice Bridge Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of the north and south access roads to the project site</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of construction workers to and from the project site</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of goods and materials to and from the project site</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of hazardous materials to and from the project site</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of the north and south access roads</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of operations workers to and from the headworks site</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of hazardous materials to and from the headworks site</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open water conditions at Dunvegan Bridge (Hwy 2)</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Open water conditions at Shaftesbury crossing (Hwy 740)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Decommissioning</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of workers to and from the project site</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Transportation of materials and waste from the project site</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Malfunctions, Accidents and Unplanned Events</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic collisions</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Spill or release of hazardous materials on roadways</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Past and Present Projects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle grazing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural land clearing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borrow pits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dunvegan Historic Site</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Water-Based recreation on Peace River</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Canfor Forest Management Area</td>
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<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Devon Energy Corp. oil and gas lease</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Bennett Dam</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Transportation and utilities corridors</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Dunvegan Bridge</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Devon Energy Corp. and Pembina Pipeline Corp. pipeline crossing of Peace River at Dunvegan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water intake pipe at Fairview</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Dunvegan West Wildland Park</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Likely Future Projects</strong></td>
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<td></td>
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</tr>
<tr>
<td>New borrow pits</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Expansion of Dunvegan Historic Site</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>New or upgraded transportation and utility corridors</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>BC Hydro Site C at Taylor</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.11.4 Residual Environmental Effects Evaluation Criteria

The residual environmental effect on transportation from project-related interactions is considered to be significant if construction and operations of the Project precludes existing transportation uses such as Highway 2, access roads and river crossings.

4.11.5 Effects Analysis, Mitigation and Residual Effects Prediction

Table 4.11-5 presents the environmental effects assessment of project-related interactions with the transportation VEC. The effects analysis is discussed in the following sections.

**Table 4.11-5: Environmental Effects Assessment Matrix: Transportation**

<table>
<thead>
<tr>
<th>Project Activity</th>
<th>Potential Positive (P) or Adverse (A) Environmental Effect</th>
<th>Mitigation</th>
<th>Evaluation Criteria for Assessing Environmental Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnitude</td>
</tr>
</tbody>
</table>
| Construction traffic on local access roads           | - Increased traffic, interference with local resident and recreational road users  
- increased potential for traffic collisions (A) | • Signage  
• Flag people  
• Lights  
• Advertising in local newspapers of traffic disruptions  
• Speed limits | 3         | 2         | 4/5              | R           | 2                      |
| Construction traffic on regional highway network (Highway 2) | Increased traffic and potential for traffic collisions (A) | • Signage  
• Flag people  
• Lights  
• Advertising in local newspapers of traffic disruptions  
• Speed limits  
• Construction of highway turnouts at access roads | 2         | 3         | 4/5              | R           | 2                      |
| Construction traffic on provincial highway network   | Increased traffic and potential for traffic collisions (A) | • Same as above | 1         | 4         | 4/5              | R           | 2                      |
| Transportation of hazardous goods to and from project site | Increased potential for spills (A) | • TDG training | 1         | 4         | 4/5              | R           | 2                      |
| Construction of south access road                    | Decreased slope stability near Dunvegan Creek (A) | • Effective design  
• Ongoing maintenance | 3         | 2         | 2/5              | R           | 2                      |
### Table 4.11-5: Environmental Effects Assessment Matrix: Transportation

