

**ENVIRONMENTAL IMPACT ASSESSMENT REPORT
TERMS OF REFERENCE**

**GLACIER POWER LTD.'S
PROPOSED DUNVEGAN HYDROELECTRIC PROJECT
ON THE PEACE RIVER**

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1.0 INTRODUCTION

1.1 Purpose

Glacier Power Ltd. (Glacier Power) proposes to develop the Dunvegan Hydroelectric Project (the Project) located on the Peace River in Sections 12 and 13, Township 80, Range 5, West of the 6th Meridian approximately 2 km west of the Highway 2 bridge crossing at Dunvegan and approximately 80 km upstream of the Town of Peace River. The Project is a low-head, run-of-river hydroelectric facility with a maximum generating capacity of 100 megawatts. The purpose of this document is to identify for Glacier Power, and for the public, the information required by government agencies for an Environmental Impact Assessment (EIA) report. Glacier Power will prepare and submit an EIA report that examines the environmental effects of the construction, operation, decommissioning and reclamation of its proposed Project.

1.2 Scope of Project

For the purposes of the EIA report, the Project includes the construction, operation, decommissioning and reclamation of the following components:

- Headworks - consisting of a powerhouse with approximately 40 – 2.5 megawatt turbine generator units connected side-by-side across the main channel and a crested, gated spillway structure to maintain a head differential of six metres between the headpond water level and the tailwater;
- Headpond – a deeper, slower section of river behind the headworks to provide the head differential for turbine generator operation, extending from 20 and 26 km upstream depending upon river stage;
- Fish Passage - fish passage structures to facilitate safe upstream and downstream fish passage;
- Boat Lock - to accommodate river traffic;
- Power Line - a 144 kV transmission line to interconnect with ATCO's 144 kV line approximately 5 km southeast of the Project;
- Access Roads – permanent roads to access both sides of the facility and river channel; and
- Boat Launch – a boat launch facility upstream of the headworks.

The Project powerhouse and spillway portion of the headworks would be located within the existing wetted river channel and the headworks abutments, boat lock, upstream passage fishways, and boat launch are situated on the banks, outside the present wetted channel.

1.3 Scope of Assessment

The EIA report shall be prepared in accordance with these Terms of Reference and the environmental information requirements prescribed under the *Alberta Environmental Protection and Enhancement Act* (EPEA) and Regulations and the *Canadian Environmental Assessment Act* (CEAA) and Regulations. The EIA report will:

- a) assist the public and government to understand the environmental consequences of the Project's development, operation and reclamation;
- b) assist Glacier Power in its decision-making process;
- c) present impact predictions in terms of magnitude, frequency, duration, seasonal timing, reversibility and geographic extent;
- d) discuss measures to prevent, mitigate or compensate for adverse effects and monitor environmental protection measures;
- e) identify residual effects and their significance including cumulative and regional development considerations;
- f) discuss proposed mitigation measures, protection plans, monitoring or research programs and other follow-up actions related to proposed activities, environmental performance objectives and anticipated regulatory requirements; and
- g) form part of Glacier Power's applications to the Alberta Energy and Utilities Board (EUB) and the Natural Resources Conservation Board (NRCB).

1.4 Public Consultation

The preparation of the EIA report will include a public consultation program documenting the results of these consultations (see Section 12.0) and providing environmental information to address the issues raised. The public consultation program is to communicate with those members of the public who may be affected, directly or indirectly, by the Project and to provide them with an opportunity to participate in the Environmental Assessment process.

1.5 Proponent's Submission

Glacier Power is responsible for the preparation of the EIA report. The submission will be based upon these Terms of Reference and issues raised during the public consultation process. The EIA report will include a glossary of terms and provide cross-reference tables between sections in the Terms of Reference and the EIA report to assist the reader in understanding the application.

2.0 PROJECT OVERVIEW

2.1 The Proponent

- a) Provide the names and business addresses of the proponent, details of the incorporation of the proponent, and the names of any people who have been hired to manage and operate the Project.
- b) Identify ownership status.
- c) Provide a brief history of Glacier Power's operations including existing activities.

2.2 Project Need

- a) Discuss the need or justification for the Project.
- b) Clearly define the purpose of the Project.
- c) State what is to be achieved by carrying out the Project.
- d) Provide reasons why Glacier Power believes the Project is in the public interest.

2.3 Alternatives to the Project

- a) Present a summary of alternatives to the Project, including a "no development" scenario.
- b) Compare identified alternatives to the Project and their anticipated environmental effects and impacts.
- c) Identify alternative means of carrying out the Project and indicate their potential environmental effects.
- d) Evaluate and compare the environmental, technical, and economic factors associated with the various alternatives to clearly demonstrate why the proposed alternative was chosen.
- e) Discuss reasons and rationale for not selecting identified alternatives.

