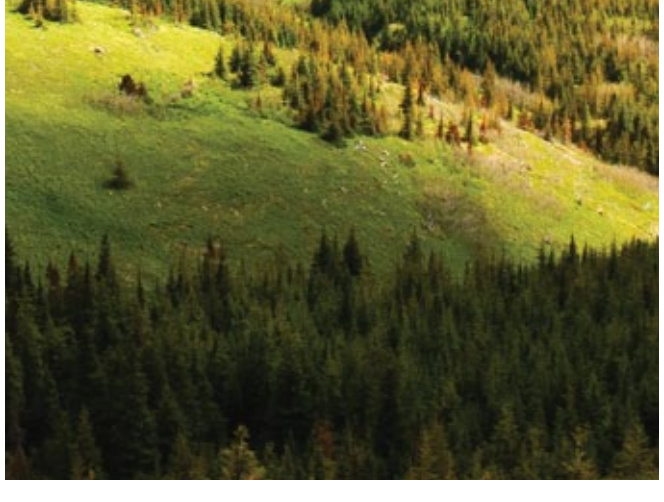
Considerations

Report of the Joint Review Panel for the Enbridge Northern Gateway Project

Volume 2



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Enbridge Northern Gateway Project

Volume 2

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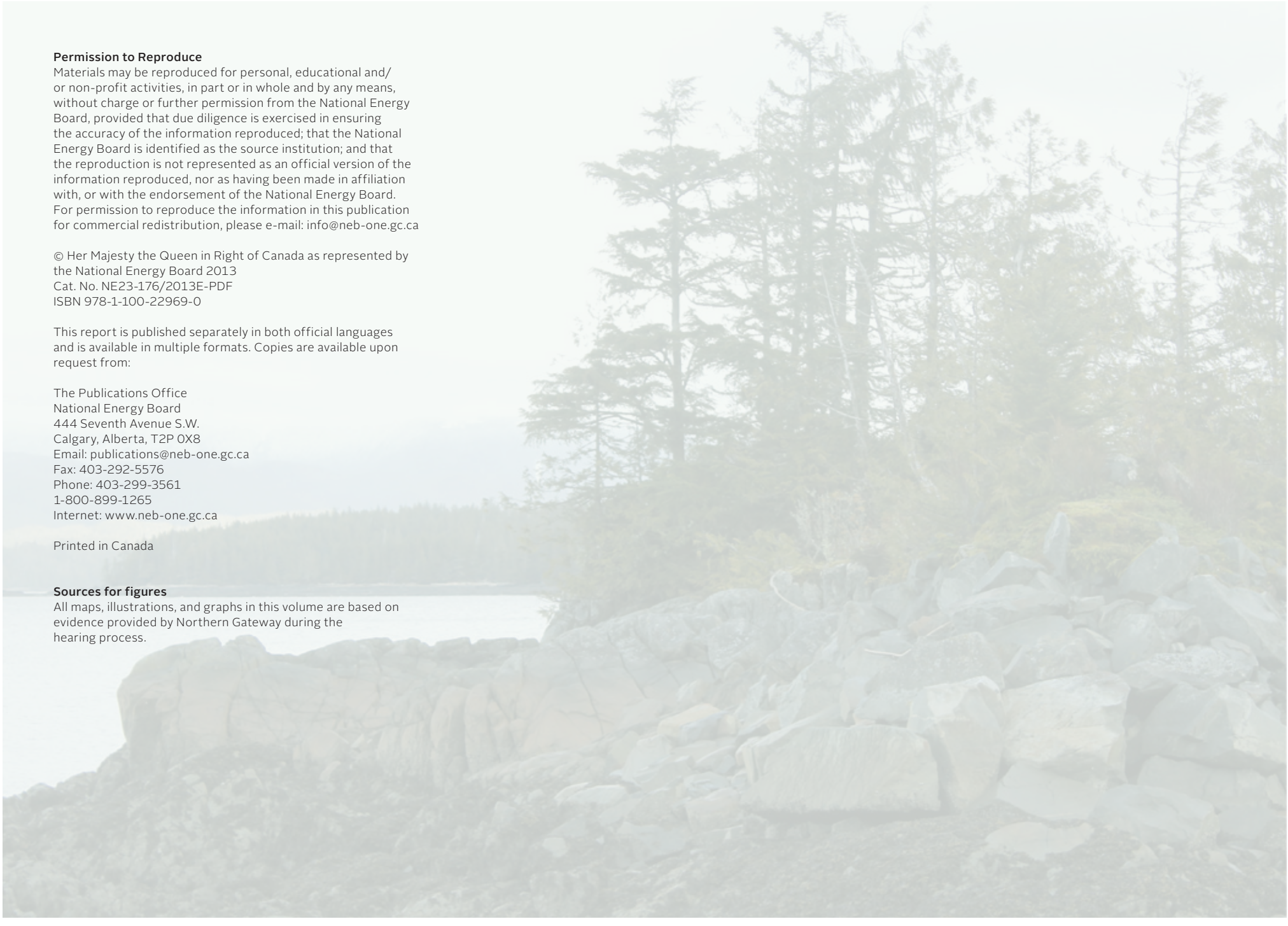


Contents

1 Principles, considerations, and disposition

The first volume of the Joint Review Panel report, *Connections,* summarizes the Panel's conclusions and recommendations for the Enbridge Northern Gateway Project. This second volume, *Considerations,* provides a more detailed description of the issues and reasoning behind the conclusions and recommendations. The Joint Review Panel and its process are described in more detail in Appendix 3.

Many Aboriginal and non-Aboriginal people described the complex connections between land, sea, air, and the people who use these natural resources. They asked the Panel to consider the complex economic, social, and environmental connections that could be affected if the Enbridge Northern Gateway Project is built. The Panel assessed the proposed facility design and operation to determine whether the project could be constructed and operated in a safe, reliable, and environmentally-responsible manner. The Panel considered how negative effects could be prevented or minimized, and how benefits could be realized and maximized.

Ultimately, the Panel is required to make a recommendation on whether the project is in the public interest. In other words, would Canada and Canadians be better off, or worse off, if the project is built and operated? The Panel's consideration of the Canadian public interest is described in Chapter 2.

FIGURE 1.1 **PROPOSED PIPELINE ROUTE**

The Alberta portion of the proposed pipeline route is about 520 kilometres in length and crosses more than 360 watercourses. About half of the Alberta portion of the route would cross private land and half would cross provincial or federal Crown lands. The British Columbia portion of the proposed pipeline route is about 660 kilometres in length and crosses about 850 watercourses. More than 90 per cent of the British Columbia portion of the route would be on provincial Crown lands. Much of the route in both provinces would cross lands currently and traditionally used by Aboriginal groups.

1.1 The project

Northern Gateway Pipelines Limited Partnership (Northern Gateway) proposed to build and operate a terminal at Kitimat, British Columbia, and two pipelines between Bruderheim, Alberta, and Kitimat (Figure 1.1). A primary purpose of the project would be to provide access for Canadian oil to international markets including existing and future refiners in Asia and the United States West Coast. The project would also be intended to provide greater diversification in the supply of condensate used for diluting heavy oil.

The total estimated capital cost of the project is $7.9 billion, which includes $500 million for associated marine infrastructure. Northern Gateway said that the project would be completed by late 2018.

The three major components of the project are:

- one 914 millimetre (36 inch) outside diameter export pipeline that would carry an average of 83,400 cubic metres (525,000 barrels) per day of oil products west from Bruderheim to Kitimat;
- a parallel import pipeline, 508 millimetres (20 inches) in outside diameter, that would carry an average of 30,700 cubic metres (193,000 barrels) of condensate per day east from Kitimat to the terminal at Bruderheim; and
- a terminal at Kitimat with 2 tanker berths, 3 condensate storage tanks, and 16 oil storage tanks.

Appendix 2 provides a more detailed description of the project.

The Joint Review Panel Agreement and the Panel's List of Issues defined the scope of the hearing. The Panel considered the project's environmental effects, the risks of accidents, effects to local economies and traditional resource use, economic benefits, the need for the project, the safety of facilities, and marine transportation, among many other factors.

In the early stages of the public hearing, the Panel heard from many people who said that the Panel should consider the environmental impacts of bitumen extraction, including the production of greenhouse gases and related effects on climate change. The Panel considered the degree of connection between the Enbridge Northern Gateway Project and upstream oil sands development, downstream air emissions from bitumen upgrading, and eventual use of petroleum products to be transported by the project. The Panel concluded that connections to oil sands development were not sufficiently direct to allow consideration of their environmental effects in its assessment of the project, other than in its consideration of cumulative effects. The Panel also concluded that downstream effects would be hypothetical and of no meaningful utility to the Panel's process. The Panel considered emissions arising from construction activities, pipeline operations, and the operation of tankers in Canadian waters to be within the scope of its assessment.

1.2 The review process

The Minister of the Environment and the Chair of the National Energy Board established the Joint Review Panel under the *Canadian Environmental Assessment Act* and the *National Energy Board Act*. The National Energy Board appointed two of its members as Panel members. The Minister of the Environment selected the third member who was subsequently appointed as a temporary member of the National Energy Board. The Panel was directed to conduct an environmental assessment of the project and submit a report recommending whether or not the project was in the public interest. In its report, the Panel was to set out terms and conditions necessary or desirable in the public interest. The Panel was also directed to set out its rationale, conclusions, and recommendations relating to the environmental assessment of the project.

As an independent expert tribunal, the Panel believed that it was important to gain a broad perspective on all aspects of the proposed project before making its recommendation. This included technical, as well as human and cultural, aspects of the project. The Panel heard local, regional, and national perspectives about the project from affected individuals, Aboriginal groups, and other groups along the proposed pipeline and shipping routes.

The Panel sought at all times to ensure that the joint review process was fair, open to the public, safe, respectful, and transparent. The Panel designed and implemented a hearing process that encouraged and supported meaningful public and Aboriginal participation. This included the collection

of oral traditional evidence, such as Aboriginal community knowledge, and the testing of the technical evidence filed during the review process. People were able to share their information with the Panel orally, in writing, or using both methods.

In preparation for the hearing process, the Panel's Secretariat staff hosted 35 public information sessions and 32 online workshops to share procedural information and answer questions about how to participate in the hearing process.

Public hearings for the proposed project attracted a high level of public interest. There were 206 intervenors, 12 government participants, and 1,179 oral statements before the Panel. Over 9,000 letters of comment were received. The Panel held 180 days of hearings, of which 72 days were set aside for listening to oral statements and oral evidence. Most of the hearings were held in communities along the proposed pipeline corridor and shipping routes. The entire record of the proceeding is available on the National Energy Board website.

The Panel acknowledges and thanks all parties for their contributions to the Enbridge Northern Gateway Project proceeding. There was a high level of participation by individuals and groups who had never before appeared in front of a regulatory panel. The Panel acknowledges the challenge of dealing with large volumes of technical evidence, particularly when additional information was submitted during the review process in response to questioning. The Panel sincerely appreciates the time and effort that people invested in their submissions and testimony. Many adjusted personal schedules and travelled long distances to express their views on the proposed project.

1.3 The Panel's approach to sustainable development

If approved and built, the Enbridge Northern Gateway Project could operate for 50 years or more. The Panel heard from participants that it must consider the project's implications for future generations. People expressed a passionate commitment and sense of stewardship for the environment and told the Panel how important it was to think about the long term. In making its public interest recommendation on the project, the Panel was mindful of the implications to future generations of Canadians, and of the need to integrate current environmental, social, and economic considerations.

One of the purposes of the *Canadian Environmental Assessment Act, 2012* is to encourage federal authorities to take actions that promote sustainable development and, thereby, achieve or maintain a healthy environment and a healthy economy. Under the *National Energy Board Act*, the Panel must determine whether the project is in the public interest based on the evidence put before it. These two objectives are complementary and both relate to sustainable development.

Hearing directly from those who may be affected by the project is key to any consideration of sustainable development. The Panel designed the public hearing to support and encourage public participation. The public hearing design included:

- public input on the draft List of Issues, additional information requirements, and locations for oral hearings;
- oral comments on the process for hearings heard in Whitecourt, Kitimat, and Prince George;
- public information sessions held in 16 communities;
- process advisors available to assist participants throughout the hearing process;
- community hearings for oral statements and oral evidence held in 21 communities to hear from those potentially affected by the project, and to enable Elders and First Nations to share their oral history and traditional knowledge;
- online workshops to assist participants in preparing for oral statements, questioning of witnesses, and participation in final argument;
- final hearings for questioning held in Edmonton, Prince George, and Prince Rupert;
- hearings for final argument held in Terrace;
- transcripts and documents that were all publicly available on the National Energy Board website; and
- audio from the hearings was webcast live.

In order to optimize opportunities for individuals and groups to present their evidence and opinions to the Panel, the Panel incorporated remote participation through video and telephone links into the hearing room during all aspects of the oral hearings, including questioning. It is the Panel's view that this approach was effective. Many participants, including expert witnesses, commented that they found the remote participation options useful and effective. This approach provided all participants with opportunities to participate and not be excluded from giving evidence and opinions due to travel, finances, work, and life commitments.

1.4 A precautionary approach

The Panel used a careful and precautionary approach in its assessment of the project. Precautionary aspects of the Panel's report and recommendations were guided by five principles:

- Precaution is an element of risk detection, risk reduction, and risk management.
- Precautionary mitigation should be based on scientific and technical information made available and tested through a public hearing process.
- Precaution is appropriate when potential environmental effects are difficult to predict accurately due to natural variability and incomplete knowledge of natural processes.
- Continuing community engagement and follow-up environmental monitoring can help to reduce scientific uncertainty and unnecessary precaution, over time.
- A public and transparent assessment process improves the quality of a precautionary approach.

1.5 Improving the project design through regulatory review and environmental assessment

Northern Gateway refined the design of the project during the review process in response to participants' views, questions, and advice. New information and analysis produced during the environmental assessment also allowed Northern Gateway, the public, and the Panel to identify and evaluate new and innovative mitigation measures.

The assessment of the Enbridge Northern Gateway Project involved predicting complex biophysical system behavior years into the future. An element of uncertainty was inevitable and had to be accommodated in the Panel's conclusions and recommendations. Some precautionary conditions set out by the Panel would require ongoing monitoring and research to help reduce uncertainty. Examples include prevention and mitigation of potential undesirable project effects on old growth forests, wetlands, caribou, grizzly bear, and marine mammals.

The Panel did not need the final design details of the Enbridge Northern Gateway Project to be presented during the hearing. Final engineering would commence if the project receives certificates of public convenience and necessity, and if the company decides to proceed with the project subject to all required terms and conditions. The Panel acknowledges that many final engineering details can only be determined after the Panel's process is concluded and project construction has begun in the field.

Through Northern Gateway's application, responses to information requests, questioning, reply, and final argument, the Panel has received sufficient detail to complete a comprehensive and precautionary assessment of the proposed project. The Panel is of the view that follow-up and monitoring programs, as set out in the Panel's conditions, would minimize adverse project impacts on people, communities, and the environment, and would support improvements to future assessments.

Northern Gateway has proposed mitigation measures that go well beyond those typically proposed for pipeline projects. An example is the funding of research chairs and the vision for a collaborative marine shipping community through the proposed Fisheries Liaison Committee (see Chapter 9 for details). The Panel finds that these types of measures would respond, to some extent, to society's broader expectations of industry.

1.6 Conditions set out by the Panel

The *National Energy Board Act* requires the Panel to set out conditions that it considers necessary or desirable in the public interest, should the Governor in Council direct the National Energy Board to issue certificates to authorize the project. The purpose of conditions is to mitigate potential risks and effects associated with the project so that the project would be designed, constructed, and operated in a safe manner that protects human health and the environment.

The Panel sets out 209 conditions in Appendix 1. The conditions address all aspects of the proposed project, including potential risks associated with the oil pipeline, the condensate pipeline, the Kitimat Terminal, and associated activities and facilities. The Panel's conditions incorporate all of Northern Gateway's voluntary commitments. During the hearing, the Panel made all of its potential conditions available for review and considered all comments received, before finalizing the conditions.

If the Governor in Council approves the Enbridge Northern Gateway Project, the National Energy Board would issue certificates of public convenience and necessity for the oil pipeline and the condensate pipeline. The certificates would be subject to the terms and conditions set out in this report, unless the Governor in Council orders the National Energy Board to reconsider any of them. If ordered to reconsider any condition, the National Energy Board would prepare a report either confirming the condition or replacing it with another one.

Any commitments made by Northern Gateway in its application, or in submissions or testimony during the public hearing, would become regulatory requirements attached to the certificates. A number of conditions would specifically require Northern Gateway to implement its commitments relating to marine navigation safety measures and the types of tankers that would access the oil and condensate terminal in Kitimat. These conditions would take effect through the certificates of public convenience and necessity authorizing the operation of the marine terminal and pipelines.

If the project is approved, and Northern Gateway decides to proceed, it would be required to comply with all conditions that are set out in the certificates. Some conditions require third party review of certain programs or plans that would be filed by Northern Gateway. The National Energy Board would monitor and enforce compliance during the lifespan of the project through audits, inspections, and other compliance and enforcement tools. Documents filed by Northern Gateway in relation to condition compliance, and related National Energy Board correspondence, would be available to the public in the project registry on the National Energy Board website.

1.7 Recommendations

In its application, Northern Gateway asked for:

- a certificate of public convenience and necessity pursuant to section 52 of the *National Energy Board Act*, authorizing the construction and operation of the oil pipeline and associated facilities, including tankage and terminal facilities at Kitimat;
- a certificate of public convenience and necessity pursuant to section 52 of the *National Energy Board Act*, authorizing the construction and operation of the condensate pipeline and associated facilities, including tankage and terminal facilities at Kitimat;
- an order pursuant to Part IV of the *National Energy Board Act* approving the toll principles applicable to service on each of the oil and condensate pipelines, including tankage and the terminal at Kitimat; and
- such further and other related relief as Northern Gateway may request or the National Energy Board may deem appropriate pursuant to section 20 of the *National Energy Board Act*.

The Panel was satisfied that the proposed Enbridge Northern Gateway Project is, and will be, required by the present and future public convenience and necessity, taking into account the terms and conditions set out in Appendix 1, including all commitments made by Northern Gateway during the hearing process. This conclusion reflects the Panel's consideration of the entire record of the Northern Gateway proceeding, including, but not limited to, environmental effects to be taken into account under section 5 of the *Canadian Environmental Assessment Act, 2012*. Our reasoning is set out in the various chapters of this volume.

The Panel recommends that the Governor in Council find that the two cases of significant adverse environmental effects are justified in the circumstances. The Panel's environmental assessment findings are summarized in Chapter 2 and are detailed in Chapter 8.

Therefore, the Panel recommends to the Governor in Council that certificates of public convenience and necessity, incorporating the terms and conditions in Appendix 1, be issued pursuant to Part III of the *National Energy Board Act*.

The Panel finds that the toll principles are acceptable for developing tolls for each pipeline in a later Part IV application, subject to the Panel's comments and conditions.

Finally, the Panel finds it appropriate for Northern Gateway to be designated a Group 1 company, and orders that it be so designated.

JOINT REVIEW PANEL

Sheila Leggett,
Chairperson

Kenneth Bateman,
Member

Hans Matthews,
Member

Calgary, Alberta, December 2013

2 Determining the Canadian public interest

The Panel considered all of the views and evidence on the record to determine whether the Enbridge Northern Gateway Project would be in the public interest. The Panel heard about values, culture, and economy from those who could be affected by the project. People living near the proposed project spoke about protection of the environment, access to fresh water, and sustainability of salmon, as examples of their values. The Panel listened to people's concerns about culture and economy, and to Northern Gateway's proposals to address those concerns. Aboriginal people told the Panel how the project could affect them and their use of the land, water, and resources.

2.1 Role of the National Energy Board

The National Energy Board is an independent federal tribunal that regulates parts of Canada's energy industry, including interprovincial and international pipelines. The National Energy Board makes and implements regulations and guidelines to promote the safety, security, and protection of people, the environment, and property throughout a pipeline project's lifespan.*

Pipelines regulated under the *National Energy Board Act* must be designed, constructed, and operated in accordance with the *National Energy Board Onshore Pipeline Regulations* and the latest versions of relevant design codes, including the Canadian Standards Association (CSA) Z662-11 (Oil and Gas Pipeline Systems) and Z245.1 (Steel Pipe). Pipelines must be operated in accordance with other regulations under the *National Energy Board Act*, such as the *Toll Information Regulations* and the *Oil Pipeline Uniform Accounting Regulations.*

* The National Energy Board takes a lifespan (lifecycle) approach to the management of issues in that it oversees all phases of a regulated facility including the planning and application phase, the application assessment and public hearing phase, the construction and post-construction phase, the operations and maintenance phase, and the abandonment phase.

When an application for a new pipeline facility is received, the National Energy Board typically:

- assesses the proposed project from environment, engineering, safety, economic, socio-economic, and lands perspectives;
- confirms that the applicant for the facility has notified and consulted with landowners, Aboriginal peoples, and other affected parties;
- determines how best to provide opportunities to those potentially affected by the project and other stakeholders to participate in the review of the proposed project;
- determines whether, with specific mitigation measures and other conditions, the project is in the public interest; and
- makes a recommendation to the Minister of Natural Resources as to whether or not a certificate approving the project should be issued.

The National Energy Board is a quasi-judicial tribunal, meaning that it is court-like and follows the principles of natural justice and fairness, which have been developed by the courts over time.

Recommendations made by regulatory tribunals such as the Panel are based on review of scientific and technical information placed on the record during a public hearing. Tribunals are not influenced by the number of letters received or by other demonstrations of public opposition or support. Rather, recommendations are based on the evidence provided, within a legal framework enacted by the legislature and applied by the courts.

2.2 Creation of the Panel

The Panel was established through the Joint Review Panel Agreement by the Minister of the Environment and the Chairman of the National Energy Board, dated 4 December 2009. The Joint Review Panel Agreement was amended on 3 August 2012 to comply with the *Canadian Environmental Assessment Act, 2012*, the *Jobs, Growth and Long-Term Prosperity Act*, and the amended *National Energy Board Act*. The Panel's purpose was to assess the environmental effects of the proposed project and consider the application under both the *Canadian Environmental Assessment Act* and the *National Energy Board Act*.

The three-member Panel was announced on 20 January 2010. The Panel consisted of two permanent members of the National Energy Board and one temporary member recommended by the Minister of the Environment. The Panel is an independent expert tribunal. It must consider all relevant evidence contained on its record, determine the weight to be given to that evidence, and make its recommendations solely on that evidence. Neither the Panel nor the National Energy Board is responsible for developing federal government policy.

2.3 Public interest and the public convenience and necessity test under Part III of the *National Energy Board Act*

In the Panel's view, the public interest is inclusive of all Canadians, locally, regionally, and nationally, and refers to the integration of environmental, societal, and economic considerations. A determination in the public interest is based on findings of fact and a review of scientific and technical information.

When applying the "present and future public convenience and necessity" test under Part III of the *National Energy Board Act* the Panel must consider the overall "public interest." The *National Energy Board Act* requires the Panel to consider any public interest that may be affected by granting or refusing the application. The Panel considers the burdens the project could place on Canadians, and the benefits the project could bring to Canadians.

In making its recommendation, the Panel assesses all the evidence on the record, including:

- the proposed engineering design and safety of the facilities;
- the economics of the proposed project including supply, demand, and access to the facilities;
- the effect the proposed project would have on the environment, as well as the effect the environment would have on the project; and
- the effect the proposed project would have on individuals, Aboriginal and non-Aboriginal groups, communities, and society.

In carrying out its assessment, the Panel looked at the environmental effects of routine operations of the project and the effects of malfunctions and accidents that may occur.

Section 52 of the *National Energy Board Act* sets out the criteria the Panel must consider in making a recommendation as to whether certificates of public convenience and necessity should be issued for the project. The National Energy Board has broad discretion in making its recommendation to the Minister of Natural Resources.

Section 52 states, in part:

1. If the Board is of the opinion that an application for a certificate in respect of a pipeline is complete, it shall prepare and submit to the Minister,* and make public, a report setting out
    a. its recommendation as to whether or not the certificate should be issued for all or any portion of the pipeline, taking into account whether the pipeline is and will be required by the present and future public convenience and necessity, and the reasons for that recommendation; and
    b. regardless of the recommendation that the Board makes, all the terms and conditions that it considers necessary or desirable in the public interest to which the certificate will be subject if the Governor in Council were to direct the Board to issue the certificate, including terms or conditions relating to when the certificate or portions or provisions of it are to come into force.
2. In making its recommendation, the Board shall have regard to all considerations that appear to it to be directly related to the pipeline and to be relevant, and may have regard to the following:
    a. the availability of oil, gas or any other commodity to the pipeline;
    b. the existence of markets, actual or potential;
    c. the economic feasibility of the pipeline;
    d. the financial responsibility and financial structure of the applicant, the methods of financing the pipeline and the extent to which Canadians will have an opportunity to participate in the financing, engineering and construction of the pipeline; and
    e. any public interest that in the Board's opinion may be affected by the issuance of the certificate or the dismissal of the application.
3. If the application relates to a designated project within the meaning of section 2 of the *Canadian Environmental Assessment Act, 2012,* the report must also set out the Board's environmental assessment prepared under that Act in respect of that project.

* Minister of Natural Resources

2.3.1 APPLYING THE PUBLIC CONVENIENCE AND NECESSITY TEST TO THE ENBRIDGE NORTHERN GATEWAY PROJECT APPLICATION

The factors considered, and the criteria applied, in making a recommendation under section 52 of the *National Energy Board Act* depend on, among other things, the location of the project, the commodity involved, and the various segments of the public that would be affected by the project. In the case of the Enbridge Northern Gateway Project, the Panel considered public safety, environmental, and socio-economic matters, and the issues identified in the List of Issues (Appendix 5).

The Panel is of the view that the consideration of a project by an independent expert tribunal process is in itself a component of the public interest. Having an independent expert tribunal take the time to collect, digest, and understand all aspects of a complex application results in thorough, reasoned recommendations and conditions. This provides the decision maker with expert views, based on tested evidence, on which to base a decision.

2.4 The Panel's views on whether the project is in the public interest

In making its recommendation, the Panel was required to consider all relevant evidence on the record and take into account whether the project is, and will be, in the present and future public convenience and necessity and, therefore, in the public interest. This report includes terms and conditions to which the certificates would be subject should the Governor in Council decide that the project should proceed.

The Panel conducted its assessment and developed its recommendations in a careful and precautionary manner, particularly when there was uncertainty in the scientific or technical information on the record. Should the project proceed, the

National Energy Board would inspect and audit the project throughout its lifespan.

2.4.1 BURDENS AND BENEFITS OF THE PROJECT

The Panel's role was to make a recommendation as to whether certificates should be issued for the Enbridge Northern Gateway Project, taking into account whether it is in the Canadian public interest. In doing this, the Panel asked itself whether present and future generations of Canadians would be better off with, or without, the Enbridge Northern Gateway Project.

The Panel considered the views and evidence of all participants to the hearing. This information was conveyed to the Panel orally and in writing, and included Aboriginal Traditional Knowledge, personal experience and beliefs, and science-based technology and research. The Panel weighed the potential burdens and benefits of the project as they would affect the environment, society, and economy at the local, regional, and national levels. These three dimensions of the public interest interact and overlap and were considered in an integrated manner.

The Panel finds that potential burdens and benefits of the project would likely be different in different locations. For example, while potential economic benefits appear likely at local, regional, and national scales, environmental and societal burdens are most likely in the local area and region of the project.

The Panel distinguished two operational contexts for consideration of project burdens and benefits. The first and most typical context involved potential burdens and benefits associated with construction and routine operation of the project. The second context involved burdens that would be experienced in the unlikely event of a large oil spill on land or water.

2.4.2 ENVIRONMENTAL BURDENS

In evaluating environmental burdens, the Panel placed considerable weight on the likelihood of successful mitigation in the case of construction and routine operations. Most of the anticipated adverse environmental effects of construction and routine operations, including occasional small spills, can be mitigated through compliance with the Panel's conditions, which include all of Northern Gateway's commitments. Chapter 8 provides details.

The Panel finds that, with the application of Northern Gateway's proposed mitigation measures and compliance with the Panel's conditions, the project would cause adverse environmental effects on a number of valued ecosystem components that Northern Gateway selected to represent the environment. These include the atmospheric environment, rare plants and rare ecological communities, old-growth forests, soils, wetlands, woodland caribou, grizzly bear, terrestrial birds, amphibians, freshwater fish and fish habitat, surface and groundwater resources, marine mammals, marine fish and fish habitat, marine water and sediment quality, marine vegetation, and marine birds. The Panel does not recommend that potential effects, from the project alone, be found likely to be significant for any of these valued ecosystem components.

The Panel also considered cumulative effects for each valued ecosystem component. In most cases, the Panel recommends that project effects, in combination with cumulative effects, be found not likely to be significant.

The Panel recommends that project effects, in combination with cumulative effects, be found likely to be significant for certain populations of woodland caribou and grizzly bear already experiencing habitat disturbance without the Enbridge Northern Gateway Project. In each of these cases, despite substantial mitigation proposed by Northern Gateway that generally surpasses industry norms, there is uncertainty over the effectiveness of Northern Gateway's proposed mitigation to control access and achieve the goal of no net gain, or net decrease, in linear feature density. This led the Panel to take a precautionary approach and recommend a finding of significance. The Panel considers these findings to be at the low end of the range of possible significance.

For these reasons, the Panel does not find that potential environmental benefits outweighed potential environmental burdens. The potential adverse environmental outcomes are, in the Panel's view, outweighed by the potential societal and economic benefits described below.

2.4.3 SOCIETAL BURDENS AND BENEFITS

The Panel examined how people use the land and waters in traditional and contemporary ways. It examined the heritage resources contained in the project area, the project's interaction with community infrastructure and services, potential changes to individual and community health and wellbeing, and potential impacts to education, employment, and economic opportunities. Chapters 3, 4, and 9 provide details.

The Panel was told that, in some cases, the same socio-economic outcome may be viewed as a benefit by one person, and as a burden by another person. The Panel heard about the stress that some people and communities feel at the prospect of the project and their fear that a large spill could impact their communities.

The Panel requires Northern Gateway to follow through on its proposed community investment initiatives. The Panel considers all of these to be potential benefits to Aboriginal communities and others who may choose to participate. They include:

- employment, education, and training initiatives such as:
  - educational and training opportunities along the proposed route and coastal areas, and a $3 million Education and Training Fund; and
  - support for increased cooperation between training institutions, contracting associations, unions, and Aboriginal groups, to meet employment and training targets;
- increased employment opportunities for Aboriginal groups, with a target of 15 per cent employment of Aboriginal people during construction and operations;
- a contract between Northern Gateway and prime contractors that would include commitment to local and Aboriginal procurement and employment targets;
- $300 million commitment for Aboriginal procurement;
- a business registration tool and contracting opportunities list for communities, businesses, and Aboriginal groups along the right-of-way and coastal areas;
- investments in building sustainable communities, estimated to be 1 per cent of pre-tax profit, or about $3 million per year;
- Aboriginal equity investment of up to 10 per cent of the project; and
- the potential for improved communication and collaboration between users of coastal waters through a Fisheries Liaison Committee.

The Panel finds that a variety of additional societal benefits are likely to result from the project. These include potential benefits to communities, industry, and local economies. Examples include research, monitoring, and planning initiatives and techniques with relevance beyond the project, such as:

- enhanced marine transportation safety and spill response on the West Coast due to improved coastal environmental sensitivity mapping and introduction of escort tugs that could also be used for open ocean rescue;
- improved pipeline leak detection systems;
- new investment capital and expertise associated with the project that could help diversify the Canadian economy;
- innovative use of semi-quantitative risk assessment in project planning;
- research on fate and behaviour of hydrocarbons in the environment;
- a marine research chair funded by Northern Gateway at a university in British Columbia;
- a public-private alliance to monitor interactions of woodland caribou and wolves, and a research chair funded by Northern Gateway;
- a collaborative marine mammal research initiative supported by Northern Gateway;
- research, monitoring, and mitigation of vessel traffic effects on marine wildlife, including birds, funded by Northern Gateway;
- collaborative environmental monitoring with communities;
- development of Community Response Plans; and
- ongoing Aboriginal Traditional Knowledge studies.

For these reasons, the Panel is of the view that the net overall societal effects of the project would be positive, significant, and would provide potential benefits and opportunities to those individuals and businesses that choose to participate in the project.

2.4.4 ECONOMIC BURDENS AND BENEFITS

The estimated capital cost of the project is $7.9 billion. Construction and routine operation of the project would provide local, regional, and national economic opportunities and benefits. These are likely to include an increase in Canada's gross domestic product, an increase in employment opportunities and labour income, and increased government revenues. The project would create hundreds of thousands of person-years of employment during construction, including contracting and economic development opportunities for Aboriginal groups and local communities. Approximately 268 long-term jobs would be created by the project, including some in the marine services sector. Chapter 9 provides details.

The concept of ecological goods and services was described during the public hearing. The Panel is of the view that there is a temporary economic burden associated with ecological goods and services affected by pipeline construction. Based on the hearing record, the Panel finds that the estimated costs for damages to ecosystem goods and services are not well quantified and are based on a methodology that is not currently broadly accepted.

The Panel also heard about potential economic burdens on the marine fisheries, ecotourism, and individual and community lifestyles. With the mitigation, commitments, and conditions required by the Panel, the Panel finds that any economic burden associated with these aspects of coastal living during routine operations would be temporary and would not be significant.

For these reasons, the Panel is of the view that opening Pacific Basin markets is important to the Canadian economy and society. Though difficult to measure, the Panel finds that the economic benefits of the project would likely outweigh any economic burdens.

2.4.5 BURDENS OF A LARGE OIL SPILL

The Panel finds that some level of risk is inherent in the Enbridge Northern Gateway Project, and that no party could guarantee that a large spill would not occur. The Panel finds that a large spill, due to a malfunction or accident, from the pipeline facilities, terminal, or tankers, is not likely. The Panel finds that Northern Gateway has taken steps to minimize the likelihood of a large spill through its precautionary design approach and its commitments to use innovative and redundant safety systems, such as its commitments to address human error, equipment failures, and its corporate safety culture. These commitments, and all others made by the company, would be enforced under the regulatory regime.

Specific examples of design enhancements required by the Panel to reduce the risk of a large spill, discussed in this chapter and Chapters 5 and 7, include:

- thicker pipe;
- additional block valves;
- complementary leak detection systems;
- re-routing the pipelines away from major rivers, wherever feasible;
- trenchless river crossings, wherever feasible;
- Tanker Acceptance Program;
- use of escort tugs; and
- navigation safety enhancements.

The Panel finds that, in the unlikely event of a large oil spill, there would be significant adverse environmental effects, and that functioning ecosystems would recover through mitigation and natural processes. The Panel finds that a large oil spill would not cause permanent, widespread damage to the environment. The extent of the significant adverse effects would depend on the circumstances associated with the spill. Past spill events indicate that the environment recovers to a state that supports functioning ecosystems similar to those existing before the spill. The Panel finds that, in certain unlikely circumstances, a localized population or species could potentially be permanently affected by an oil spill.

A large spill would cause temporary, significant adverse environmental, societal, and economic effects, including economic burdens to users of affected environments for fishing, hunting, gathering, and tourism. Research from past spills shows that environmental, societal, and economic burdens of a large oil spill would likely be reduced by effective spill response, financial compensation, and natural recovery processes within the environment, in weeks to months. Some components, such as individual species and habitats, would likely recover within weeks, months, or years. In the case of large mammals, recovery times could extend to decades. The Panel notes that users of natural environments may experience changes in relative abundance, distribution, or behaviour of biota during recovery from a spill.

Appropriate oil spill preparedness, response, and financial capability would impose an economic burden to Northern Gateway and are required as a condition of approval. The Panel requires Northern Gateway to conduct full-scale spill response exercises to provide the best possible proof of spill response capability. The Panel requires Northern Gateway to manage the safety of the project tanker fleet and tanker operations through its commitments and its contracts with owners of tankers that would load and unload at the Kitimat Terminal.

If a large spill were associated with a pipeline rupture, the pipeline's delivery capability might be lost for an extended period. A shutdown of the facilities could also have significant economic implications for the customers that rely on the project to get their product to market. A shutdown may also negatively affect Canadian prices for oil commodities.

Canadians expect industry to operate in a responsible manner. A large oil spill could affect Canada's reputation as an energy supplier and could affect local, regional, and national socio-economic development, investment, and international market access. After a large spill, the company could suffer significant economic and reputational effects that could potentially affect its ability to operate.

2.4.6 SUMMARY OF THE PANEL'S VIEWS ON BURDENS AND BENEFITS

The Panel has taken a careful and precautionary approach in assessing the project. The Panel is of the view that opening Pacific Basin markets is important to the Canadian economy and society. Societal and economic benefits can be expected from the project. The Panel finds that the environmental burdens associated with project construction and routine operations can, generally, be effectively mitigated. Continued monitoring, research, and adaptive management of these issues may lead to improved mitigation and further reduction of adverse effects. The Panel acknowledges that this project may cause some people and local communities to experience temporary disruptions during construction.

The environmental, societal, and economic burdens of a large oil spill, while unlikely and not permanent, would be significant. Through its conditions, the Panel requires Northern Gateway to implement appropriate and effective spill prevention measures and spill response capabilities, so that the likelihood and consequences of a large spill would be minimized.

Pipeline spill prevention measures would include pipeline routing, design, materials, construction techniques, maintenance, and operating procedures that support the integrity of the pipelines and keep the products contained in the system. Tanker spill prevention measures would include tanker design, inspection, and maintenance, and Northern Gateway's Tanker Acceptance Program, Terminal Regulations, operational limits, and the use of pilots and escort tugs. Spill response planning and capabilities would address foreseeable scenarios and contingencies on land and water, and would be tested through live exercises. The Panel's requirements for spill prevention measures and response capabilities are described in detail in Chapters 5 and 7.

The Panel recommends that project effects, in combination with cumulative effects, be found likely to be significant for certain populations of woodland caribou and grizzly bear already experiencing habitat disturbance without the Enbridge Northern Gateway Project. The Panel used a precautionary approach in arriving at its view. Despite substantial mitigation proposed by Northern Gateway, there is uncertainty over the effectiveness of Northern Gateway's proposed mitigation to control access and achieve the goal of no net gain, or net decrease, in linear feature density. The Panel recommends that the Governor in Council find that these cases of significant adverse environmental effects are justified in the circumstances.

It is the Panel's view that, after mitigation, the likelihood of significant adverse environmental effects resulting from project malfunctions or accidents is very low.

For all of the above reasons, the Panel is of the view that, overall, the Enbridge Northern Gateway Project, constructed and operated in full compliance with the conditions required by the Panel, is in the Canadian public interest. The Panel finds that Canadians would be better off with this Project than without it.

3 Public consultation processes

The Panel regards engaging the public as an essential and ongoing activity throughout the project's entire lifespan. As part of its review, the Panel has considered and evaluated Northern Gateway's consultation with the public for the Enbridge Northern Gateway Project. The National Energy Board's Filing Manual requires applicants to provide evidence of consultation.

The goals of consultation are to provide the public and potentially-affected parties with information to assist in their understanding of the project, to provide opportunities to raise and understand any concerns, and to discuss how these may be appropriately addressed.

Principles of thorough and effective consultation include:

- It is initiated as soon as possible in the planning and design phases of a project.
- It provides clear, relevant, and timely information to potentially-affected persons or groups.
- It is accessible to, and inclusive of, all potentially-affected persons or groups.
- It provides appropriate and effective opportunities for all potentially-affected parties to learn about a project, and to provide comments and concerns about a project to the applicant.
- The applicant is responsive to the needs, input, and concerns of potentially-affected persons or groups.
- It continues throughout all phases of a project.

To assess the design and implementation of Northern Gateway's public consultation program, the Panel reviewed the information provided by all parties. The Panel considered how the public responded to opportunities for consultation on the project, how Northern Gateway considered and addressed the concerns of potentially-affected parties, and how input from the public influenced the project's proposed design and operation.

The Panel observed that parties expressed differing views about what constitutes thorough or effective consultation, and the adequacy of consultation activities undertaken for the project. Parties also expressed differing perspectives on the roles and responsibilities of parties engaged in consultation. The Panel's views on these matters are set out at the conclusion of this chapter.

3.1 Northern Gateway's public consultation program

While Aboriginal groups participated in a number of Northern Gateway's public consultation activities, the company's public consultation program focused on consultation with non-Aboriginal groups and individuals. Northern Gateway's consultation with Aboriginal groups is described in Chapter 4.

3.1.1 PRINCIPLES AND GOALS OF NORTHERN GATEWAY'S PUBLIC CONSULTATION

Northern Gateway said that the goal of its public consultation program was to be transparent, to provide information, and to address concerns to the best of its ability, based on the following principles:

- Share information as it becomes available, so stakeholders can build their understanding of the project and engage in meaningful dialogue.
- Encourage stakeholder input.
- Demonstrate that Northern Gateway is sincere in its efforts to hear and seriously consider all input.
- Provide timely and flexible opportunities for stakeholders to provide input.
- Support dialogue through access to experts to discuss the technical aspects of the project.
- Respect diverse opinions.
- Work with stakeholders to identify possible solutions to concerns.
- Work with government agencies to achieve a coordinated approach to consultation.
- Provide consultation opportunities throughout the lifespan of the project.
- Identify opportunities and benefits for communities throughout the lifespan of the project.
- Accommodate new stakeholders that emerge throughout the process.

Northern Gateway said that it began its public consultation program in 2002 as part of feasibility studies for the Enbridge Northern Gateway Project. During 2005 and 2006, Northern Gateway focused its consultation activities on providing general project information and identifying the general concerns to be addressed early in project development. It said that consultation activities slowed in 2007 when the project was put on hold because of commercial considerations. In 2008, Northern Gateway resumed full public consultation and detailed discussions with stakeholders and Aboriginal groups.

For the purposes of public consultation, Northern Gateway said that it identified stakeholders based on the following criteria:

- landowners and tenants owning or residing on land potentially directly affected by, or adjacent to, the right-of-way where the proposed construction and operations are to occur;
- landowners and tenants residing within the project corridor;
- those who reside or work near the project and could potentially be physically affected by construction or operations and its associated activities;
- those who have established environmental, cultural, social, or economic interests in the project;
- those who have particular knowledge that would be helpful for the project; and
- those who have a statutory mandate to manage areas or activities that might be potentially affected by the project.

Northern Gateway initially identified 226 potentially-affected landowners and 541 individuals within the applied-for 1-kilometre-wide corridor or within 1.5 kilometres of a proposed pump station. As of March 2013, Northern Gateway noted that there were 1,438 landowners and occupants within these areas. Northern Gateway also noted approximately 300 land use dispositions in these areas.

Northern Gateway said that, throughout all phases of the project, stakeholders were, and would continue to be, encouraged to provide input into all aspects of project planning, development, and operation. Northern Gateway committed to continue consultation through all phases of the regulatory process and, if approved, through project construction and operations. Northern Gateway committed to continuing discussions to understand outstanding concerns. Where appropriate, it would make refinements to the project.

3.1.2 PUBLIC INFORMATION AND OUTREACH TOOLS

Northern Gateway said that it used a variety of information and outreach tools to provide timely information about the Enbridge Northern Gateway Project. As the project progressed, Northern Gateway developed additional communications materials to provide information on topics such as project refinements, studies on the project's marine component, and spill risk and response. Some of Northern Gateway's communication tools included:

- print material (letters, project brochures, project newspaper inserts, newsletters, fact sheets, project maps, employment profile cards and brochures, and open house display boards);
- mail-outs and emails;
- online modules;
- marine and pipeline discussion guides;
- project website;
- social media (Facebook, MySpace, Twitter, YouTube, and Flickr);
- videos and commercials; and
- a toll-free telephone number.

Northern Gateway said that, between 2009 and 2013, there were tens of thousands of exchanges with stakeholders through face-to-face meetings, coffee chats, presentations, public forums, technical meetings, community meetings, Community Advisory Boards (CABs), blogs, social media sites, receptions, community investment events, emails, telephone calls, letters, advertisements, and website postings. These exchanges resulted in:

- more than 970,000 visits to Northern Gateway's website;
- more than 1,000 toll-free calls received;
- approximately 2,100 resumes received from people across Canada hoping to work on the project; and
- providing responses to more than 1,900 emails and letters.

The number of stakeholders and Aboriginal groups that Northern Gateway identified increased from 1,200 in 2005 to approximately 4,500 by 2012. These included land and resource users, landowners, Aboriginal groups, government representatives, Environmental Non-Government Organizations (ENGOs), media, academic and research institutions, and the public. Between 2005 and 2008, Northern Gateway hosted 36 public open houses, and provided a presentation on the project to every regional district and county that the project route would pass through and every municipality within 25 kilometres of the right-of-way.

TECHNICAL MEETINGS

Northern Gateway said that it hosted three community technical meetings in northern British Columbia in September 2010 to offer specific information about pipeline integrity and safety, as well as local community benefits and opportunities. It said that approximately 115 attendees signed in at these meetings.

3.1.3 PUBLIC CONSULTATION ACTIVITIES

Throughout the Panel's process, Northern Gateway submitted detailed updates summarizing its project-related consultation activities. These updates included the concerns that were raised during consultations in Alberta and British Columbia. Northern Gateway said that stakeholder input was incorporated into project design, planning, and environmental and socio-economic assessment studies. Information was reviewed for consideration of refinements or modifications to the project, while balancing factors related to communities, landowners, Aboriginal groups, environment, engineering, integrity, cost, constructability, and operations.

As a result of concerns raised, and input received, from stakeholders and Aboriginal groups, Northern Gateway implemented a range of changes to the design and operation of the pipelines and the Kitimat Terminal. Some examples of these changes are listed in Table 3.1.

TABLE 3.1 **CHANGES TO PROJECT DESIGN AND OPERATION**

Pipeline Route and Pump Station Locations	Pipeline and Watercourse Crossings	Kitimat Terminal and Marine Operations	Project Operations
• Revised route between kilometre post (KP) 0 and KP 20 to address landowner concerns. • Revised route between KP 310 and KP 475 to address input from Alberta Sustainable Resources Development (ASRD). • Relocated pipelines onto Alexander Indian Reserve Nos. 134 and 134A as a result of negotiations with the Alexander First Nation. • Relocated Whitecourt pump station onto the Alexis Indian Reserve No. 232, as requested by the Alexis Nakota Sioux Nation. • Relocated Bear Lake pump station and pipelines off the Sas Mighe Indian Reserve No. 32, as requested by the McLeod Lake Indian Band. • Relocated Tumbler Ridge pump station outside the Greg Duke Memorial Forest Reserve. • Relocated Burns Lake pump station to address community concerns regarding the Boer Mountain Recreation Area. • Revised route between KP 983 and KP 988 to address a Buck Flats community concern. • Revised route between KP 1145 and KP 1161 to accommodate existing and proposed industrial land use.	• Revised Pembina River crossing method to address input from Fisheries and Oceans Canada (DFO), ASRD, and Aboriginal groups. • Revised Athabasca River crossing method to address input from DFO, ASRD, and Aboriginal groups. • Relocated Little Smoky River crossing to address input from ASRD. • Revised Smoky River crossing method to address input from DFO and Aboriginal groups. • Relocated Simonette River and Smoky River watercourse crossings. • Relocated Stuart River crossing to address landowner concerns. • Relocated Five Cabin Creek crossing to address input from the British Columbia Ministry of Environment. • Revised Kinuseo Creek crossing method to address input from DFO. • Revised Murray River crossing method to an aerial crossing to address input from DFO. • Relocated Hook Creek crossing to address input from the British Columbia Ministry of Environment. • Relocated Missinka River east crossing location to address local community input. • Relocated Missinka River west crossing location to address input from DFO and Aboriginal groups. • Relocated Parsnip River crossing location and revised crossing method to address input from DFO, stakeholders, and Aboriginal groups. • Revised Muskeg River crossing method to a bore to address input from DFO and Aboriginal groups. • Revised Salmon River crossing method to a bore to address input from DFO and Aboriginal groups. • Relocated Owen Creek crossing location and revised crossing method to address input from DFO, Aboriginal groups, and local community. • Relocated Lamprey Creek crossing location and revised crossing method to address input from DFO. • Relocated Morice River crossing location to address input from DFO, local community, and Aboriginal groups. • Relocated Gosnell Creek crossing location and crossing method to address input from DFO and Aboriginal groups. • Relocated Clore River crossing location and revised crossing method to address input from local community and Aboriginal groups. • Relocated Hunter Creek crossing location to address input from DFO, local community, and Aboriginal groups. • Relocated Chist Creek crossing location and revised crossing method to address input from Aboriginal groups and local community. • Revised Cecil Creek crossing method to address input from DFO and Aboriginal groups. • Revised Little Wedeene River crossing method to address input from DFO and Aboriginal groups.	• One or more radar stations would be installed near Gil Island to allow coverage of Wright Sound. • Weather monitoring stations would be located along the confined channel route and at the marine terminal berths. • Tanker berths would be equipped with a containment boom for use during oil loading operations. • Pilots would use independent hand-held electronic navigation systems. • Vapour recovery would be used to recover and treat hydrocarbon vapours from oil tanker cargo holds during loading operations. • Bilge water handling facilities would permit local treatment of tanker bilge liquids. • Water collection from the tanker berth decks would permit treatment before release to the environment. • A whale surveillance system would be implemented during months of peak marine mammal abundance in the Confined Channel Assessment Area.	• Training, construction employment, and long-term operations employment initiatives. • Community investment initiatives. • Potential joint venture and preferred supplier initiatives. • An Access Management Plan, to address access issues along the pipeline route.