<table>
<thead>
<tr>
<th>Project Activity</th>
<th>Potential Positive (P) or Adverse (A) Environmental Effect</th>
<th>Mitigation</th>
<th>Evaluation Criteria for Assessing Environmental Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnitude</td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations traffic on local access roads</td>
<td>Increased traffic (A)</td>
<td>• Safe driving practices</td>
<td>1</td>
</tr>
<tr>
<td>Operations traffic on regional highway network (Highway 2)</td>
<td>Increased traffic and potential for traffic collisions (A)</td>
<td>• Safe driving practices</td>
<td>1</td>
</tr>
<tr>
<td>Operations traffic on provincial highway network</td>
<td>Increased traffic and potential for traffic collisions (A)</td>
<td>• Safe driving practices</td>
<td>1</td>
</tr>
<tr>
<td>Transportation of hazardous goods</td>
<td>Increased potential for spills (A)</td>
<td>• TDG training</td>
<td>1</td>
</tr>
<tr>
<td>Open water at Dunvegan Bridge during winter</td>
<td>Increased potential for traffic collisions due to fog and ice formation(A)</td>
<td>• Signage • Lighting</td>
<td>1</td>
</tr>
<tr>
<td>Changes to ice regime along Peace River between Peace Canyon and Fort Vermilion</td>
<td>Decreased use of Shaftesbury ice bridge crossing (A)</td>
<td>• Upgrade to present ferry infrastructure or • Travel cost compensation or • Community compensation fund</td>
<td>1</td>
</tr>
<tr>
<td><strong>Decommissioning</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic on local access roads</td>
<td>- Increased traffic, interference with local resident and recreational road users - increased potential for traffic collisions (A)</td>
<td>• Signage • Flag people • Lights • Advertising in local newspapers of traffic disruptions • Speed limits</td>
<td>3</td>
</tr>
<tr>
<td>Traffic on regional highway network (Highway 2)</td>
<td>Increased traffic and potential for traffic collisions (A)</td>
<td>• Signage • Flag people • Lights • Advertising in local newspapers of traffic disruptions • Speed limits • Construction of highway turnouts at access roads</td>
<td>2</td>
</tr>
<tr>
<td>Traffic on provincial highway network</td>
<td>Increased traffic and potential for traffic collisions (A)</td>
<td>• Same as above</td>
<td>1</td>
</tr>
<tr>
<td>Transportation of hazardous goods</td>
<td>Increased potential for spills (A)</td>
<td>• TDG training</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 4.11-5: Environmental Effects Assessment Matrix: Transportation

<table>
<thead>
<tr>
<th>Project Activity</th>
<th>Potential Positive (P) or Adverse (A) Environmental Effect</th>
<th>Mitigation</th>
<th>Evaluation Criteria for Assessing Environmental Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Magnitude</td>
</tr>
<tr>
<td>Malfunctions, Accidents and Unplanned Events</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic collisions</td>
<td>Injury or fatality</td>
<td>• Signage, lighting</td>
<td>1</td>
</tr>
<tr>
<td>Spill or release of hazardous materials on roadways</td>
<td>Harm to public or workers (A)</td>
<td>• TDG training</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Spill contingency plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Emergency response plan</td>
<td></td>
</tr>
</tbody>
</table>

KEY:
- **Magnitude:**
  1 = Low: e.g., a few individuals affected occasionally.
  2 = Medium: e.g., a portion of the population of the surrounding communities and or a moderate number of visitors or users affected for a period of more than one month.
  3 = High: e.g., a large portion of the population of the surrounding communities and or a large number of visitors or users affected for a period of more than one month.
  4 = Very high: e.g., long-term regional effects on the population of surrounding communities and or a large number of visitors or users affected continuously.

- **Geographic Extent:**
  1 = less than 1 km²
  2 = 1–10 km²
  3 = 11–100 km²
  4 = 101–1000 km²
  5 = 1001–10,000 km²
  6 = more than 10,000 km²

- **Frequency:**
  1 = less than 11 events per year
  2 = 11–50 events per year
  3 = 51–100 events per year
  4 = 101–200 events per year
  5 = more than 200 events per year
  6 = continuous

- **Duration:**
  1 = less than 1 month
  2 = 1–12 months
  3 = 13–36 months
  4 = 37–72 months
  5 = more than 72 months

- **Reversibility:**
  R = reversible
  I = irreversible

- **Ecological, Socio-cultural and Economic Context:**
  1 = Area not adversely affected by human activity.
  2 = Evidence of adverse effects.

Note: TDG transportation of dangerous goods

### 4.11.5.1 Construction

#### 4.11.5.1.1 Site Access

Construction access to the Project will be from Highway 2 from both the north and south access roads. Upgrades are proposed to the existing intersections on Highway 2 to facilitate construction traffic including tractor-trailer traffic. Final design will incorporate results of consultation with AIT.

Proposed upgrades to the existing north access road intersection with Highway 2 include:

- a northbound pullout and right-turning lane will be constructed to safely accommodate traffic coming from the south over the Dunvegan Bridge turning right onto the north access road
- northbound traffic from the north access road will require a widened right turn and merge lane
• Highway 2 will be widened near the existing intersection to allow for a left-turn lane for southbound traffic on Highway 2

• a temporary flashing overhead light will be installed at the intersection. Temporary construction signs, including those reading “construction zone” and “trucks turning,” and possible speed reduction signs will be provided

• Temporary lighting at the intersection could be installed if required

Proposed upgrades to the existing south access road intersection with Highway 2 include:

• a southbound pullout and right-turning lane will be constructed from Highway 2 to the south access road to safely accommodate construction and permanent access traffic