2.4 Alternative Project Sites and Sizes

- a) Identify alternative sites considered for the Project. Describe the factors that were used to evaluate the alternative sites and the reasons why these factors were chosen. Provide the rationale for rejecting those sites that were rejected.
- b) Discuss the reasons for selecting the major features of the Project and describe how specific technical, geotechnical, economic and environmental criteria were incorporated into the decision-making process.
- c) Discuss the siting of the various Project components.

2.5 Market Setting

- a) Discuss the markets within which the Project will be competing, including the demand for those products and the sensitivity of product demand to changes in market conditions.
- b) Describe how deregulation of the energy industry affects project viability. Identify any factors that could make the Project uneconomical.
- c) Address the opportunities provided by the Project to reduce greenhouse gas emissions.

- d) Provide capital cost broken down by major project components. Include a discussion of any capital costs which may be incurred by any federal, provincial or municipal government departments or agencies to provide support facilities, such as rail, roads, municipal water and sewer lines and treatment facilities, schools and hospitals.

2.6 Project Components and Development Schedule

Provide an overview of the project activities and physical components. Specifically, address the following:

- a) a summary list, brief description and drawings of the project components and activities which are addressed in detail under Section 3.0; and
- b) the proposed stages or phases of the activities and a likely development schedule, explaining:
 - i) the timing of key construction, operation and reclamation activities;
 - ii) the expected duration of each phase for the life of the Project; and
 - iii) the key factors controlling the schedule and uncertainties.

Discuss the implications of a delay in the Project, and include the regulatory process as a consideration in the likely development schedule.

2.7 Regulatory and Planning Framework

- a) Identify the federal, provincial and municipal legislation, policies, and approvals applicable to the review of this Project. List the major components of the Project that will be applied for and constructed under the EPEA, the *Water Act* and the *Public Lands Act*.
- b) Address other regulatory authorizations that exist or will be required for the Project under provincial, municipal and federal government requirements, and describe the schedule and mechanisms Glacier Power will engage to comply with these regulatory processes.
- c) Discuss the primary focus of each regulatory requirement, such as resource allocation, environmental protection, land use development and the elements of the Project that are subject to that regulation.
- d) Discuss any regulatory systems that apply to the Project, such as solid waste or air pollution classifications, land use zones, wildlife management areas and forest management areas.
- e) Provide a summary of the regional, provincial or national objectives, standards or guidelines, such as the Kyoto Protocol, the Northern River Basins Study and the governments' response, pertinent to the Project. Discuss their implications and how they have been used in the classification and evaluation of the significance of effects.

2.8 Project Area and EIA Study Areas

The Project Area includes all lands and waters subject to direct disturbance from the Project and associated infrastructure, including access and utility corridors. For the Project Area, provide:

- a) the legal land description;
- b) the boundaries of the proposed development area;
- c) a map that identifies the locations of all proposed development activities; and
- d) a map showing the area proposed to be disturbed in relation to existing topographic features, township grids, wetlands, watercourses and waterbodies.

Study Areas for the EIA report include the Project Area and other areas based on individual environmental components where an effect from the proposed development can reasonably be expected. For the respective Study Areas, provide:

- e) the rationale used to define Local and Regional Study Areas, considering the location and range of probable project and cumulative effects;
- f) information on consultation undertaken to assist in defining study area boundaries; and
- g) maps of appropriate scale illustrating boundaries of Local and Regional Study Areas chosen to assess impacts.

2.9 EIA Report Summary

Provide a summary of the EIA report, addressing:

- a) environmental and land use conditions in the EIA Study Area without the Project;
- b) activities and components of the Project that are anticipated to influence environmental and land use conditions;
- c) the anticipated environmental effects, with emphasis on regional and cumulative considerations;
- d) potential trans-boundary environmental effects on other provincial or territorial jurisdictions and federal lands such as Wood Buffalo National Park;
- e) proposed mitigation measures and management plans; and
- f) any project-related residual effects, their contribution to regional cumulative effects, and their implications for the future management of regional cumulative effects.

List and discuss key environmental issues and issues which are important for the achievement of sustainable environmental and resource management. Identify those issues that were raised during public consultation. Differentiate between emerging issues (with ongoing uncertainties), issues with quantifiable and significant environmental effects, and issues that can be resolved through commercially proven available technology and with existing management approaches.

Provide a matrix or summary chart to describe this section.

3.0 PROJECT DESCRIPTION

3.1 Project Components

Provide a site plan for the proposed Project at an appropriate scale showing the location of all components of the Project. The site plan will include reference to township grids and significant geographic features to facilitate the location of facilities relative to existing features.

Identify and describe in detail the conceptual level of design and operation for each component of the Project including, but not necessarily limited to, the headworks, headpond, boat lock, fish passage facilities, boat launch, power line connecting to ATCO, access roads, and other utilities and services associated with the Project.