Northern Gateway said that, in some instances and after careful review, some route refinements based on stakeholder feedback were not ultimately accepted or incorporated into the project design. For example:

- A number of pipeline route alternatives between KP 13.2 and KP 88.4 were requested by affected landowners to minimize land disturbance or to increase distances from residences. Northern Gateway deemed these alternatives to have further impacts to adjacent landowners or to have design and constructability issues.
- ASRD requested a pipeline route alternative from KP 477.6 to KP 489.9 that parallels existing road and pipeline corridors. The alternative would have increased the pipeline route length by 1,246 metres, would not have significantly minimized disturbance requirements due to shared pipeline rights-of-way that have completely regrown, and would have traversed an area of much greater oilfield activity.

3.1.3.1 Community Advisory Boards

Northern Gateway established independent Community Advisory Boards in 2009 to provide an opportunity for participants to:

- gather, receive, and process information to arrive at a common body of knowledge;
- identify and discuss key areas of regional interest or concern;
- recommend improvements or enhancements to the project; and
- educate the public.

The CABs are governed by Terms of Reference and Operating Guidelines, which the CAB memberships independently developed and ratified. Northern Gateway said that the CABs were intended to function independently and provide opportunities for meaningful exchange between Northern Gateway, local communities, Aboriginal groups, industry, stakeholders, and the public in each of five geographic regions (British Columbia North Coastal, British Columbia Northwest, British Columbia Central, Alberta North Central, and Peace Country). CABs include representatives from environmental groups, Aboriginal groups, business associations, municipal governments, and the public.

Northern Gateway said that participation in the CABs was on a "without prejudice" basis, allowing organizations to put forward their own opinions during the regulatory review process, and that participation did not represent support for the project. Northern Gateway described the CABs as participant-driven, with the scope of discussions including:

- pipeline design, construction, and operations;
- environmental, economic, human health, social, and community effects from routine aspects of the project;
- risk of a hydrocarbon spill and emergency response plans;
- protection measures to limit effects or maximize enhancements; and
- employment, training, community benefits, and economic opportunities.

As of 2012, there were approximately 125 CAB members, 64 alternates, and 50 observers registered in the CAB process. Northern Gateway said that it routinely sent out over 450 invitations to CAB members, alternates, and observers, and that an average of 105 people attended each round of regional CAB meetings. Between 2009 and February 2013, there were 15 rounds of CAB meetings, for a total of 75 meetings.

Northern Gateway noted that a number of improvements recommended at CAB meetings resulted in changes to the project to enhance safety, including:

- thicker-walled pipe;
- additional isolation valves to protect environmentally-sensitive locations;
- increasing the frequency of in-line inspections across the entire pipeline system;
- installing complementary leak detection systems, and
- staffing all pump stations 24 hours per day.

Some intervenors raised questions or concerns about the CABs, including:

- how long CABs would be active;
- whether CAB members were compensated for their involvement and, if so, the compensation amount;
- how CAB members were determined or selected;
- why the names of CAB members were not publically available, and whether the minutes of CAB meetings would be publically available;
- a suggestion that some communities and Environmental Non-Government Organizations refused to participate in the CABs, due to the

perception that their participation would indicate an endorsement for the project; and

- whether any presentations on the environmental risks of the project had been offered to CABs.

In reply, Northern Gateway said that:

- CABs would remain active throughout the life of the project, or until the CAB members decide to disband;
- as a living document, the CAB Terms of Reference would be revisited semi-annually, or as needed at the discretion of the CAB;
- CAB members or their alternates are offered an honorarium, and that CAB meetings are funded by Northern Gateway;
- when requested, the names of individual CAB participants were withheld at the request of members, that the minutes of CAB meetings were available on the CAB website, and that CAB meetings were open to the public;
- the CAB planning team invited 52 individuals representing various Environmental Non-Government Organizations to attend each CAB meeting;
- Environmental Non-Government Organizations who attended as members included Alberta Fish and Game Association, BC Wildlife Federation, Ducks Unlimited Canada, Lakes District Friends of the Environment, Nature Alberta, and Spruce City Wildlife Association, while the Kitimat Valley Naturalists Club was a frequent observer;
- all presentations at the CABs, other than one presentation made at the June 2011 Richmond Conference, were posted on the CAB website; and
- environmental issues were one of the four topic areas of the CABs, and that most presentations discussed environmental issues associated with topics such as routing, construction, emergency response, and marine operations.

3.1.3.2 Quantitative Risk Assessment (Marine) Working Group

In response to feedback it received, Northern Gateway said that it proposed a Quantitative Risk Assessment (QRA) Working Group of Aboriginal, environmental, and community organizations to oversee the completion of the QRA for the Enbridge Northern Gateway Project.

Northern Gateway said that it contacted 10 Aboriginal groups, 11 Environmental Non-Government Organizations, 2 local municipal organizations, and 2 federal departments regarding their interest and capacity to participate in the QRA Working Group. Northern Gateway said that it identified Environmental Non-Government Organizations with marine-related mandates that had expressed an interest in, or concerns about, marine-related project risks. It identified Aboriginal groups and local community organizations based on geographical proximity to marine-related project activities.

Northern Gateway said that the QRA Working Group provided advice and input for selecting the most qualified consultant team to complete the QRA work, and worked with the consultant to finalize the scope and methods for conducting the QRA. The selected consultant, Det Norske Veritas – Maritime (DNV), prepared two reports, which were included in Northern Gateway's TERMPOL submission for the project.

Northern Gateway noted that a number of groups invited to participate indicated that they would not participate in the QRA Working Group because they expressed concerns about the regulatory process or they opposed the project. Attendance varied from meeting to meeting. Northern Gateway said that some groups requested that their attendance be recorded as "observer" and that their presence should not be characterized as support for the project.

Northern Gateway said that a total of seven QRA Working Group meetings were held during 2009 and 2010. It said that the QRA Working Group agreed in 2010 that the TERMPOL Study 3.8 draft, provided by Det Norske Veritas – Maritime, could be submitted to the Transport Canada TERMPOL Review Committee.

During questioning, one intervenor raised concerns about how the work of the QRA Working Group was conducted, and whether all parties could understand the information. Northern Gateway said that the QRA Working Group's intent was to allow groups invited to participate the opportunity to contribute in selecting the consultant, to review the study results, and to ask questions of the consultant. The QRA included a hazard identification process and the development of mitigation measures. Hazard identification input related to marine shipping included a number of interviews with local stakeholders to gain further local knowledge of the proposed shipping routes.

3.1.4 LANDOWNER CONSULTATION

Northern Gateway said that it engaged with landowners and occupants, as appropriate, to:

- inform them of the project;
- solicit their feedback;
- gain access for studies and surveys;
- record their comments, concerns, and recommendations; and
- develop and implement a strategy to address their concerns, whenever possible.

Northern Gateway said that, by October 2010, 99 per cent of all landowners and occupants within the original applied-for 1-kilometre-wide pipeline corridor, as well as those within 1.5 kilometres of a pump station, were personally consulted and provided with updated project information, landowner guides, project pamphlets, and maps. The company said that it would continue to consult with previously-identified landowners and with newly-identified landowners and occupants.

Northern Gateway said that, as it made route refinements, some landowners and occupants were either no longer within the 1-kilometre-wide pipeline corridor or within 1.5 kilometres of a pump station, or were subsequently identified within these areas. Those landowners who no longer fell within the consultation areas were notified and no longer engaged as part of efforts within those areas. Those landowners or occupants that were subsequently identified within these areas were contacted. Northern Gateway said that, beginning in January 2011, it contacted the "subsequently-identified" landowners and occupants in Alberta and British Columbia to review aspects of the project and provided project information to them. Northern Gateway also said that it met specifically with certain landowners and occupants upon request to address concerns on a variety of topics including, among other things, routing, proximity to various residences and buildings, tree stands, rare plants, calving areas, abandonment, compensation, damages, and the 30-metre safety zone.

3.2 Northern Gateway's consultation with governments

Northern Gateway said that it incorporated consultation with municipal, provincial, and federal governments into its consultation activities for the project, as it anticipated they would have an interest in shaping project planning.

Northern Gateway identified a range of federal, provincial, and municipal government stakeholders as part of its consultation program. Table 3.2 lists the federal, provincial, and municipal authorities consulted by Northern Gateway.

Northern Gateway said that it hosted a number of environmental and socio-economic assessment workshops beginning in 2005, targeted to those stakeholders having, or anticipated to have, an active interest in those aspects of the project. This included municipal, provincial, and federal government authorities involved in managing biophysical resources.

As well, Northern Gateway said that representatives of municipal, federal, and provincial governments participated in CAB meetings.

Northern Gateway said that it would continue consultation activities through all phases of the project, including consultation with officials of urban municipalities, counties, and regional districts, as well as with federal and provincial government officials and elected representatives.

The Government of British Columbia requested further information from Northern Gateway on aspects of its consultation with stakeholders, landowners, and government, including:

- the conflict resolution process available to land holders and holders of provincial authorizations, and any dispute mechanisms that are available; and
- information regarding Northern Gateway's consultation activities with forest industry user groups, including the forest license holders that would be affected by the project.

In reply, Northern Gateway said that section 88 of the *National Energy Board Act* provides for negotiation proceedings for the purposes of achieving voluntary settlements of damage claims with the assistance of a federally-appointed negotiator. In the event that damage claims cannot be resolved through negotiation (including appropriate dispute resolution, where appropriate), section 90 of the *National Energy Board Act* establishes a process for arbitration proceedings and the appointment of a federal arbitration tribunal to settle any disputes regarding damages claims.

Northern Gateway said that information regarding the project has been provided to forest industry user groups. It listed 53 forestry industry user groups that have received information. It also said that, if a forest industry user group, such as a forest license holder, may be directly affected or is adjacent to the right-of-way, it would have received land-specific information such as a Notice of Environmental Assessment on subject lands, land interest update letters, a pump station notification, or personal land agent contacts.

TABLE 3.2 **FEDERAL, PROVINCIAL, AND MUNICIPAL AUTHORITIES CONSULTED BY NORTHERN GATEWAY**

Government of Canada	The Auditor General of Canada, the Canadian Environmental Assessment Agency, the Canada Transportation Agency, Environment Canada, Finance Canada, DFO, Foreign Affairs and International Trade Canada, Health Canada, Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada), Industry Canada, Intergovernmental and International Affairs, International Trade, Justice Canada, the National Energy Board, Natural Resources Canada, the Pacific Pilotage Authority Canada, Parks Canada, the Privy Council Office, Service Canada Centre, Transport Canada, and the Transportation Safety Board of Canada
Government of British Columbia	Advanced Education and Labour Market Development; Agriculture and Lands; Children and Family Development; Community Services; Economic Development; Energy, Mines and Petroleum Resources; Environment; Finance; Forests and Range; Health Services; Housing and Social Development; the Intergovernmental Relations Secretariat; Labour and Citizens' Services; Public Safety and Solicitor General; Technology, Trade and Economic Development; Tourism, Sport and the Arts; Transportation and Infrastructure; the BC Environmental Assessment Office; BC Hydro; the BC Major Project Inventory; the BC Oil and Gas Commission; the BC Public Service Agency; the BC Industry Training Authority; the BC Transportation Financing Authority; and WorkSafe BC
British Columbia municipalities	Bear Lake, Burns Lake, Chetwynd, Dawson Creek, Fort St. James, Fort St. John, Fraser Lake, Hazelton, Houston, Hudson's Hope, Kitimat, Mackenzie, Peace River Regional District, Port Edward, Prince George, Prince Rupert, Regional District of Bulkley-Nechako, Regional District of Fraser-Fort George, Regional District of Kitimat–Stikine, Skeena–Queen Charlotte Regional District, Smithers, Southbank, Telkwa, Terrace, Tumbler Ridge, Valemount, Vancouver, and Vanderhoof
Government of Alberta	Culture and Community Spirit; Economic Development; Employment and Immigration; Energy; Environment; Finance and Enterprise; Health and Wellness; Infrastructure and Transportation; International, Intergovernmental and Aboriginal Relations; Municipal Affairs and Housing; Solicitor General and Public Security; ASRD; Tourism, Parks and Recreation; Transportation; the Treasury Board; Alberta Association of Municipal Districts and Counties; the Energy and Utilities Board; and the Energy Resources Conservation Board
Alberta municipalities	Beaverlodge, Bon Accord, Bruderheim, County of Grande Prairie No. 1, Edmonton, Fort McMurray, Fort Saskatchewan, Fox Creek, Grande Prairie, Lac Ste. Anne County, Mayerthorpe, McBride, Morinville, Peace River, Strathcona County, Sturgeon County, Valleyview, Wembley, Whatcom County, and Whitecourt

3.3 Public participation in the hearing process

As outlined in the Joint Review Panel Agreement, participation of the public and Aboriginal peoples was facilitated to enable them to convey their views on the Enbridge Northern Gateway Project to the Panel by various means. In the public hearing process, several options were made available to anyone wishing to participate. These methods of participation, described below, varied in their levels of involvement and respective privileges and responsibilities.

Those who did not wish to actively participate in the hearing process were still able to follow the proceeding by viewing information in the online public registry, listening to the oral hearings via webcast, or by attending the hearings in person as an observer.

A broad range of Canadian society participated in the hearing process, including individuals, community and stakeholder groups, landowners, governments, and Aboriginal groups. These included:

- children and youth;
- local, regional, and national representatives;
- business owners; and
- Aboriginal Elders, traditional knowledge holders, and leaders.

All available forms of participation were used during the hearing process.

LETTERS OF COMMENT

Over 9,400 letters of comment were filed in this proceeding. By submitting letters of comment, participants were able to provide the Panel with their knowledge, views, or concerns about the project at the level of detail they chose. Individuals or groups that submitted letters of comment were not considered intervenors, and could not ask written or oral questions of the parties or make final argument.

ORAL STATEMENTS

The Panel heard 1,179 oral statements. Oral statements allowed participants to share their knowledge, views, or concerns about the project in person to the Panel. Presenters were required to register to make a statement. Oral statement givers were not considered intervenors and could not ask written or oral questions of the parties or make final argument.

INTERVENORS

There were 206 registered intervenors (listed in Appendix 6), not including those that registered but subsequently withdrew their involvement. Intervenors were characterized as parties to the review process. Their roles and responsibilities included:

- asking questions, both in writing and orally, of Northern Gateway, other intervenors, and, with Panel approval, government participants;
- submitting written evidence or, with Panel approval, oral evidence;
- formally receiving all documents filed in the process; and
- making final argument, in writing and orally.

GOVERNMENT PARTICIPANTS

There were 12 registered government participants in the Panel's process (listed in Appendix 6). Government participants had similar capabilities and responsibilities as intervenors, with certain restrictions on their involvement, and were considered parties to the review process.

ORAL HEARINGS

A significant portion of the information that the Panel received was gathered through oral hearings. These included both community hearings (for oral evidence and oral statements) and final hearings (for oral questioning and final arguments).

Community hearings were held in locations along the proposed pipeline route, as well as locations in the vicinity of the proposed Kitimat Terminal and the proposed marine transportation routes. Final hearings occurred in Edmonton, Alberta, and in Prince George, Prince Rupert, and Terrace in British Columbia. A total of 180 days of oral hearings were held, including 7 days when the Panel received oral comments from the public and Aboriginal groups on the draft List of Issues, possible oral hearing locations, and what supplemental information Northern Gateway should be required to file.

To help the public understand and prepare for the oral hearings, staff from the National Energy Board and the Canadian Environmental Assessment Agency provided 18 presentations to the public prior to receipt of the application to explain the joint review process. Sixteen public information sessions were conducted in 2011 to discuss the hearing process and participation options. Over 450 members of the public and Aboriginal groups attended these sessions. The Panel's Secretariat staff also held a total of 32 online workshops with intervenors and oral statement presenters to assist their participation in the joint review process.

3.3.1 CONCERNS REGARDING NORTHERN GATEWAY'S PUBLIC CONSULTATION

Through information requests, written and oral submissions, and direct questioning, members of the public and stakeholders raised a number of concerns regarding Northern Gateway's public consultation.

Two landowners raised concerns regarding consultation with respect to proposed routing across their properties. In reply, Northern Gateway said that it would respect individual requests for preferred communication (such as by registered mail), and it expressed continued willingness to meet to discuss concerns. Chapter 9 includes further discussion of issues related to the proposed routing for the project.

The Fort St. James Sustainability Group asked whether Northern Gateway planned to negotiate an agreement with landowners along the project route, similar to that developed with the Manitoba Pipeline Landowners Association and the Saskatchewan Association of Pipeline Landowners for the Enbridge Alberta Clipper Pipeline Project. In reply, Northern Gateway said that its intention was to negotiate with individual landowners along the pipeline right-of-way, and that it would negotiate with British Columbia landowners as a group if asked to do so.

The group also requested details of Northern Gateway's consultation regarding the pump station location in the Fort St. James area, and whether Northern Gateway would re-evaluate the station's location. Northern Gateway said that it conducted personal consultation with approximately 109 landowners and occupants within 1.5 kilometres of the Fort St. James pump station. An additional six landowners and occupants could not be consulted with personally, but Northern Gateway said that they were consulted via mail. Northern Gateway noted that it believed the proposed Fort St. James pump station is appropriately located because it is next to the major highway corridor and major power transmission line in this area, and has good access. Northern Gateway also suggested that further information exchanges about how pump stations operate might be helpful, that it would be open to further dialogue regarding other location options in the area, and would continue to work with concerned landowners. Northern Gateway said that it provided information to landowners concerned with property values, domestic water supply, and noise.

Some intervenors raised a number of general concerns or requested further information regarding Northern Gateway's public consultation program. These were related to:

- plans for engaging with other companies who are carrying out major projects, as well as consultation with regional governments and agencies;
- how consultation is defined, whether it is meaningful, and consultation obligations;
- if Northern Gateway's approach to consultation differed depending on the audience;
- information concerning the location of valves, whether the public would have an opportunity to provide input, and information regarding the consultation programs for spill response and high consequence area maps; and
- information on the relationship between CABs and the Northern Gateway Alliance, and funding to the Alliance.

In reply to these concerns and requests for further information, Northern Gateway said that:

- The Kitimat Chamber of Commerce initiated a series of meetings involving Northern Gateway, other major companies working in Kitimat and Terrace, the District of Kitimat, City of Terrace, the Royal Canadian Mounted Police, Child Development Centre, Social Services, Kitimat Community Services, and the museum to discuss the socio-economic effects of the project and how to manage them. Upon project approval, the company said that it would approach the District of Kitimat to determine the appropriate mechanism by which information about the project and other projects in the area would be shared, effects of the project and other projects would be monitored, and corrective actions (if required) would be taken.

- Consultation is a process that should ensure that both parties are better informed and which entails testing and being prepared to amend proposals in light of information received, and providing feedback.
- The company had an overarching strategy on public consultation, with various tools to engage different groups, including the CABs, the Northern Gateway Alliance, open houses, public speaking, the company website, blogs, and hearing participation. People chose to engage in different ways and on different levels for the project. Therefore, Northern Gateway had different ways of engaging with people and information was provided in various ways.
- The locations of pipeline valve sites and consequence areas would be finalized during detailed engineering and would primarily be based on CSA Z662-11 requirements and the additional requirements identified in the pipeline risk assessment work. An opportunity for public input on valve site locations would be available through the CABs. Northern Gateway is responsible for the design, operation, and integrity of the pipelines and, consequently, it would select the valve site locations.
- The Northern Gateway Alliance was a community coalition that provided people in pipeline corridor communities and elsewhere with information about the project, the regulatory review process, and how people could participate in the review process. The Alliance chairperson was a paid position funded by Northern Gateway, and Northern Gateway reimbursed administrative expenses incurred by the Alliance.

3.4 Views of the Panel

The Panel finds that the magnitude, extent, and potential impacts of this project required an extensive program of public consultation. The Panel considers thorough and effective consultation to be a process that is inclusive of, and responsive to, all potentially-affected groups and individuals. The Panel notes that, among potentially-affected parties, there were differing perspectives on what constitutes a thorough and effective process of consultation. There were also different views among some parties about how consultation should occur, and their roles and responsibilities during consultation. The Panel believes that it is critical for all parties to recognize and understand their respective roles and responsibilities for achieving effective dialogue during consultation.

The Panel noted the principles of thorough and effective consultation at the beginning of this chapter. The Panel finds that these principles require that a process must provide timely, appropriate, and effective opportunities for all potentially-affected parties to learn about a project, provide their comments and concerns, and to discuss how these can be addressed by the applicant. The applicant must be genuinely responsive.

Affected parties have an ongoing and mutual responsibility to respond to opportunities for consultation, to communicate concerns they may have, and to discuss how these can be addressed. Consultation requires trust, mutual respect, and relationship-building. All parties have an obligation to seek a level of cultural fluency, in order to better understand the values, customs, needs, and preferences of the other parties involved in the consultation process. All parties may be required to adjust their expectations in response to the information, concerns, and interests raised and considered through the process. The Panel observed that this approach did not always occur in this proceeding.

The Panel finds that Northern Gateway developed and implemented a broadly-based public consultation program, offering numerous venues and opportunities for the public, landowners, governments, and other stakeholders to learn about the Enbridge Northern Gateway Project, and to provide their views and concerns. The Panel accepts Northern Gateway's view that consultation is a process which should ensure that all parties are better informed through consultation, and that it involves being prepared to amend proposals in light of information received. In this regard, the Panel notes that Northern Gateway made numerous changes to the design and operation of the project in response to input provided by the public, landowners, governments, and stakeholders. Changes to the project based on input provided by Aboriginal groups are discussed in more detail in Chapter 4.

The Panel heard from individuals during oral statements, in letters of comment, and from intervenors that Northern Gateway's program had been inadequate. The Panel notes that public consultation is an important process, based on general principles of timeliness, inclusiveness, accessibility, and responsiveness. The requirements set out in the National Energy Board's Filing Manual provide an applicant with a starting point, and the Panel's process was not designed to be prescriptive with respect to consultation. Meeting the principles of thorough and effective consultation, in addition

to the requirements outlined in the Filing Manual, can require an applicant to exceed the regulatory expectations in order to meet the public's need to be informed and to provide input. The National Energy Board's Filing Manual requires applicants to develop and implement a consultation program that is appropriate for the nature, magnitude, and geographic extent of the project and its potential effects.

In order to optimize opportunities for individuals and groups to present their evidence and opinions to the Panel, the Panel incorporated remote participation through video and telephone links into the hearing room during all aspects of the oral hearings, including questioning. It is the Panel's view that this approach was effective. Many participants, including expert witnesses, commented that they found the remote participation options useful and effective. This approach provided all participants with opportunities to participate and not be excluded from giving evidence and opinions due to travel, finances, work, and life commitments.

The Panel finds that Northern Gateway provided appropriate and effective opportunities for the public and potentially-affected parties to learn about the project, and to provide their views and concerns to the company. The Panel is satisfied that Northern Gateway considered, and was responsive to, the input it received regarding the design, construction, and operation of the project.

Northern Gateway has committed to continuing its engagement activities throughout the project's lifespan. This includes committing to support the CABs for as long as members are prepared to participate. The Panel views the CABs as important multi-stakeholder venues that can facilitate continued dialogue, potentially over the project's entire life.

The Panel finds that, with Northern Gateway's commitments, and by meeting the conditions set out by the Panel, Northern Gateway can effectively continue to engage the public, landowners, Aboriginal groups, and stakeholders, and address issues raised throughout the project's operational life.

4 Aboriginal interests and consultation with Aboriginal groups

The route of the pipelines of the proposed project would traverse significant portions of lands in Alberta and British Columbia that Aboriginal groups continue to use for traditional activities, uses, and practices, and for exercising various potential or established Aboriginal and treaty rights. The marine areas that would be potentially impacted by the project are also areas that are used for traditional purposes and claimed as part of traditional territories by Aboriginal groups.

The Panel was mandated to receive information related to the nature and scope of potential or established Aboriginal and treaty rights that may be affected by the project. The Panel was also mandated to receive information on impacts or infringements that the project may have on those rights. Further, this information was to be referenced by the Panel in its report. All evidence regarding the concerns and interests of Aboriginal groups was to be carefully considered by the Panel. Sections 6.5, 8.1, and 8.2 of the Joint Review Panel Agreement provide for these requirements. Potentially-affected Aboriginal groups were consulted and provided comments on the terms of the Joint Review Panel Agreement.

The goals of consultation with Aboriginal groups are to share information to assist in their understanding of the project, to provide opportunities to raise and understand any concerns, and to discuss how these may be appropriately addressed by the applicant.

The Panel assessed the design and implementation of Northern Gateway's consultation with potentially-affected Aboriginal groups. The Panel considered the company's activities to engage Aboriginal groups and to learn about their concerns. It also considered how Aboriginal groups responded to opportunities for consultation on the project and how Northern Gateway sought to

understand, consider, and address the concerns of potentially-affected groups. The Panel considered how this input influenced the project's proposed design and operation. The Panel considered the concerns and views expressed by Aboriginal groups about Northern Gateway's consultation, including the adequacy of the company's consultation activities undertaken for the project.

Northern Gateway said that it engaged with over 80 Aboriginal groups and organizations. Forty-eight of these registered as intervenors in the joint review process and provided their comments, views, and evidence through written submissions and oral evidence to the Panel. The Panel reviewed and carefully considered all the evidence submitted by Aboriginal groups and organizations, Northern Gateway, other participants, and governments. Appendix 8 refers to information and evidence sources provided by Aboriginal groups who participated in the review process, and where this information can be found on the public record.

Throughout the report, the Panel has used the word "use" in the singular form when referring to traditional Aboriginal practices and activities. The Panel recognizes that Aboriginal groups use lands and marine areas, and land and marine resources, in a variety of ways. Where the Panel has used the singular term, this is intended to refer to all uses.

4.1 Northern Gateway's consultation with Aboriginal groups

Northern Gateway committed to ongoing engagement with Aboriginal groups (First Nations and Métis belonging to a community, group, or organization) that may be affected by the Enbridge Northern Gateway Project. The company said that, through implementation of its Aboriginal engagement program, it committed to working with Aboriginal groups to provide them with information about the project, answer project-related questions, identify and address issues and concerns, and obtain community input for incorporation into project planning activities and the environmental and socio-economic assessment. Northern Gateway said that information gathered through its Aboriginal engagement program would enable it to "improve the project by avoiding, reducing, or mitigating, wherever reasonable and feasible, potential adverse effects and enhancing positive effects of the project on Aboriginal interests." Northern Gateway also committed to ensuring that Aboriginal groups "derive sustainable benefits from project-related activities that arise throughout project development, construction, and operations, including economic activity, equity participation, business development, and employment and training initiatives."

4.1.1 NORTHERN GATEWAY'S ABORIGINAL ENGAGEMENT PROGRAM DESIGN

Northern Gateway said that it designed its Aboriginal engagement program to build and maintain effective working relationships with Aboriginal groups who may be affected by the project. Northern Gateway said that it adopted Enbridge Inc.'s Aboriginal and Native American Policy for its Aboriginal consultation program. The policy places emphasis on:

- recognizing legal and constitutional rights possessed by Aboriginal peoples;
- creating sustainable benefits for Aboriginal peoples;
- offering opportunities for Aboriginal peoples to purchase equity;
- proactively encouraging procurement, sole sourcing;
- implementing additional measures to hire more Aboriginal peoples for Northern Gateway's permanent workforce and joint venture opportunities for Aboriginal peoples; and
- supporting training, environmental stewardship, and community investment.

The company said that the objectives and principles of its Aboriginal consultation program were to:

- identify and engage Aboriginal groups or Métis regions located within 80 kilometres of either side of the project corridor and the Kitimat Terminal, or whose traditional territory may overlap with the project corridor (the engagement area);

- understand the interest in project engagement of Aboriginal groups located outside the engagement area;
- provide timely information about the project to facilitate meaningful opportunities for input into project planning, design, construction, and operations;
- initiate opportunities for Aboriginal groups to share their traditional knowledge of lands potentially affected by the project, and to identify interests and concerns regarding the project;
- provide information on the ways in which Aboriginal group concerns have been considered, taken into account, or acted on, as appropriate, by Northern Gateway in project design and planning, construction, and operations;
- engage in ongoing dialogue with Aboriginal groups throughout the various stages of the project;
- provide opportunities for Aboriginal groups to identify environmental effects of the project on Aboriginal interests;
- provide opportunities for Aboriginal groups to assess the effects of the project on traditional use;
- facilitate an understanding of the results of the environmental assessment process;
- identify and pursue Aboriginal group participation in the project through community and economic development initiatives;
- provide capacity funding to assist Aboriginal groups' participation in Northern Gateway's engagement program, and to support their participation in the regulatory and environmental assessment process;
- provide Aboriginal groups with opportunities to derive sustainable benefits from project-related activities that arise throughout project development, construction, and operations; and
- enable Northern Gateway to avoid or mitigate potential adverse effects and enhance positive effects of the project on Aboriginal interests wherever reasonable and feasible.

In applying these principles and objectives, Northern Gateway said that it sought to understand and respect cultural diversity among Aboriginal communities, the varying levels of capacity among Aboriginal groups in the project area, and the need for fair treatment relative to issues such as project benefits. Northern Gateway said that it encouraged Aboriginal groups to participate throughout all phases of the project and to provide comments on all aspects of the project including planning, design, construction, and operations.

PROTOCOL AGREEMENTS

Northern Gateway said that, in 2005, many Aboriginal groups expressed an interest in establishing a formal relationship with the company, and it responded by offering memoranda of understanding or cooperation agreements to formalize such relationships. It said that these agreements were revised in 2008 in response to concerns raised by Aboriginal groups regarding the complexity and associated costs of entering into the memoranda and agreements. Northern Gateway said that it responded by developing a more functional protocol agreement that allowed for immediate access to capacity funding.

Northern Gateway said that the protocol agreements were intended to provide "the basis for a respectful and ongoing relationship between Northern Gateway and participating Aboriginal groups and facilitate dialogue on matters relating to effects and benefits of the project." It said that, in general, the protocol agreements:

- established processes where consultation can be conducted in a timely manner throughout the regulatory and environmental review process;
- established a process for participating Aboriginal groups to identify concerns they may have relating to the project and discuss options for minimizing, mitigating, or resolving those concerns;
- facilitated cooperation between the parties to identify opportunities for participating Aboriginal group involvement in economic development initiatives associated with the project;
- facilitated informal resolution of disputes, if any arise;
- provided funding to cover certain costs associated with participating in the regulatory and environmental review of the project; and
- provided opportunities for the Aboriginal groups to participate in environmental fieldwork discussions and Aboriginal Traditional Knowledge (ATK) budget discussions.

Northern Gateway said that, as of December 2009, it had entered into 30 relationship protocol agreements, which represent a total of 36 Aboriginal groups. Since then, it continued to meet with Aboriginal groups to discuss signing

protocol agreements, as well as amendments and extensions to existing agreements. Northern Gateway said that, in most cases, as its engagement progressed, the initial protocol agreements set out the groundwork for other agreements or memoranda of understanding that focused on other aspects of the project, such as education and training programs, or investment and economic opportunities. Northern Gateway said that, as of 2013, there were approximately 9 active protocol agreements in Alberta and British Columbia and 20 other agreements, letters of intent, or memoranda of understanding signed with Aboriginal groups. Northern Gateway noted that, in aggregate, it provided $10.8 million to Aboriginal groups, with $5.6 million of that amount provided to Aboriginal groups in British Columbia, including coastal Aboriginal groups. These amounts were in addition to funds provided to Aboriginal groups by the Canadian Environmental Assessment Agency.

NORTHERN GATEWAY'S CONSULTATION ACTIVITIES WITH ABORIGINAL GROUPS

Northern Gateway said that it met with Aboriginal groups individually to understand their specific views, interests, and concerns regarding the Enbridge Northern Gateway Project and to align opportunities for benefits stemming from the project with the specific interests of each group. It said that individual Aboriginal groups determined their level of participation for reviewing, discussing, and commenting on all aspects of the project. Northern Gateway said that, as part of project design, feasibility, and assessment, it initiated discussions with Aboriginal groups to undertake Aboriginal Traditional Knowledge studies with respect to the project. Northern Gateway also said that each community determined if it wished to proceed with an Aboriginal Traditional Knowledge study and whether it would work collaboratively with Northern Gateway or conduct an independent study.

The company said that some Aboriginal groups within the consultation area boundaries were not involved in Aboriginal Traditional Knowledge studies. Northern Gateway said that these groups included instances where: 1) offers to support Aboriginal Traditional Knowledge studies were made and later withdrawn due to the lapse in time or non-activity of the study; 2) an Aboriginal group declined the Aboriginal Traditional Knowledge offer; or 3) the offer was made to the Aboriginal group versus an organization that the specific Aboriginal group is affiliated with. Chapter 9 includes a detailed discussion of Northern Gateway's Aboriginal Traditional Knowledge program.

Northern Gateway said that its Aboriginal engagement program began during its feasibility studies, when various options and routes were being considered. Through the course of these early notification activities, Northern Gateway said that it initiated consultation by providing information to 171 Aboriginal groups and organizations in Alberta and British Columbia. When the project corridor was defined in 2005, Northern Gateway said that it focused its engagement activities on Aboriginal groups and Métis regions located within 80 kilometres of either side of the project corridor and the Kitimat Terminal. Northern Gateway said that it also engaged communities beyond these boundaries who identified themselves as having an interest because their traditional territory traversed the project corridor. The company said that this 160-kilometre-wide engagement area was established in consideration of the scope and scale of the project, and the nature and extent of the Aboriginal interests at stake. Northern Gateway said that Aboriginal groups were consulted based on:

- formal recognition as a "Band" as defined in the *Indian Act* and recognized by Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada);
- constitutionally-protected Aboriginal rights, lands, and land uses as defined by section 35 of the *Constitution Act, 1982*;
- proximity of a reserve or other protected land base to the project right-of-way; and
- proximity of traditional lands and territories to the project right-of-way.

Northern Gateway said that it included coastal Aboriginal groups in its Aboriginal engagement program. This included groups with interests in the Confined Channel Assessment Area, as well as groups with interests in the Open Water Area that are in proximity to tanker shipping routes calling on the Kitimat Terminal.

Northern Gateway said that, while all identified Aboriginal groups were afforded similar opportunities to participate in the project through direct consultations and by participation in Aboriginal Traditional Knowledge studies, it provided "greater consideration" to "those groups having an increased likelihood of impact to the exercise of Aboriginal and treaty rights, traditional lands, and land uses." Northern Gateway said that Aboriginal groups whose interests fell outside the boundaries of the 160-kilometre-wide engagement area were not

engaged in extensive consultation activities unless specific project impacts were communicated to Northern Gateway by affected Aboriginal groups. In instances where there were no identified impacts, Northern Gateway indicated that it shared project information, responded to questions, and documented related concerns and interests for consideration in project development.

Northern Gateway said that it communicated with Aboriginal groups in various ways, fulfilling specific requests regarding preferred methods of communication. The company said that the following communication tools were used in its Aboriginal engagement program:

- letters of introduction and follow-up letters, including information about the regulatory application filing date and contact information for the Canadian Environmental Assessment Agency and its website;
- mail-outs, brochures, and newsletters
- personal meetings and visits to communities;
- telephone discussions and email correspondence;
- attendance, presentations, and informal discussions at community events and conferences;
- open houses and community information sessions;
- Enbridge Northern Gateway Project website;
- pipeline and marine discussion guides; and
- toll-free information telephone number.

A list of Aboriginal groups that Northern Gateway identified as being potentially affected by the project, and which it subsequently engaged, is presented in Table 4.1. The table also indicates the status of any Aboriginal Traditional Knowledge study completed, and groups' participation as intervenors in the joint review process.

The status of Aboriginal Traditional Knowledge studies were characterized by Northern Gateway as:

- 'not applicable' (n/a), which included those that were: 1) offered and later withdrawn due to the lapse in time or non-activity of the study; 2) an Aboriginal group declined the Aboriginal Traditional Knowledge offer; or 3) the offer was made to the Aboriginal group versus an organization that the specific Aboriginal group is affiliated with;
- 'pending engagement', which included those where discussions had not yet taken place regarding the nature and scope of an Aboriginal Traditional Knowledge study. Northern Gateway said that it would continue to offer these Aboriginal groups the opportunity to prepare an Aboriginal Traditional Knowledge report;
- 'scoping', which referred to those studies where Aboriginal Traditional Knowledge facilitators were working with the Aboriginal group to determine the scope and parameters of the Aboriginal Traditional Knowledge report;
- 'underway', which included studies where the Aboriginal Traditional Knowledge budget was approved and work was in progress;
- 'completed', which referred to those where Aboriginal Traditional Knowledge reports were completed but had not been through a community review and sign-off process, or shared with Northern Gateway as of February 2013; and
- 'released', which referred to studies with reports that had been through the community review and sign-off process and were available upon request, subject to consent from the Aboriginal group.

Throughout the regulatory process, Northern Gateway submitted detailed updates on its ongoing activities with each engaged Aboriginal group. The information it provided included a background summary for each group, a brief summary of engagement steps it undertook, a summary of the status of any Aboriginal Traditional Knowledge programs, concerns raised by the Aboriginal groups, and Northern Gateway's responses to concerns raised.

Northern Gateway said that Aboriginal groups' broad concerns about the project were related to, among other things:

- general project information (including its timeline, its description, its need, construction and operations of the pipelines, pump station locations, route selection, tanker maneuverability in specific water channels, the project cost, job numbers created by the project, pipeline ownership, and Northern Gateway's approach to project sustainability);
- effects on the environment (including wildlife, groundwater, cumulative effects, increased tanker traffic and proximity of shipping routes to fishing and marine areas, air quality, fisheries, coastal marine life and communities, environmental standards, watercourse crossings, and increased access to sensitive areas);
- logistics, safety, and emergency response (including pipeline integrity, mitigation measures, and compensation);

- effects on land use (including reserve lands traversed by the project, traditional and non-traditional use, Aboriginal and treaty rights, trap lines and trappers issues, routing of the pipeline corridor, and proximity of construction camps);
- traditional knowledge and participation of Aboriginal groups in Aboriginal Traditional Knowledge studies (including Elder participation to complete such studies; historical, archaeological, and palaeontological materials and resources; and traditional information confidentiality);
- process issues (including capacity funding, participation in the regulatory and environmental review process, Aboriginal and treaty rights, Keyoh holders, Crown Consultation, third party technical review, and long-term Aboriginal engagement); and
- community and economic development (including economic opportunities, employment and training, business and procurement contracts, community investment, equity investment, and project legacy).

As a result of concerns raised and input received from Aboriginal groups, Northern Gateway said that it implemented a number of changes to the design and operation of the pipelines and the Kitimat Terminal, including:

- relocated pipelines onto Alexander Indian Reserves Nos. 134 and 134A as a result of negotiations with the Alexander First Nation;
- relocated Whitecourt pump station onto the Alexis Indian Reserve No. 232, as requested by the Alexis Nakota Sioux Nation;
- relocated Bear Lake pump station and pipelines off the Sas Mighe Indian Reserve No. 32, as requested by the McLeod Lake Indian Band;
- revised Pembina River crossing method;
- revised Athabasca River crossing;
- revised Smoky River crossing method;
- relocated Missinka River west crossing location;
- relocated Parsnip River crossing location and revised crossing method;
- revised Muskeg River crossing method;
- revised Salmon River crossing method;
- relocated Owen Creek crossing location and revised crossing method;
- relocated Morice River crossing location;
- relocated Gosnell Creek crossing location and crossing;
- relocated Clore River crossing location and revised crossing method;
- relocated Hunter Creek crossing location;
- relocated Chist Creek crossing location and revised crossing method;
- revised Cecil Creek crossing method; and
- revised Little Wedeene River crossing method.

Northern Gateway said that concerns were expressed by Aboriginal groups about potential project effects on aspects of Aboriginal culture, in particular:

- traditional economic activities, especially harvesting for food;
- land resources as key elements of traditional culture;
- preservation and transmission of traditional knowledge; and
- cumulative impacts of industrial development.

The company also said that substantial baseline information was provided through Aboriginal Traditional Knowledge studies, including the importance and use of:

- land, wildlife, and natural resources;
- sacred places, spiritual beliefs, and practices; and
- Aboriginal languages.

TABLE 4.1 **ABORIGINAL GROUPS ENGAGED BY NORTHERN GATEWAY** Intervenor = ⓘ

Aboriginal Group	Aboriginal Traditional Knowledge study status (as of FEB 2013)	Protocol agreements*
NORTHEAST ALBERTA		
Beaver Lake Cree Nation	n/a	
Saddle Lake (Saddle Lake Cree Nation) ⓘ	Completed and released	DEC 2008 SEPT 2011
Whitefish Lake (Whitefish Lake First Nation #128) ⓘ	Completed and released	JUN 2006 SEPT 2008
Métis Settlements General Council	n/a	
Buffalo Lake Métis Settlement	n/a	
Kikino Métis Settlement	n/a	
Métis Nation of Alberta Region 1	n/a	
Métis Nation of Alberta Region 2	Completed	
Kehewin Cree Nation	Completed and released	
EDMONTON REGION		
Alexander (Alexander First Nation) ⓘ	Completed	DEC 2005 SEPT 2008
Enoch Cree Nation ⓘ	Completed	JUN 2009
Yellowhead Tribal Council	n/a	
Métis Nation of Alberta:		
Métis Regional Council – Zone IV of the Métis Nation of Alberta	Underway	
Grande Cache Métis Local #1994 ⓘ	Completed and released	
Blueridge Métis	n/a	
Gunn Métis Local #55	n/a	

Aboriginal Group	Aboriginal Traditional Knowledge study status (as of FEB 2013)	Protocol agreements*
CENTRAL ALBERTA		
Alexis Nakota Sioux Nation ⓘ	Completed and released	MAR 2006 NOV 2008 AUG 2009
Paul (Paul First Nation)	Completed and released	DEC 2005 JUL 2009
Masckwacis Cree Nation:		
Samson (Samson Cree Nation) ⓘ	Pending engagement	
Louis Bull (Louis Bull Tribe) ⓘ	Underway	
Ermineskin Tribe (Ermineskin Cree Nation) ⓘ	Completed and released	
Montana First Nation ⓘ	Underway	
Michel First Nation ⓘ	Completed and released	
NORTHWEST ALBERTA		
Aseniwuche Winewak Nation	Completed and released	MAY 2009 JAN 2011
Nose Creek Settlement	Completed and released	
Lesser Slave Lake Indian Regional Council:		
Driftpile First Nation ⓘ	Completed and released	AUG 2008 SEPT 2009
Sawridge (Sawridge First Nation)	Underway	OCT 2008 FEB 2010
Sucker Creek (Sucker Creek First Nation) ⓘ	Completed and released	AUG 2008 APR 2010
Swan River First Nation ⓘ	Completed and released	SEPT 2008 SEPT 2011
Kapawe'no First Nation	Completed	JUL 2008
Western Cree Tribal Council:		
Duncan's First Nation	Completed and released	OCT 2008 MAR 2010
Horse Lake First Nation ⓘ	Completed and released	MAY 2010
Sturgeon Lake Cree Nation	Completed	OCT 2008 APR 2010
Métis Nation of Alberta, Region 6 (Region VI Regional Council, Métis Nation of Alberta) ⓘ	Underway	APR 2010
Grande Prairie Métis Local 1990	Underway	APR 2010
Valleyview Métis Local #1929	Underway	APR 2010
Métis Nation of Alberta Region 5 (Region V Regional Council, Métis Nation of Alberta)	n/a	
East Prairie Métis Settlement ⓘ	Underway	

* Where there are multiple dates, this indicates a re-signing of the protocol agreement

Aboriginal Group	Aboriginal Traditional Knowledge study status (as of FEB 2013)	Protocol agreements*
NORTHEAST BRITISH COLUMBIA		
Kelly Lake Cree Nation ⓘ	Completed and released	JUL 2006 OCT 2009
Kelly Lake First Nation	Completed and released	
Kelly Lake Métis Settlement Society ⓘ	Completed and released	DEC 2006
Treaty 8 Tribal Association/Council of Treaty 8 Chiefs	Underway	DEC 2008
Halfway River First Nation	Pending engagement	DEC 2008
West Moberly First Nations ⓘ	Pending engagement	DEC 2008
Saulteau First Nations ⓘ	Pending engagement	DEC 2008
CENTRAL BRITISH COLUMBIA		
McLeod Lake (McLeod Lake Indian Band) ⓘ	Completed and released	JUN 2009
Carrier-Sekani Tribal Council:	Completed and released	
Saik'uz First Nation	Completed and released	
Nak'azdli Band	Completed and released	
Tl'azt'en Nation	Completed and released	NOV 2008 NOV 2010
Takla Lake First Nation	Completed and released	
Nadleh Whut'en First Nation	Completed and released	
Burns Lake Band (Ts'il Kaz Koh First Nation)	Completed and released	DEC 2008 OCT 2010
Wet'suwet'en First Nation	Completed and released	
Stellat'en First Nation	Pending engagement	
Yekooche (Yekooch First Nation)	Completed	JUL 2008 SEPT 2010
Lake Babine Nation ⓘ	Completed and released	MAR 2009
Lheidli T'enneh (Lheidli T'enneh Band)	Underway	FEB 2009
New Caledonia Métis Association (New Caledonia Métis Association [North Central Region])	Underway	
Prince George Métis Community Association	Underway	

Aboriginal Group	Aboriginal Traditional Knowledge study status (as of FEB 2013)	Protocol agreements*
NORTHWEST BRITISH COLUMBIA		
Nee-Tahi-Buhn (Nee-Tahi-Buhn Indian Band)	Completed and released	OCT 2008 MAR 2010
Skin Tyee Nation	Completed and released	APR 2006 FEB 2009
Cheslatta Carrier Nation	Completed and released	APR 2009
Gitxsan Hereditary Chiefs	Pending engagement	APR 2009
Office of the Wet'suwet'en ⓘ	Pending engagement	
Tahtlan First Nation	n/a	
Red Bluff Indian Band	n/a	
Métis Nation of British Columbia ⓘ	Underway	
Northwest BC Métis Association (North West Region 6, Métis Nation of British Columbia)	Underway	
Tri-River Métis Association (North West Region 6, Métis Nation of British Columbia)	Underway	
COASTAL BRITISH COLUMBIA		
Kitselas First Nation ⓘ	Completed and released	AUG 2008
Kitsumkalum Band (Kitsumkalum First Nation) ⓘ	Scoping	JUN 2006 JUN 2009
Kitamaat Village Council (Haisla Nation) ⓘ	Completed and released	
Hartley Bay (Gitga'at [First] Nation) ⓘ	Pending engagement	
Gitxaala Nation (Kitkatla) ⓘ	Completed and released	
Council of the Haida [Nation] (Old Masset Village Council, Skidegate Village Council) ⓘ	Pending engagement	
Metlakatla First Nation ⓘ	Pending engagement	
Lax Kw'alaams First Nation	Pending engagement	
Kitasoo/Xaixais Nation ⓘ	Pending engagement	
Coastal First Nations/Turning Point Initiative ⓘ	Pending engagement	

Northern Gateway said that, over the course of its engagement, it modified its Aboriginal engagement program to reflect Aboriginal interests and concerns generated once the project application was filed in 2010. Modifications included tailoring meetings and correspondence to address key differences between the marine and terrestrial traditional territories claimed and used by Aboriginal groups across the proposed pipeline right-of-way or adjacent to tanker shipping routes. For example, the company said that correspondence and meetings held with coastal Aboriginal groups addressed environmental issues and concerns or potential economic development opportunities unique to the geography of coastal British Columbia, including:

- marine transportation safety;
- the proposed construction of berths and a tank terminal; and
- potential opportunities specific to coastal British Columbia in employment, training, procurement, and equity participation.