• the access road will be upgraded to provide sufficient turning radii for a right turn onto Highway 2

• Highway 2 will be widened near the existing intersection to allow for a left-turn lane for northbound traffic on Highway 2 onto the south access road

• a temporary flashing overhead light will be installed at the intersection. Temporary construction signs, including “construction zone, trucks turning”, and possible speed reduction signs will be provided

• temporary street lighting at the intersection could be installed, if required

The main access road to the powerhouse will originate from Highway 2 about 0.5 km south of the south abutment of the Dunvegan Bridge, as shown on Figure 3.1-1. The access road will be gravelled and will have a finished road width of 8 m.

The proposed road alignment crosses an abandoned gravel pit before winding south, down the east bank of Dunvegan Creek, as shown on Figure 3.1-1. A single-span bridge, about 30 m long, will carry the access road across Dunvegan Creek. The road then follows the west slope of the Dunvegan Creek valley before swinging west, paralleling the south shore of the Peace River, approximately following the 355-m contour, about 10 to 15 m above river level. The access road will terminate at a construction laydown area that will be constructed just west of the south abutment of the headworks.

Field reconnaissance has been undertaken along the proposed access road alignment. Aerial photographs of the proposed alignment have also been reviewed together with geological and geotechnical reports relevant to the area. A detailed geotechnical and slope stability review was conducted for the Project by Thurber Engineering (Thurber 2003), which included an assessment of slope stability along Highway 2 and the proposed access roads.

The proposed alignment for the access road does not impinge on any existing areas of instability along Highway 2 and hence it should have no negative effect on the stability of the main highway. Portions of the access road will cross localized areas of recent or historic slope instability, particularly along the segment paralleling Peace River. Particular care will be required during detailed design, and during
construction, to ensure a stable road alignment. It is recognized; however, that on-going maintenance of the road will be required.

The access road design will endeavour to minimize disturbance to the existing soil and groundwater regime. This will include minimizing the removal of any existing trees and vegetation and avoidance of any deep cuts or fills. It is anticipated that culverts will be used extensively to avoid disruption to existing surface water drainage paths. It is also anticipated that the detailed road design will include extensive use of geogrids or geotextile fabrics to achieve a stable subgrade without extensive sub-excavating and importing of granular material. If significant fill is required in some areas, consideration will be given to the use of lightweight fill or retaining structures.

Special measures will be implemented to control erosion both in the short term during construction and in the long term, particularly near Dunvegan Creek. These will include rip-rap armouring at the bridge structure. Other erosion control measures could include hydroseeding of any cut or fill slopes, as well as the use of hay bales, wattle fencing or other synthetic erosion control products, as required. The specific measures will be determined during final design and will be incorporated into the Environmental Protection Plan for the Project.

Dust control measures will be implemented during construction, particularly near the highway, residences and facilities.

Temporary construction signage will likely be installed in April 2008. Road upgrades to Highway 2 and the north and south access roads will likely be completed in the fall 2008. Construction signage and possible speed reductions would remain in place until the end of 2011.

4.11.5.1.2. Construction Traffic Effects

4.11.5.1.2.1 Construction Traffic Volume

All traffic traveling to and from the project site during construction will use Highway 2 and the access roads to the north and south of the Peace River that link the project site to the highway. Workers living in the construction camp, should one be required, will be transported to and from the project site on buses.

The traffic effects of the Project on Highway 2 will be greatest near the Project, specifically on Control Section 68, the section of Highway 2 that connects with the north and south access roads leading to the project site. Traffic effects on the access roads, which are also used by recreational users and tourists visiting the Dunvegan area and using the river for recreational activities, will likely be divided equally between the north and south roads over the construction period.

Table 4.11-6 presents the peak construction traffic expected to be associated with the Project during the 2008 to 2011 construction period in relation to anticipated traffic volumes on Control Section 68 of Highway 2. The anticipated traffic volumes are based on historic traffic increases reflected in data provided by AIT, as shown in Table 4.11-1 above.

Table 4.11-6 shows that the peak construction traffic effects from the Project from 2008 to 2011 are expected to result in temporary increases to the average annual daily traffic (AADT) on Highway 2 of
4 percent in August and September 2008, 13 percent in August 2009, 11 percent in August 2010, and 8 percent in June 2011. Construction traffic effects during other months during construction will vary, dropping at times to zero from January to March when construction activities will be suspended.