3.2 Construction

- a) Provide the expected schedule for the construction and operation phases of the proposed Project. Provide a proposed schedule for the reclamation of disturbances due to construction activities.
- b) Identify any needs for specific activities to be performed during particular climatic conditions (summer, winter), in a particular sequence, or within specific timing windows.
- c) Describe how river flows will be handled/diverted during construction and the level of protection provided.
- d) Describe how the operation of the Shaftesbury Ferry and/or ice bridges downstream of the Project will be affected during the various phases of construction.
- e) Discuss sedimentation from construction including mitigation and sediment control plans. Include the extent of clearing, excavation and earthworks for the Project construction site. Define the total land area disturbed by the construction of the Project. Include borrow areas for construction materials.
- f) Discuss the methods to be used to clear and maintain rights-of-way and station sites and the methods of disposal of cleared vegetation including any merchantable timber.

3.3 Start-Up

- a) Describe start-up conditions and environmental controls that will be employed.

- b) Identify potential start-up problems. Describe mitigation that will be used to ensure protection of the environment if problems are encountered or what adaptive management strategies will be employed.

3.4 Solid and Liquid Waste Management

- a) Describe solid and liquid wastes generated during the construction, operation, decommissioning and reclamation phases of the Project.
- b) Describe waste handling, storage and disposal methods on-site.
- c) Indicate what types and amounts of wastes will be sent off-site and identify potential off-site destinations of these wastes.
- d) Using the principles of pollution prevention, waste minimization and recycling, discuss the potential use of alternative technologies and methods to eliminate or reduce solid and liquid waste storage, handling and disposal requirements.

3.5 Reclamation

- a) Provide a conceptual decommissioning and reclamation plan for all physical structures constructed as part of the Project, borrow material areas, road access, and utility services.
- b) Address salvage and stockpiling of soils in preparation for reclamation.

4.0 ENVIRONMENTAL ASSESSMENT

Define assessment scenarios including:

- a) a Baseline Case, which includes existing environmental conditions, existing and approved projects or activities;
- b) an Application Case, which includes the Baseline Case plus the Project; and
- c) a Cumulative Effects Assessment (CEA) Case, which includes past studies, existing and anticipated future environmental conditions, existing projects or activities, plus other or planned projects or activities.

For the purposes of defining assessment scenarios, “approved” means approved by any federal, provincial or municipal regulatory authority. “Planned” is considered to be any project or activity that has been publicly disclosed prior to the issuance of the Terms of Reference or up to six months prior to the submission of the Project Application and EIA report, whichever is sooner.

4.1 Information Requirements for the Environmental Assessment

Basic environmental information requirements for Glacier Power’s EIA report include, for each relevant section:

- a) quantitative and qualitative information about the past and existing environmental and ecological processes in the EIA Study Area;
- b) information about the past, existing and planned human activities in the EIA report Study Area, and the nature, size, location and duration of their potential interactions with the environment, sometimes described as stressors (e.g., land disturbance, discharges of pollutants, changes to access status, consumption of renewable resources);
- c) information about ecological processes and natural forces which are expected to produce changes in environmental conditions (e.g., climate change, forest fires, flood or drought conditions, predator-prey population cycles);
- d) the demonstrated use of appropriate predictive tools and methods, enabling quantitative estimates of future conditions with the highest possible degree of certainty;
- e) quantitative and qualitative descriptions of the effects;
- f) evaluation of the significance of the effects, including the probability of the effect occurring and the importance of the consequences (measured quantitatively against management objectives and

guidelines or baseline conditions and described qualitatively with respect to the views of Glacier Power and stakeholders);

- g) management plans to prevent, minimize or mitigate adverse effects and to monitor and respond to expected or unanticipated conditions, including any follow-up plans to verify the accuracy of predictions or determine the effectiveness of mitigation plans;
- h) a record of all assumptions, including an evaluation of impact prediction confidence in data and analysis to support conclusions; and
- i) a description of residual effects and their consequences for the environment as well as for regional management initiatives that are underway or in development.

4.2 Cumulative Environmental Effects

Identify and assess the likely contributions of the Project to regional cumulative effects. Provide a comprehensive summary of all proposed monitoring, research and other strategies or plans to minimize, mitigate and manage any potential adverse contributions.

For each environmental component examined, address the adequacy of the Study Areas, information sources and assessment methods for a cumulative effects assessment. Assess the cumulative environmental effects that are likely to result from the Project in combination with other existing, approved and proposed projects in the region that could reasonably be considered to have a combined effect. Include other existing and proposed industrial projects as well as activities associated with land use and infrastructure.

Discuss the information and data used for existing and future developments:

- a) demonstrate that the information and data used is appropriate for use in this EIA report;
- b) describe any deficiencies or limitations in the existing database; and
- c) supplement, where required, and consider all relevant components of the environment.

Explain the approach and methods used to identify and assess cumulative effects including cooperative opportunities and initiatives undertaken to further the collective understanding of cumulative effects.

The assessment of cumulative effects should take into consideration guidance provided in the AENV/EUB/NRCB Information Letter entitled *Cumulative Effects Assessment in Environmental Impact Assessment Reports Required under the Alberta Environmental Protection and Enhancement Act* and the *Cumulative Effects Practitioners Guide* published by the Canadian Environmental Assessment Agency (CEAA).