Northern Gateway also said that correspondence and meetings held with Aboriginal groups along the route of the pipelines in British Columbia and Alberta addressed environmental issues and concerns and potential economic development opportunities unique to the geography of terrestrial British Columbia and Alberta, including:

- pipeline safety and integrity;
- location of pump stations and block valves; and
- potential opportunities, specific to terrestrial British Columbia and Alberta, for employment, training, procurement, and equity participation.

Northern Gateway also noted the initiatives it developed in response to the interests and concerns expressed by Aboriginal groups, including:

- an Aboriginal Economic Benefits Package made available to eligible Aboriginal groups along the pipeline route as well as to coastal Aboriginal groups with interests in, or adjacent to, shipping routes; and
- identification of additional mitigation measures during detailed design and route selection for reducing effects of project construction on traditional use.

In developing these initiatives, Northern Gateway said that it took into account the need to address the varying capacities of Aboriginal groups. Northern Gateway also said that environmental practices used by adjacent linear projects, such as the proposed Kitimat Summit Lake Looping Project (also known as the Pacific Trails Project) and the proposed Kitimat liquefied natural gas (LNG) project, were considered in developing its proposed mitigation to address effects of project construction on traditional uses.

Northern Gateway also said that Aboriginal groups were invited to participate in a number of its other broader engagement initiatives. The company said that it contacted, based on geographical proximity to marine-related project activities, the following 10 Aboriginal groups regarding their interest and capacity to participate in the Quantitative Risk Assessment (QRA) Working Group:

- Coastal First Nations / Turning Point Initiative;
- Council of the Haida Nation (Old Masset Village Council, Skidegate Village Council);
- Hartley Bay (Gitga'at First Nation);
- Gitxaala Nation (Kitkatla);
- Kitamaat Village Council (Haisla Nation);
- Kitasoo/Xaixais Nation;
- Lax Kw'alaams First Nation;
- Metlakatla First Nation; and
- Skidegate Band.

The company said that a number of groups indicated by letter that they would not participate in the Quantitative Risk Assessment Working Group because they had concerns about the regulatory process or were opposed to the project. The company said that some groups requested that their attendance be noted as "observer" and indicated that their attendance should not be characterized as support for the project.

As described in Chapter 3, Northern Gateway established independent Community Advisory Boards (CABs) in 2009 to provide an opportunity for participants to gather and receive information about the project, identify and discuss key areas of regional interest or concern, and recommend improvements or enhancements to the project. Northern Gateway said that the Community Advisory Boards were intended to function independently and provide opportunities for meaningful exchange between Northern Gateway and interested parties, including Aboriginal groups. Northern Gateway said that Community Advisory Boards were established for five geographic regions along the project route: British Columbia North Coastal, British Columbia Northwest, British Columbia Central, Alberta North Central, and Peace Country. The company also said that

the British Columbia North Coastal Community Advisory Board can continue to be a forum for issues to be addressed on a coastal perspective, and that Community Advisory Boards would remain active throughout the life of the project, or until the Community Advisory Board members decide to disband.

Northern Gateway said that its intention for engaging with Aboriginal groups was to be a partner. The company said that it could be a positive influence and that it believed communities would be better off with the project proceeding. The company said that the equity agreements with Aboriginal groups were a foundation to start initial engagement and to provide ongoing revenue to groups to continue to engage with the company and to determine the best way to partner. The company said that the Aboriginal Traditional Knowledge studies undertaken for the project, where Aboriginal groups were interested in or participated in the field work, were a way of establishing relationships with Aboriginal groups through direct personal involvement in the studies that supported the project effects assessment.

Northern Gateway also said that it was important for the company to move the head office for Northern Gateway from Calgary to Prince George, in order to be part of that community. The company said that communities expected it to be involved in local activities. The company noted that community-based education and training activities supported by the project were often brought up by communities in discussions with the company. The company also said that it provided funding to Aboriginal groups so they could begin to develop businesses that could service all pipeline companies or other infrastructure, not just Northern Gateway.

The company said that part of its consultation process was to learn from communities about those things the communities find important, and that its engagement approach included involvement in community activities. For example, Northern Gateway said that one Alberta Aboriginal community held a naming ceremony for a senior executive of the company. The company also said that, in other communities, its executives attended a pow-wow, and took part in a sweat lodge. Northern Gateway said that, along the coast, it accepted invitations and participated in feasts prior to formal consultation meetings.

Northern Gateway acknowledged that direct engagement with certain Aboriginal groups was limited over the course of its consultation efforts. The company said that this was due, in most cases, to opposition to the project and reluctance to engage in discussions with Northern Gateway. The company said that, in some cases, Aboriginal groups formally requested that Northern Gateway stop sending information in relation to the project. Northern Gateway said that it responded to these groups by letter explaining that it was required to provide certain project information as part of the regulatory process. Northern Gateway said that it continued to provide project-related information to these groups. The company also said that it remained open to continue to engage in dialogue with these groups to the extent that they are reciprocally interested and willing. It committed to continue its engagement program, if the project proceeds, with a focus on relationship building and developing additional opportunities. Northern Gateway said that, as of February 2013, 7 of the 11 coastal Aboriginal groups it engaged for the project had not undertaken discussions with the company about Aboriginal Traditional Knowledge studies, and that the offer to complete these studies was still open.

With respect to its ongoing consultation with Aboriginal groups, the company said that, in March 2013, it revised its strategy around Aboriginal engagement, aimed at encouraging those who had not engaged with the company to open dialogue. The company said that the strategy would aim to involve meetings with senior executives from Northern Gateway and Aboriginal leadership with the intention of sitting and listening to perspectives from Aboriginal groups to determine what the company would need to do to open dialogue.

4.2 The Government of Canada's consultation processes with Aboriginal groups

The Government of Canada indicated that federal departments actively participated in the joint review process, and referred any requests or concerns from Aboriginal groups on project-related issues to the Crown Consultation Coordinator.

The Government of Canada's Aboriginal Consultation Framework for the Northern Gateway Pipeline Project, filed on the record, includes five distinct phases, which provide opportunities for consultation between the federal government and Aboriginal groups before, during, and after the Panel's process:

- Phase I: Initial engagement and consultation on the draft Joint Review Panel Agreement
- Phase II: Panel process leading to oral hearings
- Phase III: Oral hearing and preparation of the Panel's final report
- Phase IV: Consultation on the Panel's final report
- Phase V: Regulatory permitting

The Government of Canada said that it encouraged Aboriginal groups to participate in all phases of the Panel's process to express their views about the project. The federal government said that it undertook various processes such as meeting, discussing, and corresponding with potentially-affected Aboriginal groups. It committed to taking a whole-of-government approach to consulting with Aboriginal groups regarding the Enbridge Northern Gateway Project in a coordinated manner that was integrated with the regulatory review processes for the project.

The Government of Canada said that it would rely on the joint review process to the extent possible to assist in fulfilling its legal duty to consult Aboriginal groups. It said that it communicated with Aboriginal groups that the Panel's process was the primary mechanism for Aboriginal groups to learn about the project and present their views to the federal government about:

- their traditional knowledge with respect to the environmental effects of the project;
- the effects that any change in the environment resulting from the project may have on their current use of lands and resources for traditional purposes; and
- the nature and scope of their potential or established Aboriginal and treaty rights, the impacts that Crown conduct in respect of the project may have on those rights, and appropriate measures to avoid or mitigate such impacts.

The Government of Canada said that, if project-related issues that required Crown consultation could not be addressed through the Panel's process, it would consult directly with the potentially-affected Aboriginal groups on these issues.

The Canadian Environmental Assessment Agency said that it was responsible for coordinating the federal government's consultation with Aboriginal groups, and had appointed the Crown Consultation Coordinator to ensure that consultation activities were carried out in an effective manner.

Participant funding was made available for Aboriginal groups to support them in preparing for, and participating in, consultation activities with the federal government, and in activities associated with the Panel's process. The funding program and the amounts allocated were administered by the Canadian Environmental Assessment Agency. Details on the amounts awarded during the process are available on the Canadian Environmental Assessment Registry Internet site.

4.3 Aboriginal groups' participation in the Panel's process

As required by the Joint Review Panel Agreement, the Panel's process was designed to facilitate the participation of Aboriginal peoples and to enable them to convey their views on the project to the Panel by various means. Aboriginal groups had the opportunity to participate through oral hearings, letters of comment, or by registering as intervenors. The Panel's process was structured so as to hear from all parties. Remote participation during the oral hearings was made available through the use of telephone and video links. Often, hearings were held in Aboriginal communities. The Panel sought, in particular, to hear from Aboriginal groups in a manner that was responsive to, and respectful of, Aboriginal traditions. The Panel provided the opportunity for oral evidence to be given, and many Aboriginal groups took the opportunity to present oral traditional evidence, such as that given by an Elder, or information that otherwise cannot be communicated in writing. A number of Aboriginal intervenors put great effort into providing their written and oral evidence to the Panel. This was demonstrated by group presentations, the use of expert witnesses and facilitators, and organizing groups of their members, youth, and Elders to share their stories, experiences, and concerns about the project.

Aboriginal intervenors also provided the Panel with written evidence. Detailed evidence was provided regarding their use of the lands, waters, and resources in the project area. Evidence was also provided on their specific histories, customs, and traditions. Aboriginal intervenors also provided detailed information on their wide-ranging and specific interests within their traditional territories. Numerous Aboriginal groups also participated in the oral questioning phase of the process, asking direct questions of Northern Gateway and federal government participants on various aspects of the project. In February 2013, Coastal First Nations indicated to the Panel that it was having difficulty engaging in the process and would no longer participate in the questioning phase of the hearing. Coastal First Nations said that it would not proceed as it had not been provided with the funding necessary to meaningfully or effectively engage in the process, and that it was disappointed with the nature of the process.

Appendix 8 refers to information and evidence sources provided by Aboriginal groups who participated in the review process, and where this information can be found on the public record.

Through information requests, oral and written submissions, and direct questioning, Aboriginal groups raised a number of concerns regarding the consultation undertaken by Northern Gateway and the Government of Canada.

4.3.1 CONCERNS RAISED ABOUT NORTHERN GATEWAY'S CONSULTATION

A number of Aboriginal groups said that Northern Gateway's consultation process failed to address some, or all, of their concerns about consultation for the project. In oral evidence, Driftpile First Nation said that, while it had met with Northern Gateway, there had not been adequate or meaningful consultation, that concerns must be properly accommodated, and that this had not yet happened. Coastal First Nations said that Northern Gateway's process for engaging with First Nations, as set out in its project application, was flawed and incomplete. Michel First Nation indicated that Northern Gateway's approach to consultation, which it described as "pan-Aboriginal," was an inappropriate approach.

Aboriginal groups were also critical of Northern Gateway's response to their specific concerns regarding the impacts of the project. Some of these concerns dealt with Aboriginal title, jurisdiction, consent, and governance. They noted that Northern Gateway's reliance on standard mitigation did not address their concerns, nor did they consider this type of dialogue to be consultation.

Gitxaala Nation, for example, said that the company had not engaged in any meaningful dialogue with Gitxaala regarding any specific mitigation measures that might address Gitxaala's concerns about the impacts of the project. It said that, for the most part, Northern Gateway's approach to discussing these matters was to present a completed analysis and plan, and to ask for comments without providing adequate time or resources for the Nation to do its own assessment or present a full list of concerns. The Gitxaala Nation said that a meaningful process of consultation should be able to accommodate culturally-relevant concepts such as *ayaawx* (traditional laws of the Gitxaala Nation), *adawx* (oral tradition, that establishes authority and jurisdiction), and *gugwilx'ya'ansk* (inheritance) within the Gitxaala territory.

Haisla Nation said that the broad and generally-phrased concerns that Northern Gateway summarized failed to properly characterize the Haisla Nation's concerns with the project, including Haisla's claim of Aboriginal title to the land proposed to be used for the pipelines and the Kitimat Terminal.

Swan River First Nation said that there was little evidence that the overarching concerns, as presented in the application, had been addressed, let alone resolved, and that the Aboriginal Traditional Knowledge study that Northern Gateway carried out with the First Nation appeared to have been undertaken only as a "demonstration of consultation."

Some Aboriginal groups disagreed with Northern Gateway's approach to how consultation should be undertaken, and contradicted how the company characterized its relationships with Aboriginal communities. The Giga'at First Nation did not believe that any sort of a relationship was established with the company, and that it was inappropriate that it was the last community to be approached by Northern Gateway. The Gitga'at First Nation said that, when company representatives visited the community, its leaders "welcomed every person that got off that plane as if the home that you were visiting was your own, and you were treated with respect, even though we knew that all of our neighbours had already been consulted with." The Métis Nation of Alberta – Region 6 said that consultation is not just about talking and doing studies, but that the company needs to be better informed about who the Métis people are, acknowledge that the project may potentially impact their way of life, and do more to encourage community involvement.

During questioning, various Aboriginal groups asked Northern Gateway how it determined which communities to consult with. In response, Northern Gateway reiterated its approach outlined in its application. The company also reiterated its commitment to engaging with Aboriginal groups located within the boundaries of the 160-kilometre-wide engagement area, or whose traditional territory may overlap with the project area.

Northern Gateway said that it would mitigate impacts on Aboriginal uses and activities through project design and that it would "always provide an opportunity for further dialogue and consultation" on these issues and interests. Northern Gateway committed to continue its consultation throughout the operational life of the project, should it be approved.

4.3.2 CONCERNS RAISED ABOUT CROWN CONSULTATION

During the course of the hearings, the Panel heard many views related to the Crown's legal duty to consult with Aboriginal groups. Some Aboriginal groups were critical of the federal government's approach to consultation. Many Aboriginal groups expressed dissatisfaction with the federal government's reliance on the Panel's process as a means for consultation. Several groups stated that, by relying on the Panel's process and Northern Gateway's consultation efforts, instead of meeting with individual Aboriginal communities, the Crown had failed to fulfill its legal duty to consult. Some of the concerns included:

- Alexander First Nation said that, although the proposed project was made known to it in 2002, and after making repeated requests for government involvement, the government's engagement had been extremely limited.
- The Haisla Nation said that it asked for direct consultation with the federal government and was told that it would have to wait until after the process is complete in 2013.
- The Office of the Wet'suwet'en said that there had been no direct engagement with Crown authorities and, therefore, there had been no meaningful consultation.
- Gitxaala Nation questioned whether the Government of Canada considered the hearings to constitute engagement between the Crown and the Gitxaala.
- The Heiltsuk Tribal Council said that it does not consider the Panel's process to be consultation as required by law, that it was not adequate for the purpose of consulting the Heiltsuk community or for addressing their concerns, and that, by integrating consultation activities with the hearing process, some groups might not have the capacity to participate.
- Several Aboriginal groups asked whether the Government of Canada had delegated any aspects of its duty to consult to Northern Gateway.

In response to the specific and general concerns raised, the Government of Canada said that:

- it had not delegated to Northern Gateway aspects of Canada's consultation or accommodation obligations and that it is relying on the Panel's process and Northern Gateway's broader consultation efforts, to the extent possible, to assist the Crown in fulfilling its legal duty to consult;
- the purpose of using the Panel's process as a way to fulfill the Crown's legal duty to consult was to have all the information about potential impacts put on the public record by being presented to the Panel "in an open and transparent manner";
- consultation had been ongoing for at least 4 years and that it will consider information that goes beyond the final hearing stages;
- it had gathered information throughout the process, including Northern Gateway's consultation record, oral evidence, and oral statements, and all other written evidence that was placed on the record;
- it used a "whole-of-government approach" whereby departments worked together to ensure that they have a collective voice while engaging in consultation activities;
- meetings that took place early in the process – throughout 2008 and 2009 – gave groups an opportunity to review the draft Joint Review Panel Agreement, which stated that the Crown would integrate Aboriginal consultation into the Panel's process to the extent possible; and
- early consultation should have resulted in Aboriginal groups understanding their opportunity to be meaningfully consulted on the project.

Aboriginal groups asked about the type of consultation that would occur once the Panel has released its report. The federal government said that, during Phase IV consultation, it would "afford to all the groups an opportunity to make their views known about whether the impacts on their rights are accurately characterized, to figure out what their views are on whether their recommended mitigation measures might address those impacts, and to find out from groups whether there are any outstanding issues." The federal government also said that:

- participant funding would be available to Aboriginal groups through the Canadian Environmental Assessment Agency for carrying out Phase IV consultation;
- it would then take into consideration these outstanding concerns before making any final decisions on the project; and
- the format for this stage of consultation would depend on the outcome of the Panel's process.

4.4 Views of the Panel

The Panel described the principles of thorough and effective consultation in Chapter 3. The Panel believes that, in order for consultation between an applicant and potentially-affected parties to be a thorough and effective process, the applicant must provide timely and appropriate opportunities for those potentially affected to learn about a project, provide their comments and concerns, and to discuss how those concerns may be addressed. An applicant must be genuinely responsive to the input it receives. It must demonstrate that it has considered the information offered by potentially-affected groups, and must effectively communicate the extent to which it has responded to the concerns it heard.

Consultation is based on a foundation of trust, mutual respect, understanding of values, and relationship-building. Aboriginal groups that may be affected by the project have a responsibility to respond to opportunities for consultation with an applicant in order to communicate any concerns they may have, and to discuss how these can be addressed. All parties have an obligation to seek a level of cultural fluency, in order to better understand the values, customs, needs, and preferences of the other parties involved in the consultation process. The Panel notes that examples of relationship-building associated with consultation were demonstrated through invitations to, and participation in, cultural events.

All parties may be required to adjust their expectations in response to the information, concerns, and interests raised and considered through the process. The Panel observed that this approach did not always occur in this proceeding. The Panel notes that, as the review of the project proceeded, Northern Gateway endeavoured to adjust its approach to consultation to meet the goals of thorough and effective consultation, and adapted its efforts to understand how the project may affect the interests of Aboriginal groups in the project area.

The Panel notes that there were differing perspectives among a number of Aboriginal groups on what constitutes a thorough and effective process of consultation with the applicant. There were

also different views among some parties about their respective roles and responsibilities in the consultation process. The Panel recognizes that each party enters the consultation process with distinctive cultural perspectives, and that these differences can present challenges to effective dialogue. The Panel finds that it is important for the applicant and potentially-affected parties to recognize and understand their respective roles and responsibilities for achieving meaningful dialogue during consultation.

The Panel also finds that it is critical for all parties to understand the role of consultation in this regulatory process. The purpose of this consultation between the applicant and potentially-affected parties is to understand the impact of the proposed project on Aboriginal use and activities and how these potential impacts can be addressed.

NORTHERN GATEWAY'S CONSULTATION WITH ABORIGINAL GROUPS

With respect to Northern Gateway's consultation with Aboriginal groups, the Panel finds that Northern Gateway met the requirements of the National Energy Board's Filing Manual. Since 2002, as part of the initial phases of the consultation process, the company provided project information to Aboriginal groups. This included information about the project's design, operations, as well as its potential environmental, social, and economic effects, including potential economic benefits to Aboriginal groups. The Panel also finds that the company continued to learn more about Aboriginal communities and their concerns related to the project. This learning caused the company to modify its consultation process to better understand the interests and concerns raised by Aboriginal groups. The Panel notes that Northern Gateway continued to provide project information to those Aboriginal groups who chose not to engage with the company throughout the consultation process.

The Panel finds that the criteria used by Northern Gateway to identify potentially-affected Aboriginal groups were appropriate. The Panel notes that the company's engagement area was established in consideration of the project's proximity to areas of traditional use along the proposed right-of-way, and within the Confined Channel Assessment Area and Open Water Area. The Panel also finds that Northern Gateway offered all potentially-affected groups adequate opportunities to raise any concerns they had with the company, and to provide information about their interests in the project area. The Panel notes that this included the opportunity for each potentially-affected Aboriginal group to complete or participate in Aboriginal Traditional Knowledge studies, in order to identify potential effects on the current use of lands, waters, and resources for traditional purposes, and to identify and discuss measures to reduce or avoid potential adverse project effects.

The Panel finds that Northern Gateway considered the information that was provided by Aboriginal groups about their use of the lands, waters, and resources, and made a number of changes to the design and operation of the project as a result of this information. These changes include relocating facilities onto Reserves No. 134 and No. 134A of the Alexander First Nation, and onto Reserve No. 232 of the Alexis First Nation, at their request. As well, a number of watercourse crossings were relocated or revised based on concerns raised by Aboriginal groups.

The Panel acknowledges that Northern Gateway and Aboriginal groups entered into protocol agreements and subsequent memoranda agreements for the project, beginning in the early stages of project design and planning. The Panel is supportive of the aims of these agreements to clarify the nature of the relationship between the parties, to outline any support necessary to aid in discussion about the project, and to facilitate cooperation. A benefit of these types of agreements could be to establish roles and responsibilities that support thorough and effective consultation. The Panel views such agreements as important demonstrations of mutual commitment to cooperatively discuss and address issues relating to the Enbridge Northern Gateway Project.

The Panel has considered the extent to which potentially-affected Aboriginal groups responded to Northern Gateway's consultation efforts. The Panel notes that some Aboriginal groups, including a majority of coastal Aboriginal groups, chose not to participate in some aspects of Northern Gateway's consultation program, such as Aboriginal Traditional Knowledge studies. The Panel notes that Northern Gateway did not have the benefit of such information from these groups early in its project design phase and assessment of potential effects.

A number of Aboriginal groups raised concerns about the adequacy of Northern Gateway's efforts to engage them and to discuss their concerns. Some groups felt they were not given sufficient opportunities to discuss their concerns, or adequate time to fully review information about the project. Some groups felt that their input and concerns were

not fully considered by Northern Gateway. Some groups were also critical of the federal government's approach to its legal duty to consult, and in particular, its reliance on the Panel's process. The Panel notes that some groups considered such an approach inappropriate, and expressed the view that consultation and accommodation by the Crown should precede consultation by the applicant. The Panel notes that the Government of Canada provided evidence that it had not delegated to Northern Gateway aspects of Canada's consultation or accommodation obligations.

The Panel acknowledges that Aboriginal groups engaged by Northern Gateway did not always share a common view with the company about their respective roles and responsibilities. The Panel notes that, where such views become polarized, meaningful dialogue can be difficult to achieve. The Panel acknowledges that this can result in the withdrawal of groups from engagement with the company, or from ongoing participation in the regulatory review process. The Panel believes it is critical for all parties to understand their respective roles and responsibilities in respect of the company's consultation activities, and participation in the regulatory review process. The Panel finds that, when parties do not participate because they have concerns about the regulatory process or are opposed to the project, the opportunity has been lost to present their views to the Panel and to have them considered during the Panel's deliberations.

The Panel notes Northern Gateway's commitment to ongoing engagement with Aboriginal groups throughout the project's lifespan, including with coastal Aboriginal groups and others that have not yet participated in all opportunities provided to discuss the project. The Panel requires Northern Gateway to report on aspects of its ongoing consultations with Aboriginal groups, including consultations in developing a number of operational plans and employment-related programs.

With Northern Gateway's commitments and its compliance with the Panel's conditions, the Panel finds that Northern Gateway can effectively continue to engage and learn from Aboriginal groups that chose to engage, and address issues raised by Aboriginal groups throughout the project's operational life.

THE GOVERNMENT OF CANADA'S CONSULTATION WITH ABORIGINAL GROUPS

In accordance with the Joint Review Panel Agreement, the Panel received evidence from Aboriginal groups related to the nature and scope of potential or established Aboriginal and treaty rights that may be affected by the project, and the impacts or infringements that the project may have on those rights. This evidence is found throughout this report and the public record. The Government of Canada stated that it has engaged in consultation activities with Aboriginal groups. The Government of Canada also said that "it will rely on the Joint Review Panel process to the extent possible to assist in fulfilling its legal duty to consult Aboriginal groups." The Panel notes that the federal government has stated that it intends to consult with Aboriginal groups after the issuance of this report. The Panel offers no views in relation to the consultation activities undertaken by the Government of Canada to date, or any future consultation that it will undertake, with Aboriginal groups.

4.5 Northern Gateway's approach to assessing potential project effects on rights and interests of Aboriginal groups

Northern Gateway said that its understanding of Aboriginal rights in Canada is based on the case law, and that such rights are derived from Aboriginal customs and traditions. It said that the Supreme Court of Canada has described Aboriginal rights as "the collective rights to participate in an activity that is an element of a practice, custom or tradition, integral to the distinctive culture of the Aboriginal group claiming the right." Examples of Aboriginal rights recognized by various courts, as noted by Northern Gateway, include subsistence hunting, fishing, and trapping.

With respect to treaty rights, Northern Gateway said that these are determined by the terms and conditions of the treaty in question. The project would traverse lands within Treaty No. 6 and Treaty No. 8 in north central Alberta and portions of northeastern British Columbia. Northern Gateway said that the rights determined under these treaties include "the right to hunt, trap, and fish on unoccupied Crown lands as well as other rights related to the establishment of Reserves."

In its evidence, Northern Gateway provided a detailed rationale for its approach to assessing the potential impacts of the project on rights and interests of Aboriginal groups:

"The exercise of Aboriginal and treaty rights is inextricably linked with use of the natural environment. For example, the treaty right to hunt on unoccupied Crown lands is affected by access to those lands, and the abundance of wildlife available for harvesting. The same can be applied to harvesting of fish (and other aquatic and marine resources) and vegetation. For this reason, it is logical and appropriate to base assessment of the project effects on Aboriginal and treaty rights on the extensive studies done in respect of the project effects on the biophysical and human environments generally. It is also logical and appropriate to supplement such assessment with information received from participating Aboriginal groups identifying site specific activities, features of cultural importance, harvesting patterns and timing, travel routes and spiritual areas and sites, and to then identify measures to avoid and reduce potential project effects on those activities or features either now or in the future. This is the approach used by Northern Gateway."

Northern Gateway said that it did not take a position on the merits of claims asserted by Aboriginal groups in respect of Aboriginal rights, including title. Northern Gateway said that, instead, it sought to "identify the interests and concerns underlying those claims so that the project could be developed in a manner that achieves alignment with those groups to the extent practical." The following description was provided as an example of Northern Gateway's approach:

"For example, rather than engaging in an analysis of whether a particular group has the Aboriginal right to fish at a particular watercourse crossing, the policy of Northern Gateway has been to assume that members of the group may have such a right, to assess whether a pipeline crossing at that location would have effects on the underlying fisheries resource, and to identify mitigation measures to limit such effects."

Northern Gateway said that it used this approach in respect of other components of the environment and associated issues, such as potential effects of the project on wildlife (and, hence, Aboriginal hunting and trapping), marine species, vegetation, and surface water quality.

4.5.1 EFFECTS ON TRADITIONAL LAND AND MARINE USES AND RESOURCES

Northern Gateway said that it used three major information sources to collect information on rights and interests of Aboriginal groups and to inform its assessment of the potential effects of the project on traditional land and marine uses and resources:

- information received during various engagement activities with Aboriginal groups;
- traditional use and environmental knowledge studies; and
- assessment of effects of routine activities on the biophysical and human environment, including project environmental effects and cumulative effects, and assessment of effects of malfunctions and accidents.

Northern Gateway said that information included in Aboriginal Traditional Knowledge studies completed for the project was used in Northern Gateway's Environmental and Socio-Economic Assessment. The company said that this was used to inform the scoping and assessment of issues, including project effects on traditional use (such as harvesting areas, sacred sites, habitation areas, or travel routes), as well as commercial trapping and hunting, which includes Aboriginal people.

Northern Gateway said that the potential effects of the project on traditional use of lands, waters, and resources by Aboriginal people were assessed through its project effects and cumulative effects studies on various components of the biophysical environment. It said that this included an assessment of potential project effects on "resources commonly understood to be of importance for Aboriginal people or that support the land base and habitat conditions essential to the sustainability of these resources."

Northern Gateway said that it took into account issues raised by Aboriginal people, information on traditional land use and ecological knowledge, and recommendations provided by Aboriginal groups on project design changes and mitigation. It also said that it took into account in its assessment species, species groups, or indicators that are, or represent, resources commonly understood to be of importance to Aboriginal people. Northern Gateway said that examples of the resources understood to be of importance included wildlife species (such as woodland caribou and grizzly bear), groups of fish (such as salmon and herring), and vegetation (such as old growth forests, rare plants, and wetlands).

Northern Gateway said that, based on its work in developing the Environmental and Socio-Economic Assessment, including Aboriginal Traditional Knowledge work, it determined that routine project activities during construction, operation, and decommissioning are not likely to cause significant adverse effects on terrestrial or marine environments. Northern Gateway said that, as a result, it is "confident that the project will not have a significant adverse effect on those who depend on the land and water for sustenance, including Aboriginal groups who may exercise their Aboriginal or treaty rights in the use of land or water for traditional purposes."

The company said that, in the event of a malfunction or accident, specifically a large spill associated with the pipelines, the Kitimat Terminal, or project-related marine transportation, there is the potential for significant adverse effects to occur on some biota and the ecosystems that support these species. The company said that the impact would depend on the setting, conditions, magnitude, and duration of the spill. Northern Gateway said that these effects could, in turn, impact resources commonly understood to be of importance and significance to Aboriginal groups. Northern Gateway said that the exact nature of these effects could differ widely as a result of many variables, as would the approach and success of cleanup operations, habitat rehabilitation, and species recovery. It provided detailed evidence in support of its conclusion that the probability of large spills is considered to be low.

Northern Gateway said that it sought to engage Aboriginal groups in discussions of spill response planning for the pipelines. It said that it would continue to engage in discussions of spill prevention and emergency response throughout the project to ensure, to the extent possible, that Aboriginal use, interests, and culturally-important resources are protected in project design, operation, and spill response. Northern Gateway committed to involving Aboriginal groups in the development of more detailed spill response plans, such as Geographic Response Plans, Community Response Plans, control point mapping, and in finalizing environmental sensitivity atlases.

4.5.2 INFORMATION AND CONCERNS RECEIVED BY NORTHERN GATEWAY

Northern Gateway said that it understands the principal concerns of potentially-affected Aboriginal groups to include:

- changes in the abundance, distribution, or diversity of resources harvested by Aboriginal people, or the land or water that support these resources, as a result of routine activities and malfunctions and accidents;
- changes in the quality of resources harvested by Aboriginal people, or the land or water that support these resources, as a result of routine activities and malfunctions and accidents; and
- changes in the ability of Aboriginal people to physically access resources, or the land or water that support these resources, as a result of pipeline construction activities, access management, marine terminal construction and operation, and marine vessel movements.

Northern Gateway said that, while it is appropriate to use western scientific methods to assess these concerns, a number of other concerns were expressed by potentially-affected Aboriginal groups. These included changes in the perception of safe access or harvesting by Aboriginal people and food quality; changes in use of territorial lands by clans, houses, or families and associated harvesting activities; and changes to Aboriginal governance systems and associated management of natural resources.

Northern Gateway filed summaries of the concerns and issues raised by Aboriginal groups as part of its evidence on consultation with Aboriginal groups, including Aboriginal Traditional Knowledge studies. More information regarding Northern Gateway's approach to the assessment of potential effects on traditional land and marine use can be found in Chapter 9.

4.5.3 PROPOSED MITIGATION MEASURES

Northern Gateway committed to a variety of project design features, mitigation measures, and environmental management measures to minimize environmental effects on Aboriginal groups' use of the lands and waters, over the life of the project. Northern Gateway also committed to including community input in the design of these features and measures.

For the pipelines, Northern Gateway said that access across the right-of-way and temporary workspaces would be limited in many cases to very short periods of time during trenching and pipe installation (i.e., days to weeks). Northern Gateway committed to work with Aboriginal groups and individuals, such as trappers, to develop measures to minimize effects on access, especially during key periods of use. It also committed to developing compensation for any trapping and harvesting losses.

Northern Gateway said that the terminal area would be fenced for security reasons and would be closed to access by individuals other than authorized personnel. It said that, as a result, access by the Haisla Nation, and possibly other coastal First Nations (such as Kitsumkalum and Kitselas), would be affected. Northern Gateway said that an access road would be constructed around the terminal area prior to construction to ensure that access to Bish Cove and Emsley Cove is maintained.

Northern Gateway said that, with operational measures and additional mitigation, routine vessel operations in the Confined Channel Assessment Area are not expected to alter the ability of Aboriginal people to access resources or cultural sites. As an example, it said that all tankers and associated escort tugs would be required to reduce speed within the Confined Channel Assessment Area and its approaches. It also said that a whale spotting vessel would be able to assist in identifying potential conflicts with fishers and small vessel traffic in the core humpback whale area for 6 months of the year. Further details are provided in Chapter 8.

In addition, Northern Gateway committed to work collaboratively with Aboriginal fishers and other fishers through the Fisheries Liaison Committee to:

- identify conflicts with fishing and other coastal harvesting activities (this could include access to cultural areas or sites);
- develop measures to minimize or eliminate these conflicts; and
- develop protocols for identifying, measuring, and determining compensation for gear loss or effects on harvest.

Northern Gateway said that, during construction and routine operations, there should not be significant adverse effects on the ability of Aboriginal people to physically access resources, or land or water that support these resources, given the project design features and proposed mitigation measures. More information on the interaction between the project and the activities within, and uses of, the project area by Aboriginal groups, can be found in Chapters 8 and 9.

Northern Gateway committed to work with Aboriginal groups during the detailed engineering, construction, and operational phases of the project to address site-specific concerns. Northern Gateway committed to undertake additional engagement with Aboriginal groups to verify their views regarding the proposed detailed pipeline route, and to identify and address site-specific issues and interests, such as proximity to mineral licks, berry-harvesting sites, medicinal plants, burial sites, or intersecting trails.

Northern Gateway also committed to ongoing Aboriginal engagement during construction and operations to address, whenever possible, concerns regarding potential project effects on traditional uses and cultural resources. It said that this would include opportunities for Aboriginal involvement in:

- compensating trappers (including baseline data collection and reporting of trapping yields during and after construction);
- monitoring construction;
- developing and implementing access management plans;
- developing and implementing fisheries habitat compensation plans;
- developing a Fisheries Liaison Committee, either separately or in conjunction with non-Aboriginal fishers; and
- developing and implementing species-specific monitoring and management plans for sensitive species such as grizzly bear.

Northern Gateway said that these programs would have the effect of "reducing potential adverse project effects on Aboriginal rights and interests by reducing effects on the resources utilized in pursuit of such interests."

With regard to addressing some of the concerns raised by Aboriginal groups, Northern Gateway said that predicting changes in perceptions, the use of traditional territorial lands, and Aboriginal governance systems requires direct input and involvement from communities, clans, houses, or individuals.

4.6 Evidence provided by Aboriginal groups to the Panel

The Joint Review Panel Agreement provides that the Panel receive information from Aboriginal peoples. Aboriginal groups provided a large amount of information to the Panel, including evidence in respect of their rights and interests, and this evidence is throughout the entire record of the proceeding.

The Panel has provided within this section of the report a high-level summary of the evidence provided by Aboriginal groups. Appendix 8 refers to information and evidence sources provided by Aboriginal groups who participated in the review process, and where this information can be found on the public record. The Panel notes that identifying and referring to specific passages within the record could lead to other direct and indirect references being overlooked. Anyone wishing to fully understand the context of the information and evidence provided by Aboriginal groups should familiarize themselves with the entire public record.

Key concerns raised by Aboriginal groups about the project related to potential impacts on:

- traditional land, marine, and resource use;
- security of traditional foods;
- disturbance of heritage resources;
- disruption of traditional governance and cultural practices;
- community health;
- community economic development;
- infringement of rights provided for in Treaty No. 6 and Treaty No. 8; and
- infringement of the Heiltsuk Nation's established Aboriginal right to trade herring spawn on kelp on a commercial basis.

Through oral and written evidence, Aboriginal groups provided information related to their use of the lands and waters along the pipeline and shipping routes. They raised concerns about how project construction, operation, and potential spills could potentially hinder or limit access to their traditional territories. The Panel heard about specific locations where Aboriginal groups have exercised or currently exercise their traditional activities, harvesting land and marine resources through means such as fishing, hunting, trapping, and gathering. Groups provided information on how much of their diet consists of traditional foods and indicated that they have concerns that these resources would be contaminated due to increased industrial activity and potential spills. The Panel heard about specific harvesting, historic, and cultural sites that community members travel to; how community members journey to these sites; and that the activities they participate in play a vital role in the transfer of knowledge between generations. The Panel also heard that all things are connected and potential interactions and impacts need to be considered holistically.

Both inland and coastal Aboriginal groups shared evidence regarding their traditional governance systems, including the importance of traditional feasting and naming practices and how these are connected to the lands and waters that surround them. They also described their cultural

knowledge and stories of their territories and their perspective of the associated resource management and stewardship responsibilities with respect to lands and waters. Aboriginal groups said that the very prospect of the Enbridge Northern Gateway Project was already causing distress to local communities, due to their views of the potential risks of the project. They pointed out that the complexity of community ties that are maintained through harvesting and distributing foods, including trade with other communities, would be significantly affected by even a small spill. Finally, they noted that a spill could lead to an out-migration from the area, negatively impacting support networks and the community.

Aboriginal groups shared information regarding their current economic activities, which included forestry, fishing, seafood processing, and eco-tourism, among others. They highlighted the importance of established Aboriginal-run businesses and noted that they are working on future economic development strategies to develop more employment opportunities for their communities. Groups noted the importance of natural resource management strategies which promote economic development in industries such as forestry and commercial fisheries, and which are based on principles of conservation and sustainability. Coastal groups spoke of conservation initiatives, such as the Coastal Guardian Watchmen Network, whose members monitor the environment and waterways along the coast, and often educate visitors about Aboriginal history and culture. Aboriginal groups said that such initiatives could not compatibly proceed with a project such as the Enbridge Northern Gateway Project.

Some Aboriginal groups were critical of Northern Gateway's approach to assessing project effects on the rights and interests of Aboriginal groups. Groups noted the lack of local knowledge incorporated in the project application. Members of the Haida Nation pointed to the work that the Council of the Haida Nation has been doing in marine planning. They said that, as part of this planning, they sought to bring Haida marine traditional knowledge forward in a manner that was respectful to Haida people, while recognizing its complexity and the sensitivity of this knowledge. They questioned whether Northern Gateway had included any of this information or sensitivities in its application.

In reply, Northern Gateway said that the Living Marine Legacy Reports submitted by the Council of the Haida Nation were focused primarily on the shoreline areas of Haida Gwaii as opposed to the Open Water Area. As the shipping lane for the project is 60 to 70 kilometres from the shoreline of Haida Gwaii, Northern Gateway said that it focused its assessment on the Open Water Area. It used the more general information provided in Pacific North Coast Integrated Management Area (PNCIMA) reports, which included data from the Haida Nation's marine planning reports, for its assessment of impacts to the Open Water Area. It also said that the traditional use information provided by the Haida Nation after the application was filed would be incorporated into coastal sensitivity mapping and be an integral part of spill response planning. Northern Gateway said that it reviewed all the information provided by the Haida Nation to ensure that it was understood by the company, and that their concerns were addressed through the mitigation that Northern Gateway had proposed in its environmental assessment. Northern Gateway said that the information provided by the Haida Nation was consistent with the information it had included in its application regarding the environmental impact on the resources used by Aboriginal communities. The company also said that it had difficulty engaging with the Haida Nation, but would welcome further dialogue going forward to jointly address any key issues and enhance understanding.

Gitxaala Nation said that information provided by them regarding their rights and interests, and the impacts on these, was not well represented in the baseline information presented by Northern Gateway. It also said that this was not reflected in Northern Gateway's Environmental and Socio-Economic Assessment. In reply, Northern Gateway said its approach to assessing potential effects of the project on the traditional use of lands and resources by Aboriginal people was done through assessing the project effects on various components of the biophysical environment.

Northern Gateway said that, since no significant adverse environmental effects were predicted during construction and routine operations for terrestrial or marine biota, or the ecosystems on which Aboriginal groups depend, the project is not expected to result in any significant adverse effects on the abundance, distribution, or diversity of resources harvested by Aboriginal people, or on the land that supports these resources. Gitxaala Nation was critical of this approach, and said that Northern Gateway's method of relying on biophysical indicators to determine whether there would be effects on resource availability is an indirect and inappropriate approach to determining potential impacts to rights and interests.

A number of Aboriginal intervenors noted that what Northern Gateway deems a non-significant impact, and what Aboriginal groups understand significance to mean, are very different. Haisla Nation said that Northern Gateway failed to consider the Aboriginal perspective on significance of effects. Other groups held similar positions, saying that Northern Gateway's determination that the project would not result in significant adverse effects on the environment does not consider the values that Aboriginal groups place on their use of resources, including scarce, rare, or unique values. Additional information regarding significance determinations can be found in Chapter 8.

The Gitga'at First Nation said that Northern Gateway's characterization of economic benefits failed to include important impacts on many natural resources and ecosystem services that are not traded in economic markets, but which are of critical importance to the Gitga'at economy, culture, and society. The Gitga'at First Nation also said that Northern Gateway had not included the impacts of increased perceptions of risk on economic values and community wellbeing. Driftpile First Nation said that Northern Gateway chose to focus on economic or financial compensation, rather than providing it with sufficient information on the project's impacts on its interests, particularly the impact on its Aboriginal and treaty rights. Various groups said that their rights go beyond just the harvesting right that Northern Gateway has assumed exists, stating that their rights encompass Aboriginal title and self-government rights, including the right to decide how their lands and resources will be utilized.

Within both written and oral evidence, Aboriginal groups provided information on how, where, and when they exercise their potential and established Aboriginal and treaty rights. Many groups also said that they felt that the project, both during construction and throughout operations, would adversely impact their uses and activities within their traditional territories. Aboriginal groups that were signatories to Treaty No. 6 and Treaty No. 8 provided evidence regarding their rights and their activities including hunting, trapping, fishing, and gathering throughout their traditional territories.

Métis groups said that they are a distinct Aboriginal people. The Métis Nation of Alberta provided evidence relating to Alberta's Métis Settlements legislation, information relating to their traditional territories, as well as how members continue to use the land along the proposed route. The Métis Nation of British Columbia presented oral evidence relating to its membership, as well as place names along the proposed route, to indicate their historic and current use of and affinity with lands in the project area. It also provided oral evidence relating to traditional and current land use.

The Heiltsuk Tribal Council placed evidence on the record about its Aboriginal right to trade herring spawn on kelp on a commercial basis, as determined by the Supreme Court of Canada in *R. v. Gladstone* ([1996] 2 SCR 723). The Heiltsuk said that this harvesting is indicative of the stewardship by the Nation towards herring and other seafood resources.

4.7 Views of the Panel

The Panel travelled to numerous communities along the project route and to coastal areas to hear and seek to understand the views and concerns of Aboriginal groups. The Panel considered it a privilege to be able to visit with individual communities and hear the participants' perspectives, which were communicated with wisdom, passion, and great personal conviction. Through the Panel's participation in feasts and ceremonies, which included the sharing of stories, music, and dance, the Panel gained increased cultural knowledge and understanding. In order to optimize opportunities for individuals and groups to present their evidence and opinions to the Panel, the Panel incorporated remote participation through video and telephone links into the hearing room during all aspects of the oral hearings. It is the Panel's view that this approach was effective. Many participants, including expert witnesses, commented that they found the remote participation options useful and effective. This approach provided all participants with opportunities to decide to participate and not be limited from giving evidence and opinions due to travel, finances, work, and life commitments.

The Panel carefully considered the evidence provided and how it pertained to Aboriginal use of lands, waters, and resources within the project area, Aboriginal interests, as well as the potential impacts of the project on these uses and interests.

In keeping with its mandate, the Panel has not made any determinations regarding Aboriginal rights, including Métis rights, treaty rights, or the strength of an Aboriginal group's claim respecting Aboriginal rights. The Panel acknowledges that

the project area includes territories of Aboriginal groups who are signatories to Treaty No. 6 and Treaty No. 8 and that there are various rights afforded those groups by those Treaties. The Panel also acknowledges the court-established Heiltsuk Nation's Aboriginal right to trade herring spawn on kelp on a commercial basis.

Through the review process, Aboriginal groups had the opportunity to make their views and concerns on the project known, including what effects it might have on their potential or established rights and interests. Aboriginal groups explained to the Panel that everything is connected. They said that not only do they harvest resources from the lands and waters, but these resources are essential and connected to their spiritual wellbeing and, for some groups, have an important role in their governance practices. They said that Northern Gateway's assessment did not include potential impacts on culture and spiritual values connected with land and marine resource use.

Aboriginal groups spoke of their desire to preserve their culture and indicated that the project and any potential spills resulting from a malfunction or accident would adversely impact their culture. Some described how their cultural practices and values are integral to their traditional forms of governance and their concern that the project may affect their ability to make decisions related to the use of lands, waters, and resources.

The Panel also heard of business initiatives being developed by individual Aboriginal groups to develop community-specific sustainable economies through ventures such as ecotourism and seafood processing plants. Aboriginal groups described the responsibility they feel to protect their land and marine resources for future generations.

The Panel acknowledges the strongly-held views of Aboriginal groups about the cultural, biophysical, and spiritual connectedness between the lands, the waters, the people, and their societies. Aboriginal groups told the Panel that a negative impact on one of these may result in a negative impact on any or all of the others. Aboriginal groups questioned the way in which Northern Gateway assessed the potential impacts of the project on their rights and interests. Groups were also critical of how Northern Gateway considered and used information that was provided to the company after it had submitted its application. In particular, some groups felt that the company did not account for, or incorporate, in its Environmental and Socio-Economic Assessment, information regarding their uses and interests that was provided through community-directed Aboriginal Traditional Knowledge studies and in oral evidence.

The Panel considered the evidence provided by Aboriginal groups, Northern Gateway, and other participants as to the nature and extent of the activities, uses, and practices that are carried out by Aboriginal groups within the project area, and the potential impacts of the project on those activities, uses, and practices. The Panel also considered all the measures committed to by Northern Gateway to avoid or mitigate such impacts.

The Panel acknowledges the importance that Aboriginal groups place on being able to continue their traditional activities, uses, and practices within the entire area of their traditional territories, including access to resources and cultural sites. It has assessed the potential project impacts and mitigation with that perspective in mind.

The Panel acknowledges that increased presence of industrial activity causes stress to some people. Much evidence was provided about increased stress, particularly to coastal Aboriginal groups, with respect to the marine aspect of this project. The project would result in increased industry, particularly off the west coast of Canada. The Panel notes that there is already large vessel traffic in this area, including those associated with commercial fisheries and industrial activities, such as the aluminum smelter in Kitimat and the cruise ship business. The Panel was presented with written evidence and heard during oral evidence that Aboriginal groups continue to use lands, waters, and resources in this area for traditional purposes. The Panel finds that this evidence demonstrates that there is a current compatibility for multiple uses in this area.

In its evidence, Northern Gateway outlined its approach for assessing the potential impacts of the project on the rights and interests of Aboriginal groups. Its approach relied on an assessment of the effects of the project on biophysical and human environments. This incorporated information provided by Aboriginal groups through consultation, Aboriginal Traditional Knowledge studies, and their participation in biophysical field studies. Northern Gateway concluded that there would be no significant adverse environmental effects on those resources or the ecosystems that support them. Northern Gateway, therefore concluded that the project would not have a significant adverse effect on those who depend on the land and water for sustenance, including Aboriginal groups who may

exercise their potential and established Aboriginal and treaty rights in the use of land or water for traditional purposes.

While some Aboriginal groups did not agree with the approach taken by Northern Gateway, the Panel finds that the general approach Northern Gateway used to assess the potential impacts of the project on Aboriginal interests to be acceptable. The Panel finds that, if Northern Gateway's assessment of the project's potential effects accurately concludes that, during construction and routine operations, there would be no significant adverse impacts to the biophysical resources used by Aboriginal groups or to the ecosystems that support these, the project would not result in significant adverse effects on the ability of Aboriginal people to continue to use lands, waters, or resources for traditional purposes.