The table also shows that concrete and gravel truck traffic is expected to peak at 100 vehicle movements per day, respectively, while tractor-trailer traffic is expected to peak at 20 vehicle movements per day.

Table 4.11-6: Peak Construction Traffic by Vehicle Type on Control Section 68, Highway 2, from 2008 to 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Passenger Vehicles and Pickups</th>
<th>Buses</th>
<th>Concrete Trucks</th>
<th>Gravel Trucks</th>
<th>Misc.</th>
<th>Tractor-trailers</th>
<th>Total Vehicle Movements</th>
<th>AADT without Project</th>
<th>Daily Traffic with Project</th>
<th>Increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>August and September</td>
<td>45</td>
<td>9</td>
<td>20</td>
<td>20</td>
<td>8</td>
<td>10</td>
<td>112</td>
<td>2707</td>
<td>2819</td>
<td>4</td>
</tr>
<tr>
<td>2009</td>
<td>August</td>
<td>100</td>
<td>18</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>10</td>
<td>348</td>
<td>2752</td>
<td>3100</td>
<td>13</td>
</tr>
<tr>
<td>2010</td>
<td>August</td>
<td>60</td>
<td>12</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>20</td>
<td>312</td>
<td>2815</td>
<td>3127</td>
<td>11</td>
</tr>
<tr>
<td>2011</td>
<td>June</td>
<td>60</td>
<td>16</td>
<td>100</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>197</td>
<td>2879</td>
<td>3105</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: AADT average annual daily traffic.

4.11.5.1.2.2 Transportation of Hazardous Goods During Construction

All hazardous goods associated with project construction will be transported and stored according to current government regulations. If any explosives are required for excavation, they will be transported to the site by a contractor and stored in approved, locked magazine(s). Transport, storage and handling of all explosives will be in compliance with regulations (Transportation of Dangerous Goods Act, Schedule 2: List 1) and by qualified persons. Safety requirements for the transportation, storage and handling of dangerous goods will be adhered to as stipulated by the Act.

Spill contingency plans will be developed to handle any accidental fuel or oil spills during transportation and storage onsite. Construction crews will be familiarized with spill containment and handling. The spill contingency plan will be posted at the work sites and available for inspection by agencies.

4.11.5.1.2.3 Increased Potential for Traffic Collisions During Construction

Traffic collisions on Highway 2 near the Project, like traffic collisions elsewhere on Alberta’s highway network, can be expected to increase in keeping with greater traffic volume during the construction period. Since the Project will contribute to those increases, it follows that it will increase the likelihood of traffic collisions. However, the peak construction traffic from the Project will occur during summer, thus avoiding winter fog and ice conditions at the Dunvegan Bridge which pose special traffic safety issues. Much of the traffic increase associated with single truck traffic will likely be very localized, since much of the concrete truck and dump truck activity will be restricted to travel between nearby borrow pits and the project site.
Glacier Power recognizes that the collision rate on Highway 2 near the project site is substantially higher than the provincial average. Therefore, Glacier Power will adopt a number of safety measures to ensure that the risk of traffic collisions is minimized during construction. These measures, as discussed above in connection with site access, include the construction of turnout lanes, the installation of lighting and, possibly, the reduction of speed limits on Highway 2. The Project will also make use of flag people, keep the access roads in good operating condition, and control dust that could be generated by construction traffic. All safety measures employed will be adopted in consultation with AIT.

Glacier Power’s employees will receive safe driver training, and will adhere to speed limits and road traffic rules as outlined in the company’s Environment, Health, and Safety Management System.

4.11.5.2 Operations

4.11.5.2.1 Site Access

Permanent access to the project site during operations is proposed on both the north and south sides of the Peace River. The primary access route for daily operations will however be the south road, because:

- the proposed transmission line route is along the proposed south access road alignment
- the majority of the turbines, which will be the centre of operations and maintenance work, are on the south side of the river
- the turbines on the north bank will be accessible through a gallery in the spillway
- the control building is on the south side of the river
- the proposed upstream boat ramp and boat lock will be on the south side of the river, the same side as the existing downstream boat ramp
- the south access road will reduce the flow of project-related traffic through Maples park and Dunvegan Historic Park

4.11.5.2.2 Operations Traffic Volume

During operations the effect of traffic associated with the Project on traffic volumes nearby is expected to be minimal. The project facility will be operated on a 24-hour basis with three shifts per day. Two operators will be on duty for each shift. Traffic associated with these three shifts will total 12 vehicle movements per day. Some additional operations traffic will be generated by the contractors traveling to and from the site for regular maintenance activities. Assuming a maximum effect scenario, the total traffic effect associated with project operations is not expected to exceed 20 vehicle movements per day. This traffic, which will primarily use the south access road, will not interfere with anyone using the road for recreational purposes, and it will represent only a marginal and virtually imperceptible increase in traffic on Highway 2 near the Project.
4.11.5.2.3 Transportation of Hazardous Goods During Operations

All hazardous goods associated with project operations will be transported and stored according to current government regulations.