4.3 Geotechnical

- a) Describe the surficial and bedrock geology of the Project site, headpond, and adjoining areas to address the site suitability for the proposed development.
- b) Discuss seismicity, slope stability, drainage, and erosion potential. Include downstream reaches, especially at the Highway 2 crossing and upstream tributaries that may be affected.
- c) Describe the likelihood of slumping of the headpond banks and, if it is likely, address how slumping could affect project operations, water quality and fish habitat.
- d) Describe geotechnical conditions in the area of the proposed south access road. Identify potential slope stability conditions that may affect the construction and operation of the south access road.

4.4 Climate, Air Quality and Noise

- a) Describe climatic conditions such as temperature, precipitation, wind speed and direction, and fog related to the Project.
- b) Identify ambient air quality conditions within the Study Area and how they will be affected by the Project.

- c) Show emission estimates for project construction, operation and decommissioning, including greenhouse gases, and put them in the context of total emissions in the region, the province and nationally.
- d) Identify the Project's sensitivities at all stages to climate parameters and their variability including, but not limited to, temperature, precipitation, and wind.
- e) Discuss the application of mitigation measures to reduce the Project's sensitivity to changes in specific climate parameters. Address any follow-up programs and adaptive management considerations.
- f) For those elements of the Project that are sensitive to climate parameters, discuss the projected range of changes in those parameters over the life of the Project (including decommissioning), the level of confidence associated with those projections and what impacts, including cumulative impacts this may have on the Project.
- g) Discuss how the predicted environmental impacts from the Project may be affected from these projected changes in climate parameters (e.g., air quality and temperature).
- h) Discuss how climate change may impact the success of mitigation measures, including reclamation success.
- i) Discuss potential noise and odour emissions from the Project. Discuss how air impacts, noise and odour resulting from the Project will be mitigated.

4.5 Water Quality

- a) Identify the impacts of the Project on water quality (temperature, dissolved oxygen, dissolved nitrogen, mercury and other metals, ammonia, suspended solids, turbidity, and total and dissolved nutrients).
- b) Discuss the potential for changes to the physical and chemical water quality characteristics resulting from sedimentation, inundation of soils and slumping.
- c) Discuss the potential for increased methyl mercury levels in the water due to Project-related inundation of soils and vegetation.
- d) Describe proposed monitoring and mitigation measures during the construction, operation and reclamation phases of the Project. Discuss contingency plans and company policy regarding remedial measures should downstream river water quality be adversely affected.

4.6 Surface Water Hydrology and Groundwater

- a) Describe the unregulated hydrologic regime that existed prior to the construction and operation of the W.A.C. Bennett Dam.
- b) Discuss the present hydrologic regime which is regulated by BC Hydro's W.A.C. Bennett Dam and Williston Reservoir and its effect on Project construction and operations.
- c) Describe anticipated changes to the topography, elevation, and drainage patterns resulting from the construction and operation of the Project.
- d) Identify any changes to the river regime and surface water hydrology including flood discharges and flood stages, water levels, flow velocities, flow patterns (thalweg), sediment discharge and erosion and scour expected as a result of the Project in both the near- and long-term. Consider potential effects upstream and downstream of the Project, including tributaries to the Peace River.
- e) Discuss the anticipated storage volume of the headpond and the mean residence time under a variety of flow conditions, including mean annual discharges and for flood events.
- f) Discuss expected changes in sediment transport and deposition in the headpond and downstream of the structure.
- g) Address anticipated effects on bridge piers, pipeline crossings, water intakes, and other riverine structures.
- h) Discuss how sediment will be managed. Include the expected impacts (as outlined above) that would result from maintenance procedures.

- i) Describe and map where turbulent water will be located (relative to the structure) as it flows over the spillway, over the powerhouse and through the turbines. Show the water levels immediately upstream and downstream of the structure under normal operation and during flood events.
- j) Identify potential changes in future operating scenarios for W.A.C. Bennett Dam and the resultant impacts on the Project and the hydrologic regime.
- k) Describe the impact to groundwater resources in the area including the groundwater base flow and interaction with the headpond.
- l) Identify any licensed users of surface and groundwater in the area, and how the Project may affect them.