The Panel heard from Aboriginal groups that any potential biophysical impacts arising from the project could have impacts on other aspects of Aboriginal society such as governance systems, community structure, and traditional teachings and learning. The Panel accepts Northern Gateway's assessment that, during construction and routine operations, there would not be significant adverse effects to the biophysical resources used by Aboriginal groups or to the ecosystems that support these. Based on this finding, the Panel finds that other associated or consequential impacts, such as those mentioned above, cannot be attributed to this project. The Panel also finds, based on this finding, that there would not be significant adverse effects on the interests of Aboriginal groups that use lands, waters, and resources in the project area.

The Panel notes that some Aboriginal groups were critical of Northern Gateway for not incorporating into its project assessment and design Aboriginal Traditional Knowledge that was received by the company after it submitted its application, or that was placed on the record during the review process. As a result of the commitment and involvement of many Aboriginal groups in the review process, in addition to the information provided by the company, the record of this proceeding contains a wealth of written and oral evidence about the uses and interests of Aboriginal people within the project area that has never before been collected in one place.

A review process like this one is iterative and results in further information being available for final project planning and design, should the project proceed. The Panel finds that Northern Gateway has considered and, to the extent possible, incorporated the information provided by Aboriginal groups in its studies, design, and mitigation measures. The Panel requires Northern Gateway to continue its consideration and incorporation of additional information it receives from Aboriginal groups as it proceeds to final design.

The Panel is also of the view that, in order to meet the principles of thorough and effective consultation, an applicant must adequately demonstrate how it considered the input and information it received from potentially-affected groups, and that this is appropriately communicated back to those groups and individuals that provided input. The Panel finds that Northern Gateway did not in all cases communicate in this manner. Some Aboriginal groups stated that they provided Northern Gateway with information and shared their knowledge about their uses and interests in the project area. In the Panel's view, the company could have done more to clearly communicate to Aboriginal groups how it considered, and would continue to consider, information provided by them.

Project construction and operation would require Northern Gateway to implement all measures that it has committed to and to comply with the Panel's conditions, including those relating to consultation. The Panel is of the view that these consultation activities, when undertaken with goodwill and commitment by all participating parties, would result in effective dialogue. This would lead to improved understanding and adaptive mitigation through initiatives such as the Fisheries Liaison Committee, the initiation of scientific research to improve the knowledge of the existing marine environment, and to identifying any site-specific traditional use interests during detailed routing. The Panel finds that inclusion of Aboriginal groups in these and other processes would contribute to shared understanding of the project and its impacts, and the sharing of opportunities and successes, for the applicant and affected communities and people.

The Panel does not share the view of some Aboriginal groups that the impacts associated with this project during construction and routine operations would eliminate the opportunity for Aboriginal groups to maintain their cultural and spiritual practices and the pursuit of their traditional uses and interests associated with the lands, waters, or resources.

The Panel finds that there would be adverse impacts associated with this project, and that these would be experienced by some Aboriginal groups. Based on the evidence, the Panel finds that, during construction and routine operations, these impacts would be temporary. Recognizing the interconnectedness that many parties pointed out, including Northern Gateway, no industrial development can occur without impacts.

The Panel is of the view that there are opportunities for potentially-affected Aboriginal groups to maintain and strengthen some aspects noted as being important to Aboriginal communities through project-related programs, such as Northern Gateway's commitment to ongoing wildlife studies, monitoring programs, and support for new education and language training opportunities.

Chapter 2 provides the Panel's analysis of all of the benefits and burdens associated with this project.

Viewing all of these factors together, the Panel finds that, during construction and routine operations, there would not be a significant adverse effect on the ability of Aboriginal groups to continue to use lands, waters, or resources for traditional purposes within the project area. Northern Gateway's routine activities would not significantly adversely affect the ability of Aboriginal groups to maintain, pursue, and strengthen their traditional and cultural activities, and would not significantly adversely affect the interests of Aboriginal groups that use lands, waters, or resources in the project area.

The Panel finds that, in the unlikely event of a large oil spill, there would be significant adverse effects on lands, waters, or resources used by Aboriginal groups, and that the adverse effects would not be permanent and widespread.

The Panel recognizes that reduced or interrupted access to lands, waters, or resources used by Aboriginal groups, including for country foods, may result in disruptions in the ability of Aboriginal groups to practice their traditional activities. The Panel recognizes that such an event would place burdens and challenges on affected Aboriginal groups. The Panel finds that such interruptions would be temporary. The Panel recognizes that, during recovery from a spill, users of lands, waters, or resources may experience disruptions and possible changes in access or use. The Panel discusses the likelihood of malfunctions or accidents, and the potential associated environmental effects, in Chapters 5 and 7.

5 Public safety and risk management

The Panel assessed the proposed project design and operations to determine whether the project would be constructed and operated in a safe, reliable, and environmentally responsible manner. A number of engineering and operational topics and issues were examined during the Panel's process. These included the suitability of the route, hydraulic design, station and terminal design, use of risk-based design, geohazards, seismic design, materials, integrity management, pipeline control, and leak detection systems.

5.1 Engineering design overview

Northern Gateway committed to designing and constructing its project to meet or exceed all applicable regulations, codes, and standards. Northern Gateway said that it benefitted from the knowledge and experience gained from other projects, and incorporated the lessons learned into its own designs. It said that innovations in engineering, technology, construction methods, and material improvements also contributed to an overall safer and more reliable design. Some intervenors said that detailed design information should be provided before any Panel recommendation on the project.

Northern Gateway said that the engineering information it provided in relation to design and construction, which is preliminary in nature, exceeds the level of information submitted for other projects, in some respects. Northern Gateway said that it deferred final decisions regarding certain aspects of the project's design, construction, and operations to the detailed engineering phase of the project, when the detailed information required for these final decisions would be available.

Views of the Panel

Final designs require a greater level of detail about the project's precise route and the geotechnical conditions along it than is currently available at this stage of the project. The Panel finds that Northern Gateway has presented a level of engineering design information that meets or exceeds regulatory requirements for a thorough and comprehensive review, in terms of whether or not it can construct and operate this project in a safe and responsible manner that protects people and the environment. The Panel has set out conditions that the National Energy Board would enforce to provide continued oversight during final engineering design.

The Panel expects Northern Gateway to continue to follow good engineering practice. This consists of applying informed judgement and proven and accepted engineering methods, procedures, and practices to address a technical problem. The application of good engineering practice results in an appropriate, cost-effective solution that meets the needs of the project, meets regulatory requirements, and protects the safety of persons, the environment, and property, when the solution is properly implemented and maintained. Where there are potential unknowns that are difficult to predict accurately due to natural variability, the Panel finds that a precautionary approach is needed in applying good engineering practice.

5.2 Hydraulic design

The project's oil pipeline is designed to transport four different low vapour pressure (LVP) crude types: conventional oil, synthetic crude oil, bitumen blended with condensate, and bitumen blended with synthetic crude oil. The proposed condensate pipeline would transport a single comingled condensate commodity. Because the oil pipeline would operate as a batched pipeline, the hydraulic analysis assumed that dilbit, the hydrocarbon with the highest viscosity, would govern its flow rate.

The goal of a pipeline's hydraulic design is to optimize facilities in order to minimize construction and operating costs. This involves considering a number of factors, such as fluid properties, pressure, temperature, pipe diameter, steel grades and wall thicknesses, pump facility locations and capacities, the required flow, and economic factors.

Among the concepts that Northern Gateway evaluated in the initial design stages were:

- transporting dilbit versus a heated and insulated bitumen pipeline;
- system design pressures from 1,440 to 2,160 pounds per square inch gauge (psig); and
- route alternatives in the coastal mountain area to reduce pumping requirements and associated power costs.

Northern Gateway's target annual average capacity for the oil pipeline in 100 per cent dilbit service is 83,400 cubic metres (525,000 barrels) per day. It said that a potential expansion of the annual average capacity of up to 135,100 cubic metres (850,000 barrels) per day was part of the engineering design for this pipeline. Northern Gateway referred to this volume as the pipeline's ultimate capacity. Both of these capacities represent 90 per cent of the pipeline's theoretical design capacities of the pipeline and would allow for normal maintenance and construction activities that reduce pipeline flow.

Northern Gateway said that the condensate pipeline's target average capacity is 30,700 cubic metres (193,000 barrels) per day with an ultimate capacity of 43,700 cubic metres (275,000 barrels) per day.

Northern Gateway would be required to file subsequent applications with the National Energy Board, should it wish to increase the oil pipeline's volume capacity above 83,400 cubic metres (525,000 barrels) per day or the condensate pipeline's annual average capacity above 30,700 cubic metres (193,000 barrels) per day.

Northern Gateway selected the optimal diameter size for the oil and condensate pipelines using a parametric cost of service analysis which considered various diameter and number of station options, and determined the optimal pipeline size for a given flow. The cost of capital, and operating and maintenance costs, were calculated for these flow rates. Northern Gateway eliminated some design options because they exceeded Enbridge's maximum pipe velocity limitation of 3 metres (10 feet) per second. Other options were eliminated because the velocity at initial flow rates was too low and would not maintain the turbulent flow needed for batching operations.

Views of the Panel

For new pipelines, it is prudent for companies to consider the ultimate capacity at the project design stage. Typically, pipeline construction affects the environment to a greater extent than pump station construction, and having the ability to increase capacity economically by only adding pump stations has merit.

The Panel finds that Northern Gateway followed good engineering practice by optimizing the pipeline hydraulic design using a parametric cost of service analysis and ensuring that turbulent flow is maintained. Turbulent flow permits batching operations and reduces the potential for sedimentation issues within the oil pipeline. The Panel accepts that the chosen design may be expanded to accommodate some future growth by adding pumping facilities. This approach would minimize the potential footprint associated with hydrocarbon transportation infrastructure between Alberta and Kitimat.

5.3 Route selection process

The Panel reviewed the appropriateness of the applied-for general pipeline route under Issues 9 and 10 of the List of Issues (Appendix 5), which address the criteria that Northern Gateway used to select the proposed 1-kilometre-wide general route corridor, and the proposed facilities' general locations. Pipeline routing criteria are discussed in Chapter 8.

In its application, Northern Gateway identified a preferred 25-metre-wide permanent pipeline right-of-way, plus associated temporary workspace within the corridor. The Panel explained that, while it may consider evidence and submissions regarding potential effects associated with the preferred 25-metre-wide right-of-way and associated temporary workspace, it is not within the Panel's mandate to approve the specific, detailed pipeline route or facility locations.

Northern Gateway would be required to apply separately to the National Energy Board for subsequent approval of the detailed route, if the project is approved. It must prepare plans, profiles, and books of reference (PPBoR) that describe the precise location of the pipeline right-of-way in relation to the land it crosses. It must make the plans, profiles, and books of reference available for public viewing and must serve notice on directly-affected landowners, as well as publish notices in local newspapers. Under the *National Energy Board Act,* the National Energy Board would establish a separate regulatory process to review the proposed detailed route.

Northern Gateway provided a list of criteria that it considered in evaluating various alternatives for the pipeline route during the preliminary design stage. Northern Gateway said that each alternative was reviewed by its Route Review Committee, consisting of engineering, geotechnical, construction, and environmental specialists, which made decisions on a consensus basis. Northern Gateway said that its route selection process is ongoing and involves consultation, as well as technical and geotechnical field work.

Northern Gateway said that one of the challenges in determining a route through the Coast Mountains was pipeline constructability and operability in very steep and rugged terrain. It evaluated a number of alternative segments through this area and selected a route with 2 tunnels, each approximately 6.5 kilometres long, between the Clore River and Hoult Creek valleys. Northern Gateway said that the tunnels allowed it to:

- eliminate the need to construct and operate the pipelines at high elevations;
- significantly reduce potential constructability and operability issues;
- locate the pipelines at lower elevations resulting in reduced hydraulic pumping needs; and
- propose a significantly shorter route that avoids numerous watercourse crossings, sensitive alpine terrain, and potential geohazards.

The Panel notes that the route filed as part of the May 2010 project application was referred to as Route Revision R, whereas the route considered throughout most of the Panel's process was Route Revision U. On 28 December 2012, Northern Gateway filed Route Revision V, which included five

pipeline route and four pump station relocations. Northern Gateway said that these revisions were in response to input received during Aboriginal and public consultations. It said that it was considering an additional relocation in the Burns Lake area of British Columbia, but decided not to propose it since it depended on further engagement with the relevant Aboriginal groups.

Northern Gateway said that it would finalize the detailed pipeline route within the 1-kilometre-wide pipeline corridor during detailed engineering. The detailed route would incorporate detailed engineering, construction, and operations considerations; further site-specific constraint mapping; results of Aboriginal Traditional Knowledge studies; and further field investigations. It would also incorporate input from participating Aboriginal groups, communities, landowners, the public and other interested parties, and government authorities.

Various intervenors said that it was challenging to access and understand details related to ongoing route revisions. One intervenor questioned the Route Revision V filing timing, as it was after the evidentiary hearing's portion on construction and engineering had taken place.

The Fort St. James Sustainability Group questioned the proposed location of the pump station near Pitka Creek, south of Fort St. James. It recommended that Northern Gateway relocate the station further away from the creek. Reasons given included concerns about noise, effects on wildlife habitat loss, and the potential for leaks that may contaminate the local aquifer.

Regarding the Fort St. James pump station, Northern Gateway said that it considered, but did not accept, alternate locations east and west of the proposed location. It said that the proposed location is adjacent to year-round road access that is important for this type of facility. It also noted that the location is adjacent to a high voltage power line, which is tentatively slated for an upgrade that would accommodate the station's power requirements. Because of these factors, the potential footprint for access and power supply was minimized. Northern Gateway said that ground conditions are favourable at the proposed location and there do not appear to be any environmentally-sensitive areas at or adjacent to the site.

Northern Gateway said that, within the hydraulic design constraints, locations to the west of the proposed site were found to be either closer to occupied properties, in environmentally-sensitive areas, or in more geotechnically-challenging areas. Locations to the east were either closer to occupied properties adjacent to the airport, in closer proximity to the Stuart River, or in more geotechnically-challenging areas.

Views of the Panel

The Panel finds that Northern Gateway followed good engineering practice in determining a route that avoids or minimizes exposure to geohazards (e.g., unstable slopes), reduces pumping requirements, and provides a safe and responsible route for construction and operations. Northern Gateway used a Route Review Committee, comprised of an internal team of engineering, geotechnical, construction, and environmental specialists, to determine the proposed corridor. The Panel finds that this multi-disciplinary committee, which used a consensus-based decision-making process, was an acceptable approach to developing the initial corridor both prior to and through Northern Gateway's consultation on the project.

The Panel finds that Northern Gateway's route selection process, route selection criteria, and level of detail were appropriate for the project. The Panel recognizes that, in some situations, such as locating the Fort St. James pump station, the outcome of the route selection process did not produce the desired end result for some parties.

The Panel heard concerns about Northern Gateway's process for deciding where to re-route and the fact that revisions were ongoing. Northern Gateway's submitted route revisions reflect new information obtained from ongoing consultation with affected parties, as well as changes that address environmental or geohazard concerns. The Panel finds that its process provided a venue for interested parties to question Northern Gateway on its route and notes that Northern Gateway made amendments to its application as the process proceeded. The Panel is satisfied that intervenors had an appropriate opportunity to question Northern Gateway and comment on these changes in their final argument.

5.4 Tunnel design and construction

The pipeline route segment between the upper reaches of the Clore River and Hoult Creek would cross a section of the Coast Mountains unbroken by low elevation passes. Northern Gateway proposed 2 tunnels, each approximately 6.5 kilometres long, to avoid construction, environmental, and operating risks associated with a conventional pipeline route on steep slopes. Northern Gateway's 2009 preliminary geotechnical report (revised in 2010) examined the geology and anticipated geotechnical conditions for the tunnels.

The geological assessment was based on a field investigation program consisting of geological mapping, core drilling, and geophysics. The field-mapping and drilling program included identifying rock types, estimating rock strength, and characterizing geological structures and discontinuities. Geological and engineering geology profiles were created for the tunnel alignments based on information collected. Rock mass properties for the main rock types along the tunnel alignments were developed and used to estimate tunnelling conditions.

Northern Gateway's feasibility assessment considered slope hazards, portal locations, engineering geology, tunnelling conditions, tunnel construction, and pipeline design and installation. In addition, tunnel and surface site investigation field work took place in October 2012. This consisted of portal site visits to visually assess the suitability of the proposed tunnel portal locations, geological mapping visits to visually assess geological units along proposed tunnel alignments, and access road and surface works visits to visually assess surface soil units and terrain (e.g., slopes, creeks, and instability). Three individuals representing two different Aboriginal groups participated in these site visits and field work.

Northern Gateway convened an external review panel of international tunnelling experts to look at a number of scenarios, particularly with respect to the potential for difficult tunnelling in portal areas and in fault zones. That panel concluded that the means exist to safely construct the Clore and Hoult tunnels.

Northern Gateway provided conceptual cross-sectional drawings for the tunnels indicating that each would be approximately 6.8 metres in diameter (Figures 5.1 and 5.2). The tunnels would either be circular or inverted U-shaped, depending on the tunnelling method used (bored, or drill and blast). Other preliminary concepts that Northern Gateway presented included:

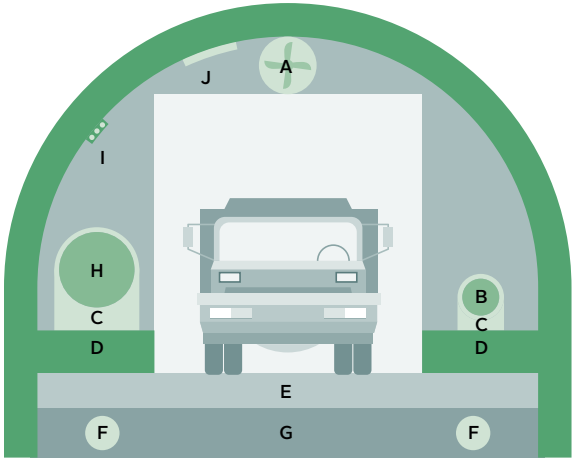
- permanent infrastructure to provide road access for inspection and maintenance to all tunnel portals;
- lighting and ventilation for inspection and maintenance;
- power supply by either dedicated service line or on-site generator;
- a maintenance building for maintenance equipment and material storage;
- safety systems for tunnel monitoring that are designed to meet project requirements, and that would be connected to the Enbridge Edmonton pipeline operations control centre through remote communications to provide real-time monitoring;
- monitoring sensors to detect vibration, temperature, fire, and gas; and
- closing tunnel portal doors during normal operations to prevent unauthorized entry.

Northern Gateway said that it would develop further details about tunnel design and construction during detailed engineering.

The Office of the Wet'suwet'en raised questions about the camp and staging site, and the waste rock dump site. Concerns were related to potential effects from metal leaching and acid rock drainage in Wet'suwet'en territory and on their natural resources. It was also concerned that the volume of potentially acid generating rock is not known.

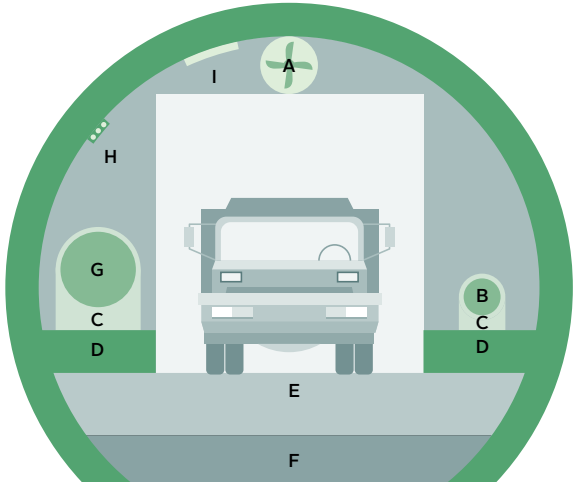
During the Panel's process, Northern Gateway's experts answered questions about the predicted tunnel waste rock volume, the potential storage space required, and the disposal of sulphide-bearing rock. These experts estimated the volume of in-situ rock from the tunnels at 350,000 cubic metres (plus or minus), assuming an approximately 13,000-metre combined length, a 7-metre width, and a 7-metre height. The locations of the disposal areas are illustrated in Figure 5.5. They also estimated a bulking factor of 30 to 40 per cent, representing 455,000 to 490,000 cubic metres of waste rock. The waste rock volume would depend on the tunnel construction method. Waste disposal fills would be approximately 6 to 8 metres high and would be contoured with the landscape. Regarding sulphide-bearing rock disposal, Northern Gateway's experts expect to segregate sulphide-bearing materials and use established techniques and design principles from the mining industry, such as encapsulation and containment. Another option may be dilution using limestone, depending on the amount of sulphide-bearing materials encountered.

FIGURE 5.1 **CONCEPTUAL DRILL AND BLAST TUNNEL**



A Ventilation
B 20 Inch (Condensate) Pipe
C Pipe Support
D Curb
E Road Deck
F Drain
G Granular Material
H 36 Inch (Oil) Pipe
I Cable Tray
J Lighting

FIGURE 5.2 **CONCEPTUAL BORED TUNNEL**



A Ventilation
B 20 Inch (Condensate) Pipe
C Pipe Support
D Curb
E Road Deck
F Granular Material
G 36 Inch (Oil) Pipe
H Cable Tray
I Lighting

Views of the Panel

The Panel heard evidence of a preliminary nature regarding construction of the Clore and Hoult tunnels. Northern Gateway would determine the final design of the tunnels during detailed engineering. The Panel requires Northern Gateway, before constructing the tunnels, to obtain further information on rock mass quality, groundwater conditions, mitigation measures for groundwater and potential sulphide-bearing rock, confined space entry procedures, final cross-sectional drawings, and the tunnel construction plans.

The Panel is of the view that Northern Gateway may have under-estimated the waste rock bulking factor given the rock type classifications in the preliminary geotechnical report for the tunnels and potential alignment changes. The Panel requires Northern Gateway, before constructing the tunnels, to develop final details on the location, size, and design of waste rock disposal. Provisions within the *National Energy Board Act* would allow Northern Gateway to apply for National Energy Board approval of amendments to its disposal locations, if necessary.

5.5 Pipeline design

Northern Gateway said that its approach to selecting pipeline wall thickness and pressure design is to ensure a flat maximum operating pressure (MOP) head profile (with an emphasis on the maximum operating pressure head profile expressed in terms of metres or feet of crude, and not a flat maximum operating pressure profile expressed in kilopascals or pounds per square inch). Northern Gateway reasoned that a flat maximum operating pressure head profile would reduce the risk of pipeline overpressure in the event of a downstream blockage. It said that this approach also results in a design where the maximum station discharge pressure is the only pressure control set-point that is necessary to protect the pipeline from overpressure under steady state conditions between two consecutive pump stations. This is illustrated in Figures 5.3 and 5.4 for both the oil and condensate pipelines.

Implementing this design approach means that locations along the pipeline route with elevations lower than that of the upstream pump station require a higher design pressure (thicker-walled pipe). Locations with elevations higher than that of the upstream station require a lower design pressure (thinner-walled pipe). This relationship is due to the static head of the fluid column in a pipeline during zero-flow conditions, resulting in higher pipeline pressures in low-lying areas, and lower pipeline pressures at high points. Northern Gateway said that, during detailed engineering, any pipeline wall thickness changes along the route would be balanced with the additional required manufacturing, logistical, and construction considerations. It said that it would validate the design by conducting transient analyses where it would analyze various abnormal conditions to ensure the pipelines can withstand the operating pressures that may result.

Northern Gateway's application contained wall thicknesses for both the oil and condensate pipelines that were fully compliant with the Canadian Standards Association (CSA) Z662-11 pipeline standard and the design philosophy described above. Northern Gateway said that it decided to increase the wall thickness and operate the pipeline at a lower stress level in response to feedback from the public and Aboriginal groups about the sensitivity and the special habitats the pipeline would cross.

Northern Gateway said that this design approach, which is a conventional stress-based approach, is consistent with industry standards, *National Energy Board Act* regulations, CSA Z662-11, as well as Enbridge Engineering Standards, which embed a risk-based approach.

The Enbridge Engineering Standards require pipe design to consider the effect of resultant longitudinal, axial bending, torsional, and hoop stresses, in addition to the stress interactions and reactions on the pipeline system. Typical loads considered during design include:

- internal pressure;
- thermal expansion and contraction;
- differential movements;
- self-weight of the pipe, contents, and gravity loads;
- static wind loads and static fluid loads;
- external hydrostatic pressure;
- buoyancy effects;
- geotechnical loads, such as slope failures and other soil movements;
- cyclic loads;
- external live loads (e.g., overburden, vehicles);
- dynamic or seismic loads; and
- ice loads.

Northern Gateway said that there may be specific locations along the pipeline route where strain-based design would be used in accordance with Annex C of CSA Z662-11. These locations would be determined during detailed engineering. It said that it would consider geography, geology, soil type, service loading, and operational design parameters to conservatively predict the stresses and strains that the pipelines may experience.

Northern Gateway would also consider stresses associated with pipeline construction. It said that it would consult engineering experts for pipeline segments predicted to experience soil instability, such as upheaval forces, consolidation, forces due to loading by soil movement, and seismic forces and soil strains. These experts would have expertise in pipeline stress and strain and, in consultation with geotechnical, hydrological, welding, and materials experts, may recommend alternative stress mitigation strategies to reduce the in-service strain to a suitable level.

Northern Gateway said that it would develop a stress and strain monitoring methodology for the pipelines, tailored specifically to each pipeline segment. It said that available technologies include internal inspection tools incorporating an inertial navigation system, sometimes referred to as a GEOPIG™. Other technologies use instrumentation mounted directly on the pipeline to monitor pipeline strain, or installed within a slope or other geohazard area to monitor ground movement.

Views of the Panel

The Panel finds that Northern Gateway's proposed pipeline engineering design meets or exceeds the minimum requirements of the *National Energy Board Onshore Pipeline Regulations,* which incorporate CSA Z662-11 requirements.

The Panel is satisfied with Northern Gateway's design approach to achieve a flat maximum operating head profile to reduce the risk of overpressure incidents that could occur from equipment failure or incorrect operations. In the design that Northern Gateway provided near the end of the Panel's process, there were localized instances where the objective of designing for a flat maximum operating head profile was not achieved with the pipe wall thicknesses specified. The Panel requires Northern Gateway to have the pipeline maximum head profile be greater than or equal to the discharge head of the upstream pump station. Where that is not possible, the Panel requires Northern Gateway to develop design and operational measures that reduce or eliminate the risk of pipeline overpressure (i.e., that the pressure could exceed the maximum operating pressure established by the National Energy Board). Northern Gateway said that it would achieve this requirement by incorporating mechanical overpressure protection into its design, where necessary.

Northern Gateway would use a conventional stress-based design together with a strain-based design, where circumstances require it. Northern Gateway said that it would monitor the actual amount of stress and strain on the pipelines, as well as other hazards, using a number of methods, including in-line inspection (ILI) tools. The Panel requires Northern Gateway to monitor the amount of stress and strain on the pipelines, particularly for sections where it used strain-based design. The Panel requires Northern Gateway to prepare a report summarizing the loading and dynamic effects that the pipelines may experience and that verifies adequate pipeline strength. This report must also identify and address potential pipe deformation that may impede in-line inspection tool passage.

As a precautionary measure, the Panel requires Northern Gateway to verify the fracture toughness of the weld metal and heat affected zones of pipe fabrication welds, where strain-based design is used. Instances of low toughness in these areas may affect the integrity of the weld or base metal during strain-induced pipe deformation.

5.5.1 PIPELINE DESIGN AND INSTALLATION WITHIN THE CLORE AND HOULT TUNNELS

Northern Gateway said that many aspects of pipeline design and installation within the tunnels would be finalized during detailed engineering. This includes workspace requirements, staging areas, construction procedures, supports, anchors and rollers (for moving pipe through the tunnels), and pipe stress analysis. It said that a critical requirement of the tunnel lining and ground support system would be to protect the pipelines from potential rock fall hazards originating from the tunnel crown.

Northern Gateway anticipated that pipeline installation in the tunnels would use a staged approach. It said that tunnel line pipe segments would be assembled, welded, coated, and tested outside of the tunnels, creating strings up to 240 metres long at pipe staging areas at one of each tunnel's portals. This would be done using standard pipeline construction equipment during the last stages of tunnel excavation. Northern Gateway said that it has identified potential staging areas at the east portal of the Clore tunnel and the west portal of the Hoult tunnel.

Northern Gateway said that, during pipe installation, it would move pipe strings to a roller-based launch frame at each staging area portal. A cable and winch system would then pull the pipe strings into the tunnels. The lead end of each successive pipe string would be welded to the trailing end of the pipe already in the tunnels. Coating and testing would be completed at the portal before the pipe string is advanced. During installation, rollers would support the pipe along the full tunnel length. Northern Gateway would establish the final, optimal pipeline placement during detailed engineering.

Based on recent European experience with a 48-inch gas transmission pipeline in the Sorenberg Tunnel in Switzerland, Northern Gateway said that its proposed pipelines would be permanently supported on concrete or steel pipe supports fixed to the tunnel floor. It would design pipe supports for long-term operations. Straps on the pipe supports would provide lateral restraint. It would select support spacing to meet pipe deflection criteria. Northern Gateway would install an anchor block at the centre of each tunnel to isolate pipe expansion. It would also install expansion loop pipe and induction bends in individual segments, which

FIGURE 5.3 **CONDENSATE PIPELINE HYDRAULIC GRADIENT** (Route Revision V)

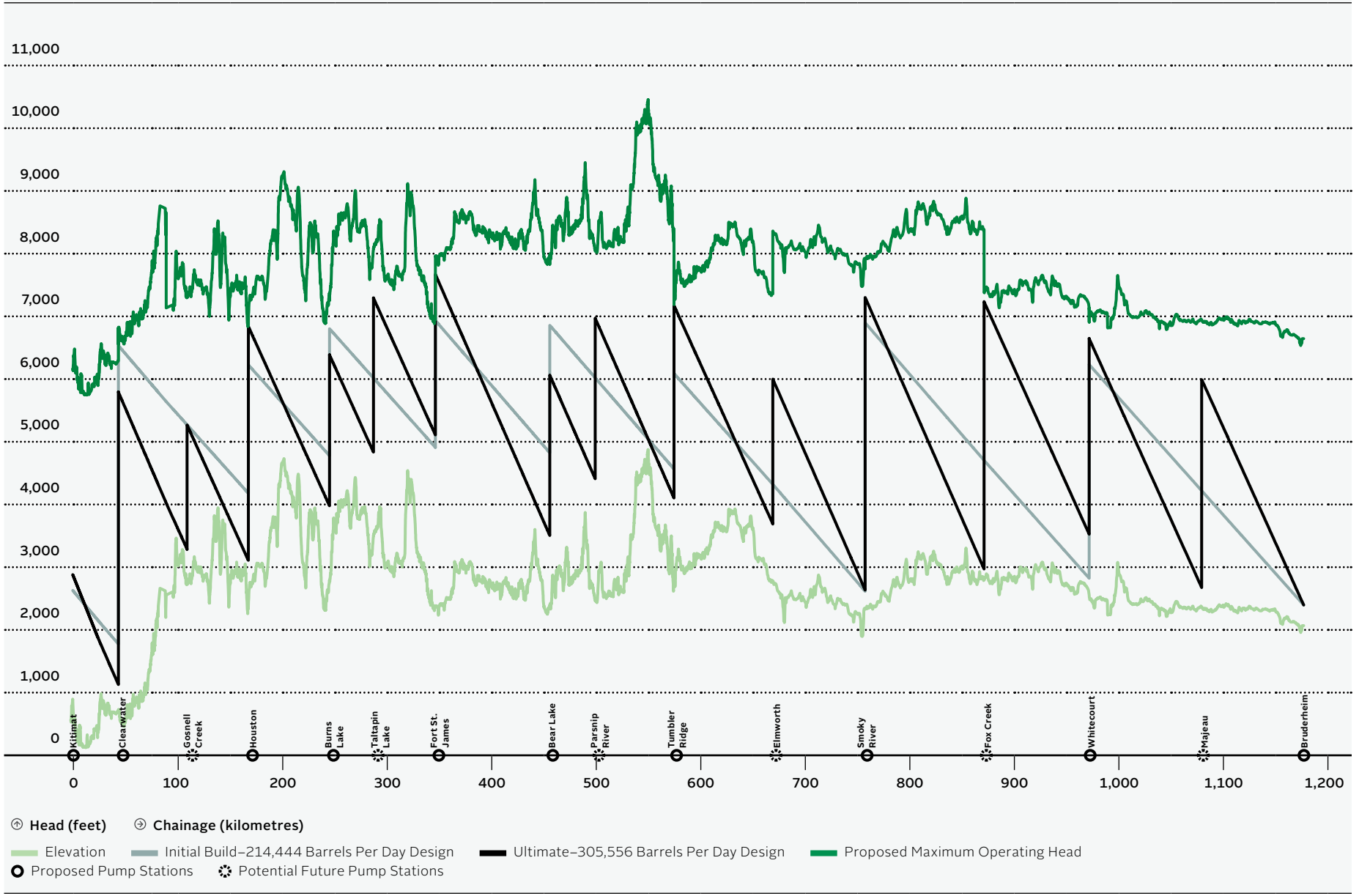
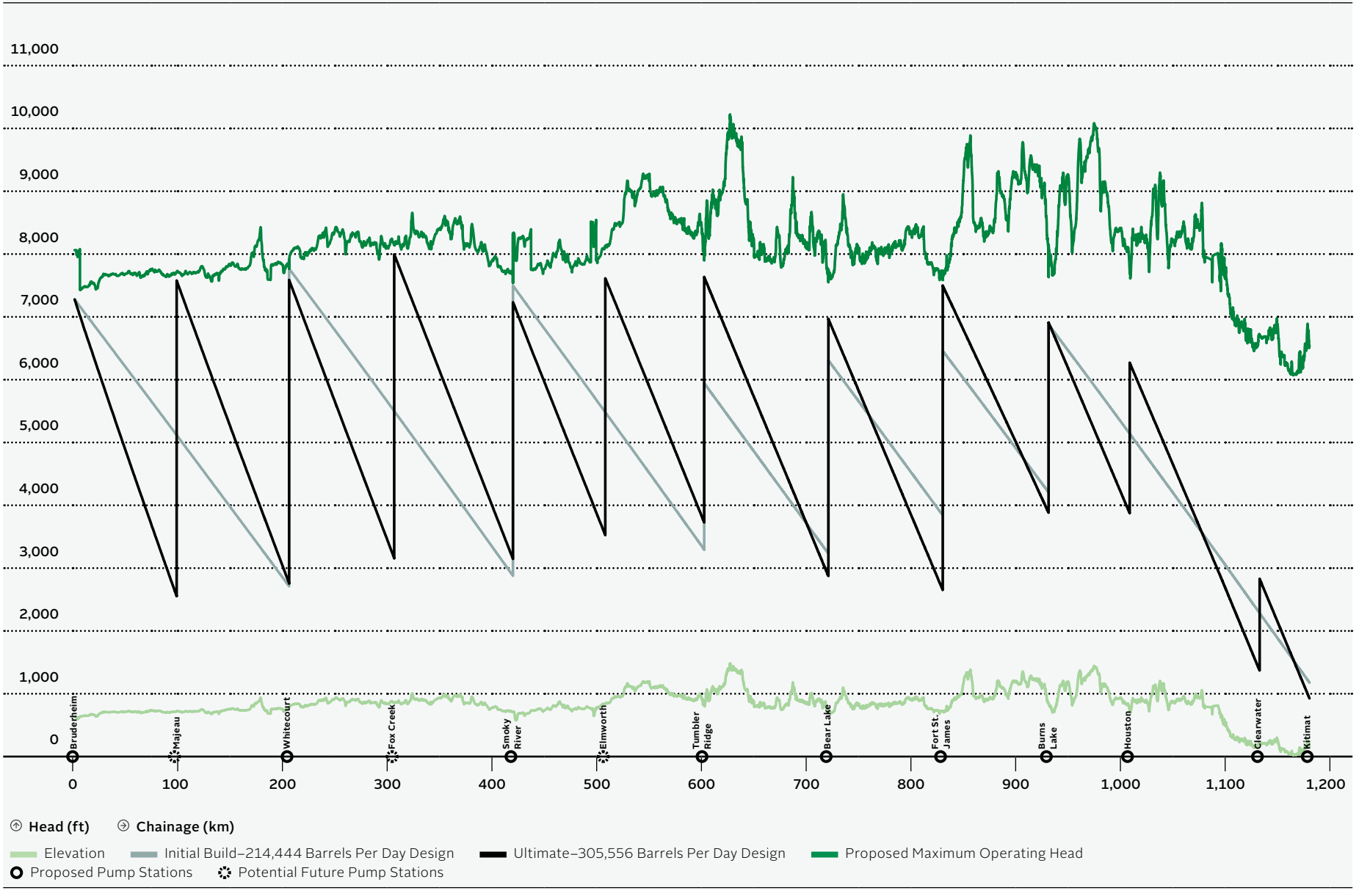


FIGURE 5.4 **OIL PIPELINE HYDRAULIC GRADIENT** (Route Revision V)



it would weld in place to accommodate thermal and stress-induced pipe expansion. Tie-ins for tunnel line pipe with expansion loop pipe would also be completed in place. The work inside the tunnels would use some specialized construction equipment suitably sized to work within the confined space.

Views of the Panel

Oil and gas pipelines currently operate in long tunnels in Europe and South America, and in shorter tunnels in Canada. Based on the evidence that other larger pipelines have been successfully built and operated in tunnels, and Northern Gateway's preliminary descriptions of its pipeline installation in the tunnels, the Panel finds that pipeline construction and operations within the proposed tunnels is feasible. Construction methods to be used would differ from standard pipeline procedures and may create unique issues. As a result, the Panel requires Northern Gateway to develop further details on how it would construct the pipeline segments within the tunnels, including details about welding, non-destructive examination, protective coatings, and pressure testing.

5.5.2 CORROSION CONTROL MEASURES

Northern Gateway said that the oil and condensate pipelines would be coated with fusion bond epoxy applied at a coating plant. It said that, during detailed engineering, it would evaluate a three-layer High Performance Composite Coating system for use on either a portion or the entire length of the pipelines. Northern Gateway said that the High Performance Composite Coating system would be comprised of fusion bond epoxy, adhesive, and polyethylene layers. Horizontal directionally-drilled or bored pipeline sections would have an additional abrasion-resistant coating. It said that it would also use rock shield, sand padding, wooden lagging, or concrete coating, where needed during construction, to provide additional protection for the pipe coating. Coating costs would make up approximately 3 to 5 per cent of the total construction costs.

Northern Gateway said that fusion bond epoxy, used extensively by Enbridge on large diameter pipeline projects, would be the key layer in terms of preventing corrosion on the proposed pipelines. It said that advantages of fusion bond epoxy, relative to High Performance Composite Coating, include lower material and installation costs, and easier weld-coating in the field.

It said that advantages of a High Performance Composite Coating, where required, relative to fusion bond epoxy, include:

- better resistance to corrosion and cathodic disbondment in highly-corrosive environments such as acid rock drainage;
- higher resistance to damage during transportation, handling, and backfilling;
- higher resistance to damage in rugged terrain and trench conditions;
- better long-term resistance to ultra-violet degradation; and
- overall cost savings compared to additional protective measures required where fusion bond epoxy coating is damaged under conditions such as those listed above.

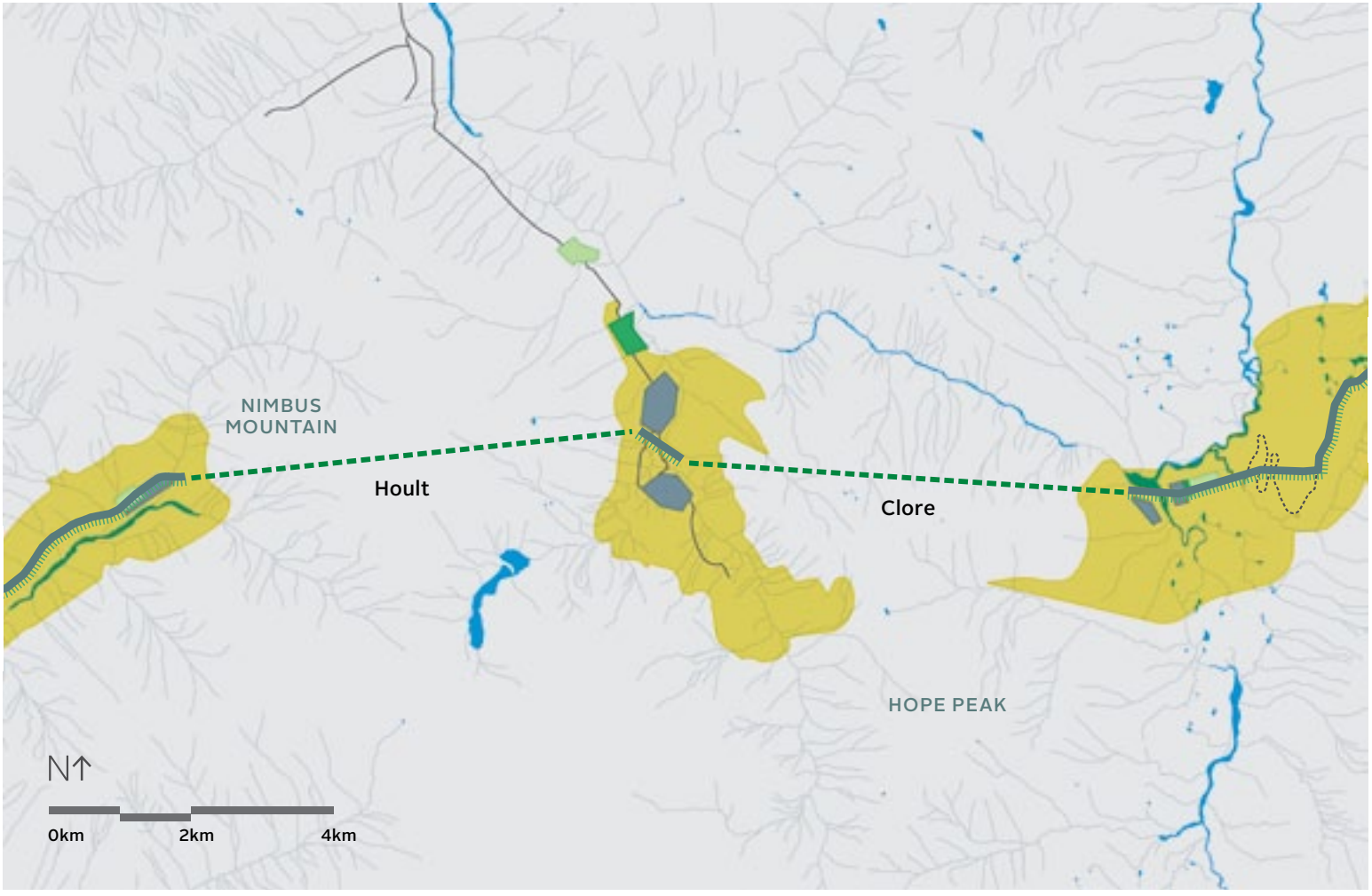
Northern Gateway said that decisions on coating would incorporate Enbridge's detailed coating standards. It would work with coating producers, coating applicators, and construction personnel during detailed engineering to select the appropriate coating system for each location.

In its review of the project, Natural Resources Canada said that the approaches proposed by Enbridge to control external corrosion by using protective coatings are appropriate and consistent with current industry best practices. It said that High Performance Composite Coating is more widely used in Europe than in North America. It was of the view that more widespread use in North America would increase pipeline integrity and safety.

Northern Gateway said that, for the oil and condensate pipelines, cathodic protection (CP) is a secondary corrosion control measure in support of the protective coating. The pipeline cathodic protection system would be designed and installed in accordance with applicable codes and regulations and Enbridge's engineering standards and specifications. Ongoing cathodic protection monitoring would be in accordance with CSA Z662-11 and Canadian Gas Association (CGA) Standard OCC-1-2005. The pipelines would be electrically isolated from the pump stations so that the available pipeline cathodic protection current remains with the pipelines. The cathodic protection system would be designed to connect to the local power grid. Northern Gateway said that there are two major classes of cathodic protection systems – remote rectifier bed and distributed anode – and that the choice of system would depend on the soil conditions at a given location.

FIGURE 5.5 **PROPOSED TUNNEL LOCATIONS**

Tunnels through two mountains would avoid numerous watercourse crossings, sensitive alpine terrain, and potential geohazards.



In response to questions about cathodic protection effectiveness in different soil conditions, including permafrost, Northern Gateway said that it measured rectifier voltage and amperage on an ongoing basis, but that it typically recorded readings on a monthly basis since the change between incremental readings was typically quite small. It then used recorded data to determine the requirement for ground bed maintenance or replacement, or for installing new equipment.

Regarding the potential for pipeline coating disbondment due to cathodic overprotection (applying too much voltage to a pipeline), Northern Gateway said that this would be unlikely to happen because it followed well-known practices. It said that, if such damage occurred, annual surveys or regular in-line inspections would detect it.

In response to the Panel's potential condition to require a three-layer or High Performance Composite Coating for the entire length of both pipelines, Northern Gateway said that such a requirement would result in an uneconomic design that would add no value in most instances. Northern Gateway said that it would be best to work with coating producers and applicators, and with construction personnel during detailed engineering, to select the appropriate coating for each location.

The Samson Cree Nation and Ermineskin Cree Nation said that both pipelines should be coated for their entire length with a three-layer or other high performance coating to decrease the likelihood of a spill resulting from external corrosion.

C.J. Peter Associates Engineering said that the National Energy Board should determine the coating specifications for strength, resistance to cracking, and other properties, as well as field repair methods and non-destructive examination under the coating and of the coating itself.

In reply argument, Northern Gateway said that the estimated incremental cost of requiring a 3-layer coating for the entire length of both pipelines was approximately $50 million. It said that Enbridge has experience with three-layer and fusion-bond epoxy coatings on its various systems and is familiar with the advantages of each system. It said that fusion-bond epoxy is well-suited to the soils along the route in Alberta, and it expected engineering assessments to confirm that it would be an appropriate coating from Bruderheim to kilometre post (KP) 600. Northern Gateway said that, while detailed engineering had yet to be done, it expected engineering assessments to confirm that a 3-layer coating system would be appropriate in the rocky terrain from approximately KP 600 to KP 800, and KP 900 to KP 1177.

Views of the Panel

External corrosion is a frequent cause of pipeline leaks and ruptures. The Panel finds that pipeline coating is the principle measure to prevent external corrosion. To ensure that there are no gaps in protection, the condition of the coating is checked before the pipe is lowered into the trench. Coating damage may occur during the lowering and backfilling processes. In light of the consequences of a pipeline failure, it is imperative to protect the coating during the construction process, or to have it be sufficiently resistant to damage from stones that may hit the pipe. Northern Gateway said that it would use appropriate mitigation, such as sand padding or rock shield, in areas of rocky terrain.

The Panel accepts Northern Gateway's evidence that the benefits of High Performance Composite Coating include better resistance to corrosion and cathodic disbondment in highly-corrosive environments, and higher resistance to damage in rugged terrain and from rough handling. These are desirable traits for this project.

Despite the additional cost, the Panel requires Northern Gateway to use a three-layer or High Performance Composite Coating for the oil and condensate pipelines from KP 600 to the Kitimat Terminal. The Panel finds that flexibility is needed in situations where another coating is expected to provide superior protection, such as for directional drilling where abrasion resistance may be paramount.

Field welds must be protected from external corrosion by field-applied coatings that are compatible with the factory-applied coating. The Panel requires Northern Gateway to file its field-applied coating and application specifications. This requirement would facilitate inspections during construction.

The Panel requires Northern Gateway to verify the integrity of the pipeline coating after construction to determine whether it was damaged during the lowering and backfilling processes.

The Panel is satisfied with Northern Gateway's proposed approach for designing, installing, monitoring, and maintaining its cathodic protection systems and composite coatings in order to achieve safe and responsible pipeline operations.