4.11.5.2.4 Increased Potential for Traffic Collisions during Operations

Traffic collisions on Highway 2 near the Project are expected to increase in keeping with increases in traffic volume. Since operations traffic associated with the Project is expected to result in minimal increases to traffic volume, it is also expected to result in minimal increases in the number of traffic collisions. Glacier Power will take steps to minimize the risk of collisions involving its employees and contractors by requiring that they drive safely and in accordance with all traffic regulations.

4.11.5.2.4 Dunvegan Bridge

An analysis was conducted by RWDI Inc. (2005) to determine the incremental effects of the Project on the likelihood of fogging and icing events at the Dunvegan Bridge. The analysis was based on approximate, empirical estimates of evaporation rates from the water surface combined with an estimate of the resulting vertical profiles of water vapour concentration. Field observation data was also used to determine the conditions of fogging at the bridge. The fog and ice modeling was conducted from January to March when the river is typically frozen; however, it is expected to remain open following the construction of the Project. This is detailed in Section 4.7.

Results of the bridge fog and ice modeling are presented in Table 4.11-7. The table indicates that the frequency of fogging and icing at the Dunvegan Bridge will generally increase under the influence of the Project. Post-project fogging and icing at the bridge is expected to occur just over 27 percent of the time in January (compared to 22 percent pre-Project), 9.7 percent of the time in February (compared with zero percent pre-Project), and less than 5 percent of the time in March (compared with less than 1 percent pre-Project). During the fogging events, visibility will likely be reduced to less than 100 m about 5 percent of the time under post-project conditions, compared to about 2 percent under pre-project conditions, an increase of 3 percent. Fogging at bridge deck height will be limited to night-time hours and should not persist beyond a few hours following sunrise. Visibility will likely not be reduced below 50 m due to localized fogging.

Table 4.11-7: Fogging and Icing at Dunvegan Bridge

| Climate Conditions                          | Scenario       | Predicted Frequency of Fogging and Icing from River Vapour Emissions (%)
|--------------------------------------------|----------------|-------------------------------------------------------------------
| Two standard deviations colder than average (1995–1996) | Pre-project    | January 12.3, February 0, March 0                               |
| One standard deviation colder than average (1984–1985) |                |                                                                  |
| Average (1992–1993)                         |                |                                                                  |
| One standard deviation warmer than average (1997–1998) |                |                                                                  |
| Two standard deviations warmer than average (1987–1988) |                |                                                                  |
| All conditions (open water all year round)   | Post-project   | January 27.3, February 9.7, March 4.7                          |

Jacques Whitford © 2006 PROJECT ABC 50541 October 2006 4-418
As discussed above, collisions occurring on, at or near the Dunvegan Bridge are more likely to involve fog conditions, similar to elsewhere on CS 68 of Highway 2. By contrast, collisions occurring at or near the bridge are only marginally more likely to involve ice, snow or slush conditions. Project operations will increase the frequency of fogging and icing at the Dunvegan Bridge, therefore, they will also increase the potential for such collisions.

Glacier Power, in consultation with AIT, will take steps to minimize the potential for collisions in fog and ice conditions at Dunvegan Bridge. Such steps may include the installation of lighting at or on the bridge, as well as the installation of advanced warning signs indicating when hazardous conditions exist on the bridge (such as Telvent or similar). It should be noted that AIT has plans to rehabilitate the Dunvegan Bridge deck within the next three years and also plans to install improved lighting on the bridge itself within the next year (AIT 2006). Currently, only the northern approach to the bridge has lighting.

4.11.5.2.5 Shaftesbury Crossing

Based on extensive ice-modeling designed to ascertain the effects of the Project on the ice regime of the Peace River, it is estimated the Project will reduce the ice bridge season at the Shaftesbury crossing by an average of two to three weeks annually during the operations phase. Over the last 25 years, operating days of the ferry have ranged from approximately 195 to 275 annually. Although official data are not available for the ice bridge, anecdotal information from local residents and results from ice modeling (PRICE) indicate that operating days for the ice bridge likely range from 0 to 120 days annually. Therefore, the expected decrease of two to three weeks falls within the range of existing variability in the crossing availability.