4.7 Ice Formation and Break-Up

- a) Describe ice formation and break-up processes, and the modelling that is used to simulate these processes. Clearly identify the limitations of the model(s) including sources of error, simplifying assumptions and relative accuracy.
- b) Discuss and assess the effects of the proposed structure with one ice front moving from downstream and approaching the structure, and a second ice front starting at the headpond and moving upstream towards British Columbia.
- c) Describe any changes to flood potential at communities and properties upstream and downstream of the Project during construction and operation. Describe any change in the frequency of flooding due to ice-jams and break-up.
- d) Assess the potential effects of the current operating regime at the BC Hydro's W.A.C. Bennett Dam Site on the freeze-up process.
- e) Assess the overall change in ice cover thickness and ice strength during freeze-up as a result of the Project.
- f) Assess the effect of the change of thickness and strength on the local flooding regimes at Dunvegan and in the vicinity of the Town of Peace River. Include both freeze-up and break-up scenarios, and the occurrence of secondary consolidations.
- g) Discuss the potential for additional ice generation as a result of the Project and evaluate:
 - i) the effects of any additional ice on upstream and downstream structures, and
 - ii) the effect of additional ice cover on the typical spring break-up processes for the Peace and Smoky Rivers.
- h) Discuss the potential increase in frazil ice formation and its effects on downstream over-wintering fish habitat. Describe the potential for frazil ice dam build-up ("hanging dam") in the headpond created by the Project.
- i) Discuss and evaluate the impacts of possibly changed freeze-up processes on ice bridges across the Peace River. Include the ice bridges at the Shaftesbury Ferry crossing site upstream of the Town of Peace River and the Tompkin's Landing and Sunny Valley sites downstream of the Town of Peace River.
- j) Describe the impact of the Project on the thermal characteristics of the river and the resultant effect on freeze and thaw timing for ferry operations.
- k) Identify the cumulative impacts and effects of the Project on ice formation in the Peace River.

4.8 Aquatic Environment

4.8.1 Fish and Fish Habitat

- a) Determine the occurrences, and potential for occurrences of fish and benthic invertebrates listed by Alberta Sustainable Resource Development (at risk, may be at risk, and sensitive list species in the *General Status of Alberta Wild Species* 2000, or update) and the federal *Species at Risk Act* (endangered, threatened, and special concern species). Include species which are at the extent of their geographical range or transitory through the affected reach.

- b) Describe fish species known to occupy the Local Study Area. Identify species composition, distribution, relative abundance and general life history parameters in the area of potential impact. Delineate the spawning/breeding period for each species.
- c) Evaluate the quality and quantity of all fish habitats in the Local Study Area. Refer to critical or sensitive areas such as spawning, rearing, and over-wintering habitats and migration routes. Consider the seasonal variability of habitat conditions. Describe the criteria used in the evaluation process.
- d) Identify aquatic habitat expected to be harmfully altered, disrupted or destroyed by the Project. Indicate how environmental protection plans will address provincial and federal policies, including the "No Net Loss" principle. Discuss proposed mitigation and compensation measures to offset any loss in the productive capacity of fish habitat and benthic invertebrate and algal communities during the construction, operation and decommissioning of the Project.
- e) Provide a risk assessment for each species of fish in the Local Study Area. Include the following:
 - i) habitat changes created by the headpond as well as upstream and downstream of the headworks;
 - ii) upstream and downstream fish migrations by species and life history stages and their potential to be affected by the Project. Identify the entire time-period that encompasses all migrating species;
 - iii) fish mortality from all aspects of the Project;
 - iv) any potential impacts on the genetic diversity of fish populations above and below the Project site;
 - v) the likelihood of gas pressure impacts on fish resulting from water discharge over the structure; and
 - vi) anticipated residual effects and their significance.
- f) Describe follow-up and monitoring plans to determine the effectiveness of measures taken to mitigate or compensate for the adverse environmental effects of the Project in order to maintain the productive capacity of fish habitat.

4.8.2 Fishways

- a) Provide summary statistics on the number of dams, dams with upstream and downstream fish passage, and evidence of dams that have successful fish passage facilities. Provide documentation of fish passage efficiency and the success of passing all fish species. The summary is intended to provide perspective on the state of best management practices.
- b) Discuss the fishway design and rationale for the design.
- c) Discuss the location of the fishways and the location of the entrance of the fishways.
- d) Demonstrate that the proposed design will allow upstream and downstream fish passage for the species and size ranges of fish present at the Dunvegan site. Discuss adaptive management strategies that may be employed in the event fish passage is impeded.
- e) Discuss the full range of velocities expected at various river discharges and the resulting fishway velocities.
- f) Relate fish species and fish size-specific swimming capabilities to expected fishway velocities.

4.8.3 Near-Structure Fish Movement

For upstream migration:

- a) Describe the current understanding about how fish moving upstream approach structures.
- b) Identify critical design elements that aid fish staging below the structure to locate the fishway entrance.
- c) Identify concern areas with respect to fish passage. Describe the specific periods of time when fish passage facilities may not be operating and which species may be impacted.
- d) Describe follow-up and monitoring plans to evaluate the effectiveness of fish passage and the maintenance of fish populations above and below the structure. Discuss the rationale and weaknesses of the strategy. Ensure monitoring programs include strategies to evaluate what percentage of a given species actually finds the fishway as well as the size ranges that can successfully navigate the fishway.

- e) Describe the adaptive management program that will allow the facility to adjust fish passage conditions.