5.5.3 PIPE TOUGHNESS

Northern Gateway said that it would specify CSA Category I pipe for the oil and condensate pipelines because both pipelines were classified as low vapour pressure pipelines. It would specify CSA Category II pipe during detailed engineering for locations, if any, where it determines air testing to be the preferred test method. It said that Category II pipe may be installed at aerial crossings, in the two proposed tunnels, and in areas with potential geotechnical hazards or seismic activity. It said that, while it may consider using Category II pipe as an additional safeguard in geotechnically-hazardous or seismic areas, this may not be necessary from a fracture initiation perspective. It said that, although it may specify Category I pipe, it expected this material to have a sufficient degree of toughness from a fracture initiation perspective, given modern pipeline steelmaking practices.

Northern Gateway said that the notch toughness requirements would be based on a high percentage (typically 90 per cent) of the flow stress dependent criteria. Northern Gateway said that this approach has been applied and accepted on other major pipeline projects. Its preliminary calculations, using the Battelle fracture initiation model, suggested that critical through-wall defect lengths would be in excess of 100 millimetres for all pipe thicknesses it is currently considering. Its preliminary calculations also indicate that a through-wall defect with a length of approximately 50 millimetres can be sustained with Charpy V-notch absorbed energy values of less than 10 Joules.

Northern Gateway said that proven notch toughness properties are not required for Category I pipe. It said that Category II pipe is distinguished from Category III pipe because it requires both Charpy V-notch toughness testing and a drop weight tear test, while Category III pipe requires only Charpy V-notch toughness testing. The drop weight tear test is for a full-thickness specimen, unlike the Charpy test, which has a fracture surface area of no more than 10 by 8 millimetres. Northern Gateway said that, with the oil pipeline's specified thicknesses, current research in drop weight tear test results suggests that a great deal of variability in the shear area results could occur. Northern Gateway was concerned that, if Category II pipe was required, there was a possibility of introducing some manufacturing risk on the pipeline suppliers. It said that the drop weight test's only purpose was to guard against long propagating fractures, which do not occur on liquid pipelines.

C.J. Peter Associates Engineering said that Northern Gateway should specify CSA Category II pipe because it had the most stringent toughness requirements. It argued that Northern Gateway's own evidence indicates that at least 10 Joules would be sufficient to sustain a 50-millimetre-long through-wall defect, which suggests that, instead of no toughness requirements for Category I pipe, a Charpy V-notch test is required to determine the pipe body toughness. C.J. Peter compared the proposed pipelines' toughness requirements to those that the American Pipeline and Hazardous Materials Safety Administration (PHMSA) specified for the Keystone XL pipeline (40 Joules). It argued that, since the project involves more northerly pipelines that would experience colder temperatures, Northern Gateway should be even more conservative in its specification.

Views of the Panel

The proposed pipelines would transport low vapour pressure products and the CSA Z662-11 code allows Northern Gateway to specify Category I pipe. Category I pipe has no proven notch toughness requirements. Northern Gateway's evidence indicates that a minimum fracture initiation toughness value is required and that Charpy V-notch testing can determine if the pipe has the required toughness.

The Panel does not approve the use of Category I pipe for this project. The Panel requires Northern Gateway to specify Category III pipe, as a minimum, for the oil and condensate pipelines, which would result in Charpy V-notch testing to confirm notch toughness. The Panel finds that, by specifying Category III pipe as a minimum, Northern Gateway would obtain toughness data for its entire system that would be useful for pipeline integrity issues that might arise in the future.

The Panel notes that Northern Gateway has committed to using Category II pipe when needed. Since fracture propagation is not an issue on liquid pipelines, the Panel finds that requiring the use of the drop weight tear test would not provide data that would be needed for the project.

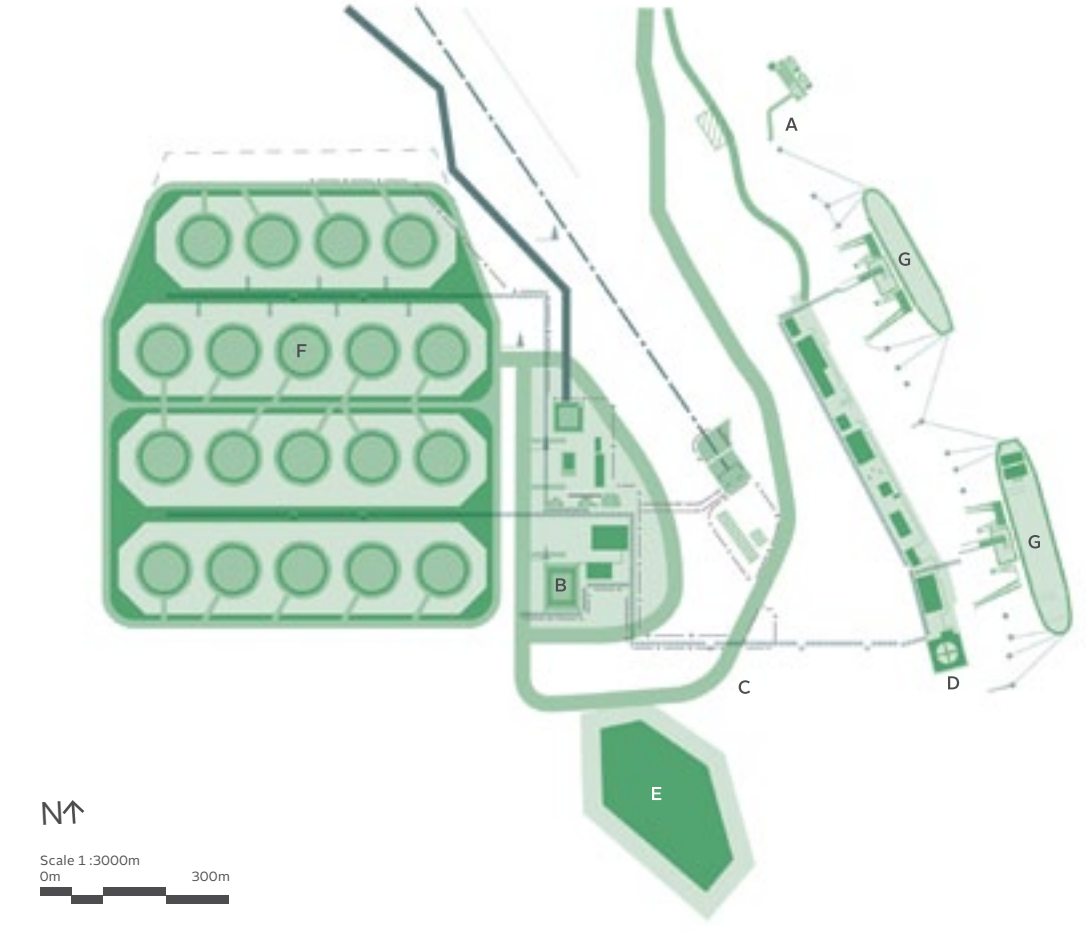
5.6 The Kitimat Terminal

Northern Gateway said that the Kitimat Terminal site on the west side of the Kitimat Arm would consist of a tank terminal and a marine terminal. Northern Gateway said that it would design, construct, and operate the Kitimat Terminal and associated facilities in accordance with applicable regulations and industry codes, and the standards that are referenced within them. The existing ground surface at the Kitimat Terminal rises steeply from the shoreline to an elevation of approximately 180 metres above sea level at the tank lot.

Northern Gateway said that purpose of the Kitimat Terminal facilities is to:

- receive oil transported by the oil pipeline;
- transfer oil to oil tanks;
- load oil into tankers;
- unload condensate from tankers;
- transfer condensate to condensate tanks; and
- transfer condensate to the condensate pipeline.
- It said that the major tank terminal facilities would include:
- 16 oil tanks and 3 condensate tanks;
- hydrocarbon transfer systems, including custody transfer metering;
- oil receiving facilities to reduce the pressure of incoming oil;
- a condensate pump station; and
- associated infrastructure, including a remote impoundment reservoir.

FIGURE 5.6 **KITIMAT TERMINAL**



Oil & Condensate Pipelines
Transmission Line
Power Line
Fence

A Utility Berth
B Firewater Reservoir
C Construction Access
D Recovered Tank and Pumps

E Remote Impoundment Reservoir
F Storage Tanks
G Tanker

Northern Gateway said that its basis for determining the initial tank capacity was the assumption that the pipelines would transport four different oil commodities and a single condensate commodity. Northern Gateway said that general industry practice is to provide 50 per cent more capacity than the nominal capacity of the largest tanker that would load or unload at the terminal. To determine the required tankage capacity, Northern Gateway also modelled pipeline operations and potential interruptions to it, together with incoming and outgoing tanker movements.

Northern Gateway said that the applied-for tank numbers and sizes provide the required tank capacity requested by prospective shippers, as well as adequate product segregation and operational flexibility. In a potential expansion scenario with expanded throughput rates on either pipeline, additional tanks may not be required, as greater use of the existing tank facilities may result.

Northern Gateway said that all tanks would be equipped with floating roofs, complete with mechanical shoes and secondary seals to limit hydrocarbon vapour emissions.

Northern Gateway said that the marine terminal would include two tanker berths, one utility berth, and associated infrastructure. The marine terminal would be designed to accommodate various tanker classes, from VLCC (very large crude carriers) to Suezmax (average-sized tankers) to Aframax (smallest-sized tankers). It said that the marine terminal would have the capacity to load visiting tankers within 48 hours of berthing time. It said that the loading rate would be controlled to minimize the potential for static charges that could lead to fires.

TABLE 5.1 **TANK SPECIFICATIONS**

Item	Metric Units	Imperial Units
Tank Diameter	74.07 metres	243 feet
Tank Height	24.4 metres	80 feet
Roof Type	----------Open-top external floating pontoon----------	
Minimum Freeboard	1.05 metres	3.44 feet
Nominal Capacity	98,410 cubic metres	619,000 barrels
Working Capacity	87,440 cubic metres	550,000 barrels
Total working Capacity for 16 Oil Tanks	1,399,000 cubic metres	8,800,000 barrels
Design Injection Flow Rate per Oil Tank	150,100 cubic metres/day	944,000 barrels/day
Average Takeaway Flow Rate per Oil Tank	15,900 cubic metres/hour	100,000 barrels/hour
Total working Capacity for 3 Condensate Tanks	262,320 cubic metres	1,650,000 barrels
Design Injection Flow Rate per Condensate Tank	11,130 cubic metres/day	70,000 barrels/day
Average Takeaway Flow Rate per Condensate Tank	30,680 cubic metres/day	193,000 barrels/day

5.6.1 STRUCTURAL DESIGN OF THE TANKS

Northern Gateway said that it would design the Kitimat Terminal's tanks to meet American Petroleum Institute (API) 650, which has well-established design criteria for seismic design, as well as the National Building Code of Canada's structural provisions. It said that, due to the terminal's geographic location, the seismicity hazard is considered no higher than moderate, and is much lower than many other similar facilities along the coast. It said that it would construct the tanks on bedrock, providing favourable foundation conditions. Northern Gateway said that it would design the tanks so that potential forces or strains imposed by seismic events would not cause the tanks to rupture or collapse, although they may undergo plastic deformation (e.g., bulging). Because most tanks would not be full, actual seismic loads would be less than design maximums for most tanks at the terminal. Northern Gateway said that it would design piping systems attached to the storage tanks to have sufficient mechanical flexibility to accommodate tank wall and foundation displacements without damage that could cause a hydrocarbon release.

5.6.2 SECONDARY CONTAINMENT

Northern Gateway said that the tank terminal, and the tank for recovered oil at the marine terminal, would have containment berms. The berm wall design would likely be constructed of engineered fill or would be a vertical concrete wall system. It would design the tank terminal berm system to allow overflow between tanks before overflow of the perimeter walls. The containment berms would be designed to collect liquids and direct them through a pipe system to the remote impoundment reservoir. The remote impoundment reservoir is shown in Figure 5.6. All

secondary containment facilities, including the bermed areas and the impoundment reservoir, would be double-lined with an impervious membrane liner and would be equipped with a leak detection system.

Northern Gateway said that the remote impoundment reservoir location at the southeast end of the tank lot would conform to the current British Columbia Fire Code. Its size would be:

- 100 per cent of the volume of the largest tank in the tank terminal; plus
- 10 per cent of the aggregate volume of the 18 remaining tanks; plus
- an allowance for potential future tanks; plus
- 100 per cent of the runoff from the catchment area during a 1 in 100-year, 24-hour storm event; plus
- the amount of fire water generated from potential firefighting activities at the tank terminal.

Northern Gateway said that water from the secondary containment reservoir's catchment area may be released to the ocean, providing the oil-water concentration is less than 15 parts per million.

Views of the Panel

The Panel is satisfied with Northern Gateway's current Kitimat Terminal design, as it committed to designing, constructing, and operating the facilities in accordance with applicable regulations, industry codes, and standards. The Panel notes Northern Gateway's evidence that seismicity at the terminal site is considered to be moderate and that it would design the facilities to meet API 650 and the National Building Code of Canada.

Northern Gateway proposed a number of precautions to limit leaks and ruptures. The Panel is not satisfied that the method Northern Gateway used to calculate secondary containment volumes adequately considers the potential for multiple tank ruptures from a single event, such as an earthquake, or the environmental consequences should this occur. Full tanks would be the most vulnerable to severe earthquake damage and evidence indicated that it is unlikely that all tanks would be full at any given time. The Panel requires, as a precautionary measure, that Northern Gateway construct secondary containment to accommodate six times the volume of the largest tank in the tank terminal, plus an allowance for peak precipitation, potential future tanks, and firefighting activities. This volume is roughly equivalent to the number of full tanks required to fill a VLCC, plus the volume that might be in tanks from a recently-unloaded Suezmax condensate tanker.

5.7 Pump stations

During its hydraulic analyses, Northern Gateway determined the number and horsepower of pumps required at each station to achieve the design capacities of the oil and condensate pipelines.

The oil pipeline would require seven pump stations, including the initiating pump station at the Bruderheim Station. The condensate pipeline would require nine pump stations, including the initiating pump station at the Kitimat Terminal. Six of the eight proposed intermediate pump stations between Bruderheim and Kitimat would have pumps for both the oil and condensate pipelines. The remaining two intermediate stations would only have pumps for the condensate pipeline (see Table 5.2).

Automated pump station bypass assemblies would be installed at the intermediate oil pump stations to facilitate batch separation operations. Each pump station would be controlled using a variable-frequency drive (VFD) system that would supply a soft start for the pump motors and provide primary station pressure control. In its application, Northern Gateway initially said that stations would also have pressure control valves (PCVs) on the discharge side to provide secondary station pressure control.

Northern Gateway said that it would finalize each station's design and actual layout during detailed engineering, once final design parameters and site-specific data are available. This includes the requirement for flow recirculation lines that may maintain minimum flow at start-up and allow for throughput volumes below the design values.

It would also determine the need for additional variable-frequency drives at the initiating and other stations during detailed engineering. Northern Gateway said that, if it considers the variable-frequency drive system implemented in final design to be suitably reliable, pressure control valves for secondary station control might be eliminated, subject to other operational considerations.

Engineered containment berms would be constructed around the perimeter of each station site to prevent surface runoff from flowing off-site and to contain any leaked hydrocarbons. The area inside the berm would be graded so that surface runoff would collect in a lined containment pond. The containment pond capacity would be approximately 1,600 cubic metres (10,000 barrels). The water in the containment pond would be tested and treated as necessary before being discharged off-site. The pump house buildings would be enclosed structures with concrete floors.

TABLE 5.2 **SUMMARY OF PUMP AND MOTOR SIZES**

Station Name	Approximate Kilometre Post	Purpose	Oil Pumps and Motor size	Condensate Pumps and Motor Size
Bruderheim	0	Oil	6 @4,290 kW (5,750 HP)	N/A
Whitecourt	204.5	Oil and Condensate	6 @4,290 kW (5,750 HP)	2 @4,290 kW (5,750 HP)
Smoky River	418	Oil and Condensate	5 @4,290 kW (5,750 HP)	2 @4,290 kW (5,750 HP)
Tumbler Ridge	600.3	Oil and Condensate	3 @4,290 kW (5,750 HP)	2 @4,290 kW (5,750 HP)
Bear Lake	718.8	Oil and Condensate	3 @4,290 kW (5,750 HP)	2 @4,290 kW (5,750 HP)
Fort St. James	827.8	Oil and Condensate	3 @4,290 kW (5,750 HP)	2 @4,290 kW (5,750 HP)
Burns Lake	928.8	Oil and Condensate	3 @4,290 kW (5,750 HP)	2 @4,290 kW (5,750 HP)
Houston	1006.2	Condensate	N/A	2 @4,290 kW (5,750 HP)
Clearwater	1130.0	Condensate	N/A	2 @4,290 kW (5,750 HP)
Kitimat	1177.6	Condensate	N/A	2 @4,290 kW (5,750 HP)

NOTES: All pumps would be electrically driven and connected in series HP – horsepower kW – kilowatt

Views of the Panel

The Panel is satisfied with Northern Gateway's current pump station designs, including the containment pond capacities. The Panel is of the view that safety systems, such as overpressure protection, should have some redundancy, as a precaution. The Panel requires Northern Gateway to install both pressure control valves and variable-frequency drives at all pump stations.

5.8 Mainline valves and valve locations

Northern Gateway said that mainline valves (MLVs) on the oil and condensate pipelines would allow them to be shut down in a controlled manner, either for regular operational and maintenance requirements or for responding to a potential operating emergency. It said that, in the unlikely event that a pipeline fails or is damaged, the valves enable its operations staff to isolate an outage and minimize release volumes. Northern Gateway determined a preliminary list of valve locations after considering potential release volumes, environmental sensitivity, and potential environmental effects. It calculated the potential release volumes with a proprietary model based on a dynamic (i.e., pressurized) release prior to full valve closure, and a static (drained down) volume after valve closure. Figure 5.7 illustrates the potential for drain-down following valve closure. Valve locations were adjusted after taking into account terrain and service access requirements. Northern Gateway used a spill trajectory model to determine the potential spill extent, both on and off the right-of-way.

During the Panel's process, Northern Gateway updated the preliminary list of valve locations. In determining these locations, it assumed that all block valves would be fully automated and remotely operated from the Enbridge Control Centre in Edmonton. It also assumed that the valves would be fully closed within 13 minutes of detecting an alarm event. This includes 10 minutes of detection and response time and 3 minutes for full valve closure.

Northern Gateway used the following criteria in its engineering assessment to locate valves:

- valves placed at each of the pump stations, the Kitimat Terminal, the Bruderheim Station, and the tunnel portals;
- valves placed at all major water crossings with a channel width greater than, or equal to, 30 metres; and
- valves placed using a guideline of limiting the potential release volume to less than 2,000 cubic metres at locations meeting the following criteria:
- watercourses with a channel width greater than 10 metres and high fish sensitivity;
- valves placed to limit the potential release volume to less than 2,000 cubic metres along zones where a spill may affect tributaries to rivers with high fish sensitivity, such as the Upper Kitimat valley;
- enhanced protection of high-value salmon habitat in the Fraser, Skeena, and Kitimat watersheds;
- watercourses with high-volume downstream intakes for potable water or high-value commercial use; and
- natural topographic variations can be considered in determining potential release volumes and valve site locations.

Northern Gateway said that specific valve placement was determined by factors such as:

- locations not subject to geohazards such as slides, avalanches, avulsion, or lateral erosion of streams, rock fall, or flooding;
- ground access, preferably all-season;
- proximity to local power supply;
- level or gently-sloping ground with sufficient room to service the valves;
- existing land use, with the intention to avoid locations where valve placement may be a hindrance to other land uses or users;
- avoiding locations, or providing appropriate protection, where third party strikes are a risk; and
- placing oil and condensate valves at a common site.

As a result of these updates, Northern Gateway proposed 39 additional valves for the oil pipeline and 52 for the condensate line, bringing the total number of valves for each pipeline to 132.

Northern Gateway said that it would review and update block valve locations as engineering activities progress. It said it would take into account revised assumptions for valve design and operations, pipeline route changes, fisheries, community and Aboriginal inputs, and additional engineering and environmental information.

One intervenor said that the potential release volumes are based on Northern Gateway's interpretation of CSA Z662-11 and that they have not been justified as the highest achievable volumes. It said that the valve placements included in Route Revision V, Northern Gateway's latest route revision, were not scrutinized and tested by cross-examination.

Another intervenor said that the Panel should impose a condition requiring Northern Gateway to revise its valve placement strategy so that release volumes on either pipeline during a full-bore rupture would be no more than 100 cubic metres for 13-minute shutdown scenario. It said that this should apply for the life of the pipelines, and to any future capacity expansions.

Views of the Panel

The Panel finds that a pipeline rupture in certain areas along the route could release high volumes of oil or condensate. Properly-placed isolation valves would limit the consequences of a rupture and the corresponding scale and complexity of the emergency response. The Panel finds that Northern Gateway has not demonstrated that the calculated potential release volumes along the route are as low as practicable. A significant percentage of the volume spilled is dependent on the drain-down after a pipeline is shut down and the pipe segment is isolated.

Pipeline valves also introduce a risk of leaks from equipment failure at the valve locations that is higher than the risk of leaks from a pipeline rupture. These leaks would be harder to detect than pipeline leaks and could continue for an unspecified period of time before discovery. The Panel is satisfied that more valves would reduce potential release volumes from a rupture (a high consequence, low probability event) at the expense of an increased potential for leaks (a lower consequence, but higher probability event).

The Panel has not specified a maximum release volume of 100 cubic metres using the 13-minute shutdown scenario, as it is not practicable. For the oil pipeline, a rupture under dynamic (i.e., pressurized) conditions would require less than 2 minutes to discharge 100 cubic metres at the pipeline's average capacity of 83,400 cubic metres per day, not including drain-down volumes.

The Panel requires Northern Gateway to re-evaluate release volumes and the valve placement required to decrease them to as low as practical. The Panel requires Northern Gateway to provide rationales for the potential release volumes, develop spill extent mapping, and identify geohazard locations to facilitate assessment and to verify that the pipelines in areas potentially affected by geohazards have low potential release volumes.

FIGURE 5.7 **DRAIN DOWN VOLUME AFTER ISOLATION**

5.9 Joining and non-destructive examination

The *National Energy Board Onshore Pipeline Regulations* include the following requirements for welding:

16. A company shall develop a joining program in respect of the joining of pipe and the components to be used in the pipeline and shall submit it to the Board when required to do so.

17. When a company conducts joining on a pipeline, the company shall examine the entire circumference of each joint by radiographic or ultrasonic methods.

Northern Gateway committed to developing and submitting to the National Energy Board a comprehensive project-specific Joining Program. It said that its submission would be as timely as practical following preliminary qualification of the welding procedures for pipe representative of what would be manufactured for the project. It would update its program as necessary after final testing with project production pipe, before starting pipeline welding.

Northern Gateway said that line pipe field girth welding would be by mechanized gas metal arc welding (GMAW) or manual shielded metal arc welding (SMAW). Tie-in welding would likely involve a combination of manual shielded metal arc welding and semi-automatic arc welding.

Northern Gateway said that large-diameter pipeline construction routinely requires a number of different welding procedures. Typically, one welding process would be identified as the "production welding process" for a given construction spread. A variety of welding processes and related welding procedures are used to join pipe or repair welds, and their use depends on the circumstances. Northern Gateway said that it would consider variables when establishing its welding procedures. These variables include the pipeline design and operational stresses, material specifications, temperature, and wall thickness changes.

During the Panel's process, Northern Gateway had not yet determined which welding processes would be used in every situation, but said that it was optimistic that it would be in a position to specify mechanized gas metal arc welding for the condensate pipeline. It would make this decision following extensive due diligence to determine the suitability of this process for pipes with outside diameters less than, or equal to, 610 millimetres (24 inches).

For exceptionally high stress/strain design situations, Northern Gateway said it would use a pipe segment-specific decision record process where subject matter experts, including specialist consultants, would specify the most appropriate welding and non-destructive testing processes and procedures. This could include gas metal arc welding (which is inherently low hydrogen), low-hydrogen-dominated shielded metal arc welding, or semi-automatic procedures.

One intervenor questioned the scope of the Welding Procedure Specifications and the extent of inspections and audits, and commented on the National Energy Board's role in this regard.

Views of the Panel

The Panel finds that Northern Gateway's development of the project-specific Joining Program meets the engineering technical requirements for constructing this project. The Panel requires Northern Gateway to file the Joining Program with the National Energy Board to facilitate compliance verification before starting construction.

5.9.1 NON-DESTRUCTIVE EXAMINATION OF FINAL TIE-IN WELDS

The *National Energy Board Onshore Pipeline Regulations* require companies to examine the entire circumference of each pipeline joint by radiographic or ultrasonic methods.

Northern Gateway said that its comprehensive project-specific Joining Program would be submitted on its behalf by Enbridge following preliminary qualification of the Welding Procedure Specifications. These specifications would require manual cellulose shielded metal arc welding for final tie-in welds. The electrodes used for shielded metal arc welding would have relatively-high hydrogen content, requiring a controlled cooling rate to enable diffusion of the hydrogen away from the weld.

By definition, final tie-in welds are not subject to final hydrostatic or pneumatic strength testing. Northern Gateway said that cracks in girth welds are currently the most significant construction integrity concern for higher grades of micro-alloyed steels. It would use delayed non-destructive examination to check for the presence of delayed

hydrogen-assisted cracking for all final tie-in welds. Northern Gateway said that, by diligently using a matrix of Welding Procedure Specifications and visual and non-destructive examination best practices, latent hydrogen-assisted cracking in cellulosic shielded metal arc welding can be eliminated.

Northern Gateway said that hydrogen-assisted cracking is one of two primary mechanisms of construction girth weld cracking, the other mechanism being caused by excessive stress being applied prior to adequate weld reinforcement. It said that strict adherence to the Welding Procedure Specifications is critical in preventing the occurrence of hydrogen-assisted cracking. This means assuring a field focus of avoiding residual hydrogen in welds, mitigating the residual stresses from weld joint fit-up related to ovality or high-low alignment and designed differential wall thicknesses, applying the required preheat, maintaining the required inter-pass temperatures, and controlling the cooling rate. Northern Gateway said that it would take all these steps to avoid the potential for hydrogen entrapment and limit the formation of a weld microstructure susceptible to hydrogen or construction stress cracking.

Northern Gateway said that delayed hydrogen-assisted cracking caused by hydrogen entrapment can be very small, or tight initially, and can grow to more detectable levels after completing welding, often inclusive of an extended cooling period.

Northern Gateway said that Enbridge frequently conducts delayed non-destructive examination, during the day following weld completion, as a supplemental means to mitigate risks of latent hydrogen-assisted cracking in cellulosic shielded metal arc welding used for final tie ins. Northern Gateway said that the non-destructive examination would be delayed a minimum of 18 hours after weld completion.

In response to the Panel's potential condition requiring a 48-hour delay before the non-destructive examination of tie-in welds, Northern Gateway said that it preferred Enbridge's current 18-hour delay practice since it is a proven method. It said that there was no incremental risk mitigation by increasing the delay beyond 18 hours.

C.J. Peter Associates Engineering supported the requirement for a 48-hour delay before the non-destructive examination of tie-in welds, emphasizing that this delay should be required for both tie-in welds and repair welds.

Views of the Panel

The Panel finds that delayed non-destructive examination of all final tie-in welds is essential for both the oil and condensate pipelines. Northern Gateway said that Enbridge's current practice of delaying non-destructive examinations at least 18 hours after weld completion is adequate. The Panel is concerned that the formation of hydrogen-assisted cracking might continue beyond 18 hours. One method of detecting these cracks, other than by radiography or ultrasonic inspection, is a sensitive pipeline leak test. Final tie-in welds are not subject to these tests because they connect sections of pipeline that have already been pressure tested in situ.

The Panel agrees with Northern Gateway that cracks in girth welds are a significant construction integrity concern for higher grades of micro-alloyed steels. The Panel finds that the safety, environmental, and economic consequences of a rupture, regardless of the likelihood, may be very high for this project. The Panel requires Northern Gateway to conduct non-destructive examination of final tie-in welds a minimum of 48 hours after weld completion for safety and to reduce risk.

5.9.2 RADIOGRAPHER AND ULTRASONIC TECHNICIANS

Northern Gateway said that it would use only Canadian General Standards Board-certified radiographers and ultrasonic technicians for final non-destructive examination interpretation, in accordance with CSA Z662-11. Should there be a shortage of qualified non-destructive examination personnel, Northern Gateway said that it would use American Society for Non-Destructive Testing-certified personnel to assist with the non-destructive examination inspection process. Northern Gateway proposed that Canadian General Standards Board-certified operators and technicians would conduct and/or approve all final interpretations and acceptance of welds.

In response to the Panel's potential condition to require using only Canadian General Standards Board-certified radiographers and ultrasonic technicians to operate non-destructive examination inspection equipment and for final interpretation of radiographic film and ultrasonic inspection system results, Northern Gateway said that there is no practicable way to meet this requirement. It

said that there are an insufficient number of these certified pipeline inspection operators in Canada and that Enbridge currently uses radiographers and ultrasonic technicians with equivalent certifications. Northern Gateway requested that this condition be removed.

Natural Resources Canada proposed revised condition wording that would require Canadian General Standards Board-certified personnel to be specified for operating all types of non-destructive examination equipment, not just for radiographic and ultrasonic equipment.

Views of the Panel

Non-destructive examination is a key component in managing modern pipeline system integrity. CSA Z662-11 requires radiographers to be qualified as specified in CAN/CGSB-48.9712. This standard also requires ultrasonic inspectors and radiographers doing radiographic image interpretation to be qualified as specified in CAN/CGSB-48.9712 to Level II or III. The Panel requires Northern Gateway to meet this standard.

5.9.3 PRESSURE TESTING

Northern Gateway said that each pipeline section would be pressure tested in accordance with CSA Z662-11 and that, in most cases, water would be used. It said that it would examine the feasibility of using compressed air for pressure testing at certain locations, particularly in isolated steep mountainous terrain or in areas with limited water supply. It would select pipeline sections to be considered for air testing during detailed engineering. Northern Gateway confirmed that it would use Category II steel for the pipe sections to be air tested, to provide greater notch toughness. It said that air testing may be a good test for detecting leaks from small defects if the test is of sufficient duration.

For the Kitimat Terminal, Northern Gateway said that it would test the various systems, including tanks, piping, control systems, and other infrastructure, in accordance with current regulations and industry standards. Tanks would be hydrostatically tested with fresh water or storm water collected in the remote impoundment reservoir. Water would be transferred from tank to tank for each subsequent test. After completing all tests, the water would be managed according to applicable regulations. Piping would by hydrostatically tested with water collected in the remote impoundment reservoir or trucked in from off site. Northern Gateway would develop detailed hydrostatic testing plans before testing.

Northern Gateway said that it would seek leave to open from the National Energy Board after successfully completing pre-commissioning of the terminal facilities and tanks, before introducing hydrocarbons and start-up.

Views of the Panel

Pressure testing in accordance with CSA Z662-11 involves a strength test and a leak test, which can be performed with liquid or air. The Panel is of the view that air testing can effectively demonstrate that the strength of the pipe or pressure vessel is able to withstand the pressure it is tested to. The Panel is not convinced that air testing can effectively determine the presence of pinholes or fine through-wall cracks for larger diameter pipelines, due to the compressibility of air. While testing with a liquid medium may be troublesome, given the concerns regarding potential leaks expressed during the hearing, the Panel requires Northern Gateway to pressure test the pipelines with water and to report any failed tests and their causes on a monthly basis.

5.10 Leak detection

5.10.1 LEAK DETECTION SYSTEM OPERATIONS

Northern Gateway said that the Enbridge Edmonton Control Centre would monitor and operate the proposed pipelines and related facilities. The Kitimat Control Centre would monitor and operate the Kitimat Terminal facilities associated with vessel loading and unloading. A supervisory control and data acquisition (SCADA) system would enable the pipelines and facilities to be monitored and remotely operated simultaneously from both control centres. Emergency shutdown systems would be capable of being initiated remotely or locally.

Northern Gateway said that the SCADA system would include a redundancy of SCADA systems and associated hardware within the control centres, and also a backup control centre. The telecommunication system would include a redundancy of communications to all terminals, pump stations, and other remote sites deemed critical for safe operation. Northern Gateway said that it was also investigating a number of telecommunications technologies, such as dedicated fibre optics for use on the pipeline right-of-way.

Northern Gateway indicated that, by placing ultrasonic flow meters at every pumping station, combined with the custody transfer meters, and pressure transmitters around every valve site, it would probably have one of the best-instrumented pipeline systems in the world.

5.10.2 LEAK DETECTION METHODS

Northern Gateway said that Enbridge uses the following four primary monitoring methods to detect possible leaks on its pipelines and that these would also be used on the proposed pipelines:

- Visual surveillance and reports, including aerial and ground patrol reports and third party reports of oil or oil odours. Aerial patrols occur a minimum of 26 times per year at no greater than 3-week intervals.
- Scheduled line balance calculations at fixed intervals (over/short reports) using a commodity movement tracking system. This compares volumes entering the pipeline system to deliveries leaving the pipeline, and then calculates any overall imbalance.
- Continuous controller monitoring of pipeline conditions at the Enbridge Edmonton Control Centre using the SCADA system that reports key flows, pressures, and other sensor data every few seconds.
- The Material Balance System, which is a sophisticated real-time Computational Pipeline Monitoring system supported from the Edmonton Control Centre 24 hours per day.

Northern Gateway said that its system would be designed to meet the requirements of CSA Z662-11 Annex E, U.S. DOT's CFR 49 Part 195, and API 1130. Northern Gateway said that the Computational Pipeline Monitoring system has a threshold accuracy of 1.5 to 3.0 per cent, depending on the pipeline segment length for which the volume balance is being calculated, and that the meters had a 1 to 2 per cent range of sensitivity. It said that it uses API 1149 methods, which are industry-accepted for determining leak detection system sensitivity. AP1 1149-predicted thresholds and sensitivity were tested with API 1130 methods, and the results of fluid withdrawal tests and these lined up well with the API 1149 predictions.

Northern Gateway said that its Material Balance System can effectively model column separation, which has the potential to mask and delay leak detection when the leak is in the vicinity of column separation and begins at approximately the same time that the column separation forms. Northern Gateway identified potential areas at higher risk of column separation. It said that, with pressure transmitters located at these critical areas, it may implement operating procedures to maintain sufficient operating pressures to prevent column separation from occurring.

As part of its ongoing consultation and project review, Northern Gateway committed to a number of potential design features that would enhance pipeline safety and reliability over and above standard industry practice. One such commitment was to implement a second real-time leak detection system that would complement the existing Enbridge real-time transient modelling leak detection system.

Some technologies that Northern Gateway said it is actively investigating include:

- "Computational Pipeline Monitoring" leak detection systems that use algorithmic tools to enhance the pipeline controller's ability to detect leaks;
- highly-permeable vapour sensing tubes, installed along the pipeline, that include pumps

to push the air column in the tube past a gas detection unit at a constant speed (not a real-time detection system);

- chemical-sensing cables that physically or chemically change when in contact with a contaminant that causes a detectable voltage drop;
- fibre-optic cable systems that detect leaks based on temperature changes in the surrounding soil;
- acoustic or negative pressure wave detection systems that are based on the negative pressure waves associated with the onset of a leak or break;
- aerial-based remote-sensing leak detection systems that use thermal cameras, laser-based technologies, or gas-sampling technologies installed on aircraft (not a real-time detection system); and
- in-line inspection tools that detect acoustic emissions associated with leaks (not a real-time detection system).

Northern Gateway said that its procedures would require initiating a line shutdown within 10 minutes of receiving an unexplained Material Balance System alarm (this is the "10-minute rule"). Three additional minutes would be required for segment isolation to occur once the shutdown was initiated. In response to questions by Haisla Nation, Northern Gateway said that it would look at the feasibility of an automatic pipeline shutdown after the 10-minute analysis period, assuming it may do so safely and reliably. Before it could commit to this, Northern Gateway said it would need to go through its change management processes and do associated hazard and risk assessments. For operational reasons, it said it preferred to implement a controlled system shutdown, as opposed to an automatic emergency shutdown.

Northern Gateway said that, regardless of the means of detection, it is the leak detection time that is of concern and it would strive to minimize this time, especially for rupture conditions. Northern Gateway provided details on detection times for 11 leaks greater than 159 cubic metres (1,000 barrels) on the Enbridge system in the United States. In most cases, the leak (or rupture) was detected in less than 5 minutes. The Line 6B rupture in Marshall, Michigan, was not recognized by operators for 17 hours, although instrumentation detected the leak within 5 minutes.

Northern Gateway was questioned about detecting larger leaks on Enbridge's system, including the Marshall, Michigan, rupture and a pinhole leak on the Norman Wells Pipeline.

Regarding the Marshall, Michigan, rupture, Northern Gateway said that the SCADA and leak detection systems detected the leak within 5 minutes, but that human error and systemic problems lead to Enbridge's delayed response. Specifically, two "golden rules" were not followed: adherence to the emergency procedures and, when there is any doubt, shut the system down and bring it to a safe state. Northern Gateway said that Line 6B was in a transient state at the time and the operators incorrectly interpreted the cause of the alarm condition as column separation of the product within the pipeline.

Northern Gateway said that Enbridge underwent a total reorganization after the leak occurred. It said that Enbridge enhanced its management systems to clearly define roles and responsibilities, revisited the interface between the SCADA system and operations staff, incorporated fatigue and alarm management, and made changes to its training programs. Northern Gateway said that Enbridge also launched a safety culture initiative. Northern Gateway said that its pipelines and Material Balance System would be designed to ensure the conditions leading to column separation, and the false detection of column separation, would not occur.

Northern Gateway said that the Norman Wells Pipeline leak was a pinhole leak that released a volume of 258 cubic metres (1,628 barrels). It said that pinhole leaks are difficult to detect with instrumentation, but that a pressure test or in-line inspection tool may be able to identify them. In this case, the oil was trapped under frozen ground in winter and was not discovered until the ground thawed in spring.

Douglas Channel Watch questioned whether the Enbridge Edmonton Control Centre would monitor and control Northern Gateway's pipelines, noting that this control centre also monitored and controlled Enbridge's Line 6B when it experienced the rupture in Marshall, Michigan.

Ms. Wier questioned leak detection system threshold limits, sensitivities, and success. She said that significant releases may occur before being detected by leak detection systems or other means.

Views of the Panel

Reliable SCADA and leak detection systems are necessary for safe and efficient pipeline system operations. The Panel finds that Northern Gateway's system would be well-instrumented and would meet the requirements of CSA Z662-11 Annex E, U.S. DOT's CFR 49 Part 195, and API 1130. To facilitate monitoring of design and implementation issues, the Panel requires Northern Gateway to describe its SCADA and leak detection systems, relevant hardware, performance measures, and quality assurance program before starting construction. The Panel also requires Northern Gateway to report on the results of its quality assurance program for the project's operational life.

The Panel finds that Northern Gateway's proposed combination of visual surveillance, aerial and ground patrols, and SCADA and leak detection systems is consistent with industry practice, and recognizes that the applicability and effectiveness of its various proposed leak detection methods depend on the nature of the leak or rupture.

The ability to detect leaks and ruptures quickly is an important factor in spill response and in minimizing the volume of hydrocarbons released. The Panel acknowledges the Haisla Nation's suggestion that the default should be to shut down a pipeline 10 minutes after detecting a leak, unless overridden by an operator. The Panel also acknowledges Northern Gateway's intention to follow established shutdown procedures, as opposed to invoking an emergency shutdown. The decision to delay shutdown procedures must be weighed against safety and environmental concerns, especially in the event of a rupture. The Panel finds that Enbridge (hence, Northern Gateway) has enhanced its management systems to clearly define roles and responsibilities, revisited the interface between the SCADA system and operations staff, incorporated fatigue and alarm management, and made changes to its training programs.

The Panel is also satisfied that Enbridge has launched a safety culture initiative. The National Energy Board would assess control room performance as part of its audit program. The Panel has determined that, with these improvements, the safest and more responsible approach to operating the pipelines is not to have an automatic shutdown that would need to be overridden by human action. The Panel is convinced that human intelligence, supported by good SCADA and leak detection systems at its current state of technology, would optimize safety and environmental protection.

Regarding Northern Gateway's assurance that it would design its pipelines so that column separation, and the false detection of it, would not occur, the Panel finds that the pipelines may be required to operate at much less than the design operating pressure under certain circumstances. In such instances, there would be an increased likelihood of column separation occurring. The Panel requires Northern Gateway to identify areas where column separation may occur and to install pressure transducers in these areas, as well as alarms and procedures to prevent its occurrence.

The Panel accepts Northern Gateway's commitment to implement complementary leak detection systems. The Panel recognizes that leak detection is an evolving technology and understands Northern Gateway's plans to investigate options and implement the technology with the greatest chance of success. The Panel requires Northern Gateway to report on its assessment, implementation plans, and quality program for complementary leak detection technologies. The Panel also requires Northern Gateway to report on the observed detectability, sensitivity, reliability, robustness, and accuracy of the leak detection systems, for the project's operational life.

5.11 Corrosiveness of dilbit

Many participants in the Panel's process were concerned about the corrosiveness of dilbit. Two reports filed by ForestEthics Advocacy served as primary sources for these concerns. The first report, *Tar Sands Pipeline Safety Risks*, was authored by the Natural Resources Defense Council, National Wildlife Federation, Pipeline Safety Trust, and the Sierra Club. The second report, *Pipeline and Tanker Trouble*, was authored by the Natural Resources Defense Council, the Pembina Institute, and Living Oceans Society. The Haisla Nation filed a third report, authored by G. Bakker, *The Corrosive Nature of Diluted Bitumen and Crude Oil – Literature review*.

In response to these reports, Northern Gateway filed an independent study, *Comparison of the Corrosivity of Dilbit and Conventional Crude*. Northern Gateway's report examined the properties of 15 representative crudes and dilbits in western Canada.

The primary concerns cited in the first two referenced reports regarding dilbit corrosiveness included:

- dilbit contains 5 to 10 times more sulphur, which can lead to pipeline embrittlement;
- dilbit contains 15 to 20 times higher organic acid content than conventional crude;
- dilbit has a high concentration of chloride salts, which can lead to chloride stress corrosion in high temperature pipelines;
- oil sands crude contains more abrasive sand particles making dilbit a sort of "liquid sandpaper";
- dilbit has a higher viscosity than conventional crude and creates higher temperatures as a result of friction;
- the provincially-regulated Alberta pipeline system has had 16 times as many spills due to internal corrosion than the United States pipeline system, which indicates that dilbit is more corrosive than conventional crudes;
- a combination of chemical corrosion and abrasion dramatically increases deterioration;
- higher operating temperatures increase the corrosion rate (a rule of thumb is that for every 10 degree Celsius increase in temperature the corrosion rate doubles);
- dilbit pipelines may be subject to a higher incidence of external stress corrosion cracking; and
- regulations do not distinguish between conventional crude and dilbit when setting minimum standards for oil pipelines.

The potential for under-deposit corrosion beneath sludge deposits was discussed during the Panel's process. The Northern Gateway report said that, while it would be expected to find sludge deposits at the lowest spots in a pipeline, Enbridge observed, and it has been reported in scientific literature, that under-deposit corrosion in its dilbit lines also occurred near overbends. Overbends are locations of low fluid shear stress. Northern Gateway's report said that little is known about the sludge deposition mechanism and the role of dilbit chemistry. The report recommended that research should continue to improve understanding of sludge formation, the resulting corrosion mechanism, the role of dilbit chemistry and solids, mitigation practices and frequencies, and preventive measures. The report said that Enbridge has been quite successful in mitigating under-deposit corrosion, but there were uncertainties regarding each technique's effectiveness and the required application frequency.

C.J. Peter Associates Engineering referred to a paper co-authored by an Enbridge employee, which indicated that, for heavy oil pipelines, corrosion also occurs on the pipe bottom of overbends. The paper said that this deposition is attributed to "inertial forces that increase the thickness of the boundary layer at the pipe floor thereby reducing the flow forces responsible for mobilizing solids." C.J. Peter referred to a passage in the same paper indicating that a crude oil pipeline with low corrosion rates by conventional corrosion monitoring standards was found to have locally-severe under-deposit pitting.

Northern Gateway said that it would monitor incoming crude batches to ensure that they meet the applicable oil pipeline tariff requirements. All oil would be tested for adherence to the Enbridge Crude Petroleum Tariff, which specifies acceptable crude quality, such as maximum temperature, maximum density, maximum allowable basic sediment and water (BS&W), and viscosity. Every commodity nominated for transport on the oil pipeline would require prior approval through the Enbridge New Service Request Process, currently implemented on the Enbridge Mainline System.

Northern Gateway anticipated the precipitation of solids from dilbit. It said that Enbridge conducts regular analyses of its pipeline operations to determine the potential for potentially-corrosive sediments to settle, contact, and persist on the pipe floor where they might cause corrosion. These

analyses are used to determine the requirement for cleaning programs that would displace accumulated sediments. Northern Gateway said that any solids formation would be handled as per Enbridge's current operating standards and maintenance.

Northern Gateway said that the level of corrosive substances in dilbit (water, sediment, chemical species corrosive under normal pipeline operating conditions, and bacteria) is fundamentally similar to conventional heavy crude oils. It said that Enbridge conducts regular in-line inspections to identify corrosion metal loss processes.

Corrosion potential in the proposed pipeline was discussed during the Panel's process. Northern Gateway's semi-quantitative risk assessment (SQRA) identified an analogous pipeline (Line 4) in the Enbridge system. Line 4 has been operating since 1999 and has many of the same technical attributes of the proposed pipeline, including size, coating, flow mode (i.e., turbulent), internal corrosion control measures, and products delivered (including dilbit). The assessment indicated that internal inspections found no internal corrosion issues on Line 4.

Views of the Panel

The Panel is not convinced that dilbit meeting the Enbridge Crude Petroleum Tariff would be more corrosive than conventional heavy crude oils. The Panel has based this conclusion on the hearing evidence including the outcomes of Enbridge's management of internal corrosion issues on Line 4, which has no internal corrosion issues.

5.12 Risk approach

Northern Gateway said that the purpose of its initial risk assessment was to provide general information for the environmental assessment on the likelihood of spills, to identify priority zones that may require mitigation, and to determine mitigation measures that might be needed. It emphasized that the assessment was not meant to predict spills.

In its application, Northern Gateway provided a table of the spill return periods for physiographic regions along the pipeline route. The likelihood of medium or large hydrocarbon releases occurring in selected regions and at specific locations along the route were calculated using National Energy Board failure data. It was expressed as a spill return period (years per spill). Northern Gateway said that, although numerous databases provide data for the pipeline industry worldwide, National Energy Board data is based on liquid hydrocarbon transmission lines under its jurisdiction, best representing the project. Results of the most recent analysis of the National Energy Board liquid pipeline failure database from 1991 to 2009 were used to represent applicable failure types. Northern Gateway said that the National Energy Board data, although based on recent performance, included pipelines up to 50 years old, built using older technology and material standards.

Northern Gateway said that the frequency results did not predict whether hydrocarbons would reach particularly sensitive locations. It said that the estimated probability of hydrocarbons reaching a watercourse is less than the probability of a release at any particular location along the pipeline route. This was based on elements such as topography, soil type, season, temperature, viscosity, distance, pipeline depth, engineering design, containment strategies, construction methods, and local conditions. The volume that might be released depends on many factors, including failure detection, shutdown time, hydraulic gradients, and valve spacing.

Northern Gateway said that it is committed to pipeline integrity management and maintenance and acknowledged its responsibility to conduct business to high standards of integrity, transparency, safety, and environmental protection. It said that preventative measures, monitoring, and mitigation are central to its pipeline integrity policies. For comparative purposes, Northern Gateway provided spill statistics for Enbridge's liquids pipeline system between 2005 and 30 September 2012. It said that it selected this timeframe because Enbridge typically provides 5 years of data for reporting purposes. It noted that release sizes differed slightly from other data because Enbridge categorizes spills greater than 15.9 cubic metres (100 barrels) as large. Evidence provided by Northern Gateway suggested that 92 per cent of the reported releases occurred within fenced facility yards and did not escape company property. It said that these involved relatively small volumes that Enbridge was able to immediately contain and clean up. It said that it was unlikely that small spills at facility sites would migrate beyond property boundaries during the project's lifespan.