The Shaftesbury crossing is one of three crossings of the Peace River in the RSA, the other two being at Dunvegan and the Town of Peace River. Viewed from the perspective of the transportation system in the RSA as a whole, the reduction of the ice bridge season at Shaftesbury affects less than 0.2 percent of vehicle movements over the Peace River. In relation to the total annual use of the Shaftesbury crossing alone (ferry and ice bridge combined), the reduction represents a decrease of 4 to 7 percent. Finally, compared to an average annual ice bridge season of 84 days at the Shaftesbury crossing (based on anecdotal data and modeling results), the reduction represents a decrease of 16 percent. This effect will be borne principally by residents living south of the Shaftesbury crossing and between the crossing and the Tangent area, who use it to reach the service and supply centres of the Town of Peace River and Grimshaw.

Several options to mitigate the effects of the Project on the Shaftesbury crossing have been discussed with AIT and a local stakeholder group concerned about the crossing, Concerned Residents for Ongoing Service at Shaftesbury (CROSS). The options that have been considered are:

- travel cost compensation - Glacier Power, in consultation with CROSS, will determine the eligibility criteria for individuals and families to be considered for compensation, the basis for compensation; and the method and duration of the compensation
advocacy and support for ferry upgrades - on behalf of affected stakeholders, Glacier Power will advocate that AIT advance the timing of the ferry replacement and optimize the design of the new ferry for ice conditions to extend its operating season

community compensation fund - Glacier Power will assist the establishment of a community-based group and provide funds for the group to undertake various community initiatives

Evaluation of these three options includes criteria such as:

- the ability to clearly define the affected group
- the ability to focus and control the boundaries of the mitigation measure
- the ability to affect the desired change
- the ease of implementation

Consideration of these criteria suggests that the ferry upgrade option is equivalent or dominant to the other options on all criteria. The superiority of this option is further emphasized by the fact that CROSS has already rejected an offer of travel cost compensation, presented to them by Glacier Power in 2004. Glacier Power has approached AIT with a conceptual discussion of the ferry upgrade option, and their initial response has been supportive. Replacement of the ferry with an improved design better able to withstand flowing ice (such as those used in the Northwest Territories) and improvements to the ferry docking infrastructure to ease the removal and replacement of the ferry, have the potential to more than offset the two- to three-week delay in ice bridge construction, and provide year-round benefits to all ferry users as well. As the Project would not likely be operational for four or five years after approvals are received, there is ample time to design and implement appropriate infrastructure changes at the crossing.

Glacier Power has not received any comments from CROSS on the ferry upgrade proposal, however, given the extent of the effect (an average of two to three weeks annually) within the context of the widely variable existing conditions, this proposal would have the potential not only to mitigate the effect but to improve crossing conditions at Shaftesbury year-round.

Consideration of the construction of a bridge, although requested by the CROSS stakeholder group, was not considered in detail because discussions with AIT have indicated that:

- the traffic volume at the crossing does not approach the level required to justify construction of a bridge at the crossing
- three existing bridges across the Peace River in Alberta (at Dunvegan, Peace River and Diashowa) are too close to justify a fourth bridge at this location
- the magnitude of cost and effort for bridge construction does not fit the magnitude of the two to three week effect in question
4.11.5.2.6 Operations Effects on Other Existing and Future Transportation Crossings on the Peace River and its Tributaries

4.11.5.2.6.1 Hydrological and Hydraulic Effects on Existing Highway 2 Bridge Structures

A comparison between the pre- and post-construction water velocity distributions for the alternative project geometries were examined for the 100-year flood event (10,300 m$^3$/s) to identify the hydraulic effects that the proposed geometries may have on flow patterns, and hence, on bed scour at the Dunvegan Bridge (NHC 2004). Based on these results, it is reasonable to expect that for 100-year flood event flow conditions associated with the final project layout will closely resemble pre-construction conditions. This is demonstrated in the velocity distributions extracted across sections 500 m and 1000 m downstream from the Project. The magnitude of the maximum velocities associated with the project layout is similar to those predicted for the pre-construction conditions, particularly 1000 m downstream from the Project. The model results demonstrate that the potential effect on flow velocities at the Dunvegan Bridge approximately 2 km downstream from the project centreline will be insignificant.