For downstream migrations:

- f) Discuss the current knowledge of how fish approach structures.
- g) Discuss the percentage of river flow going through the turbines, over the structure and through fish passage facilities at the various discharges expected during the migrations.
- h) Describe design elements of the Project aimed at preventing fish entrainment.
- i) Evaluate the variability, magnitude, duration and timing of debris loads in the river. Assess the influence of debris on the function of the fish screens and how the screens will be deployed, removed, altered or cleaned.
- j) Discuss fish passage and estimate the mortality rate of fish through the turbines considering the species and sizes of fish expected.
- k) Provide evidence of facilities that document successful passage of fish of the same swimming characteristics and of similar size as species found in the Local Study Area.
- l) Calculate total annual mortality rates and relate to population sustainability.

4.9 Terrestrial Environment

4.9.1 Soil Resources

Provide the Local Study Area and Regional Study Area geological, terrain and soils conditions, including the following:

- a) Describe the bedrock and surficial geology, including surface topography, of the Local Study Area;
- b) Describe and map the soil types and their distribution in areas that will be affected by Project construction activities using appropriate survey intensity levels;
- c) Present all baseline biophysical information in a manner that enables a detailed ecological land classification (ELC) of areas that will be affected by Project construction activities. Describe the impact of the Project on each ELC unit based upon the key characteristics of the soil;
- d) Identify and locate erosion sensitive soils and discuss potential effects of the Project on these soils including mitigative actions; and
- e) Describe plans for sand and gravel management in the area prior to commencement of the Project.

4.9.2 Vegetation Resources

- a) Map vegetation communities and dominant species within the Project Area incorporating physiological features such as slope, aspect, elevation, and other terrain features. Provide ELC maps that show the pre- and post-disturbed landscapes. Comment on the importance of the size, distribution, and variety of these ELC units for wildlife habitat and other land uses from a local and regional perspective. Discuss the accuracy and resolution of the information used to develop the ELC maps.
- b) Discuss the work done, planned and required to establish the presence or absence of rare plants and rare plant communities. Identify all species on the Alberta Natural Heritage Information Centre tracking list of vascular and non-vascular plant species of conservation concern and from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Describe the proposed mitigation plan for their protection and the monitoring program that will determine the effectiveness of these strategies.
- c) Show the extent of surface disturbance due to construction and operation of the Project and determine the extent of any off-site disturbance. Identify the type and amount of vegetation to be disturbed during the construction and operation of the various Project components. Address clearing required in the headpond, along the access roads, and powerlines.
- d) Discuss temporary and permanent changes to vegetation communities.
- e) Identify changes to vegetation communities within, and along the margins of the headpond that may result from fluctuating water levels. Comment on the significance of the effects and their

implications for other environmental resources, including habitat diversity and quantity, water quality, erosion potential, soil conservation, and reclamation.

- f) Address how locally adapted native plant species will be used for reclamation.
- g) Describe the impacts to wetlands and wetland functions in conjunction with other project-induced variations in hydrology, habitat quality and wildlife populations. Discuss how the Project will address provincial and federal policies for wetlands.

4.9.3 Wildlife Resources

- a) Describe existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals) and their use or potential use of habitats in the Local and Regional Study Areas. Document the anticipated changes to wildlife in the Study Areas. Include current survey data and all sensitive species listed by Alberta Sustainable Resource Development (at risk, may be at risk, and sensitive list species in the *General Status of Alberta Wild Species 2000*, or update) and the federal *Species at Risk Act* (endangered, threatened, and special concern species).
- b) Provide a map and description of the habitat types and values.
- c) Discuss any significant habitat, habitat use patterns (calving, rearing and nesting areas, and escape terrain), extent or range in both summer and winter, and seasonal movement corridors. Identify critical areas and migration routes, and mitigation strategies if any will be required.
- d) Discuss the potential for adverse impacts on wildlife, wildlife utilization, habitat quality and food supply during the construction and operation phases of the Project.
- e) Determine the percentage of river shoreline, islands and benches that will be inundated. Evaluate the change for ungulates (both for winter forage and for production of young) and breeding/migrating birds. Consider abandonment, loss, fragmentation or alteration of habitat, vehicle/wildlife collisions, power line collisions, obstructions to delay seasonal movements, noise, hunting, and mortality due to improved or altered access. Evaluate the potential impacts to wildlife as a result of emissions or other changes to air, water and soil quality.
- f) Describe measures designed to mitigate impacts of construction and operation activities on wildlife. Describe monitoring programs to determine the effectiveness of mitigation strategies to protect wildlife.
- g) Discuss the effects of fish mortality on piscivorous (fish-eating) birds, the attraction of prey species and parasitic bird species.

5.0 TRANSPORTATION

- a) Describe the anticipated impact on the local, regional and provincial road systems during the construction, operational and decommissioning phases of the Project. Provide a detailed description of the method and form of transporting construction materials or equipment via public roads to the Project site, including measures to ensure public safety. Include estimated incremental traffic volume and the seasonality of the activity.
- b) Discuss the potential for increased bridge deck icing and fog at the Dunvegan Bridge due to winter open-water conditions near the Project and describe how necessary mitigating measures will be undertaken.
- c) Discuss the transportation of any chemicals needed and wastes generated during the construction and operation of the Project. Indicate what measures will be put in place to prevent and mitigate any potential contamination and accidents.
- d) Discuss the potential impacts to both existing and future bridge crossings on the Peace River and tributaries arising from any possible changes to the river regime. This should include potential hydrological and hydraulic impacts on the existing Highway 2 bridge structures at Dunvegan and the Town of Peace River with respect to issues such as water levels, flow velocities, sediment discharge, ice-jam formation, erosion and scour.