5.12.1 SEMI-QUANTITATIVE RISK ASSESSMENT

Northern Gateway said that it recognized and shared the public's concern about the consequences of spills and that it was very much aligned with regulators and the public in wanting to avoid spills of any size. It said that the objective of its pipeline design, engineering, construction, and operations is to mitigate and manage the risk level, over the life of the pipeline, with the goal of avoiding spills of any size.

Northern Gateway said that, as part of its risk mitigation and management objective, it undertook a risk-based design process for the pipelines. It said that risk-based design is an iterative approach that evaluates and prioritizes risks associated with a preliminary design and the associated risk-drivers. It then establishes mitigation measures to be incorporated into the design to address the principal unmitigated risks. Northern Gateway's semi-quantitative risk assessment provided a risk assessment of a full-bore rupture releasing dilbit from the oil pipeline.

From the perspective of consequence mitigation, Northern Gateway said that the focus of its semi-quantitative risk assessment was on ruptures because ruptures have the most extreme consequence and are of the greatest interest in completing a risk-based design. Northern Gateway said that this was consistent with the Panel's guidance to characterize full-bore rupture effects. Northern Gateway said that any consequence-mitigation measures developed and incorporated into the design for mitigating ruptures would also be effective in mitigating less significant releases.

Since Northern Gateway's failure likelihood assessment evaluates and characterizes all failure modes, including leaks and ruptures, it said that guidance from the quantitative failure likelihood assessment report would be used in the risk-based design process.

Northern Gateway said that the first step in the semi-quantitative risk assessment was to identify hazard and threat events, including:

- internal corrosion;
- external corrosion;
- material and manufacturing defects;
- construction defects (welding, fabrication, and installation);
- incorrect operations;
- equipment failure (such as pump stations components);
- third party damage; and
- geotechnical and hydrological threats.

Northern Gateway said that the next step was to determine the failure frequency based on reliability methods and expert judgement. It developed a quantitative failure frequency model for threats associated with constructing and operating its pipeline system. It said that historical pipeline industry failure statistics are not representative of modern pipeline designs, materials, and operating practices. It said that a review of industry failure statistics indicated that approximately 90 per cent of pipeline failures occur on pipelines installed in the 1970s or earlier. Northern Gateway identified 16 technologies and practices that have been largely developed since the construction of these pipelines, which it would use for the project.

Northern Gateway said that older pipeline designs were not optimized using modern modelling techniques, such as overland spill modelling and valve optimization, to minimize spills. It said that the consequences of older pipeline failures, as reported in industry incident databases, are usually more severe than would be the case for a pipeline designed using a modern risk-based design approach. It also said that another disadvantage of using industry failure databases as the basis for a quantitative risk assessment is that they do not address unique site-specific threats, such as geotechnical hazards.

To predict potential failure mechanisms and quantitative risk values for new pipelines, Northern Gateway's threat-based approach used actual operating data from recently-constructed (modern) pipelines with technology and products similar to that proposed, in conjunction with reliability-based methods relevant to the threat being considered. It used a quantitative failure frequency model using reliability methods to address the primary challenge associated with deriving quantitative risk values for new pipelines.

Northern Gateway said that the geotechnical work supporting its application was used to eliminate many significant hazards through routing choices. As a result, the geohazard evaluation only considered residual hazards associated with the applied-for route. The evaluation considered threats within the Project Effects Assessment Area, as well as hazards outside the corridor that may potentially affect the pipelines. Rock fall, debris flows, avalanches, and various forms of slides were assessed to distances of sometimes several kilometres from the pipeline route and were typically, although not always, assessed to the height of land above the corridor. Northern Gateway said that approximately

250 kilometres of the route (20 per cent) has associated geotechnical threats.

Northern Gateway said that the third step in the semi-quantitative risk assessment was to evaluate consequences, beginning with spill trajectory modelling to determine whether a product release would affect a consequence area. It said that effect magnitude is a function of spill volume, accessibility, and inherent sensitivity of the particular consequence area.

Northern Gateway said that the final step was to evaluate unmitigated risk severity. It used the risk matrix developed for the project to evaluate risk severity, which involved a combination of rupture frequency and rupture consequence.

Northern Gateway said that it considered the following consequence areas:

- officially-designated protected areas, including federal and provincial parks, conservancies, and ecological and wildlife reserves;
- settlements, including hamlets, villages, towns, and cities;
- Indian reserves;
- licensed water withdrawal locations related to human consumption or other uses, such as for industry and agriculture;
- watercourses with endangered or harvested fish species;
- wildlife habitat containing species likely to interact strongly with oil and likely to contain species at risk; and
- wetlands, fens, and marshes.

Northern Gateway ranked these consequence areas based on sensitivity to an oil spill event. For example, fish-bearing watercourses containing species at risk or that have a conservation concern were ranked higher than other watercourses.

Spill volumes were calculated for each kilometre of the route and varied based on a number of factors, such as topography and valve placement. Spill volumes were ranked and Northern Gateway used this ranking to modify the consequence score.

Northern Gateway said that ease of access, either by highway or paved road close to the right-of-way, decreases the response time to access a spill location. The accessibility to each kilometre-long pipeline segment was ranked according to whether the segment had nearby road access and whether the road was for all-weather or seasonal use. This ranking was also used to modify the consequence score.

The semi-quantitative risk assessment concluded that most of the pipeline route has a low-risk rating. It also confirmed a number of higher-risk areas, primarily associated with high-value watercourses such as the Kitimat River.

Northern Gateway said that the terrain and geotechnical conditions that it would encounter are similar to those of other liquid transmission pipelines in Canada and throughout the world. It said that the types of products to be carried by this pipeline are similar to those carried by existing pipelines in Canada and the United States.

Northern Gateway said that a release of any magnitude from the pipeline would be unacceptable and that it would undertake additional work during the detailed design phase to identify and apply mitigation to minimize the risk of a release.

Individual hazards and threats are discussed in the proceeding sections.

Views of the Panel

Risk assessments based solely on historical incident records provide poor insight into future performance since incident records do not account for new technology and learnings that occur from the incident investigations. Northern Gateway said that it strives for continued improvement. The Panel finds that Northern Gateway's semi-quantitative risk assessment is a sound approach to designing a pipeline system because it provides a framework to anticipate, prevent, manage, and mitigate potential hazards at the design stage of the project.

5.12.2 INTERNAL CORROSION CONTROL

Northern Gateway's reliability approach for internal corrosion used a superimposition of an analog in-line inspection dataset on its preliminary design and materials, that took into account tool measurement error and corrosion growth. To ensure that the internal corrosion mechanism and corrosiveness of the analog in-line inspection dataset was representative, Northern Gateway examined several factors: water content, erosion and corrosion, flow velocity, flow mode, temperature, susceptibility to under-deposit corrosion (e.g., solid deposition, microbiologically-induced corrosion, potential, and water chemistry), and mitigation measures (e.g.,

using inhibition, biocides, or pigging). Northern Gateway determined that in-line inspection data from Enbridge's nominal pipe size (NPS) 36 Line 4 would be most representative of the corrosion conditions expected on the proposed oil pipeline. Line 4 was inspected several times and the results were reviewed. Northern Gateway said that no evidence of active internal corrosion was found. It said that the proposed oil pipeline would operate in fully-turbulent mode, resulting in full entrainment of what little water is present. Its maximum basic sediment and water tariff specification for the proposed oil pipeline would be 0.5 per cent, as is the case for Line 4. Considering these operating conditions, Northern Gateway said that no significant internal corrosion is expected on the oil pipeline and the failure probability for this threat is negligible.

Northern Gateway said that it would manage any internal corrosion on either the oil or condensate pipeline through periodic cleaning programs and condition monitoring by scheduled in-line inspections. It added that it would conduct chemical treatment on its pipeline systems when deemed appropriate to do so.

Views of the Panel

The Panel accepts Line 4 as an appropriate analog because it transports similar products and has similar physical characteristics as the proposed oil pipeline, such as size, operating temperature, flow mode, and flow velocity. Based on the results of Line 4 monitoring, the Panel is of the view that Northern Gateway's periodic cleaning and condition monitoring program would adequately mitigate internal corrosion issues on the proposed pipelines.

5.12.3 EXTERNAL CORROSION CONTROL

Northern Gateway identified external corrosion as one of eight threats to the proposed pipeline system for input into the semi-quantitative risk assessment. The semi-quantitative risk assessment identified influences on the susceptibility to external corrosion, referred to as "threat attributes," as being:

- coating type;
- cathodic protection;
- soil characteristics (e.g., acid-generating rock);
- above-ground pipe (including the Hoult and Clore tunnels, and possible aerial crossings of gorges and watercourses);
- casings (possibly used to stabilize trenchless crossings); and
- in-line inspection data from the analog pipeline (Line 4).

Northern Gateway said that it would identify locations of acid-generating rock and develop mitigation plans in the detailed engineering phase. It would consider factors influencing the susceptibility to atmospheric corrosion during detailed design. It would also consider measures, such as filling the annulus between the pipe and any casing, during detailed design.

To model the failure frequency due to external corrosion, Northern Gateway chose Enbridge's 2010 in-line inspection data set for Line 4 (from the Bethune Station to the Regina Terminal) as an appropriate analog for the proposed oil pipeline, since Line 4 was constructed in 1999 and has a fusion bonded epoxy coating. The modelling results showed that measureable corrosion failure probabilities were reached after 11 to 20 years of simulated unmitigated operation for the range of pipe wall thicknesses proposed for the project. Full-bore rupture failures due to external corrosion were not predicted to occur between regular in-line inspections, when corrosion rates would be assessed and the corrosion mitigated, as appropriate.

Northern Gateway said that modern pipelines are built to limit corrosion infringement through high-quality metallurgy, pipe manufacturing processes, welding materials and techniques, modern fusion bonded epoxy coatings, and numerous pipeline integrity provisions including regular internal magnetic flux leakage inspections. Northern Gateway said that, as a result, the loss of containment due to corrosion and environmentally-assisted cracking is virtually eliminated.

Northern Gateway said that protective coatings would be the primary external corrosion control measure for the oil and condensate pipelines and that cathodic protection would be the secondary control measure.

Views of the Panel

As discussed in Section 5.5.2, external corrosion is a frequent cause of pipeline leaks and ruptures. A pipeline's coating is the principle measure by which external corrosion is prevented. Through Northern Gateway's compliance with the Panel's various conditions, there is likely to be minimal external corrosion on the pipelines. The Panel finds that the risk related to external corrosion would be well managed and monitored.

5.12.4 THIRD PARTY DAMAGE

Northern Gateway's semi-quantitative risk assessment identified third party damage as one of eight threats relevant to the proposed pipelines. Northern Gateway said that, when combined with the other threats, third party damage emerges as a dominant contributor to the overall failure frequency.

Northern Gateway said that third party damage can be established as the product of two independent variables: the frequency of incurring a hit by heavy equipment, and the probability of failure given such a hit. It said that the probability of failure can be determined as a function of pipe design and material properties. Northern Gateway referred to research indicating that approximately 25 per cent of third party damage failures result in rupture. The frequency of impact can be characterized in terms of the following damage prevention factors:

- land use type;
- one-call system availability and promotion;
- pipeline marker sign placement frequency;
- using buried marker tape at crossings;
- third party requirements regarding notification of intent to excavate;
- patrol frequency;
- response time for pipe location requests;
- pipeline locating methods used;
- pipeline marking methods used; and
- depth of cover.

Northern Gateway said that the potential for strikes and damage to any-sized pipeline increases with human activity, such as excavation, oil and gas activity, and road works. Proximity to urban areas and settlements or to commercial operations also increases the potential for third party damage. Northern Gateway said that, typically, ruptures caused by third party damage would only result from a strike by a large excavator. Of the factors that would affect the probability of a strike by a large excavator, Northern Gateway identified land use type as a key factor in the third party damage model because it defines the overall frequency of excavation on a pipeline right-of-way.

Northern Gateway included the likelihood of failure due to third party damage in its overall risk ranking for each kilometre-long segment of the oil and condensate pipelines. It said that, although the likelihood of failure from third party damage is higher for the condensate pipeline than the oil pipeline due to the different wall thicknesses, the consequence of a failure is less for the condensate pipeline than the oil pipeline. It said that the condensate pipeline's risk ranking was generally calculated as being the same or lower than that of the oil pipeline on a kilometre-by-kilometre basis. Northern Gateway said that European (EGIG) and American (PHMSA) databases show no third party damage failures for any onshore pipeline with wall thicknesses greater than 15 and 16 millimetres, respectively. The proposed oil and condensate pipelines would have minimum wall thicknesses of 19.8 and 7.5 millimetres, respectively.

Views of the Panel

There is a potential risk to the pipelines from third party damage. For this project, the Panel is satisfied that Northern Gateway would adequately mitigate the risk of a rupture caused by third party damage to the oil pipeline by using techniques specified in regulations (e.g., pipeline markers, one-call systems, and depth of cover), particularly since its wall thickness makes it highly resistant to rupture from this threat. The condensate pipeline, with a proposed minimum wall thickness of 7.5 millimetres, would be more susceptible to third party damage. The Panel agrees with Northern Gateway's assessment that the condensate pipeline's overall rupture risk ranking is lower than that for the oil pipeline on a kilometre-by-kilometre basis due to the lower consequence associated with a condensate pipeline rupture, rather than a lower rupture probability.

Due to the potential contribution of third party damage to the overall failure frequency of the pipelines, the Panel requires Northern Gateway to assess and report on additional protective measures for the condensate pipeline in proximity to areas of higher public population and activity (near the Whitecourt casino, Burns Lake, and Kitimat).

5.12.5 MATERIAL AND MANUFACTURING DEFECTS

Northern Gateway said that material defect failures are a result of the presence of pipe body defects or seam weld defects. Northern Gateway's approach to estimate the frequency of occurrence used a baseline failure frequency derived from industry failure statistics for over 274,000 kilometres

(170,000 miles) of hazardous liquid pipelines in the United States between January 2002 and December 2005. These statistics, collected by PHMSA, included both leaks and ruptures, and were modified to account for modern pipeline materials, design, and installation.

Northern Gateway said that the United States data contained 19 failures attributed to material defects, which equates to a failure frequency of 1.7×10^{-5} failures per kilometre-year. Northern Gateway's analysis of the data found that modern pipelines had fewer material defects that resulted in leaks and ruptures, and only 2 of the 19 failures were on large-diameter pipelines. Northern Gateway estimated the failure likelihood for a full-bore rupture to be 3×10^{-6} failures per kilometre-year.

Views of the Panel

One of the Panel's potential conditions was to require Northern Gateway to prepare and file with the National Energy Board a project-specific quality management plan, before materials, equipment, etc., were procured. Northern Gateway requested that the condition be limited to the manufacture of major components for the pipelines (including all associated facilities to be installed along it) and the Kitimat Terminal.

A quality management plan is essential for reducing failures caused by material and manufacturing defects. In addition to the *National Energy Board Onshore Pipeline Regulations*' requirements for Northern Gateway to have a quality assurance program in place, the Panel requires Northern Gateway to file its project-specific quality management plan for National Energy Board approval before manufacturing pipe and major components.

5.12.6 CONSTRUCTION DEFECTS (WELDING AND INSTALLATION)

Northern Gateway said that construction defect failures are failures attributed to construction or installation defects such as girth and fillet weld defects and pipe body failures from dents and gouges. Northern Gateway used the PHMSA database to estimate the frequency of failure due to construction defects, as it did for its analysis of material and manufacturing defect frequency.

Between January 2002 and December 2005, three sub-causes were related to this major threat category. These were:

- pipe body failures caused by defects such as dents (16);
- butt weld failures (15); and
- fillet weld failures (9).

Northern Gateway said that, together, these 40 failures represent a failure frequency of 3.7×10^{-5} failures per kilometre-year. Northern Gateway used this value as the baseline failure frequency for construction defects. Its review of the construction defect failure statistics varied by decade of construction. Newer pipelines had a normalized incident rate that was 60 per cent of the pipeline infrastructure as a whole. To account for this effect, Northern Gateway used an adjustment factor of 0.60 when calculating the construction defects failure frequency. This resulted in a failure likelihood of 2.2×10^{-5} failures per kilometre-year. Northern Gateway said that, in the absence of some large-scale outside force (e.g., a landslide), these defects fail by a leak mechanism, rather than by a rupture. It said that the probability of a full-bore rupture is negligible. It said that this was consistent with the findings of a review of failure incidents from the PHMSA leak database related to construction defects.

Views of the Panel

The Panel is not convinced that Northern Gateway's 0.60 adjustment factor was justified. Construction defects, such as dents, on the older pipelines may have failed as a result of fatigue rather than from a large-scale external force such as a landslide, and the loading cycles for the newer pipelines may not have been sufficient to result in failure. While the failure frequency for new pipelines may not be as low as Northern Gateway suggested, the Panel is of the view that the risk may be reduced by inspections that target pipe body defects. In order to verify that dent defects are adequately identified and addressed, the Panel requires Northern Gateway to complete a high-resolution caliper inspection within 6 months after starting operations. The Panel also requires Northern Gateway to investigate all dents greater than 2 per cent of the pipe's outside diameter, to ensure they are free of gouges and are not associated with a weld. Since 100 per cent of all circumferential welds are subject to non-destructive examination and a pressure test, the majority of field welds would be verified.

5.12.7 INCORRECT OPERATIONS

Incorrect operations failures are related to a failure to follow set procedures during pipeline operations. Northern Gateway estimated the frequency of occurrence for this threat by analyzing the baseline failure frequency derived from the PHMSA industry failure statistics. It modified this value with an adjustment factor to account for modern pipeline materials, design, and installation practices. The adjustment factor was derived from a questionnaire developed by Dynamic Risk Assessment Systems Inc. and administered to Enbridge operations and other subject matter experts during a threat assessment workshop. The questionnaire covered topics intended to gauge the expected performance of Northern Gateway operations in terms of the causal factors of failure related to incorrect operations. The methodology for assigning the adjustment factor based on the questionnaire results was derived from API RP 581 – *Risk-Based Inspection Technology*.

Northern Gateway said that 61 failures were attributed to incorrect operations, which equates to a failure frequency of 5.607×10^{-5} failures per kilometre-year. Northern Gateway determined the final adjusted failure frequency to be 1.828×10^{-5} failures per kilometre-year.

To estimate potential spill outcomes associated with incorrect operations, Northern Gateway found that 10 of the 61 failures occurred on pipelines over 508 millimetres in diameter. None of these resulted in a pipeline rupture. As a result, it said that the probability of incurring full-bore failures related to incorrect operations was negligible.

Views of the Panel

The Panel finds that Northern Gateway's procedures and training programs address the potential failure to follow set procedures during pipeline operations. Northern Gateway's system implementation would be subject to National Energy Board compliance audits over the course of project operations.

5.12.8 EQUIPMENT FAILURE

Equipment failures encompass the failure of non-pipe components and equipment, such as pumps, seals, valves, and flanges. With the exception of block valves and other equipment along the right-of-way, these failures occur at stations. Northern Gateway's approach to estimate the frequency of occurrence for this threat used a baseline failure frequency derived from PHMSA failure statistics, modified by an adjustment factor to account for modern pipeline materials, design, and installation practices.

The failure incident data for four sub-causes related to this threat category is as follows:

- ruptured or leaking seal or pump packing (64 failures);
- component failure (45 failures);
- control or relief equipment malfunction (45 failures); and
- stripped threads (30 failures).

Northern Gateway said that the combined 184 failures over the analyzed 4-year period represent a failure frequency of 1.7×10^{-4} failures per kilometre-year. No full-bore ruptures associated with this threat were identified. Northern Gateway considers the probability of incurring full-bore ruptures on the proposed pipelines due to this threat to be negligible.

Views of the Panel

With the exception of mainline block valve sites, equipment failure incidents generally occur in stations and terminals. Northern Gateway committed to have all stations and terminals manned by trained personnel at all times and to have systems in place to contain released product within station property. The Panel is satisfied that Northern Gateway would appropriately mitigate this risk. The Panel finds that Northern Gateway's commitment to have facilities manned by trained personnel 24 hours per day is a proactive and precautionary mitigation measure to minimize spills and limit their potential effects.

5.12.9 GEOHAZARDS

A geohazard is a threat from a naturally-occurring geological, geotechnical, or hydrotechnical process or condition that may lead to damage. Northern Gateway said that, in the case of this project, damage is considered to be a loss of containment of the product in a pipeline. A geohazard may be triggered by natural or anthropogenic causes.

Northern Gateway said that geohazards were one of the primary considerations in determining the project's feasibility, as well as the proposed route and preliminary design. The project would cross six physiographic regions, including regions with mountainous terrain, geohazards, and areas known to have potential acid rock drainage. It would also involve safely constructing and operating the Kitimat Terminal in an area known to be subject to seismic activity.

Northern Gateway said that it has done a significant amount of work to identify, understand, and assess the risks associated with geohazards along the pipeline route and at the Kitimat Terminal. It said that it recognized that there is more work to be done.

In its application, Northern Gateway considered:

- deep-seated slides;
- shallow- to moderately-deep slides;
- rock falls and rock toppling;
- debris flows;
- avalanches;
- sedimentation and erosion;
- karst;
- acid rock drainage;
- seismicity;
- marine clays;
- tsunamis; and
- associated standard mitigation measures.

Northern Gateway provided preliminary geotechnical considerations and recommendations, and acknowledged that it would undertake further investigations during detailed engineering for design and construction.

Northern Gateway said that its semi-quantitative risk assessment incorporated a quantitative geohazard assessment (QGA). The quantitative geohazard assessment focused on geohazards with the potential to cause a loss of containment. The assessment extended as far from the proposed 1-kilometre-wide route corridor as was necessary to make sure that all applicable geohazards were assessed. Assessed geohazards included:

- avalanche;
- avulsion;
- debris flow;
- lateral migration;
- lateral spreading;
- slide (shallow to moderate);
- deep-seated slide;
- rockfalls; and
- scour.

For each geohazard, the quantitative geohazard assessment considered mitigation options to reduce the potential for it to occur. This included hazard-specific programs such as:

- an avalanche control program;
- surface water management;
- construction techniques or structures such as berms, rock anchors, slope grading, or rip rap;
- routing or location refinements, such as routing higher on alluvial fans; and
- avoidance by re-route.

The quantitative geohazard assessment also considered the ability of the pipeline to withstand the imposed effects of a geohazard that may cause a loss of containment. Northern Gateway said that mitigation options to reduce pipeline vulnerability to loss of containment included:

- heavy wall pipe;
- concrete-coated pipe;
- increased depth of cover;
- trenchless crossing methods;
- routing around or under a geohazard;
- deflection berms; and
- avoidance by re-route.

Northern Gateway said that it would update its geohazard assessments and mitigation options as the project evolves.

Northern Gateway committed to carry out additional geohazard assessments during detailed engineering and to acquire more LiDAR data for the pipeline route's entire length. It also committed to initiate discussions with expert groups and federal and provincial agencies for the purpose of creating an independent geohazard working group.

Northern Gateway filed an updated semi-quantitative risk assessment with Route Revision V to reflect a number of changes to the design basis and route. For example, Northern Gateway identified a major re-route in the Morice River area to move the pipelines up to 3.5 kilometres south of the Route U alignment. This reduced the number of geohazards encountered and reduced the number of spill trajectories that may directly reach the Morice River. Northern Gateway said that its commitments to increase wall thickness,

conduct additional geotechnical assessments, and increase the number of valves allowed it to reduce, by almost one-half, the risk of a full-bore rupture along the pipeline route.

Northern Gateway said that it undertook a conservative and cautious approach with respect to geohazards. It said its approach was to avoid geohazards where possible and, where they cannot be avoided, mitigate and design for the potential maximum effect of the geohazards. For example, Northern Gateway's geotechnical experts said that the proposed landslide mitigation is based on the assumption that landslides would be triggered, not that they might be triggered, allowing for the fact that weather and climate change can be variable.

During final argument, a number of parties raised concerns that Northern Gateway did not adequately assess and characterize geohazards. The Province of British Columbia was concerned that Northern Gateway's assessment of existing and potential geohazards along the pipeline route was not complete, and that further investigations were required. It said that, since not all geotechnical hazards had been identified in the completed investigations and comprehensive investigations would not be done until the detailed design phase, Northern Gateway has only a rough idea of the measures that may be used to mitigate hazards that may be encountered. The Haisla Nation was concerned that geotechnical hazards and terrain stability assessments were incomplete and that Northern Gateway had not yet acquired detailed LiDAR data. The Coalition argued that it was not clear how Northern Gateway could identify technically- and economically-feasible mitigation measures when its geohazards identification and assessment was not yet complete.

In response to the concerns raised about insufficient geohazard information, Northern Gateway said that it is doing what is right by committing to a rigorous program to manage geotechnical risk and acquire additional data, such as LiDAR data, as it proceeds.

Views of the Panel

The Panel is of the view that Northern Gateway's precautionary approach regarding geohazards is consistent with good engineering practice. The Panel finds that Northern Gateway's conservative assumption that geohazards would be triggered ensures that mitigation would be in place for all identified geohazards, or that they have been avoided by routing around areas of concern.

The Panel is satisfied that Northern Gateway recognizes that more work remains to be done with regards to understanding and predicting geohazards. This includes acquiring additional information, such as LiDAR data, and involving other experts in geohazards assessment, mitigation, and monitoring.

The Panel requires Northern Gateway to develop and file for National Energy Board approval a final Geohazard Assessment, Mitigation, and Monitoring Report. This project would benefit from input from other experts on this topic. The Panel requires that this final report include any reports from the independent geohazard working group that must be comprised of geohazard specialists from various organizations, including governments, local experts, and Northern Gateway's consultants.

5.13 Post-construction monitoring and inspections

The National Energy Board requires each regulated company to establish, implement, and maintain a management system that, among other things, applies to all company activities involving the design, construction, operation, and abandonment of a pipeline. As part of its management system, each company is required to:

- establish and implement a process for identifying and analyzing all hazards and potential hazards;
- establish and maintain an inventory of identified and potential hazards;
- establish and implement a process for evaluating and managing risks associated with identified hazards, including risks related to normal and abnormal operating conditions; and
- establish and implement a process for developing and implementing controls to prevent, manage, and mitigate identified hazards and risks, and for communicating those controls to anyone exposed to the risks.

Management system requirements apply to post-construction monitoring, including inspections and audits. From an engineering perspective, the National Energy Board has previously described monitoring as the regular observation of pipelines and facilities (e.g., through surveys, patrols, inspections, testing, and instrumentation) to verify that their operation is within defined parameters, with the goal of identifying any issues or potential concerns (e.g., pipeline integrity, geohazards, erosion, and security) that may compromise the protection of the pipelines and facilities, property, persons, and the environment.

The National Energy Board requires companies to conduct inspections on a regular basis. It also requires companies to conduct audits at a maximum interval of 3 years. These activities assess whether their pipelines are designed, constructed, operated, and abandoned in compliance with applicable parts of the *National Energy Board Act*, the *National Energy Board Onshore Pipeline Regulations*, as well as with the terms and conditions of any National Energy Board-issued certificates or orders. The objective is to ensure the protection of property and the environment, and the safety of the public and company employees.

5.13.1 INTEGRITY MANAGEMENT

Northern Gateway said that integrity management entails risk identification and assessment. The results of the integrity assessment would be used to prioritize maintenance activities or projects and the activities would be formalized in various integrity management programs. Each program would use documented policies, procedures, and practices and would confirm the operational reliability of all system components including the pipelines, pump stations, tank terminal and marine terminal piping, and tanks.

5.13.1.1 Pipeline integrity

Northern Gateway said that its pipeline integrity program's primary goal is to prevent leaks and ruptures caused by pipeline deterioration. Northern Gateway would monitor its pipelines to identify defects that may occur, so that remedial action can be taken in a planned approach that would realize the integrity management program's objectives. Northern Gateway said that, by applying risk-control measures over the pipelines' lifespan, a constant base integrity level would be maintained. Northern Gateway described three integrity management activities related to the pipeline integrity program: prevention programs, monitoring programs, and mitigation programs.

Prevention programs would include reviews of pipeline design, construction, and operations; developing construction practices and material specifications; and incorporating quality assurance or quality control measures.

Monitoring programs would monitor corrosion, cracking, and other defects that may cause pipeline deterioration. Techniques to monitor pipeline integrity and assess operational data would include:

- cathodic protection monitoring;
- in-line inspections to locate and measure the size of any defects;
- investigative excavations to assess anomalies and obtain data on coating condition and soil characteristics; and
- slope stability monitoring.

Northern Gateway said that it would have mitigation programs in place to manage risks posed by pipeline deterioration. It said that it would address anomalies not meeting fitness-for-service acceptance criteria using sleeve repairs, pipe replacements, pressure reductions, and rehabilitation or inhibitor injections.

Northern Gateway said that its slope stability monitoring program would include monitoring sensitive slopes for ground movements and assessing the potential effects of these movements on pipeline integrity. It speculated that this monitoring might include instrumentation, regular visual inspections, pipe assessments, or some combination of these. It would implement remediation or reconstruction projects, or both, to confirm the affected pipeline's ongoing integrity.

Northern Gateway said that its pipeline integrity management structure would include its risk-based integrity management program that addresses the potential for, and the consequences of, a pipeline rupture. It would establish a geohazard management program for the necessary areas identified during detailed engineering, including the Kitimat Valley. This would include collecting weather data, aerial and satellite surveillance, continuous slope stability monitoring, and periodic on-site assessments of critical areas.

Northern Gateway said that it would conduct comprehensive inspections following pipeline construction and commissioning. This includes:

- baseline inspections with high-resolution in-line inspection tools, including GEOPIG™, ultrasonic corrosion, ultrasonic cracking, and magnetic flux leakage (MFL);
- surveys of pipeline coating integrity (using "above-ground" survey techniques); and
- strict thresholds for excavation and repair of identified pipeline anomalies.

Northern Gateway said that, because the Kitimat Valley is deemed to be a high consequence area, it would perform the following inspection procedures that are over and above routine Enbridge integrity management processes:

- a GEOPIG™ during the first year of operations;
- crack detection within the first 2 years of operations;
- corrosion magnetic flux leakage (MFL) within the first 2 years of operations; and
- ultrasonic wall measurement during the first 2 years of operations.

In addition to specific plans for high consequence areas (e.g., the Kitimat Valley) that would involve numerous in-line inspection surveys within the first 2 years of operations, Northern Gateway said that it would increase the frequency of its in-line inspections across the entire pipeline system by a minimum of 50 per cent over and above its current standards.

5.13.1.2 Facilities integrity

Northern Gateway said that it would implement facility-based integrity programs that would be administered by the project's program coordinators, engineers, and regional operations personnel. Northern Gateway said that there would be an inspections program for all components of the marine facilities at the Kitimat Terminal. It would complete periodic inspections throughout each year, with extended inspections being conducted whenever the periodic inspections indicated the need. Special inspections would be performed before and after maintenance and repair work. All terminal piping would be above ground and its inspection would be included as part of regular maintenance practices. Northern Gateway would visually inspect piping to confirm there is no corrosion, leakage, or other evidence indicating that it is not in good condition.

Northern Gateway said that tanks would be subjected to regular inspection protocols at intervals specified by API standards. These inspections would assess wall thickness, coating integrity, tank base settlement, and welds. Northern Gateway would regularly monitor tank cathodic protection for its functionality. The tank design would include a leak detection system to monitor for leaks below the tanks.

Northern Gateway said that it would inspect and cycle valves in accordance with industry standards as part of regular maintenance practices. It would inspect and test safety systems on a regular basis to confirm they are in good working order. Northern Gateway would establish inspection and testing frequency in the site operating and maintenance procedures.

Northern Gateway said that it would staff all of its pump stations 24 hours per day, 7 days a week, for on-site equipment monitoring and security, rapid response, and, ultimately, to further ensure the safety of the public and protection of the environment.

Views of the Panel

Northern Gateway has committed to carry out certain inspection procedures for the Kitimat Valley area, which it indicated are over and above routine Enbridge integrity management processes. The Panel requires Northern Gateway to apply these procedures along the entire pipeline route, regardless of the rupture likelihood.

The Panel requires Northern Gateway to conduct baseline inspections and verification of dents and coating condition. The Panel is of the view that Northern Gateway's approach to post-construction monitoring is appropriate for the project.

Summary views of the Panel

The Panel notes that there is the potential of unforeseeable naturally occurring events such as landslides, earthquakes, and tsunamis, that add uncertainty and risk. The Panel finds that such risks are likely to be inherent in projects of the scope of the Enbridge Northern Gateway Project. Risk posed by these types of natural events cannot be precisely known, measured, or completely prevented. Based on the evidence, the Panel finds that Northern Gateway has taken a proactive approach in the incorporation of baseline data into its initial project design elements to mitigate risks from these types of natural events. The Panel finds the Northern Gateway's approach to further understand geohazards would be enhanced by their commitment to work with an independent geohazard working group. The Panel finds that Northern Gateway's semi-quantitative risk assessment methodology is

a proactive approach to managing potential threats to pipeline integrity at the design stage of a project. The Panel finds that Northern Gateway has taken all reasonable steps to design a project that would minimize risks of project malfunctions and accidents due to naturally occurring events.

The proposed pipelines and terminal would incorporate new, proven technology and materials that were not available in the 1970s or earlier. Since then, pipeline technologies, materials, codes, and regulations have been developed as a result of lessons learned from previous failures, and research is ongoing to find ways to improve pipeline performance. The Panel finds that Northern Gateway's valve optimization and overland spill modelling is a sound approach to minimizing consequences should failures occur. As a result of these innovations, historical industry failure statistics may not have been the most suitable basis for estimating future failure rates for this project.

Northern Gateway has taken a precautionary approach by showing a commitment to improve performance, and, in some cases, to go beyond applicable regulations, codes, and technologies. Northern Gateway's intention to implement new complementary leak detection technologies, to improve its ability to detect leaks, is an example of this. The Panel recognizes Northern Gateway's commitment to change its corporate culture to improve its pipeline integrity programs.

6 Environmental behaviour of products to be transported by the project

Many participants, including those that provided oral statements and oral evidence, expressed concerns about the behavior and fate of spilled dilbit (bitumen blended with condensate or synthetic crude oil). A primary concern was the potential for dilbit to sink when spilled into fresh or marine waters.

6.1 Weathering and dispersion of oil in aquatic environments

Northern Gateway said that oil spilled in water would behave in different ways depending on the physical and chemical characteristics of the oil and on the environmental conditions it is exposed to. The environmental, physical, and chemical processes acting upon spilled oil in a river or lake are illustrated in Figure 6.1, based on evidence submitted by Northern Gateway. Similar processes would occur in the ocean. These processes are collectively called weathering.

Northern Gateway said that none of the hydrocarbon products it was proposing to ship could be considered sinking oils, as they would initially be less dense than water, and would float. The company said that the products potentially carried on the pipeline, including dilbit, would weather like other floating oils, and could submerge or sink in some circumstances. Parties such as Haisla Nation and the Gitxaala Nation did not agree with Northern Gateway's position that dilbit would float like a typical crude oil, or that it is comparable with crude or refined oils shipped through pipelines or transported in marine tankers.

Many participants said that the diluent component of dilbit would separate, evaporate, and leave behind the heavier bitumen component. Northern Gateway said that dilbit is not a simple two-phase mixture of bitumen and condensate, but is instead a new, cohesive, blended product. The company said that, when spilled onto water, lighter hydrocarbon fractions of the entire blend would begin to evaporate. It said that, as lighter fractions evaporated, the viscosity of the weathered dilbit would increase, and evaporation of remaining lighter fractions would be progressively inhibited. Environment Canada and Natural Resources Canada agreed with that general characterization of dilbit evaporation.

Northern Gateway said that, as spilled oil weathers, it may disperse from large patches or slicks into smaller patches, or even small droplets. It said that large patches of thick oil are not likely to be submerged by waves and that smaller aggregations of oil are more susceptible to overwashing, temporary entrainment or submergence, and emulsification. Northern Gateway said that the dilbit products proposed to be shipped would not be likely to disperse significantly. It also said that dispersion potential depends on factors such as wave energy, water temperature, and the degree of oil weathering. The company said that even the most viscous oil could be dispersed over the longer term with sufficient wave energy. It said that condensate and synthetic crude oil were much more prone to evaporation and wave dispersion than diluted bitumen products.

Northern Gateway said that oil may become entrained in the water column by wave- or current-induced water turbulence in freshwater and marine environments. It said that the depth and duration of submergence depends on factors such as oil density and viscosity, wave energy, and size of the oil particles. It said that entrainment in the water column would typically be temporary, and that the oil would resurface in calm conditions.

Northern Gateway and Haisla Nation said that oil can form emulsions with water. Northern Gateway said that bitumen diluted with synthetic crude was likely to emulsify and, although unlikely to sink in marine water, could be overwashed by waves and temporarily submerged. Northern Gateway said that emulsification reduces the evaporation of lighter hydrocarbons from the oil.

Northern Gateway, Haisla Nation, and Environment Canada said that there are circumstances where oil can sink in water. Northern Gateway said that the portion of oil that could sink would depend on suspended sediment concentration, water turbulence, and the degree of oil weathering. Northern Gateway said that, while dilbit is not likely to sink due to initial weathering alone, if not recovered in a cleanup operation, dilbit weathered over a period of weeks could eventually sink.

Northern Gateway, Haisla Nation, and Environment Canada all said that oil may sink if it attaches to sediment or organic particles that sink. Northern Gateway and Environment Canada said that smaller droplets of oil are more prone to interact with suspended particulate matter.

Northern Gateway said that total suspended solids concentrations are generally low in the Confined Channel Assessment Area. It said that large aggregations of heavily-weathered dilbit or emulsions are not likely to sink as there would not be a sufficient quantity of sand or sediment, except in nearshore areas. Environment Canada recommended that additional suspended sediment and suspended particulate matter data be gathered within the project area to support further assessment of oil fate and behavior and to enhance marine spill fate and trajectory modelling. It said that this work would be appropriately conducted under the direction of a Scientific Advisory Committee.

Concerns regarding the potential behavior of dilbit spilled in water, and the potential for it to sink or submerge, were also raised by the Province of British Columbia, the Government of Canada, ForestEthics, Living Oceans Society, and Gitga'at First Nation.

Fisheries and Oceans Canada expressed uncertainty as to whether dilbit would float or sink. Environment Canada and Natural Resources Canada said that dilbit spilled in water would clearly initially float because its density is less than the density of water.

Environment Canada referred to its research indicating that the potential for oil to sink depends on many factors, such as evaporation, photo-oxidation, emulsion formation, water temperature, salinity, and oil particle size. It said that uptake of particulate matter is the most important contributor to increased density of spilled oil. It said that experience with previous spills shows that some of the oil could sink, some would float, and some would become neutrally buoyant and temporarily submerged or overwashed. It said that it did not have enough information to make quantitative predictions of dilbit behaviour, and was planning research on the topic.

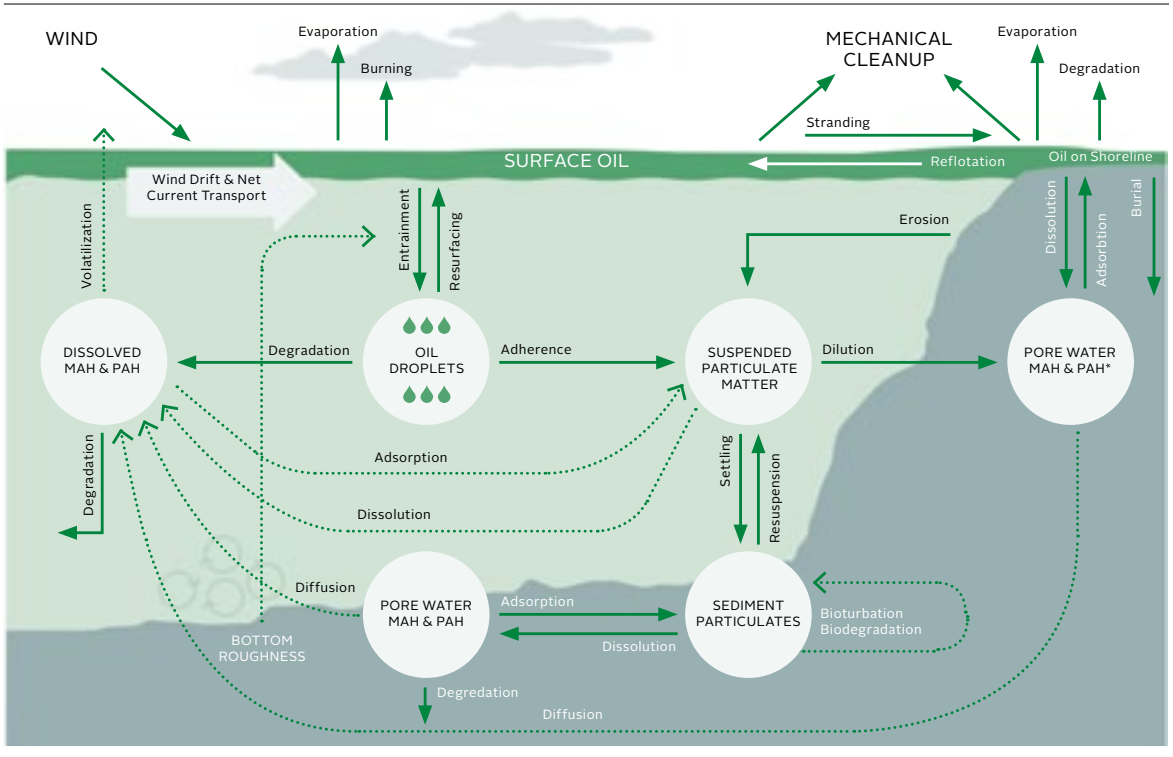
Transport Canada said that the physical characteristics of the spilled product are the most important oil behavior indicators that a spill response organization needs to know when responding to an oil spill. It said that it had not heard anything new in evidence that led it to believe that a response organization would not treat a dilbit spill as a blended crude oil product. It said that the current response regime was set up to respond to such spills.

EFFECT OF WEATHERING ON OIL DENSITY AND VISCOSITY

Northern Gateway said that spilled oil undergoes a number of changes as it weathers on the water surface, including a loss of the lighter hydrocarbon fractions with a resultant increase in density and viscosity. Northern Gateway said that, as the density and viscosity of the product increase, the evaporation of the lighter hydrocarbons decreases dramatically.

Parties said that the density of water can vary according to temperature and pressure. Northern Gateway said that the density of fresh water is approximately 1,000 kilograms per cubic metre and that of sea water is approximately 1,025 kilograms per cubic metre. Should the density of the hydrocarbon or emulsion exceed that of the water, the hydrocarbon is likely to sink. Northern Gateway said that there is a higher potential for oil to sink in fresh water than seawater due to the lower density of fresh water. The company said that the maximum initial density of any hydrocarbon to be carried on the proposed pipeline would be 940 kilograms per cubic metre, measured at 15 degrees Celsius, as this would be the maximum allowed under its proposed pipeline tariff specification.

FIGURE 6.1 **SIMULATED OIL FATES PROCESSES IN LAKES AND RIVERS**



* MAH refers to monocyclic aromatic hydrocarbons (such as benzene, toluene, ethylbenzene, and xylene – combined, BTEX) and PAH refers to the lighter polycyclic aromatic hydrocarbons. These compounds are both volatile and relatively soluble in water.

Northern Gateway said that oil density and viscosity increase as weathering progresses and that density and viscosity decrease with increasing temperature. Northern Gateway said that viscosity is one of the most important properties influencing the behaviour of spilled oil and it affects the following processes:

- spreading – viscous oils spread more slowly;
- natural and chemical dispersion – highly-viscous oils are difficult to disperse;
- emulsification tendency and stability – viscous oils form more stable emulsions;
- recovery and transfer operations – highly-viscous oils are generally harder to skim and more difficult to pump; and
- evaporation – as viscosity increases, evaporation rates tend to decrease.

Environment Canada said that viscosity is an important property influencing the behaviour of spilled oil. It recommended more research to measure the rate of density change due to evaporation as dilbit weathers. In response to questions from Northern Gateway, Environment Canada agreed that, even for the heaviest oil products, most evaporation would be expected in the first 48 hours.

LABORATORY TESTING AND MODELLING

Northern Gateway tested the physical properties and weathering behaviour of four representative hydrocarbons that may be transported by the project: synthetic crude oil, condensate, and two dilbit products (one diluted with condensate, and one diluted with synthetic crude oil). Northern Gateway said that a primary purpose of its laboratory testing was to generate input parameters for its spill modelling. The results of this work informed Northern Gateway's ecological and human health risk assessment work and oil spill fate and trajectory modelling discussed in Chapter 7.

The testing was conducted in a laboratory "bench-top" setting using recognized procedures. Changes in properties, such as evaporation rates, density, viscosity, the tendency and stability of potential emulsion formation, and oil adhesion, were measured. In turn, these results were used to predict the behaviour of the hydrocarbons in terms of characteristics such as evaporation, dispersion in the water column, emulsion water content, viscosity, and density. The behaviour was predicted for a variety of environmental scenarios, at various times after a spill. Northern Gateway conducted its testing at water temperatures of 1 degree Celsius and 15 degrees Celsius, to approximate possible seasonal water temperatures in the Confined Channel Assessment Area. Environment Canada said that evaporative weathering studies conducted by Northern Gateway for dilbit products and synthetic crude were in good agreement with its own similar studies.

Northern Gateway said that its laboratory testing weathered the oils in a wind tunnel and not on the water surface. The company said that the results of the wind tunnel testing did not account for potentially high viscosities that might be reached due to emulsion formation with water. Northern Gateway said that the wind tunnel data were then used to predict changes in density and viscosity, due to evaporative loss or weathering, by correlating the rate of evaporation of oil under the conditions in the wind tunnel to other environmental conditions of the scenarios modelled.

Northern Gateway conducted additional research using a wave tank to further assess the potential for dilbit to sink based on weathering alone. Northern Gateway said that the wave tank testing simulated more realistic environmental conditions than the laboratory bench-top testing. Wave tank testing had also been recommended by Haisla Nation. The work indicated that, although not likely to sink, oil could be temporarily submerged due to current or wave action.

Some participants expressed concern regarding Northern Gateway's measurements and conclusions for its wave tank testing. The Gitxaala Nation and Haisla Nation said that the density of the dilbit was not measured at water temperatures that may be present along the marine shipping routes. Northern Gateway said that the density of the dilbit tested would not be likely to reach the density of sea water even under colder water temperatures. It said that the increase in oil density at colder water temperatures would be offset by higher viscosity, which would reduce evaporation-based density increases. The company also said that the density of an emulsion would not exceed the density of the water in which it formed. Northern Gateway said that density, viscosity, and emulsion formation must all be examined together to consider the potential for an oil to sink.

The Gitxaala Nation filed reports indicating that heavy oils to be transported by the project may sink in the marine environment, under the right environmental conditions. This conclusion was partially based on weathering studies conducted

by Environment Canada on two bitumen products. Northern Gateway did not agree with this conclusion and said that one of the products tested would not meet the proposed tariff specifications for the oil pipeline. It said that the density of the other product following weathering was still less than that of sea water, and that the products tested were already highly weathered prior to testing. Northern Gateway also said that the methodology used by Environment Canada did not approximate environmental conditions associated with an actual spill event. Northern Gateway said that it saw no evidence in Environment Canada's studies that would lead it to the conclusion that the oil tested would sink.

One of the Gitxaala reports was critical of the evaporation rates assumed by Northern Gateway in its studies, and concluded that additional research would be required to address the behavior of dilbit spilled in the marine environment. Environment Canada said that numerous factors in addition to evaporation rates must be considered in a spill scenario, and that additional research is required to support the conclusions noted in both Northern Gateway's and the Gitxaala Nation's studies. In response to questions from the Panel, the Gitxaala Nation said that dilbit could submerge, rather than sink, depending on environmental conditions.

In response to questions from the Panel, Northern Gateway's expert said that, based on his experience, he had confidence in Northern Gateway's descriptions and models of oil behavior. He said that his research with the dilbit products indicated that they behave similarly to other heavy fuel oils that he had worked with. In terms of transferring small-scale trials to progressively larger-scale work, he said that he did not expect there to be a significant difference in oil behavior. Another expert also said that he was of the view that the oils transported by the project are a type of oil that response organizations are familiar with.