Further details on downstream channel evolution with respect to the Dunvegan Bridge is provided in Section 4.6. However, MMA (2006) summarized the relevant conclusions for downstream channel evolution as follows:

- Sediment trapping in the proposed headpond will reduce the coarse-textured sediment load to the downstream channel. However, the post-Bennett Dam flow regime is generally incapable of mobilizing the channel bed. Therefore, a significant acceleration in channel downcutting or degradation below the proposed headworks is not expected.

- Modeling indicates that nearly all the silt and clay-sized sediment load will pass through the project headpond. These sized materials make up the majority of the sediment load. In contrast, 27 to 82 percent of the sand-sized materials (depending on their grain size) will be deposited. The deposition of these sediments in the headpond is not expected to significantly affect downstream channel stability, but sediment accumulation rates in overbank or slack water sites could be reduced. These effects are likely to be minimized or undetectable downstream from large sediment sources, such as the Smoky River.

- The Hines Creek fan will continue to aggrade and constrict the river channel and possibly cause further channel downcutting near the Dunvegan Bridge. This process has occurred under the present regulated flow regime and bedload deposition and the proposed headpond is not expected to result in significant acceleration. The report by NHC (2004) also indicates that the proposed headworks will not alter the velocity distribution significantly near the Dunvegan Bridge.

4.11.5.2.6.2 Geotechnical Stability of Channel Banks, Bridge Headslopes and Approach Embankments

The effects of the Project on upstream slope stability are considered to be minimal (AGRA 2000). This is partly because of the low-head project concept that has been adopted. The increase in water levels upstream from the Project will not be significantly higher than levels that the slopes have experienced historically.
Also, the mode of operation proposed will try to maintain constant headpond levels to the extent possible keeping in mind that the Project is a run-of-river development and will respond to releases from BC Hydro's Bennett Dam. By minimizing daily river level fluctuations, the Project may actually improve upstream conditions by eliminating, or at least reducing, rapid drawdown conditions that can affect slope stability.

As noted in the report by Thurber Engineering (2003), the proposed alignment for the access road does not impinge on any existing areas of instability along Highway 2 and, therefore, it should have no negative effect on the stability of the main highway.

There are areas along the access road that cross local areas of instability; however, with particular care during detailed design and construction, a stable road alignment can be constructed. Any local slope stability issues in this area will not affect Highway 2 or the Dunvegan Bridge.

4.11.5.2.6.3 Long-term Fluvial Geomorphologic Changes

Upstream from the Project, no fluvial geomorphologic changes relevant to transportation crossings on the Peace River are expected. Downstream channel evolution near the Dunvegan Bridge is addressed above, and in Section 4.6. The flow regime of the Peace River will not be modified downstream from the project site, and flow velocity and distribution will resemble pre-project conditions within 1000 m downstream from the Project.

4.11.5.2.6.4 Other Crossings Downstream from the Project

The Project will have no negative effects on river crossings downstream from the Shaftesbury location, at the Town of Peace River, Diashowa-Marubeni or La Crete. The flow regime of the Peace River will not be modified downstream from the project site. The ice regime on the river will not be affected downstream from the Notikewin River. The formation of the ice cover near the Diashowa-Marubeni and Town of Peace River bridges will be delayed each year, and while freeze-up water levels are expected to be marginally higher (0.5 m) than present, the overall reduction in the likelihood of secondary consolidations will reduce the likelihood of freeze-up ice jams and related extreme high water levels near these crossings. For additional information on the potential effects on other ferries and ice bridges downstream from the Project, refer to Section 4.7, Ice Formation and Breakup.

4.11.5.3 Decommissioning

Decommissioning activities will be similar to construction activities in terms of traffic flow to and from the site. Contractors hired to complete decommissioning of the facility will be required to implement procedures (e.g., signage, lights, flag people and possible reduction in speed limit) for the protection of the public using the roads near the project site and to minimize disruption to local traffic patterns.

4.11.5.4 Malfunctions, Accidents and Unplanned Events

Although unlikely to occur, it is possible that malfunctions, accidents and other unplanned events relating to transportation could happen during any phase of the Project. Potential malfunctions and accidents include traffic collisions during construction and operations, and accidental spills or releases of hazardous materials during transportation. As described above, Glacier Power will take steps to minimize the risk of collisions near the project site during construction and operations, including the
installation of signs and lighting on Highway 2 and access roads near Dunvegan Bridge. The accidental release of hazardous materials will be avoided through training all drivers and handlers of hazardous materials in the transportation of dangerous goods (TDG). Contingency plans will be in place to deal with an accidental release, should it occur. Glacier Power staff will receive safe driver training and will adhere to all posted speed limits and road rules.