- e) Discuss impacts of the Project on the geotechnical stability of channel banks, bridge headslopes and approach embankments. Long-term fluvial geomorphologic changes should also be evaluated along with their impacts on the bridge structure and water opening stability.
- f) Describe the possible effects on the operation of the Shaftesbury Ferry and the ice bridge and the resulting impact on traffic along Secondary Highway 740 during the construction and operation phases of the Project. Also discuss the potential effects on other ferries and ice bridges further downstream from the Project.
- g) Identify and discuss the possible alternatives to mitigate the impacts of the Project on users of the ferries and ice bridges downstream of the Project.
- h) Discuss the permanent road requirements to access both sides of the Project.
- i) Discuss design and construction features that will be employed to minimize the potential for the south access road to affect the slope stability of Highway 2 along Dunvegan Creek. Discuss monitoring and mitigation plans to address potential effects of the south access road on Highway 2.

6.0 LAND AND WATER USE

6.1 General

- a) Describe present land and water uses such as recreation, agriculture, forestry, oil and gas, and mining activities at the proposed Project site, on adjacent lands including current dispositions and other commitments on public lands, and informal or traditional uses on public lands. Discuss the potential impact of the proposed development on the land and water uses, and describe possible mitigation strategies.
- b) Identify potentially-affected areas designated by Alberta as Natural Areas, Environmentally Significant Areas, Protected Areas, Prime Protection, or Critical Wildlife and discuss how they may be affected by the proposed Project.
- c) Describe present resources - specifically oil and gas and mining activities at the proposed Project site on adjacent lands including current dispositions and other commitments on Public Lands.
- d) Discuss the municipal land use implications of the proposed Project and the steps that have been or will be taken by Glacier Power or others to resolve any concerns.
- e) Discuss the types of tenure proposed and describe the responsibilities of Glacier Power and others.
- f) Summarize Glacier Power's status in securing consent from landowners and leaseholders for various components of the Project.

6.2 Boating and Navigation

- a) Describe the current and projected boat use on the Peace River in the Project Area, including information on types of boats and patterns of use.
- b) Discuss the ownership of the boat lock and boat launch and who will be responsible for operating the facilities.
- c) Describe and provide diagrams for boat passage over or around the Project structure under the full range of flow scenarios.
- d) Describe all proposed safety, signage and awareness strategies associated with navigation including travel during dark and foggy conditions. Address the safety precautions, which will prevent a boat from floating over the structure. Use a worst-case scenario such as loss of power and no visibility. Discuss how accidents will be avoided in river navigation and transfer of vessels past the structure.

7.0 VISUAL RESOURCES

Discuss and illustrate the siting of the Project facilities at the proposed location with respect to visibility of the headworks, access roads, and power line in the Peace River valley, both up and downstream, from above the valley breaks, public roadways or adjacent properties. If required, discuss possible mitigation strategies to minimize adverse visual impacts.

8.0 HERITAGE RESOURCES

Describe those aspects of the Project that may have implications for historical resources and traditional use and provide the following:

- a) details of consultation with Alberta Community Development and with Aboriginal communities;
- b) a Historical Resources Impact Assessment (HRIA) for the Project to Alberta Community Development, and any other interested parties, prior to or at the same time as the submission of the EIA report to Alberta Environment;
- c) a general overview of the results of any previous historical resource studies that have been conducted in the Study Area, including archaeological resources, palaeontological resources, historical period sites, and any other historical resources as defined within the *Historical Resources Act*;
- d) a summary of the results of the HRIA that is carried out with respect to the Project;
- e) an outline of the historical resources management program and schedule of field investigations that may be required to further assess and mitigate the potential effects of the Project on historical resources;
- f) results of consultation with Aboriginal groups to determine the extent of traditional use of the Local Study Area;
- g) document any stakeholder concerns with respect to the development of the Project based on the historical significance of sites within the Local Study Area or its current use by traditional users; and
- h) identify the existing and historical land uses including tourism, forestry, fishing, hunting, traditional plant harvesting, cultural use and outdoor recreation with specific regard given to the Aboriginal peoples. Determine the impact of Project on these uses and identify possible mitigation strategies.