In response to questions from the United Fishermen and Allied Workers Union, Northern Gateway said that its oil spill fate and trajectory modelling, conducted as part of its pipeline ecological and human health risk assessment work, considered the potential for oil to sink based on weathering alone and after interaction with suspended particles. Depending on the circumstances modelled, sinking was predicted for both dilbit and synthetic crude. Synthetic crude was sometimes predicted to be more prone to sinking due to its lower viscosity and higher potential for entrainment and interaction with suspended sediment. Northern Gateway said that, for the oils it modelled, it would take many days for them to sink based on evaporative losses only.

ACTUAL SPILLS OF HEAVIER OILS

Northern Gateway said that dilbit is expected to behave similarly to an intermediate fuel oil or lighter heavy fuel oil, such as Bunker C, when spilled in marine waters. Haisla Nation agreed. Northern Gateway said that experience with previous spills indicated that products with a density less than or equal to water, similar to the dilbit products it tested, do not sink based on weathering alone. Rather, exposure to sand or other particulate matter is required for the products to sink. Haisla Nation said that the exact behaviour of spilled oil and associated cleanup efforts would depend on the circumstances and that every spill is different. Northern Gateway agreed.

Northern Gateway said that there have been no significant marine spills of the specific dilbit or synthetic crude oil products that may be carried by the Enbridge Northern Gateway Project. Northern Gateway said that approximately 70 cubic metres of a bitumen-based product diluted with condensate and synthetic crude oil had been spilled into Burrard Inlet in Burnaby, British Columbia, in 2007. The oil floated and was subsequently recovered by skimming and mechanical recovery techniques. Environment Canada said that sediment aggregation was not observed in this spill. In response to questions from Northern Gateway, Environment Canada agreed that dilbit would behave in a similar fashion to the product spilled into Burrard Inlet, but there could be subtle differences due to the presence of synthetic crude in the product.

Haisla Nation said that much of the oil from the Enbridge pipeline spill into Talmadge Creek and the Kalamazoo River near Marshall, Michigan, in July 2010 sank or submerged within 24 hours. Northern Gateway said that the majority of the spilled oil floated, and that 15 to 20 per cent of the oil submerged. It said that submergence was caused by increased density of the product due to evaporation of the lighter hydrocarbons, interaction with sediments, or emulsification. It said that the oil particles observed to have submerged or sunk were typically smaller particles or aggregations, ranging from 1 to 75 millimetres in size. Northern Gateway said that an underwater "slick" of oil was not observed, and that entrained oil-sediment mixtures settled in low-flow or still-water areas. Northern Gateway also said that, at the time of the spill, the river had high flow and a high concentration of suspended solids.

Fisheries and Oceans Canada, Environment Canada, and the Gitxaala Nation agreed that past spill examples of intermediate and heavy fuel oils, and research regarding these products, may provide useful information as to how products to be transported by the project might behave if spilled in the marine environment. They also said that additional research would be required regarding the behavior, fate, and environmental effects of the products to be shipped, as the actual behavior of spilled oil depends on the environmental conditions at the time and the physical and chemical characteristics of the product.

In a letter of comment, the Friends of Clayoquot Sound discussed the spill of 500 cubic metres of Bunker C oil from the Nestucca Barge in 1988 near Gray's Harbour, Washington. The Nestucca spill was also noted by Haisla Nation and the United Fishermen and Allied Workers Union. The spilled oil had a density of 986 kilograms per cubic metre and was overwashed by waves. Some was transported 175 kilometres north of the spill site and washed up on approximately 20 kilometres of shoreline on Vancouver Island 2 weeks later. Northern Gateway said that the oil had been submerged in the upper few metres of the water column.

6.2 Additional physical and chemical characterization

Northern Gateway tested the physical properties of four representative oils that may be transported by the pipeline and provided additional information on physical and chemical properties of these representative products. In response to questions from the Gitxaala Nation and Environment Canada about how representative the tested oils were, Northern Gateway said that, in terms of behavior, they were good surrogates for the types of products that would be shipped on the pipeline. Northern Gateway said that the proposed tariff specification maximum density of 940 kilograms per cubic metre would constrain variation in physical properties and behavior.

The Gitxaala Nation said that there may be significant variability in the physical and chemical properties of the products potentially carried by the project. In response to questions from Northern Gateway, Natural Resources Canada and Environment Canada confirmed that variability within hydrocarbons is typical, and that blending of oil is commonplace within the oil industry. Environment Canada said that, dilbit has not been studied as much as other oils. Natural Resources Canada said that, while it is not likely that oil behavior differs radically among similar classes of hydrocarbons, more information about dilbit behaviour would inform spill response.

Environment Canada said that dilbit chemical composition is variable and needs to be considered as an important aspect of dilbit behavior. It recommended that Northern Gateway keep spill responders, regulators, and researchers informed regarding the physical and chemical properties of products which may be transported by the project. Environment Canada said that information about chemical characteristics is needed when developing forensic models to distinguish spilled oil from background hydrocarbons, and is also relevant to toxicological properties. Northern Gateway said that it would include, in its operational spill response plans, data on the physical properties of each product to be transported by the project.

Environment Canada recommended that Northern Gateway help regulators and other researchers obtain product samples to be used in studies about the environmental fate and behavior of products that would be shipped by the project. Northern Gateway said that it was willing to assist in the acquisition of samples from producers.

In response to questions from the Kitimat Valley Naturalists and others, Northern Gateway committed to further analysis of physical and chemical properties of the products moved on its system. Northern Gateway said that it would engage other industry partners to examine a potential system to meet the recommendations of Environment Canada. In response to questions from the Panel, Northern Gateway clarified that, in the event that other industry partners were not willing to participate, it would undertake such work on its own.

6.3 Bioavailability, bioaccumulation, and toxicity

Northern Gateway and the United Fishermen and Allied Workers Union said that the most acutely-toxic components of oil are monocyclic aromatic hydrocarbons (such as benzene, toluene, ethylbenzene, and xylene – combined, BTEX) and lighter polycyclic aromatic hydrocarbons. These compounds are both volatile and relatively soluble in water.

Northern Gateway said that the dominant polycyclic aromatic hydrocarbons found in petroleum products are lighter two- and three-ringed polycyclic aromatic hydrocarbons. It said that, unlike chemicals such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons in petroleum products do not bioaccumulate up the food chain as they are metabolized and excreted in a water-soluble form by organisms such as fish and crustaceans. It said that the Canadian Council of Ministers of the Environment standards confirmed this position. The United Fishermen and Allied Workers Union noted research undertaken following the Exxon Valdez oil spill, which indicated that polycyclic aromatic hydrocarbons are generally neither bioaccumulative, nor persistent in biota.

Northern Gateway said that hydrocarbon exposure after a spill would be low-level and of short duration for many animals, including fish and crustaceans. It said that concentrations in tissues would be relatively low and would not persist. Northern Gateway said that the absence of appreciable hydrocarbon bioaccumulation was the reason it did not include top predators, such as killer whales, as receptor species in its ecological risk assessment. Northern Gateway said that, in contrast, molluscs are unable to readily metabolize aromatic hydrocarbons and may accumulate moderate amounts of hydrocarbons.

Northern Gateway said that bioavailability depends on a number of factors such as the characteristics of the chemical and its location in the environment. It said that a substance can be present in the environment, but be relatively unavailable to biota. For example, oil dispersed in the water column and tightly bound to fine particulate or organic matter may pass unabsorbed through the gut of fish and other invertebrates. Weathered oil can eventually be buried and isolated in sediments.

Northern Gateway said that the potential for acute toxicity is the result of a balance between bioavailability, toxicity once exposed, and duration of exposure. The toxicity of compounds that are relatively insoluble in water is generally limited, as they are less bioavailable to aquatic biota. Higher molecular weight polycyclic aromatic hydrocarbons may be taken up directly into fats or ingested after binding to organic particulate matter. Monocyclic aromatic hydrocarbons are the most soluble, but tend to evaporate or weather quickly and have a short period of exposure. Two-ringed polycyclic aromatic hydrocarbons are semi-soluble, and three-ringed polycyclic aromatic hydrocarbons are considered only slightly soluble.

Northern Gateway said that, following an oil spill, concentrations and mixtures of hydrocarbons in water or sediment vary over time as a result of the differential solubility of individual chemical constituents and weathering. As a result, there is no single answer to the question of how toxic a particular hydrocarbon product may be.

Northern Gateway noted the differences between toxicological effects exhibited in laboratory studies and the recovery of species and populations following spill events. It said that many studies have also demonstrated sublethal effects that may not lead to actual reduction in fitness or population level effects. Northern Gateway said that, while sublethal effects may not be fully understood, a good understanding of population-level effects has been attained.

Fisheries and Oceans Canada said that toxicity tests, such as the LC50 test, are often conducted in a closed system with direct exposure at high concentrations. It said that such tests may approximate initial exposure levels where water column concentrations are quite high. It said that, in a real spill event, spatial dilution through current and wave action would cause water concentrations to fall off over time.

The Gitxaala Nation said that weathering can produce toxic intermediate products, and that products such as bitumen are generally lower in alkanes (straight-chain hydrocarbons), which are the most readily biodegradable compounds in crude oil. It said that aromatic compounds (more complex, cyclic compounds) may degrade much more slowly, over years to decades. A Gitxaala Nation expert said that asphaltenes are another class of compounds present in bitumen products that are relatively slow to degrade. Northern Gateway said that asphaltenes are present in all petroleum products to varying degrees.

Northern Gateway analyzed polycyclic aromatic hydrocarbon concentrations within representative products that may be transported by the project. In response to questioning from Haisla Nation, Northern Gateway said that, although other hydrocarbon products with higher polycyclic aromatic hydrocarbon concentrations may also be transported, those concentrations would not be likely to change Northern Gateway's conclusions regarding potential acute and chronic effects of an oil spill. Northern Gateway said that, even if total polycyclic aromatic hydrocarbon concentrations were much higher than those modelled using the representative products, potential effects would still be in the lower end of the range of concentrations for which potential effects may occur. It said that a variety of factors must be considered when assessing acute and chronic effects. It also said that a large spill would have significant adverse effects that are generally reversible through mitigation and natural recovery.

6.4 Is more research needed?

Northern Gateway said that commercial vessels already carry substantial volumes of heavy fuel oil throughout coastal waters. It said that dilbit is currently being transported by pipeline throughout North America, and is shipped by tankers through British Columbia coastal waters. The Canadian Coast Guard and Environment Canada said that ship traffic is projected to grow, and that heavy oils are increasingly being transported by tankers around the world.

In response to questions from Douglas Channel Watch, Northern Gateway said that the issue of the potential submergence of diluted bitumen and other oils has been recognized by industry, regulators, and the public. Northern Gateway outlined a number of related research and development activities currently taking place in North America to enhance understanding of heavy oil behavior and to further develop response options. Northern Gateway committed to participate in some of these activities and noted the importance of additional information to assist in spill response planning.

Northern Gateway said that, although additional research is always helpful, it was of the view that the currently available research, including its own work, allowed a good understanding of how products potentially shipped by the project might behave in the environment.

Northern Gateway committed to participate in, and contribute funding to, a collaborative government-industry-university research effort to study the environmental behaviour and fate of diluted bitumen. Northern Gateway proposed the establishment of a Scientific Advisory Committee consisting of various technical experts to facilitate this research, as recommended by Environment Canada. The Scientific Advisory Committee would be guided by a management team and an advisory panel. Northern Gateway envisioned that the research would be a broader initiative led by a government agency such as Environment Canada, with Northern Gateway being a key participant. Northern Gateway said that its discussions with Environment Canada indicated that Environment Canada had already identified potential sources of funding for the initiative.

Living Oceans Society said that it supported future research initiatives, including laboratory studies related to dilbit spill behavior in the marine environment. It noted the need for larger-scale research in controlled outdoor facilities. In response to questions from the Panel, Northern Gateway confirmed that, in the event that a broader initiative was not established, it would undertake and fund, in consultation with Environment Canada, those elements of the initiative that would be directly applicable to the project.

Environment Canada, Fisheries and Oceans Canada, and Natural Resources Canada identified the need for additional research on the fate, behavior, and effects of heavy oil products to be transported by the project. Transport Canada said that such research would further inform spill response planning.

Environment Canada recommended that Northern Gateway consider research on environmental behavior and fate models, addressing topics such as weathering, dispersion potential, oil-particulate

interactions, submergence, and remediation options for shorelines. The results of this research would be closely linked to Environment Canada's recommendation for additional spill modelling and risk assessment studies. Environment Canada recommended that this work be guided by an expert scientific committee.

In response to questions from the Panel, Haisla Nation, and the United Fishermen and Allied Workers Union, federal government departments outlined research that they were proposing to conduct on the behaviour, fate, and transport of dilbit products in a marine environment. This research would be conducted outside of the context of the Enbridge Northern Gateway Project and would occur over several years. The departments said that the work was being undertaken because there are many proposals to transport dilbit products throughout Canada and the United States. They said that the work would contribute to spill response associated with rail, pipeline, and ship incidents. The federal research would also examine response options and consider oil behavior in varying sea states and environmental conditions. In turn, this research could inform additional toxicological studies and environmental effects research. Fisheries and Oceans Canada and Environment Canada said that research on biological and toxicity effects associated with oil spills is typically undertaken in collaboration with academia.

Different terms may be used to describe the state of oil spilled in water. The Panel used the following definitions in its consideration of the evidence:

Dispersed oil: fine droplets of oil on the water surface or suspended in the water column through wave action or other turbulence.

Emulsion: an oil and water mixture or "mousse."

Entrained oil: small globules of oil or an emulsion that has temporarily submerged due to wave action or other turbulence. The oil or emulsion may be neutrally buoyant, meaning that it is not floating, but simply submerged in the water column.

Floating oil: oil on the water surface.

Flocculation or oil-mineral aggregates: an electrostatic process in which very fine, clay-sized particles bind to very small oil particles.

Oil/suspended particulate matter, oil/sediment or oil/total suspended solids interactions, or oil bound to sediment: larger silt- and sand-sized particles, or other organic matter, that are bound to oil particles.

Overwashed oil: similar to entrained oil, but typically occurring as larger accumulations of oil referred to as pancakes or mats, where water turbulence is not energetic enough to move the oil deeper in the water column. Overwashed oil would typically remain close to the surface.

Submerged oil:* a variety of oil states that are below the water surface, such as entrained oil or overwashed oil, but is not sunken oil.

Sunken oil:* oil that has sunk to the bottom of the watercourse or to the ocean floor because it has become denser than water.

Tarballs: small, rubbery balls of oil weathered at sea.

* The Panel often heard that oil could sink. Depending on the context, the Panel understood this to refer to sunken or submerged oil.

6.5 Views of the Panel

The Panel acknowledges the variety of opinions from experts regarding the behavior and fate of oil spilled in aquatic environments. These experts generally agreed that the ultimate behavior and fate of the oil would depend on a number of factors, including the volume of oil spilled, the physical and chemical characteristics of the product, and the environmental conditions at the time.

The Panel finds that likely oil behaviour and potential response options can be predicted from knowledge of the type of oil spilled and its physical and chemical characteristics. Details of oil behaviour and response options cannot be specified until the actual circumstances of a spill are known.

The Panel is of the view that, if placed along a spectrum of: tendency to submerge; persistence; and recovery difficulty, dilbit would be on the higher end of the spectrum, similar to other heavy oil products.

The Panel accepts evidence from previous spills showing that, in response to circumstances at the time, the behaviour of heavier oils, including conventional oils and synthetic crudes, can be dynamic. Some oil floats, some sinks, and some is neutrally buoyant and subject to submergence and overwashing.

Although the project would transport different types of oil, the majority of the evidence presented during the hearing process focussed on whether dilbit is likely to sink when spilled in an aquatic environment. In light of this, the Panel has chosen to focus its views on dilbit. The Panel heard that the fate and behaviour of dilbit has not been studied as much as that of other oils.

Although there is some uncertainty regarding the behavior of dilbit spilled in water, the Panel finds that the weight of evidence indicates that dilbit is no more likely to sink to the bottom than other heavier oils with similar physical and chemical properties. The Panel finds that dilbit is unlikely to sink due to natural weathering processes alone, within the time frame in which initial, on-water response may occur, or in the absence of sediment or other particulate matter interactions. The Panel finds that a dilbit spill is not likely to sink as a continuous layer that coats the seabed or riverbed.

The Panel accepted the following facts in reaching its findings:

- The maximum initial density of the dilbit would be 940 kilograms per cubic metre, in conformance with the proposed pipeline tariff specification. When initially spilled, the density would be less than that of fresh water or salt water, making dilbit a floating oil.
- Experts agreed that dilbit is not a simple two-phase mixture of bitumen and condensate, but is instead a new, cohesive, blended product. When spilled into water, lighter hydrocarbon fractions of the entire blend would begin to evaporate. As lighter fractions evaporate, the viscosity of the weathered dilbit would increase, and evaporation of remaining lighter fractions would be progressively inhibited.
- Past examples of spills do not indicate that products similar to dilbit are likely to sink within the timeframe for response options, or in the absence of sediment or other suspended particulate matter interactions.
- Dilbit may sink when it interacts with sediment or other suspended particulate matter, or after prolonged weathering.
- Bench-top and wave tank testing indicated that dilbit is not likely to sink due to weathering alone within a short to medium timeframe. The evidence indicated that multiple factors, such as the interaction between density, viscosity, potential emulsion formation, and environmental conditions must all be examined together in considering the fate of spilled oil, including the possibility of sinking. Much of the evidence that the Panel heard did not consider these factors collectively.
- The weight of evidence indicates that, when spilled in water, dilbit with a maximum density of 940 kilograms per cubic metre would behave similarly to an intermediate fuel oil or lighter heavy fuel oil with a density less than 1,000 kilograms per cubic metre. Various experts, including those involved in spill response, said that these products provide reasonable analogs for dilbit behaviour as it relates to oil spill response.
- Transport Canada said that a response organization would be likely to treat a dilbit spill as a blended crude oil product spill.

The Panel benefitted from the Gitxaala Nation's critique of Northern Gateway's bench-top and wave tank testing, which concluded, in part, that Northern Gateway's work "came closer than anybody else to mimicking environmental conditions" and stressed that more work needs to be undertaken under a wider range of environmental conditions. This critique did not appear to fully consider interactions between density and viscosity of the oil. The Panel also notes that the Gitxaala Nation's expert did not have access to the methodology used in the Environment Canada studies on which the critique was partly based. Such access could have further informed the critique. Environment Canada's experts did not conclude that dilbit is likely to sink in the marine environment.

If dilbit sinks due to weathering over the longer-term, or due to interactions with sediment or suspended particulate matter, the evidence indicates that such sinking would likely be patchy in distribution and not likely to result in widespread, thick mats of fresh, sunken oil on the bottom of the watercourse or ocean. In the marine environment, sinking is most likely in nearshore areas or as smaller particles of oil in deeper waters. Except in certain nearshore areas, suspended sediment concentrations throughout most of the Confined Channel Assessment Area and Open Water Area are not likely to be high enough to cause sinking of larger aggregations of oil or oil emulsions. In rivers and lakes, sinking of oil-sediment mixtures would be most likely in areas of low turbulence or slow current.

Although the evidence does not indicate that dilbit is prone to sink in the marine environment, it clearly indicates that dilbit would be subject to emulsion formation and temporary submergence. This would cause challenges in tracking and recovering spilled dilbit. All parties, including Northern Gateway, acknowledged this point. In response to questions from the Panel, the Gitxaala Nation's expert clarified that his work could be interpreted as indicating that dilbit may not necessarily sink, but that it could submerge. The Panel notes that other heavier conventional and synthetic crudes carried by the project may also be prone to submergence, depending on environmental circumstances.

The Panel finds that Enbridge's spill of dilbit into the Kalamazoo River near Marshall, Michigan, provides a case study of the behavior of dilbit in the freshwater environment. The Panel finds that the evidence presented on the Marshall, Michigan, spill demonstrates that dilbit can sink in some circumstances. The relatively small proportion of the spill that sank to the bottom of the river presented significant cleanup challenges. The Panel understands that cleanup is ongoing to this day.

The Panel acknowledges that dilbit may be prone to stranding on the shoreline in both freshwater and marine environments. This could occur on shorelines closer to the spill within a relatively short time frame or as a result of temporarily submerged oil being transported and washing up on the shoreline elsewhere. Oil spill response is discussed in Chapter 7.

The Panel considered how representative the products tested by Northern Gateway were of the products potentially transported by the project. Northern Gateway provided data on physical and chemical properties of representative examples of condensate, synthetic crude, and dilbit. These data represented a range of properties, all of which would meet the proposed tariff specifications.

The Panel finds that Northern Gateway has provided it with sufficient information to assess the general behavior and potential environmental effects of the types of products to be transported by the project. The information provided by Northern Gateway was also sufficient to inform the Panel's assessment of spill response planning.

The Panel accepts Northern Gateway's commitment to provide additional data on physical and chemical properties of products that would be shipped on the project to support detailed spill response planning and modelling. The data may also facilitate research conducted outside of the context of this project.

The Panel accepts the expert evidence that toxic components of the products likely to be shipped on the project generally do not bioaccumulate in the food chain in most species. Hydrocarbons are prone to natural biodegradation processes. This assists in the natural recovery of the environment.

The Panel finds that toxic effects from a major spill would be significant in the short term, and that longer-term chronic effects could also occur. The duration of chronic effects would depend on the volume and type of oil spilled; its persistence in the environment; species affected; and the extent of natural dispersion by wind, waves, and currents. Acute effects are likely in the event of a spill of any hydrocarbon. Chronic effects are more likely to be associated with spills of heavier hydrocarbons, such as dilbit.

The Panel recognizes the scientific uncertainty associated with sublethal, secondary, and synergistic effects. There is ongoing research and debate as to the extent to which these effects result in measurable effects on the environment. The Panel is not persuaded that the presence of residual hydrocarbons necessarily results in a measurable effect at the species or population level. Food safety would be protected through guidelines and standards for allowable residual hydrocarbon concentrations in seafood.

In the Panel's view, the weight of evidence indicates that disagreement among experts on the fate and behaviour of spilled oil is related to specific details that may not be significant from a spill response perspective. Additional research is required to answer outstanding questions related to the detailed behaviour and fate of dilbit. All parties with technical expertise on the topic were in agreement with this.

The Panel finds that research on the behaviour and cleanup of heavy oils is required to inform detailed spill response planning and heavy oil spill response in marine and freshwater environments. Northern Gateway has committed to be responsible for this research.

7 Emergency prevention, preparedness, and response

An applicant must demonstrate that it is able to build and operate safely, and protect people, the environment, and species living within the project area. Almost all participants in the Panel's process expressed concern about the potential for spills from pipelines, the Kitimat Terminal, and tankers associated with the Enbridge Northern Gateway Project. This chapter examines Northern Gateway's ability to anticipate, prevent, and respond to project malfunctions and accidents.

Northern Gateway said that, although an oil spill could affect a variety of habitats, the most critical effects would be expected to be to aquatic environments. The Panel notes that much of the evidence focused on potential spill effects and emergency preparedness and response planning in these environments.

The Panel has considered four key elements of Northern Gateway's emergency preparedness and response planning and capacity:

- Risk – what is the chance that a malfunction or accident could happen and, if it did, what would the potential negative effects be?
- Prevention – what measures, tools, plans, and processes are in place to prevent malfunctions and accidents from happening?
- Response – in the event that a malfunction or accident does happen, what would the response be and how would it help?
- Financial responsibility – how are people affected by malfunctions or accidents compensated for their losses, and who pays?

Under its Terms of Reference and the *Canadian Environmental Assessment Act, 2012*, the Panel's environmental assessment must take into account environmental effects of project malfunctions or accidents that may occur in connection with the Enbridge Northern Gateway Project. The spatial scope of the Panel's assessment was the pipeline, the Kitimat Terminal, and the marine shipping component of the project out to Canada's territorial sea boundary (also commonly referred to as the 12-mile limit). The National Energy Board does not regulate marine shipping. It is primarily under the jurisdiction of Transport Canada.

7.1 Regulatory framework for safety and environmental protection

This section provides a brief overview of the regulatory framework that would apply to the project and discusses the roles and responsibilities of the various regulatory bodies.

7.1.1 *NATIONAL ENERGY BOARD ACT*

Northern Gateway said that the project would be designed, constructed, and operated in accordance with the *Onshore Pipeline Regulations* under the *National Energy Board Act.*

Based on publically available information, the Panel provides the following summary of the National Energy Board's regulatory framework related to emergency prevention, preparedness, and response.

The *Onshore Pipeline Regulations* require companies regulated by the National Energy Board to use management systems to achieve safety, environmental protection, and other regulatory requirements. Management systems must be in place for the key program areas contained in the *Onshore Pipeline Regulations*, including:

- Integrity;
- Safety;
- Security;
- Environmental Protection; and
- Emergency Management.

A pipeline company is required to have a systematic, comprehensive, and proactive risk management approach integrated into its overall management system throughout the lifespan of a pipeline system. This includes design, construction, operation, maintenance, and abandonment. The *Onshore Pipeline Regulations* also reflect the National Energy Board's expectation for continual improvement with regard to safety, security, environmental protection, and the promotion of a safety culture.

Northern Gateway would be audited and evaluated against the legal requirements identified in the *National Energy Board Act* and its associated regulations, other relevant legislation and regulations, and any commitments made by Northern Gateway or conditions contained within the applicable project certificates or orders.

With respect to emergency management, a company must develop and implement an Emergency Preparedness and Response Program for all aspects of its facilities, including pipelines, loading facilities, tank farms, and operational activities. A company's Emergency Preparedness and Response Program should include the following elements:

- Emergency Preparedness and Response Program development (hazard assessment) which ensures that all persons and parties that may be involved in responding to an emergency are knowledgeable of company facilities, the hazardous products involved, and emergency procedures to be followed in the event of an incident or emergency;
- emergency Procedures Manual which is regularly reviewed and updated, with the current version filed with the National Energy Board;
- liaison Program with first responders which establishes and maintains liaison with all parties that may be involved in an emergency situation;
- continuing Education Program for all appropriate agencies, organizations and the public adjacent to its pipeline to inform them of the location of the facilities, potential emergency situations, and emergency procedures to be followed;
- emergency response training;
- emergency response exercises;
- incident and response evaluation; and
- emergency response equipment.

The National Energy Board undertakes compliance verification activities and references a number of industry wide standards in addition to the emergency preparedness and response program elements described in the *Onshore Pipeline Regulations.*

Compliance verification activities are designed to provide feedback to the company, to determine if regulations are being followed, to assess if enforcement is required, and to compile information on the company's performance. Compliance information is used to track company performance trends and to assess the amount of oversight required in the future.

A company must also consider how to prevent and respond to emergency situations resulting from criminal activities. These may be related to terrorism, vandalism, or other property crime. These should be identified through a formal hazard analyses and security audits.

The Emergency Preparedness and Response Program must include procedures for receiving and disseminating information to first responders, adjacent commercial, industrial, or pipeline operations, product receivers and members of the public who may be involved in responding to an emergency or may be impacted by an actual or threatened act of terrorism or other criminal activity.

Parties filed, or referred to, the Office of the Auditor General of Canada's 2011 report on transportation of dangerous products which evaluated the National Energy Board's emergency management program. The report said that the Board had designed a sound risk-informed approach to monitor regulated companies' adherence to regulations and Board expectations. It recommended that the National Energy Board establish and implement a clear action plan that sets out specific steps to improve the Board's risk-informed model, including practices and procedures for monitoring compliance, documenting compliance, and procedures for follow-up on non-compliances. The action plan was fully implemented by the National Energy Board by April 2012.

7.1.2 MARINE SHIPPING REGULATORY FRAMEWORK

Transport Canada provided an overview of the regulatory environment pertaining to marine shipping activities in Canada. A summary of relevant legislation, guidelines, and policies pertaining to shipping and navigational safety and oil spill preparedness and response is provided below. The summary is based on Transport Canada's response and other evidence from the Government of Canada.

MARINE NAVIGATION AND SAFETY REGIME

Transport Canada said that the federal government has exclusive legislative jurisdiction over navigation and shipping, coastal fisheries, and aids to navigation such as beacons, buoys, and lighthouses. Transport Canada said that it has a comprehensive legislative and regulatory framework that helps ensure marine transportation is safe, secure, and environmentally responsible. Other federal departments, including Fisheries and Oceans Canada and Environment Canada, also have key roles regarding marine shipping activities and protection of the marine environment.

CANADA SHIPPING ACT, 2001

Marine shipping in Canadian waters is regulated in accordance with the principle that, as long as ships are in compliance with the law, they have the right to navigate within Canadian waters. The *Canada Shipping Act, 2001* is the main legislation governing safety in marine transportation and protection of the marine environment. It aims to balance shipping safety and marine environmental protection while encouraging maritime commerce, and is applicable to all vessels operating in Canadian waters and Canadian vessels worldwide. No special permission or authority is required to transport goods in vessels that comply with the *Canada Shipping Act, 2001*.

In addition to national requirements, the *Canada Shipping Act, 2001* and its regulations give effect to many international conventions which are enforced on Canadian vessels and on foreign vessels in Canadian waters. Transport Canada said that international organizations such as the International Maritime Organization and the International Labour Organization play a central role in establishing the highest possible maritime standards for safety and security, protection of the environment, and safety of seafarers. Canada works closely with these organizations in adopting these international standards into its marine safety regulations.

The International Maritime Organization is a specialized agency of the United Nations which focuses on the improvement of safety at sea and the prevention of pollution from ships. The International Maritime Organization also deals with international aspects of liability, compensation, and the facilitation of maritime traffic. International Maritime Organization member countries develop and promote the adoption of conventions, protocols, codes, and recommendations, to achieve their common objectives. Canada has ratified

or acceded to several International Maritime Organization Conventions. Transport Canada said that this enables Canada to fully enforce safety and environmental standards in accordance with the *Canada Shipping Act, 2001*.

Some examples of marine safety and pollution prevention measures under the *Canada Shipping Act, 2001* and its regulations include:

- establishment of vessel traffic services zones and mandatory vessel reporting to monitor vessel movement;
- traffic separation schemes and routing measures, where warranted;
- ship design and construction requirements including double hull requirements for tankers;
- crew qualification and training; and
- implementation of an international safety management code.

Transport Canada monitors compliance with the *Canada Shipping Act, 2001* and enforces its requirements. Transport Canada has two main programs for monitoring compliance: Flag State Control and Port State Control. Flag State Control ensures that Canadian-flagged vessels are inspected to both Canadian regulations and, for vessels on international voyages, the appropriate international memoranda, conventions and protocols that are integrated into Canadian regulations. Port State Control is a ship inspection program whereby foreign vessels entering Canada's waters are boarded and inspected to ensure compliance with various major international maritime conventions.

The International Maritime Organization and the International Labour Organization provide the regulatory framework for the Port State Control program. Canada works together with the global Port State Control community to verify that foreign vessels entering Canada are in compliance with strict international safety and anti-pollution standards. Ships that are found to be in serious violation of standards are detained in port until their deficiencies have been rectified. The objective of Port State Control is to detect and inspect sub-standard ships and to help eliminate the threat that they pose to life, property, and the marine environment. All foreign tankers are inspected on their first visit to Canada and once a year thereafter.

PILOTAGE ACT

The purpose of the *Pilotage Act* is to allow a mariner with extensive knowledge of a local waterway and its ports to board a ship and guide it safely to its destination. The Pacific Pilotage Authority, a federal Crown corporation, operates pilotage service on the west coast. In reference to the Enbridge Northern Gateway Project, Transport Canada said that local pilots would board tankers at established pilot boarding stations, either by helicopter or pilot boats, depending on visibility and weather conditions. A minimum of two pilots would board the tankers for transit to and from the Kitimat Terminal and through coastal waters. The use of local marine pilots for transit to and from the Kitimat Terminal, as proposed by Northern Gateway, meets the requirements set out in the *Pacific Pilotage Authority Regulations*.

Navigation safety and the Waterways Management Program

There are several regulations under the *Canada Shipping Act, 2001* that help vessels navigate safely in Canadian waters. Vessels must have the appropriate navigation equipment, follow navigational rules and procedures, and have effective means of communications. Vessels must also have up-to-date nautical charts and, for each voyage, a passage plan that takes into account relevant information for safe navigation and protection of the environment, and allows the progress of the vessel to be closely monitored. There are vessel reporting requirements and vessel routing measures that also help ensure safe navigation.

Navigability in Canadian waterways is highly influenced by water levels and the bottom condition of shipping channels. The Waterways Management Program is intended to support safe, economical, and efficient movement of ships in Canadian waterways. The Canadian Coast Guard said that the physical characteristics of the proposed shipping routes for the Enbridge Northern Gateway Project fall within the Channel Design Guidelines of the Waterways Management Program.

Vessel reporting and vessel routing measures

Regulations have established vessel traffic services (VTS) zones along Canada's east and west coasts out to the limit of the territorial sea. Shipping in these zones is monitored by the Canadian Coast Guard – Marine Communications and Traffic Services (MCTS). Ships must report to an MCTS officer 24 hours before entering the VTS Zone and report prescribed information about the ship

and its intended route, including any pollutant cargoes and defects. Vessels are not allowed to enter a VTS Zone unless they receive clearance from an MCTS officer. This allows any safety or environmental concerns to be addressed before the ship enters Canadian waters. Ships within the VTS Zone must also make regular reports at specified calling-in-points. Monitoring of ship traffic within a VTS Zone allows MCTS officers to provide information services that help on-board navigational decision-making.

Vessels approaching the west coast bound for the ports of Prince Rupert and Kitimat enter the Prince Rupert Traffic Zone. In response to a question from Ms. Brown, the Government of Canada said that, even in weak coverage areas, there is an update on a vessel's movements every minute. The Canadian Coast Guard said that the Enbridge Northern Gateway Project does not involve a significant workload increase for MCTS.

Ships of 300 tons gross tonnage or more (other than fishing vessels) engaged on an international voyage, and domestic ships of 500 tons gross tonnage or more (other than fishing vessels) must be fitted with an Automatic Identification System (AIS). AIS automatically provides information including the ship's identity, type, position, course, speed, navigational status, and other safety-related information, to AIS-equipped shore stations, other vessels, and aircraft. Ships can automatically receive AIS data from similarly fitted vessels. This improves a ship's situational awareness and the ability of shore VTS, if equipped to receive AIS, to monitor marine traffic. All five MCTS centres on the west coast are equipped with AIS.

Places of vessel refuge

Canada has a National and Regional Places of Refuge Contingency Plan that applies to all situations where a vessel needs assistance and requests a place of refuge within waters under Canadian jurisdiction. The Places of Refuge Contingency Plan is based on International Maritime Organization guidelines. When a vessel requests assistance through the MCTS, regional officers would invoke the plan and work with all appropriate partners to resolve the issue as quickly and effectively as possible. Places of refuge are not pre-designated and would depend on the circumstances of each situation. Northern Gateway has identified potential places of refuge within the Confined Channel Assessment Area.

In response to questions from the Coastal First Nations, Transport Canada said that there are no pre-designated places of refuge in the Pacific Region. The most suitable place of refuge can only be determined after the details of the specific incident are known. It also said that pre-designation of places of refuge is of little value due to the different circumstances associated with each incident.

Aids to navigation

The Canadian Coast Guard's Aids to Navigation Program provides an extensive system of short-range and long-range aids to navigation throughout coastal communities and inland waterways in the Pacific Region. Aids to navigation may include:

- visual aids such as lights, buoys, and beacons;
- sound producing aids such as whistles, horns, and bells;
- radar aids; and
- global positioning systems.

The Program provides aids to navigation where justified by the volume of traffic and the degree of risk, in accordance with its design methodology and provision directives. Aids to navigation are provided to help mariners navigate safely and do not replace prudent navigation practices or the use of onboard navigational equipment such as the latest charts, Global Positioning System (GPS) technology, and radar.

Canadian Coast Guard's Aids to Navigation Program is also responsible for providing detailed information on the operation of, and changes to specific aids. This information is communicated to mariners through Notice to Shipping MCTS broadcasts and Notice to Mariner publications and Internet postings. Canadian Hydrographic Services also receives this information for inclusion onto nautical charts.

The Canadian Coast Guard said that it is committed to completing a thorough review of the aids to navigation system with regard to the Enbridge Northern Gateway Project. The installation of new aids to service Kitimat is estimated to cost in the order of $2.5 – 3.0 million, not including maintenance costs. Northern Gateway said that it is has had discussions with Canadian Coast Guard as to how future additions to aids to navigation, including provision of shore based radar coverage, may be paid for, constructed, and maintained.

In response to questions from the Province of British Columbia and the Coalition, Northern Gateway said that the Canadian Hydrographic Service was scheduled to complete its chart update program by 2013. It also said that the Government of Canada was proposing

improvements to navigational aids. Northern Gateway also committed to funding the installation of new radar and navigational aids in the event that the Canadian Coast Guard or Transport Canada does not fund them prior to operation of the project. Any such navigational aids would still be subject to approval by the Canadian Coast Guard.

Safety management systems

The *Safety Management Regulations* under the *Canada Shipping Act, 2001* incorporate the requirements of the International Safety Management Code, which provides an international standard for safely managing and operating vessels and for preventing pollution. Safety management systems are formal management systems that strengthen safety awareness and pollution prevention practices. Safety management systems integrate formal rules and processes to enhance safety of daily operations and seek to identify and manage any risks before they cause accidents.

Transport Canada said that safety management systems allow vessel owners and operators to have a safety system that prepares them for the realities of day-to-day work and that meets safety management regulatory requirements. The requirement for a safety management system is an independent safety requirement and it does not replace safety requirements under other regulations. The Minister of Transport has authorized five Responsible Organizations to perform Safety Management System certification of Canadian vessels and the companies that operate them. Companies operating Canadian vessels are legally required to comply with the regulations. Transport Canada monitors and oversees the audit and certification process for the International Safety Management Code as part of its responsibilities under international shipping treaties. Foreign vessels are inspected through the Port State Control Program.

TERMPOL Review Process

Transport Canada said that the TERMPOL Review Process (Technical Review Process of Marine Terminal Systems and Transhipment Sites) is a voluntary review process for proponents involved in building and operating a marine terminal system for bulk handling of oil, chemicals, and liquefied gases. The TERMPOL Review Committee includes representatives of federal departments and authorities, including specialized subject matter experts in marine transportation. The process and committee are led by Transport Canada. The committee reviews a series of technical reports and studies prepared by the proponent according to terms of reference established by the committee. After reviewing the studies, the committee may request additional information or it may make recommendations related to the proposal. The work undertaken may also be used by other agencies or bodies when considering their own regulatory obligations and making recommendations.

Northern Gateway participated in a TERMPOL Review that was conducted concurrently with the Panel's process. Northern Gateway filed its TERMPOL technical documents with the Panel. Transport Canada filed the TERMPOL Review Committee's final report with the Panel. The report focused on navigation and safety of proposed tanker traffic to and from the Kitimat Terminal, including berthing and mooring procedures and cargo transfer operations at the terminal.

Northern Gateway said that the TERMPOL Review complements the Panel's process by providing a forum for a detailed expert review of navigational issues, vessel operations, and accident hazards. The construction and operation of the marine terminal would be under the jurisdiction of the National Energy Board and were not reviewed by the TERMPOL Committee.

The TERMPOL Review Committee made a number of findings and recommendations in its report. Northern Gateway provided comments on the findings and recommendations of the committee. Northern Gateway said that it was committed to fully implementing the risk mitigation measures that it had submitted to the TERMPOL Review Committee.

Transport Canada noted that a TERMPOL report is not a regulatory instrument and the findings and recommendations are not binding on any department, agency, group or individual or the proponent. Implementation of any recommendation by the proponent is optional. To clarify this point, the Panel asked Northern Gateway and Transport Canada whether the TERMPOL Review Committee's recommendations, and other voluntary commitments made by Northern Gateway that exceed regulatory requirements, were enforceable under any existing marine shipping legislation. Their answers indicated that the recommendations and commitments are not directly tied to any legislative tool and, to be enforceable, would need to be tied to a certificate issued under the *National Energy Board Act.* The issue of the enforceability and legislative backing for Northern Gateway's marine voluntary commitments was also raised by other parties including the Haisla Nation.

MARINE OIL SPILL PREPAREDNESS AND RESPONSE REGIME

Transport Canada said that it is the lead federal regulatory agency responsible for the National Marine Oil Spill Preparedness and Response Regime. As the lead regulatory agency, Transport Canada:

- provides regime management and oversight;
- develops, applies, and enforces relevant regulations;
- monitors marine activity levels, and makes adjustments to the regime, as required
- monitors and prevents marine oil spills through the National Aerial Surveillance Program;
- sets up Regional and National Advisory Councils; and
- provides post-spill reporting for the purposes of improving the regime.

Transport Canada said that Canada's oil spill response regime is based on the principle of cascading resources. It said that, in the event of a spill larger than 10,000 tonnes (approximately 11,200 cubic metres), the company's capabilities can be supplemented by resources of the Canadian Coast Guard, by resources from other regions, or internationally though the International Convention on Oil Pollution Preparedness, Response and Cooperation.

Transport Canada said that most of Canada's spill response capability is provided by industry response organizations, certified by Transport Canada, that provide response services for their member stakeholders. These services include operational spill response, spill management, government and stakeholder liaison, and access to technical advisors. It said that these response organizations must demonstrate the ability to respond to marine oil spills of up to 10,000 tonnes within prescribed time standards and operating environments. It said that response organizations are certified every 3 years by Transport Canada. Vessels such as those proposed for use by Northern Gateway must have an arrangement with a response organization to provide marine oil spill response services when requested by a member, the Coast Guard, or a lead government agency.

The Panel received a letter of comment from the Western Canada Marine Response Corporation, currently the only certified response organization on the west coast of Canada. The letter outlined the Western Canada Marine Response Corporation's role, responsibilities, response capability, and state of readiness, including its access to external resources through mutual aid agreements and its Fishers Oil Spill Emergency Team, and its training program which is monitored by Transport Canada.

Transport Canada said that the oil spill response regime in Canada is based on the polluter-pay principle. It said that, for a spill from a ship, the ship owner is the responsible party and is liable for reasonable costs as outlined in the *Marine Liability Act*. It said that responsible parties generally take responsibility for a marine spill and identify one person to act as the Incident Commander to lead the response to the incident. If the responsible party is unknown, unwilling, or unable to respond, the Canadian Coast Guard would take over and direct the response, working with the response organization.

Transport Canada said that other agencies can also be involved in marine spill response and planning. It said that the Canadian Coast Guard acts as the Federal Monitoring Officer and Lead Agency for all ship-source marine spills, in addition to maintaining its own spill response preparedness capacity. The Province of British Columbia can also have a role in marine spill response if a spill threatens or impacts shorelines or wildlife.

Environment Canada's main responsibility related to ship-source oil spill response is to support the Canadian Coast Guard by providing advice through the Regional Environmental Emergencies Team. The Regional Environmental Emergencies Team is a multi-agency, multi-disciplinary group that provides consolidated and coordinated environmental advice, information, and assistance in the event of an environmental emergency. Federal, provincial, and municipal government departments, Aboriginal communities, private sector agencies, and local individuals are represented. Environment Canada and the British Columbia Ministry of the Environment co-chair the Regional Environmental Emergencies Team program in British Columbia.

Oil pollution prevention and emergency plans

Transport Canada said that, in addition to the requirements for an arrangement with a response organization, the *Canada Shipping Act, 2001* and associated regulations require vessels, such as those proposed for the project, to have a Shipboard Oil Pollution Emergency Plan. These ship-specific plans help shipboard personnel deal with unexpected discharges of oil. Transport Canada said that their main purpose is to set in motion the necessary actions in a structured,

logical, and timely manner to stop or minimize the discharge and to reduce its effects.

Transport Canada said that the operator of an oil handling facility, such as that proposed by Northern Gateway, must also have an Oil Pollution Prevention Plan and an Oil Pollution Emergency Plan in place. It said that equipment and resources must be available on-site to immediately contain and control an oil spill incident at the facility. It said that the company must also have an arrangement with a response organization.

Several parties, including Ms. Brown, Mr. Cullen, Ms. Wier, Living Oceans Society, Mr. Donaldson, Gitxaala Nation, and the Government of Canada, filed or referred to two reports from the Office of the Auditor General of Canada which have relevance to the marine shipping component of the project. The 2010 and 2011 reports discussed oil spills from ships, and transportation of dangerous products, respectively.

The Canadian Coast Guard and Transport Canada said that the federal Interdepartmental Marine Pollution Committee, co-chaired by the Canadian Coast Guard and Transport Canada, was formed in 2010. The Committee is addressing issues raised in the Office of the Auditor General's audit on oil spills from ships. The Committee has developed an integrated Management Action Plan to address recommendations and has initiated a process to report on progress.

In response to questions from Coastal First Nations, the Haisla Nation, Coalition, and the Panel, Transport Canada said that, in response to the recommendations of the Office of the Auditor General's 2010 report, it was developing a Canada-wide process to assess risks of oil spills from ships. Transport Canada had completed the scoping stage of the project and had consulted with its federal partners. A risk assessment of ship-source oil spills would then be coordinated interdepartmentally. This would include risk identification, risk analysis, and risk evaluation. The projected completion date for the work is the end of 2013. Transport Canada said that a related component of the risk assessment was the creation of a Tanker Safety Expert Panel by the Government of Canada. Transport Canada said that it had reviewed and updated its Environmental Prevention and Response National Preparedness Plan in November 2011 in response to the Office of the Auditor General's report.

In response to questions from Ms. Brown and the Coastal First Nations, Transport Canada said that the Government's Economic Action Plan 2012 provides funding for a variety of ship safety and spill response measures including enhancing the existing tanker inspection regime, legislative changes, updating navigational products, creation of the Tanker Safety Expert Panel, and research on marine pollution risks.

REGULATORY IMPROVEMENT AND REDUCTION IN THE NUMBER AND VOLUME OF OIL SPILLS FROM TANKERS

Northern Gateway said that, on a worldwide basis, all data sets show a steady reduction in the number and size of oil spills since the 1970s. This decline has been even more apparent since regulatory changes in 1990 following the Exxon Valdez oil spill, which required a phase-in of double-hulled tankers in the international fleet. No double-hulled tanker has sunk since 1990. There have been five incidents of double-hulled tankers that have had a collision or grounding that penetrated the cargo tanks. Resulting spills ranged from 700 to 2500 tonnes. Northern Gateway said that there have been no significant spills resulting from structural failure of a double-hulled tanker. In response to questions from the Gitxaala Nation, Northern Gateway said that every large spill dating from 1970 has been from a single hull tanker.

Northern Gateway said that the regulatory environment and the tanker industry are subject to continuous improvement in the areas of vessel construction and operation. Examples include:

- a requirement for double hulls, including double hull protection for cargo and bunker fuel tanks;
- changes in the liability and compensation regime;
- vessel design changes to facilitate inspections of cargo tanks;
- vessel design changes to ensure stability of the vessel;
- a common set of structural design rules for use by classification societies;
- a requirement for coating of ballast tanks;
- increased inspection frequencies;
- design changes to limit oil outflow in the event of collision or grounding;
- a requirement for coating the top and bottom of cargo tanks;
- regulations pertaining to safety and performance of the crew;

- a requirement for use of the Automatic Identification System;
- changes to standards used in the vetting of vessels; and
- a requirement for a tanker's rudder to return to a neutral position in the event of failure.

In light of these changes and potential future improvements, Northern Gateway said that it is likely that the number of spills will continue to decline in the future.

The Haisla Nation said that, although there have been no major spills since the Exxon Valdez spill in Prince William Sound, there were 111 reported incidents involving tanker traffic in Prince William Sound between 1997 and 2007. The three most common types of incidents were equipment malfunctions, problems with propulsion, steering, or engine function, and very small spills from tankers at berth at the marine terminal. The Haisla Nation said that, in the absence of state-of-the-art prevention systems in Prince William Sound, any one of those incidents could have resulted in major vessel casualties or oil spills.

GOVERNMENT OF CANADA REGULATORY IMPROVEMENT INITIATIVES

The Government of Canada and Northern Gateway said that the Government of Canada had recently announced regulatory improvement initiatives in areas related to:

- tanker inspections;
- the National Aerial Surveillance Program;
- pilotage programs;
- tug escort requirements
- marine safety inspections and enforcement
- designation of Kitimat as a public port for marine traffic control measures;
- aids to navigation and navigational charts;
- marine oil spill preparedness and response; and
- research on the behavior of dilbit spilled in the marine environment.