4.11.5.5 Cumulative Environmental Effects

The environmental effects of the Project on transportation have the potential to act in combination with transportation effects from other future projects in the regional study area. Specifically, the expansion of transportation corridors in the area has the potential to increase traffic volumes and offer the potential for increased accidents and spills of hazardous materials. Traffic associated with the Project is greatest during construction but is short-term and intermittent. It is unknown if any other new development will be occurring at the same time as Project construction but none is scheduled at present. Consequently, Project construction traffic is not expected to act cumulatively with future projects. Operations traffic will be minimal (not expected to exceed 20 vehicle movements a day) and its addition to cumulative effects on traffic is assessed as not significant. The effects of the Project on the ice bridge at Shaftesbury are not expected to act together with the other potential future projects (borrow pits, transportation and utility corridors, expansion of the Dunvegan Historic Site, BC Hydro Site C) in a cumulative manner. The Project’s contribution to cumulative effects on transportation is assessed as not significant.

4.11.6 Summary of Mitigation

A number of traffic-related mitigation activities and initiatives are built into the Project. They have been addressed in various sections and are summarized as:

- Construction traffic will be managed in close cooperation with AIT. Possible actions include signs, flag people, improved lighting and changes to posted speed limits.

- Glacier Power has discussed the expected increase in the occurrence of ice fog and bridge-deck icing with AIT, and has proposed to install live (flashing) signs indicating when hazardous conditions exist on the bridge (such as Telvent or similar). This is expected not only to mitigate the increased ice fog and bridge-deck icing, but also to improve the overall safety of the bridge.

- The effect of the Project on the ferry and ice bridge crossing at Shaftesbury are under active discussion between Glacier Power and a group of stakeholders, CROSS. As inputs into these discussions, Glacier Power has had discussions with AIT and conducted work around:

  - earlier replacement of the ferry and design changes to make it better able to deal with ice conditions
  - changes to the systems for taking the ferry out of water at freeze-up to allow more flexibility in the ferry operations
  - possible time- and distance-based compensation schedules for selected stakeholders
  - community-based compensation initiatives

4.11.7 Residual Environmental Effects Summary

Table 4.11-8 presents a summary of the predictions for residual environmental effects associated with transportation. The transportation effects of the Project include the short-term traffic increases during
construction and the minimal increases during operations. The table shows that these effects on the transportation VEC are rated as not significant.

Table 4.11-8: Residual Environmental Effects Summary Matrix: Transportation

<table>
<thead>
<tr>
<th>Phase</th>
<th>Residual Environmental Effects Rating including Cumulative Environmental Effects*</th>
<th>Level of Confidence</th>
<th>Likelihood of Significant Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Probability of Occurrence</td>
</tr>
<tr>
<td>Construction</td>
<td>NS</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>NS</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Decommissioning</td>
<td>NS</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Malfunctions, accidents and unplanned events</td>
<td>NS</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Project overall</td>
<td>NS</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Key:
- Residual environmental effect rating:
  - S = significant adverse environmental effect
  - NS = not significant adverse environmental effect
  - P = positive environmental effect
- Level of confidence:
  - 1 = low level of confidence
  - 2 = medium level of confidence
  - 3 = high level of confidence
- Probability of occurrence based on professional judgement:
  - 1 = low probability of occurrence
  - 2 = medium probability of occurrence
  - 3 = high probability of occurrence
- Scientific certainty based on scientific information and statistical analysis or professional judgement:
  - 1 = low level of confidence
  - 2 = medium level of confidence
  - 3 = high level of confidence
  - N/A = not applicable

Note:
*As determined in consideration of established residual environmental effects rating criteria.

4.11.8 Monitoring and Follow-up

Glacier Power will continue to engage in ongoing consultations with AIT, local government authorities and other stakeholders, including CROSS, to ensure that transportation issues are addressed.

4.11.9 Summary

The effect of project-related activities on transportation is expected to be negative during construction, but not significant. Depending on the traffic mitigation measures that will be executed in cooperation with AIT, the road infrastructure at the Dunvegan Bridge may be improved. The Project will reduce the ice bridge and ferry season at Shaftesbury, however the duration of the reduction is short, and mitigation acceptable to AIT has been proposed. The effects on the ice bridge and ferry season at Shaftesbury are assessed as not significant. The overall effect of the Project on transportation in the RSA is assessed as not significant.