9.0 HEALTH AND SAFETY

9.1 Health

Describe those aspects of the Project that may have implications for public health and determine whether there may be implications for public health arising from the Project and provide the following:

- a) Identify and discuss the data and methods used to assess the impacts of the Project on human health and safety.
- b) Assess the potential health implications of compounds (including methyl mercury) that will be released to the environment from the proposed Project in relation to exposure limits established to prevent acute or chronic adverse effects on human health.
- c) Assess cumulative health effects that are likely to result from the Project in combination with other existing, approved, and proposed projects or reasonably-foreseeable activities in the region.
- d) Describe the potential for contamination of fish by wastewater discharges relative to fish consumption guidelines.
- e) Discuss the potential for changes to water quality, air quality, soil quality and the bioaccumulation of contaminants in natural food sources in the Study Area to increase human exposure to contaminants.
- f) Discuss relevant factors and parameters that influence possible health risks such as water quality changes and design and operation features of the headworks.
- g) Identify and discuss potential health and safety impacts due to higher regional traffic volumes and the increased risk of accidental leaks and spills.
- h) Document health and safety concerns raised by stakeholders during the consultation on the Project.

9.2 Safety

- a) Describe the impact of natural hazards such as ice, logs and other debris on the safety of the structure. Provide a description of the level of protection and operations under emergency or upset conditions.
- b) Discuss mitigation strategies and emergency contingency guidelines that will be implemented to ensure public safety during construction and operation of the proposed Project. Describe how

accidents will be avoided in association with the navigation system. Describe the purpose and operation of the boom.

- c) Discuss how Glacier Power's Emergency Response Plan will be developed, including a landowner and local municipality emergency notification program.
- d) Describe how local residents will be contacted during an emergency and what type of information will be communicated to them.
- e) Discuss safety procedures and personnel training that will be required of employees on the site during construction and operation of the plant to promote worker safety.
- f) Evaluate public safety in the areas around existing spillways of similar and smaller size.

10.0 ENVIRONMENTAL PROTECTION PLAN

- a) Present a conceptual Environmental Protection Plan to minimize or eliminate impacts and monitor environmental performance during the construction and operations. Summarize the key elements of the plan and discuss reporting and monitoring requirements including plans for public notification and release of information.
- b) Describe risks and uncertainties associated with each Project component that may have environmental and community-wide implications, and discuss how they will be addressed in the implementation stage.
- c) Outline the key elements that will promote operation of the proposed Project in an environmentally responsible manner including action plans to address any significant adverse impacts associated with construction and operations.
- d) Identify any potential environmental factors such as flooding, ice formation and breakup or other natural events that may affect the Project, and describe contingency plans.
- e) Describe measures to be implemented to monitor environmental protection processes.
- f) Address how on-site spills and accidents will be mitigated and identify associated environmental effects.

11.0 SOCIO-ECONOMIC ASSESSMENT

Provide information on the socio-economic effects of the Project. Discuss the following:

- a) the selection of the Study Areas, information sources and assessment methods;
- b) the number and distribution of people who may be affected by the proposal;
- c) the social impacts of the Project on the Study Areas and on Alberta, including:
 - i) local employment and training;
 - ii) local procurement;
 - iii) population changes;
 - iv) demands on local services and infrastructure;
 - v) regional and provincial economic benefits;
 - vi) trapping, hunting and fishing; and
 - vii) effects on First Nations and Métis (e.g., traditional land use and culture);
- d) the economic impacts of the Project on the Study Areas and on Alberta, having regard for capital, labour and other operating costs and revenue from services. In addition, discuss Glacier Power's policies and programs respecting the use of local, Alberta and Canadian goods and services. Provide an estimated breakdown of Alberta, other Canadian and non-Canadian industrial benefits from project management/engineering; equipment and materials; construction labour; and total overall project;
- e) the employment and business development opportunities the Project may create for local communities and the region. Provide a breakdown of the type of employment and number of employees with respect for the construction and operational workforces. Identify the source of labour for the proposed Project;

- f) the potential economic and social impacts on the population groups within the Regional Study Area due to any changes in the operation of the Shaftesbury Ferry and ice bridges on the Peace River; and
- g) strategies to mitigate socio-economic concerns raised by municipalities and other stakeholders in the region. Include a discussion on the potential impacts to housing availability and the social ramifications of that impact.

12.0 PUBLIC AND ABORIGINAL CONSULTATION

Describe discussions with:

- a) residents of the Municipal Districts of Fairview and Spirit River; the Counties of Saddle Hills and Birch Hills; the City of Grande Prairie; and the Towns of Peace River, Grimshaw, Fairview, Rycroft, and Spirit River and others as identified during the consultative process;
- b) First Nations and Métis organizations;
- c) commercial, industrial and recreational users;
- d) Alberta and British Columbia provincial representatives;
- e) federal government representatives; and
- f) other potentially-affected parties.

Document the public consultation program implemented for the Project including methods, the type of information provided and the level and nature of Glacier Power's response, and provide the following:

- g) describe the consultative process and show how public input was obtained and addressed;
- h) document individual participation and attendance at each meeting and record specific comments or issues raised by individuals present at the meetings;
- i) describe and document the concerns and issues expressed by the public, Glacier Power's analysis of those concerns and issues, and the actions taken to address those concerns and issues;
- j) describe how resolution of the concerns and issues was incorporated into the project development, impact mitigation and monitoring; and
- k) describe plans to maintain the public consultation process following completion of the EIA report review to ensure that the public will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.