7.1.3 FINANCIAL RESPONSIBILITY AND COMPENSATION FOR TANKER INCIDENTS

Northern Gateway and Transport Canada summarized the marine spills liability and compensation regime in Canada. This regime is governed under the *Marine Liability Act* and associated regulations. The *Marine Liability Act,* amended in 2009, is administered by Transport Canada. Based on the polluter-pays principle, the *Marine Liability Act* is the principal legislation dealing with the liability of ship owners and vessel operators in relation to passengers, cargo, pollution, and property damage. Transport Canada said that the *Marine Liability Act* establishes uniform rules on liability and compensation by balancing the interests of ship owners and other parties involved in maritime accidents. There are various regimes available to pay for cleanup and compensation costs, such as ship owners' insurance and domestic and international funds. A single oil pollution incident may draw compensation from multiple regimes. Between ship owner insurance and other federal legislation and international agreements, there is approximately $1.35 billion worth of coverage. Transport Canada said that this is one of the largest amounts of compensation available in the world.

Table 7.1 is based on Transport Canada's written evidence.

SHIP OWNER INSURANCE AND STRICT LIABILITY

Transport Canada said that the liability of tankers carrying persistent oils is governed by the *International Convention on Civil Liability for Oil Pollution Damage, 1992*. This Convention imposes strict liability on the ship owner for oil pollution from its ship, subject to a limited number of defenses. In exchange, ship owners are entitled to limit their liability to a maximum amount linked to the tonnage of the vessel. To ensure that victims are protected, the Convention requires that ship owners carry insurance to cover the full amount of their liability.

Transport Canada said that the maximum liability of a ship owner or its insurers in respect of an oil spill from a tanker is approximately $145 million. Northern Gateway said that, if the spill is attributable to the ship owner's gross negligence, or if the ship owner was reckless and had knowledge that the damage which occurred would probably result, this limitation of liability does not apply and the ship owner's liability would be unlimited. In the case of a condensate spill from a tanker, there is no liability cap.

INTERNATIONAL OIL POLLUTION COMPENSATION FUNDS

Transport Canada said that the International Oil Pollution Compensation Funds is an international organization of which Canada has been a member since 1989. This organization manages two compensation funds (1992 Fund

TABLE 7.1 **FINANCIAL RESPONSIBILITY AND COMPENSATION AVAILABLE FOR TANKER INCIDENTS**

Persistent Oil Spill **(crude oil, fuel oil, etc. carried in tankers, e.g., dilbit)**	**Bunker Oil Spill** **(fuel used to propel or operate non-tankers, e.g., escort tugs)**	**Non-Persistent Oil Spill** **(refined or volatile oil or hydrocarbon, e.g., condensate)**
Shipowner strictly liable under the 1992 Civil Liability Convention Compulsory insurance certified by states Separate and higher limits of liability (approx. $145 million) Access to international compensation funds (approx. $1.05 billion): • 1992 Fund • Supplementary Fund Access to domestic compensation fund: • Ship-Source Oil Pollution Fund (approx. $158 million)	Shipowner strictly liable under the 2001 Bunkers Convention Compulsory insurance certified by states General limits of liability (approx. $90 million) Access to domestic compensation fund: • Ship-Source Oil Pollution Fund (approx. $158 million)	Shipowner only liable under *Marine Liability Act* No compulsory insurance General limits of liability (approx. $90 million) Access to domestic compensation fund: • Ship-Source Oil Pollution Fund (approx. $158 million)
Total amount of compensation available: **Approximately $1.35 billion**	**Total amount of compensation available**: **Approximately $250 million**	**Total amount of compensation available**: **Approximately $250 million**

and Supplementary Fund) created through two International Marine Organization conventions that Canada ratified and adopted through Part 6 of the *Marine Liability Act*.

Transport Canada indicated that the first convention is the *International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992*. This establishes the 1992 Fund, which is the second tier of compensation in the event of a tanker spill of persistent oil. The purpose of the 1992 Fund is to provide additional compensation beyond the ship owner's liability discussed above.

Transport Canada said that the second convention is the *Protocol of 2003 to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992,* which establishes the Supplementary Fund, an optional third tier of compensation under the International Oil Pollution Compensation Funds system.

Transport Canada indicated that the International Oil Pollution Compensation Funds cover a range of loss and damage, including reasonable costs for preventive measures to minimize or prevent a spill, cleanup, property damage, environmental damage, quantifiable economic losses, such as in the fisheries or tourism sectors, and post-spill monitoring and studies. It covers actual losses and reasonable expenses that can be directly linked to the pollution incident. All claims for compensation, whether made to the ship owner's insurer or the International Oil Pollution Compensation Funds follow the same principles:

- the expense, loss, or damage was actually incurred;
- the expense relates to measures that are considered reasonable and justifiable;
- the expense, loss, or damage is compensated only if, and to the extent that, it was caused by contamination resulting from the spill;
- there is a reasonably close link of causation between the expense, loss, or damage covered by the claim and the contamination caused by the spill;
- the claimant has suffered a quantifiable economic loss; and
- the claimant can prove the amount of his or her expense, loss, or damage by producing appropriate documents or other evidence.

In combination with the ship owner's liability, the 1992 Fund, and the Supplementary Fund, the total amount of compensation available for a tanker spill is $1.2 billion for a single incident.

SHIP-SOURCE OIL POLLUTION FUND

Transport Canada said that, in addition to the international funds, Canada has a domestic fund called the Ship-source Oil Pollution Fund, which is set out in Part 7 of the *Marine Liability Act*, and which can provide an additional tier of compensation to victims of oil spills. This fund was created from levies paid by receivers and importers of oil in Canada.

The Ship-source Oil Pollution Fund covers pollution damages from any type of oil and any type of ship, including mystery spills, if it can be proven that the spill originated from a ship. The current maximum liability for the fund is approximately $158 million for a single incident, which would apply to spills noted in Table 7.1.

Transport Canada indicated that, when processing claims for compensation, the Ship-source Oil Pollution Fund follows the procedure set out in Part 7 of the *Marine Liability Act*. The admissibility of claims to the fund is the same as the criteria established for the shipowner's liability and the International Oil Pollution Compensation Funds. Section 107 of the *Marine Liability Act* specifies the treatment of claims for loss of income, including subsistence fishing or hunting.

INTERVENOR QUESTIONS

Various intervenors, including the Kitsumkalum Indian Band, Coastal First Nations, United Fishermen and Allied Workers Union, and the Gitxaala First Nation expressed concerns that adequate compensation would not be assured in the event of a marine spill.

The Gitxaala Nation asked Northern Gateway who would be responsible for cleanup costs and compensation payments if costs associated with a spill exceed the amounts available under the various funds. In response, Northern Gateway said that there has never been a spill in Canada exceeding the compensation available under the various regimes. It also said that, since the establishment of the International Oil Pollution Compensation Supplementary Fund, there has never been a spill globally that has exceeded compensation available under the international funds. The Gitxaala Nation questioned Northern Gateway on the type of compensation, if any, that would be available to compensate Gitxaala Nation and its members for indirect or non-economic losses in the event that a spill impacts their traditional marine uses or their social, cultural, or psychological wellbeing. Northern Gateway indicated that the Gitxaala Nation and its members would be entitled to be compensated for all proximate losses reasonably foreseeable as a result of a spill. Damages for indirect or non-economic loss are recoverable through general damages awards.

The Gitxaala Nation questioned Northern Gateway on the sources of information that would be used to determine the marine harvests landed by traditional users, for the purpose of calculating compensation. Northern Gateway responded that the company would be prepared to work with the Gitxaala Nation and other participating coastal First Nations and appropriate government agencies to quantify harvests and the quality of harvested foods and other resources, with a focus on the Confined Channel Assessment Area. Information on landed harvests would build on information contained in the Gitxaala Use Study. Harvest quality, and some information on quantity, would also be obtained through the Environmental Effects Monitoring Program.

The Gitxaala Nation questioned Northern Gateway on the appropriateness of the cost benefit analysis modelling that the company conducted for costs related to clean up and environmental damages. It also asked whether the company fully considered local data within a First Nation area, specifically the Gitxaala Nation. Northern Gateway said that it did not give special weight to costs imposed on Aboriginal communities versus other communities in Canada. Northern Gateway indicated that the cost benefit analysis was used to compare construction and operating costs with the costs of a potential spill. Northern Gateway said that it had confidence in the cost estimates generated by the cost benefit analysis because the analysis took into account data from tanker and ship-based spills that have occurred worldwide. Northern Gateway said that estimated costs for a specific incident would be based on best available evidence. The company provided what it described as a conservatively high estimate of $15,000 per barrel for clean up costs and $22,500 per barrel for costs related to environmental damage.

Coastal First Nations expressed concerns that Northern Gateway had not included in its spill estimate costs passive use values and damage assessment for things such as loss of ecological values, social problems associated with a spill, costs of strained community relationships, losses related to homes, or uncertainties associated with the effects. Coastal First Nations said that the use of passive values could provide monetary estimates of what people are willing to pay to prevent an oil spill through mitigation measures. Northern Gateway's expert said that his experience with trying to monetize passive use values was that the numbers tended to be low and that the amount that could be monetized through modern techniques is very small. The company said that, for the Enbridge Northern Gateway Project, these values are expected to be low.

Coastal First Nations estimated that the total annual benefits from marine activities within Coastal First Nations traditional territories that could be impacted by a spill range from $28.9 billion to $29.9 billion. In response to Northern Gateway questioning, Coastal First Nations said that $28 billion of this total estimate was for non-market values including ecological services such as nutrient cycling. It said that the value of ecological services is difficult to estimate and that the purpose of the work was to give a general order of magnitude as to the value of ecological services. It said that, although these values are important and should be considered, they should not be utilized for project-specific decision making and that more detailed analysis to fully understand such costs would be required.

The United Fishermen and Allied Workers Union questioned Northern Gateway and the Government of Canada on compensation for commercial fishers. Northern Gateway committed to establishing a Fisheries Liaison Committee which, among other issues, would address compensation for both routine effects of the project as well as oil spill effects. Northern Gateway expected that it would work with the Fisheries Liaison Committee to document the type of catch and fishing efforts over the first 5 years of the project, using Fisheries and Oceans Canada catch-effort data. The information collected would help to quantify losses should a spill ever occur. Northern Gateway said that it would be responsible for any damages directly attributable to its operations.

7.1.4 VIEWS OF THE PANEL

The *National Energy Board Act* addresses malfunctions, accidents, and emergency preparedness and response for facilities under National Energy Board jurisdiction. In the case of the project, this includes the two pipelines and the Kitimat Terminal to the tanker connection point.

The evidence indicates that there is a comprehensive regulatory regime in place related to pipeline and terminal design, safety, spill prevention, and spill preparedness and response. Northern Gateway would be subject to this regime. The regulatory functions of the National Energy Board, including those following the issuance of any certificate under the *National Energy Board Act*, would address compliance with conditions set out by the Panel.

Marine shipping navigation, safety, and spill prevention are not under the jurisdiction of the National Energy Board. Marine shipping legislation and associated regulations, standards, programs, and policies fall primarily under the jurisdiction of Transport Canada. Other departments, such as Canadian Coast Guard, also have a role. International organizations, such as the International Maritime Organization, play a role in the development of marine shipping safety regulations and standards. Any refinements or additions to Canada's marine shipping regulatory regime would be under the jurisdiction of these authorities as they have the appropriate mandate, regulatory authority, and expertise.

The evidence indicates that there is a comprehensive regulatory regime in place in Canada related to marine shipping navigation, safety, spill prevention, and spill preparedness and response. The regime addresses various elements related to ship design, ship operation, navigational safety, inspection, compliance, enforcement, and oil spill response planning.

Northern Gateway said that the regulatory environment for the oil tanker industry is subject to continuous improvement, and provided several examples. These changes have led to a substantial reduction in the number and size of oil tanker spills since the 1970s and, in particular, since 1990. Northern Gateway has chosen to exceed regulatory requirements through its marine voluntary commitments in relation to navigation, safety, and oil spill preparedness and response planning. These commitments are discussed in Sections 7.3 and 7.4.

Transport Canada confirmed that there are no provisions in Canadian marine shipping legislation that would make Northern Gateway's marine voluntary commitments, or the findings of the TERMPOL Review Committee, mandatory or enforceable. The Panel finds that these voluntary commitments should be mandatory and enforceable as conditions under any certificates which may be issued under the *National Energy Board Act*. These conditions would be enforced by the National Energy Board.

The Panel notes that financial responsibility and compensation associated with marine shipping spills is addressed under the *Marine Liability Act* and is under the authority of the Government of Canada. The Panel understands that the marine shipping financial responsibility and compensation regime is intended to balance the need for appropriate compensation with the need for maritime commerce. The regime is subject to both national and international input.

The Panel finds that spill costs are unknowable in advance and would depend on a number of factors associated with a spill. Liability for any spill along the pipeline route, and from the Terminal into marine water, before the product is loaded in the tanker, would be covered by the liability condition imposed by the Panel.

The Panel notes that, if the spill is attributable to the ship owner's gross negligence, or if the ship owner was reckless and had knowledge that the damage which occurred would probably result, limitation of liability does not apply and the ship owner's liability would be unlimited. Assuming no gross negligence or reckless actions, the Panel notes that a ship owner or its insurers would have to provide up to approximately $145 million as a maximum liability for an oil spill. The Panel notes that there is no liability cap in the case of a condensate spill from a tanker.

Based on the evidence, the Panel finds that there is an existing regulatory regime to provide for costs associated with spills in marine waters. The Panel notes that Transport Canada and Northern Gateway said that a total of $1.35 billion would be available from the ship owners maximum liability, the Ship-Source Oil Pollution Fund, the 1992 Fund, and the Supplementary Fund, for any releases from tankers into marine waters, whether within the Confined Channel Assessment Area, the Open Water Area, or beyond.

Many parties questioned whether a large marine oil spill could result in costs which exceed the current amount available of approximately 1.35 billion dollars. The Panel notes the evidence that, since the establishment of the Supplementary Fund in 1992, there have been no spills throughout the world where the total funds available were insufficient to cover all costs and losses. In the event of spill costs that exceeded available funds, the money would have to come from corporate entities or governments.

This regime is not regulated by either the National Energy Board or Canadian Environmental Assessment Agency and, therefore, the Panel does not express a view as to the sufficiency of the current amount available. The Panel notes that any changes to the marine spill compensation framework would be handled by the regulatory bodies that are responsible for the current regimes.

7.2 Consequences of spills

Many participants told the Panel that an oil spill could potentially cause permanent ecological, social, and cultural damage. Northern Gateway said that large spills would be likely to cause significant adverse environmental effects that are generally reversible through mitigation and natural recovery. It said that natural recovery occurs after terrestrial, freshwater, and marine oil spills. It said that recovery time would depend on the local environment, species affected, and other factors such as spill volume and characteristics of the spilled product.

Northern Gateway said that spills from pipelines, the Kitimat Terminal, or tankers could result in petroleum products being released onto land, into water and onto shorelines, and into the air through evaporation. A condensate spill would result in acute effects and would be toxic to biota but would typically tend to evaporate from water and land relatively quickly. Diluted bitumen and synthetic crude would result in toxicological and physical effects and would be more persistent, likely causing both acute and chronic effects.

7.2.1 CONSEQUENCES OF PIPELINE SPILLS AND SPILLS AT THE KITIMAT TERMINAL

7.2.1.1 Pipelines

Northern Gateway said that the effects of hydrocarbons on terrestrial and freshwater organisms are typically influenced by a combination of physical and biological factors, including:

- type of oil or other hydrocarbon, which determines behaviour in the environment and degree of toxicity;
- volume spilled;
- habitats affected;
- ability of animals to avoid the spill;
- geology, geography, and hydrology of the receiving environment, including river flows, type of terrain, and groundwater; and
- season and weather, which affect evaporation, dispersion, and degradation of petroleum products.

Northern Gateway assessed the potential consequences of a dilbit or condensate pipeline spill in different locations including agricultural land, a fen wetland, a low gradient watercourse (Crooked River), and a high gradient watercourse (Hunter Creek). It said that dilbit and condensate represent the two extremes of products that would be shipped on the project, in terms of physical and chemical properties. Diluted bitumen is a viscous, persistent, moderately heavy oil, and condensate is a low-viscosity, volatile fluid that weathers rapidly.

Northern Gateway summarized potential environmental effects of a pipeline spill as follows:

- Fish, other aquatic biota, and birds that feed or dwell at the water surface would be most affected.
- Most wildlife would be affected to some degree by habitat loss, particularly those species with low mobility and small home ranges.
- Direct contact and absorption, ingestion, or inhalation of hydrocarbons could harm or kill animals and plants.
- Hydrocarbons dissolved in water have an immediate toxic effect on aquatic organisms. Juvenile fish are more vulnerable than adults.
- Mechanisms of toxicity vary depending on the organism, and toxic effects would be affected by location and season.
- The significance of adverse effects may vary widely. In some areas only a few individuals from a population may be affected. Other locations could have a high concentration of rare species or species with limited distributions. Critical seasonal habitat for populations such as migratory birds may be affected.
- Some chronic toxicity might remain after cleanup until biodegradation has reduced the levels of relatively persistent compounds.
- A pipeline spill could adversely affect the human environment by interfering with land and water use by Aboriginal groups and other public and industrial user groups.
- Cleanup costs would increase if a terrestrial spill reaches water, because cleanup time and complexity would increase.
- Northern Gateway would provide appropriate compensation to Aboriginal groups, private commercial resource users, and landowners, according to standard industry practices and methods.

PIPELINE ECOLOGICAL AND HUMAN HEALTH RISK ASSESSMENT

Northern Gateway also prepared an ecological and human health risk assessment for the pipeline component of the project. It said that the work was completed to respond to intervenor concerns about long-term environmental, resource, and health effects of pipeline spills.

The pipeline ecological and human health risk assessment modelled potential ecological and human health effects resulting from a hypothetical, instantaneous, full-bore pipeline rupture releasing diluted bitumen, synthetic crude, or condensate at four watercourse locations along the pipeline route. The company said that the volumes and locations of the hypothetical releases were derived from its semi-quantitative risk assessment.

Each spill was evaluated for high and low river flow scenarios, broadly representing summer and winter river flow. The simulated watercourses included Chickadee Creek, (which flows into the Athabasca River), Crooked River (which flows into Davie Lake), the Morice River, and the Kitimat River. These watercourses represented a range of gradient, flows, watersheds, discharge locations, downstream resources, and users. The modelled scenarios also reflected specific concerns, such as locations of interest, expressed by the public or Aboriginal groups.

Northern Gateway said that the risk assessment model considered changes due to weathering of physical and chemical properties of the spilled products. Chemicals of potential concern, including monocyclic and polycyclic aromatic hydrocarbons, were also tracked in the simulated spills.

Northern Gateway said that the primary focus of the ecological risk assessment was to quantify the risk of acute and chronic effects to aquatic biota. It said that the assessment was conducted according to accepted methods and guidance published by regulatory agencies, including the Canadian Council of Ministers of Environment and the United States Environmental Protection Agency.

Assessment of acute ecological risk focused on the short-term effects (7 to 50 days) for each spill scenario, with natural recovery (no spill cleanup). The model ran until it indicated that floating product was no longer present in the modelled waterbody. Product transport, product fate, and mortality of key indicator species were estimated. The products were relatively unweathered at the end of the acute effects simulations. Large volumes of product would be transported downstream in the receiving river or stream.

The chronic ecological assessment began after the acute exposure assessment ended, and extended for up to 2 years post-spill. Northern Gateway said that the chronic ecological assessment also addressed:

- weathering of spilled products on shoreline soils and in stream sediments;
- product sinking or deposition on sediment, penetration into the pore water of streambed spawning gravels, and potential effects on fish eggs and embryos present in spawning habitats; and
- long-term risk to animals, such as bears, waterfowl, or fish-eating birds, that are chronically exposed to hydrocarbons present in shoreline soils, sediment, water, or aquatic flora and fauna subsequent to the spill.

Northern Gateway identified sources of uncertainty in the pipeline ecological and human health risk assessment and noted the following:

- Risk estimates normally include an element of uncertainty. These uncertainties are generally addressed by incorporating conservative assumptions into the analysis. As a result, risk assessments tend to overstate the actual risk.
- Different pipeline spill scenarios could be imagined and modelled. Northern Gateway said that the results would be similar to those obtained from the instantaneous full-bore rupture scenarios it assessed. Any large spill would have the potential to cause significant adverse environmental effects whether it is confined to land or enters a wetland or watercourse.
- Three representative petroleum products were evaluated, representing a broad range of physical and chemical characteristics affecting the fate, distribution, and effects of spilled hydrocarbons. Other products could also be transported on the pipeline. Some could have characteristics or behave in the environment in ways that were not fully represented by the models. Northern Gateway said that the density of the modelled dilbit product was approximately the maximum density that the oil pipeline would be designed to transport.
- Environmental fate models use representative environmental data and simplified descriptions of the environment and environmental processes. They do not perfectly represent or reproduce all of the environmental processes or factors present in an actual spill event.
- The models were based on extensive experience with spills in both marine and freshwater environments. They provide a reasonable simulation of the major environmental effects of spilled hydrocarbons.

Northern Gateway said that the effects of a spill are influenced by the characteristics of the product, environmental conditions, and the precise locations and types of organisms present. The goal of the pipeline ecological and human health risk assessment was not to forecast every situation that could potentially occur, but to describe a range of possible consequences to inform planning.

Summary of acute effects assessment and results

Northern Gateway assessed the acute (immediate or short-term) effects of a pipeline spill using a model called the Spill Impact Model Application Package (SIMAP). The model simulated potential spill effects on a variety of aquatic organisms, including fish, and on wildlife such as birds, mammals, and reptiles. The model estimated amounts of the hydrocarbon product and chemicals contained in the atmosphere, water column, and sediments, and on the water surface and shorelines. It also simulated downstream transportation of the product over time.

Northern Gateway said that simulated acute effects differed between scenarios. Flow conditions and product type had important effects on the outcomes. Other findings included:

- Synthetic crude oil was sometimes found to have a greater tendency to sink than other products, as it was relatively easily entrained in the water column and interacted with

suspended and bottom sediments. Both synthetic crude oil and diluted bitumen could sink depending on the conditions modelled.

- Dilbit was more prone than other products to strand on shorelines. This limited its effects to a smaller area but created opportunities for wildlife to encounter it.
- The spatial extent of acute effects was typically higher for synthetic crude oil and condensate, than for dilbit.
- Fish and other aquatic organisms could be exposed to potentially lethal concentrations of oil or condensate for several kilometres downstream of the spill site.
- All scenarios predicted a large amount of entrained oil and high concentrations of dissolved aromatics moving down the entire stretch of modelled river and beyond.

Summary of chronic effects assessment and results

Northern Gateway used acute effects assessment results to assess potential chronic (long-term) effects, focusing on the fate of oil that stranded on shorelines or deposited to river sediments. The company said that, although products transported downstream beyond the area modelled would also have the potential to cause effects, they would be more dispersed by then and would represent a lower level of risk than the more concentrated accumulations upstream.

Northern Gateway assessed chronic effects on shoreline soils, sediment, and water quality, including sediment pore water, plants, invertebrates, fish, and wildlife. The chronic assessment of spill effects assumed that some shoreline cleanup activity would be completed.

The predicted product concentrations were compared against toxicity benchmark values to assess the potential for chronic effects. Northern Gateway said that, when the ratio of predicted value to benchmark value is less than one, adverse effects are not considered to be likely due to the conservative assumptions built into the analysis. Model results varied depending on the key indicator assessed. Most ratios generated in the modelled scenarios were less than one.

River channel characteristics and flows affected the model outcomes. Effects tended to be more severe in smaller watercourses like Chickadee Creek, and in the slow-moving Crooked River, where organic soils and fine-grained sediments were predicted to trap and retain hydrocarbons. Despite the presence of fine-grained sediments in the Kitimat River estuary, the model predicted very light deposition of hydrocarbons there. Oiling of shorelines was predicted to cause acute effects on shoreline plant communities and soil invertebrates. Impacted shorelines were predicted to recover quickly with appropriate cleanup.

Northern Gateway said that, although fish and benthic invertebrates would be subject to acute effects after the initial phase of a spill, hydrocarbon concentrations in river water were expected to decrease substantially below the chronic effect thresholds for fish and other aquatic biota. The time frame for this decline could range from weeks to over 2 years depending on circumstances and spill location.

The company said that, where oil deposited to sediment, predicted hydrocarbon concentrations and total polycyclic aromatic hydrocarbon concentrations in sediment pore water were, for the most part, unlikely to cause adverse effects to developing fish eggs. In gravels most likely to be used by salmonid fish as spawning habitats, expected hydrocarbon concentrations in sediment pore water were below established toxicity benchmarks.

Northern Gateway concluded that conditions harmful to developing fish eggs could occur for a period of weeks following a major oil spill. It said that hydrocarbon concentrations would rapidly decline, due to weathering, to concentrations below effects thresholds. It said that the most likely outcome is that a portion of the eggs or larvae of a single year-class of fish could be lost, but that recovery would occur in subsequent years.

Northern Gateway said that a full-bore pipeline rupture would have long-term effects. Weathered oil residues would likely persist in the environment for years to decades. Weathered residues would be less toxic than fresh oil, and were not predicted to cause significant effects.

Northern Gateway said that the effects of a hydrocarbon spill would be reversible and that the environment would recover with time. It said that appropriate response and remediation activities can substantially reduce the time required for recovery.

Summary of pipeline ecological and human health risk assessment

Northern Gateway said that the spill scenarios modelled in the pipeline ecological and human health risk assessment were unlikely to occur. It said that, if they occurred, the potential adverse environmental and human health effects may be significant. Potential spill behavior and outcomes are likely to be highly incident-specific and influenced by many factors including:

- the type and volume of product released;
- the location of the spill;
- whether the spill is onto land or into water;
- the size of the watercourse;
- slope and flow volumes;
- river bed substrate;
- the amount of suspended particulate in the water;
- weather, including temperature, wind, and precipitation;
- season; and
- shoreline soils and vegetation.

Hydrocarbons with higher concentrations of volatile organic compounds and total polycyclic aromatic hydrocarbons would generally be expected to create more toxic effects.

Northern Gateway said that, in general, spill effects would be more significant in slow flowing watercourses with fine-grained sediments than in fast flowing watercourses with coarse-grained substrates. Effects to rivers or other watercourses would vary considerably, with effects extending more than 50 kilometres downstream.

Northern Gateway said that effects of spills on land would be limited. It said that, as the movement of oil on land tends to be slower than in aquatic environments, response strategies on land can be targeted and implemented more readily. Remediation of terrestrial spills would generally be completed to applicable environmental quality standards for the local land use.

Northern Gateway said that fish and aquatic biota, wildlife, and vegetation would be affected during the acute phase of the spills evaluated. After the acute phase of the spill the hydrocarbons in the river water would decline to the point that they would not be expected to create chronic adverse effects to fish and other aquatic biota. Northern Gateway said that local populations of smaller animals and waterfowl were more likely to experience adverse chronic effects than wide ranging species such as the grizzly bear or bald eagle. It said that, while the presence of residual, weathered hydrocarbons could persist for an extended period of time, adverse environmental effects would not be expected to continue beyond 1 to 2 years and are expected to be reversible, especially with appropriate response and remediation activities.

Intervenor questions on the pipeline ecological and human health risk assessment

In response to the Province of British Columbia, Northern Gateway said that it had broken new ground in environmental assessment, since the modelling of chronic effects from oil spills is something that has rarely been done before. It said that the typical focus has been on acute effects and emergency response, with less effort to quantify chronic effects. It said that it had used state-of-the- art models and conservative approaches throughout the pipeline risk assessment.

The Haisla Nation submitted a review of the pipeline ecological and human health risk assessment. It said that there was the need for more detailed site-specific and situation-specific information in the Kitimat River. It said that the pipeline risk assessment may underestimate risks because it does not include sufficient site-specific physical, chemical, biological, and ecological data.

The Haisla Nation asked how mass balance models can reliably quantify the fate of a hydrocarbon at all times without the use of real oil spill data. Northern Gateway said that any real spill of hydrocarbon would be unique, with many site specific factors affecting transport and fate of hydrocarbon components. It said that mass balance equations and models are the only way to make defensible predictions about potential exposures and risks for hypothetical spills. The Haisla Nation noted the potential for a single spill to affect up to three generations of salmonids (adults, juveniles, larvae, or eggs) present in the Kitimat River, causing the loss of 1 year's reproduction.

Participants asked about the origin of data used in the pipeline ecological and human health risk assessment. Northern Gateway said that typical modelling practice is to use as much site-specific data as possible, and then augment those data using professional judgement based on similar rivers and regions. The company said that its approach was conservative. As an example, it said that it had assumed high concentrations of suspended sediment in the water in some scenarios, which could cause some oil to sink during the simulation.

The Northwest Institute for Bioregional Research, the Province of British Columbia, and the Haisla Nation questioned how stream flow rates were calculated and incorporated into the model. In response, Northern Gateway said that it used the maximum mean monthly flows and minimum mean monthly flows to represent the high and low flow rates, respectively. Northern Gateway said that the data for each river came from a variety of different sources, including Environment Canada. It recognized that there can be annual, seasonal, and spatial variation in stream flows and velocities. The company said that it had modelled the rivers at representative high and low flows to represent typical annual variation in flows.

Several parties, including the Haisla Nation, questioned Northern Gateway regarding the applicability of the SIMAP model to rivers, and its suitability for ecological risk assessment purposes. Northern Gateway said that the SIMAP model has been used in hundreds of Natural Resource Damage Assessments in the United States for both riverine and marine environments. The Northwest Institute for Bioregional Research and the Friends of Morice-Bulkley asked whether Northern Gateway had explicitly validated the SIMAP model for northern interior British Columbia salmon rivers such as the Morice River and Kitimat River. Northern Gateway responded that, as modelling attempts to simplify complex natural processes, it is not necessary to specifically validate a model against the specific river being examined. It said that SIMAP has been used to simulate a wide range of river systems, and that the company appropriately used local data as model inputs to characterize the rivers that were assessed.

The Friends of Morice-Bulkley said that the Sutherland River contains provincially significant fish habitat, as it is the spawning and rearing channel for more than 80 per cent of Babine Lake rainbow trout. It wondered whether an uncontrolled spill could cause extensive acute toxicity of juvenile rainbow trout or developing eggs in the river. Northern Gateway said that such a situation could occur, and was the reason it was focused on preventing such an occurrence through its risk based design, including thicker pipe and isolation valves at key watercourses. The company said it had been very clear that adverse and significant acute and chronic effects could result from a spill, depending on circumstances, although the probability of such events occurring is very low. The pipeline risk assessment and other information were used to assess such effects.

Northern Gateway said that total polycyclic aromatic hydrocarbon concentrations in the representative petroleum products it modelled are either similar to, or less than, other crude oils including those derived from Alberta and the Alaska North Slope. The Alaska North Slope was the source of the crude oil spilled by the Exxon Valdez.

The Haisla Nation questioned Northern Gateway on the potential toxicity of polycyclic aromatic hydrocarbons, and how they were considered in the pipeline risk assessment. Northern Gateway said it had modelled the acute toxicity of numerous compounds, including polycyclic aromatic hydrocarbons. It said that, in general, potential toxicity increases with increasing polycyclic aromatic hydrocarbon levels, and that other factors must also be considered.

The Haisla Nation said that the concentrations of total polycyclic aromatic hydrocarbons that cause chronic toxicity range from about 1 microgram per litre to more than 100 micrograms per litre. It said that toxic effects range from induction of non-lethal enzymes, all the way up to mortality. Northern Gateway said that its assessments indicated that, even if total polycyclic aromatic hydrocarbon concentrations in the modelled petroleum products were much higher, potential effects would be at the lower end of the range described by the Haisla Nation.

In response to Haisla Nation questions about the range of petroleum products to be shipped, Northern Gateway said that products with much higher total polycyclic aromatic hydrocarbon concentrations than those modelled could be shipped on the pipeline. Northern Gateway said that this would not change the conclusion that a large spill would result in significant adverse environmental effects.

7.2.1.2 Marine terminal ecological risk assessment

Northern Gateway conducted an ecological risk assessment for an accidental release of 250 cubic metres of representative diluted bitumen and condensate in the marine environment at the Kitimat Terminal, under summer inflowing wind conditions. The size of the simulated spill is the maximum credible release volume estimated for tanker loading or unloading at the terminal, as determined in Northern Gateway's marine shipping quantitative risk analysis. Northern Gateway said the risk assessment was conducted according to accepted ecological risk assessment methodologies and guidance published by regulatory agencies, including the Canadian Council of Ministers of Environment and the United States Environmental Protection Agency.

All scenarios were assessed without mitigation measures. Northern Gateway said that booms would be placed around the tanker during actual oil loading operations to contain any spillage that might occur.

The marine terminal ecological risk assessment addressed a number of chemicals of potential concern, including, but not limited to, monocyclic aromatic hydrocarbons and polycyclic aromatic hydrocarbons. A marine water quality model and a marine sediment quality model were used to calculate chemical exposure levels for biota in water and sediment. The marine water quality model simulated oil weathering and fate, including evaporation, emulsification, dispersion, and sinking to subtidal sediments.

The study assessed acute toxicity to marine algae, fish, and invertebrates in the water column. Chronic effects to subtidal benthic invertebrates, such as crabs and bivalves exposed to chemicals of potential concern in sediment, were also assessed. Potential chronic effects resulting from oil stranded on shorelines were assessed qualitatively based on experience gained from the Exxon Valdez oil spill.

Acute effects to organisms in the water column, in certain areas of Kitimat Arm, were predicted for the condensate spill. Northern Gateway said that a condensate spill would be unlikely to cause chronic effects to benthic invertebrates, and that recovery of the intertidal zone was predicted to be complete within 2 years.

Dilbit was predicted to strand on the shoreline near the terminal and near Kitamaat Village across Kitimat Arm. Northern Gateway said that a dilbit spill would not be likely to cause acute toxicity to organisms in the water column or on the seabed. Intertidal biota, birds, and mammals contacting the oil at the water surface would be most affected by the acute phase of a dilbit spill. It said that, due to the relatively small spill volume and duration of the spill, effects on mammals and birds would be unlikely or limited. The chronic assessment did not predict chronic effects on subtidal benthic invertebrates, but showed longer term effects for the shoreline and subtidal sediments.

Northern Gateway said that, as diluted bitumen contains a large fraction of heavy and persistent tarry material, some weathered material would be stranded on shoreline sediments and rocks. The company said that some small pockets of residual dilbit might remain buried in gravel or rocky substrates for several years, although the presence of these persistent pockets would not necessarily inhibit restoration of adjacent intertidal habitat. Northern Gateway said that recolonization of damaged habitat would be quite rapid, due to the presence of nearby undamaged habitat. It said that recovery of the intertidal zone would be complete within about 2 to 5 years.

In response to questioning from the Province of British Columbia, Northern Gateway said that, although the model potentially allows an oil to weather to a state where it may sink, the dilbit product modelled in the assessment is not likely to sink due to weathering alone.

Northern Gateway said that risk assessments are conducted following conservative assumptions, which tend to overestimate exposure and risk. It said that:

- If the assessment predicts that wildlife chemical exposure is below levels considered to cause risk, it is unlikely that adverse effects would occur.
- If the assessment predicts that wildlife exposures may exceed levels considered to be safe, this does not necessarily mean that adverse effects would occur. Rather, a more detailed and rigorous analysis of that finding is advisable.

Northern Gateway said that the ecological risk assessment was based on measured data, rather than assumed data. It used, to the extent practical, conservative assumptions in the exposure and hazard assessments. Northern Gateway said that it is not likely to have underestimated the risk of adverse effects on the marine environment.

At the request of the Panel and Environment Canada, Northern Gateway ran mass balance and spill trajectory modelling under winter outflowing wind conditions. The company said that the altered conditions did not alter the conclusions of the marine terminal ecological risk assessment.

7.2.2 CONSEQUENCES OF TANKER SPILLS

Northern Gateway said that the effects of a large oil spill from a tanker would likely be significant. Northern Gateway said that the potential effects of a tanker spill would depend on numerous factors, including type of oil, volume spilled, season, and environmental receptor.

In response to questioning from the Province of British Columbia, Northern Gateway said that, relative to the Confined Channel Assessment Area, a spill in the Open Water Area would be much more affected by environmental factors such as wind and waves. Spills in open water would be more likely to be naturally dispersed and degraded. In response to questions from the United Fishermen and Allied Workers Union, Northern Gateway said that a spill in the Open Water Area would be unlikely to affect fish, due to rapid dispersion and dilution of the oil.

Northern Gateway said that marine organisms likely to come in direct contact with oil include birds, fish (primarily those spawning and rearing in nearshore areas), plankton, mammals, and intertidal invertebrates and vegetation. Terrestrial biota along the shoreline might also come into contact with oil. Northern Gateway said that viscous products such as dilbit would be less likely than lighter oils to penetrate into shoreline sediments. The company said that human activities such as traditional or subsistence harvesting, commercial fishing, and recreational activities are also likely to be adversely affected by a large spill from a tanker.

The Council of the Haida Nation questioned Northern Gateway on potential spill-related effects on three species of particular importance to the Haida Nation: black seaweed, Dungeness crab, and razor clams. Northern Gateway said that its assessment of potential spill effects had considered potential effects on all these species.

Northern Gateway said that black seaweed is a rapidly growing, transitory algae that, in past spill events, had been shown to be relatively insensitive to toxic effects, although smothering had occurred. It said that black seaweed recovery after spill events had typically been quite rapid, in the range of 1 to 2 years or less

Northern Gateway said that, although crabs are known to be sensitive to toxic effects, they have been shown to recover within 1 to 2 years following a spill such as the Exxon Valdez incident. Northern Gateway said that Dungeness crab was a key indicator species in its assessment of spill effects.

Northern Gateway said that potential effects to razor clams are not as well studied. It said that sediment toxicity studies after the Exxon Valdez spill did not suggest significant effects on benthic invertebrates. Following the Exxon Valdez and Selendang Ayu oil spills in Alaska, food safety closures for species such as mussels, urchins, and crabs were lifted within 1 to 2 years following the spill.

In response to questioning from the Council of the Haida Nation regarding potential spill effects on herring, Northern Gateway said that herring were a key indicator species in its spill assessment. Northern Gateway said that the Exxon Valdez spill did not appear to cause population-level effects on Prince William Sound herring.

In response to a question from the Council of the Haida Nation on depressed Haida Gwaii herring stocks, Northern Gateway said that depressed herring populations were not unique to Haida Gwaii. It said that herring populations all along the coast of British Columbia were exhibiting similar trends.

Some intervenors expressed concerns about the potential for an ocean oil spill to move into tidal estuaries and rivers such as the Kitimat, Nass, and Skeena Rivers. The Haisla Nation specifically enquired about the potential for tides to carry oil far enough up the Kitimat River to contaminate eulachon spawning habitat.

Northern Gateway said that such effects would be unlikely due to a natural protective barrier caused by the interface, known as a density front, between fresh water and salt water. The company indicated that a density front typically prevents movement of surface oil from salt water to a freshwater environment, although its effectiveness would depend on environmental conditions at the time. In response to questions from the Heiltsuk Nation, Northern Gateway further clarified that the strong outflow of the Kitimat River prevents tidal influence from going very far upstream.

MARINE ECOLOGICAL RISK ASSESSMENT

Northern Gateway completed an ecological risk assessment of a scenario where 36,000 cubic metres of dilbit were released over a period of 13 hours in Wright Sound, under summer conditions. Northern Gateway said that this was a conservative scenario as it involved a large volume of dilbit, which would be more persistent than condensate or synthetic crude oil. It said that the assessment considered interactions between oil and suspended sediment in the water column, which may result in sinking of the oil.

Northern Gateway said that, under the modelled conditions, dilbit would first strand on islands near the spill site, including the region of Hartley

Bay, and eventually reach more distant shorelines. By the end of day 15, the model predicted that approximately 1 per cent of the dilbit would be left on the water surface, 6 per cent would be in the water column, 17 per cent would have evaporated, and 76 per cent would have stranded along approximately 240 kilometres of shoreline.

Northern Gateway said that potential effects of oil stranded on the shorelines and in the intertidal environment were assessed qualitatively with particular reference to the Exxon Valdez oil spill. It said that the entire intertidal zone along affected shorelines would likely be oiled, coating rocks, rockweed, and sessile invertebrates. Some of the diluted bitumen could penetrate coarse-grained intertidal substrates, and could subsequently be remobilized by tides and waves. There were relatively few shoreline areas with potential for long oil residency. Northern Gateway said that the stranded bitumen would not be uniformly distributed, and that heavy oiling would likely be limited to a small proportion of affected shoreline. Northern Gateway said that, compared to the Exxon Valdez oil spill, the simulation suggested that more dilbit would be distributed along a shorter length of shoreline.

Northern Gateway said that, due to the relatively sheltered conditions in Wright Sound, and in the absence of cleanup, most of the stranded oil would be weathered or dispersed into the marine environment within 3 to 5 years. It said that, while weathering and dispersal could represent an important secondary source of hydrocarbon contamination of offshore or subtidal sediments, the weathered hydrocarbons themselves would have lower toxicity than fresh dilbit.

Northern Gateway assessed potential effects on key marine receptors including marine water quality, subtidal sediment quality, intertidal sediment quality, plankton, fish, and a number of bird and mammal species. The company said that acute effects from monocyclic aromatic hydrocarbons such as benzene, toluene, ethylbenzene, and xylene may briefly occur in some areas. Acute effects from polycyclic aromatic hydrocarbons were not likely due to their low water solubility.

Northern Gateway said that chronic adverse effects on the subtidal benthic community were not predicted. After a large spill, consumption advisories for pelagic, bottom-dwelling and anadromous fish, and invertebrates from open water areas and subtidal sediments would probably be less than 1 year in duration. Northern Gateway said that consumption advisories for intertidal communities and associated invertebrates, such as mussels, could persist for 3 to 5 years or longer in some sheltered areas.

In response to questions from the United Fishermen and Allied Workers Union, Northern Gateway said that its modelling showed that only very small amounts of oil would reach the subtidal sediments and, as the chronic risk assessment showed, would not pose a significant risk to marine life.

Fisheries and Oceans Canada said that Northern Gateway's ecological risk assessment approach and methodology were reasonable and provided useful information on fisheries resources. It acknowledged that predicting or quantifying the impacts of an oil spill is challenging because there are so many factors to consider.

In response to questions from the Haisla Nation and the United Fishermen and Allied Workers Union, Fisheries and Oceans Canada said that, although it had a great deal of information on conventional oils, the results of research conducted on the biological effects of conventional oil products may not be true for dilbit or unconventional products. Fisheries and Oceans Canada said that it was not in a position to quantify the magnitude and duration of impacts to marine resources in the Confined Channel Assessment Area and Open Water Area without additional research. This research would require collaboration with Environment Canada, academia, and Northern Gateway.

Environment Canada said that, in order to fully understand detailed potential lethal and sublethal effects associated with a spill, additional research on fate and behavior, routes of exposure, and oil spill modelling would be required. It said that a cascading series of various types of science would be required. It said that the Scientific Advisory Committee could guide this type of work.

Northern Gateway was asked to explain the long-term fate and effects of oil dispersed in the water column, oil in flocculation, and oil remobilized from the shoreline. It said that flocculation would result in the oil being continually broken down into smaller and smaller particles, which increases the surface area for microbial degradation. It said that sunlight may also assist in breaking down oil particles. It said that degradation can occur entirely in the water column, or a small amount of particles may settle to the ocean floor. Oil particles could also be directly adsorbed to

suspended sediment particles and, if the sediment particles are of sufficient size, settling would occur. The company said that oil bound to sediment and remobilized from sand and gravel beaches would likely settle in subtidal areas.

The company said that any of these processes could result in settling of oil to the ocean floor, but stressed that its ecological risk assessment showed that toxicological consequences would be negligible. It also said that potential effects on subtidal organisms, such as filter feeders, would depend on the specific circumstances of the spill, including polycyclic aromatic hydrocarbon concentrations in the spilled oil.

EVIDENCE OF INTERVENORS

The United Fishermen and Allied Workers Union said that, because there are so many variables, each spill is a unique event, and some results will be unknowable. It said that a spill the size of the Exxon Valdez incident would affect the entire ecosystem in the project area, and that recovery to pre-spill conditions would be unlikely to ever occur. It said that a spill the size of the Exxon Valdez oil spill would likely have similar effects in the project area because marine resources in the project area are similar to those in Prince William Sound. It argued that the cold, sheltered, waters of the Confined Channel Assessment Area would likely experience reduced natural dispersion and biodegradation of oil, leading to heavier oiling and longer recovery times than seen in Prince William Sound and elsewhere.

The United Fishermen and Allied Workers Union said that different fish species will have diverse reactions to oil, and that acute, short-term, chronic, or long-term effects vary between types of fish. It said that the overall impact of spills on plankton community, both in the short term and over a number of years, is relatively poorly understood. It said that, although studies of the British Petroleum Deepwater Horizon spill in the Gulf of Mexico have indicated relatively rapid recovery of the plankton community, more research is required to measure impacts to sensitive species and other long-term effects.

The United Fishermen and Allied Workers Union said that patches of buried oil from the Exxon Valdez oil have been found on sand and gravel beaches overlain by boulders and cobbles. It said that effects from a tanker spill associated with the Enbridge Northern Gateway Project would likely be more severe than the Exxon Valdez oil spill due to the more persistent nature of dilbit and the lack of natural cleaning action in the sheltered waters of the Confined Channel Assessment Area.

The Gitxaala Nation's experts said that large historical spill events are not necessarily good indicators of what will happen in the future. They argued that each spill has unique circumstances and there is still significant uncertainty about the effects of major spills.

The Gitxaala Nation concluded Northern Gateway had failed to adequately consider the potential consequences on ecological values of interest to the Gitxaala. It also said that:

- oil could reside in shore areas for months to years in the majority of the area of interest to the Gitxaala Nation;
- a number of species important to Gitxaala are present in areas where spilled oil may accumulate and come into contact with these species;
- dilbit was qualitatively different from most petroleum products transported by sea, and that Northern Gateway's assessment had not sufficiently accounted for this difference, specifically regarding the potential persistence of dilbit in the natural environment; and
- additional physical and chemical properties information, such as polycyclic aromatic hydrocarbon distribution, would be helpful in informing the risk assessment process.

Coastal First Nations said that a tanker spill would result in significant adverse environmental effects and that Northern Gateway had failed to adequately consider potential effects associated with smaller spills.

Gitga'at First Nation said that a spill of dilbit greater than 5,000 cubic metres would result in significant, adverse, long-term, lethal, and sublethal effects to marine organisms, and that effects would be particularly long-lasting on intertidal species and habitats. It also said that effects from a tanker spill associated with the project would probably be more severe than the Exxon Valdez oil spill, due to the more persistent nature of dilbit and the lack of natural cleaning action in the sheltered waters of the Confined Channel Assessment Area.

7.2.3 NATURAL RECOVERY OF THE ENVIRONMENT FOLLOWING AN OIL SPILL

Northern Gateway said that no oil recovery occurred for many large historical marine oil spills and that marine oil spill effects are largely reversible with appropriate cleanup strategies and natural recovery.

The company said that, when oil is spilled into the terrestrial, freshwater, and marine environments, numerous chemical, physical, and biological processes immediately begin to break down, biodegrade, and otherwise disperse and assimilate the spilled oil. It said that this natural degradation of oil sets the conditions under which the recovery of the biophysical and human environments from oil spills occurs. It said that, ultimately, spilled oil is broken down into carbon dioxide and water by sunlight (photolysis) and microbes (biodegradation).

The company said that degradation rates depend on the oil type and characteristics of the receiving environment, such as temperature, sunlight, and prevailing microbial populations. Northern Gateway said that, in the early stages of oil weathering after a spill, evaporation and photo-oxidation are usually more important than biodegradation, which is considered to be a relatively slow process.

It said that some oil fractions may persist for long periods of time as weathered, "tarry," high molecular weight polycyclic aromatic hydrocarbons. Others degrade more rapidly, including gasoline, light fuel oil, or low molecular weight hydrocarbons such as benzene. It said that dispersed hydrocarbons also degrade more readily than hydrocarbons that remain as blobs or pools of free product.

Northern Gateway said that microorganisms capable of degrading hydrocarbons are known to be present in the coastal waters of British Columbia, and their role in degrading oil in Prince William Sound following the Exxon Valdez oil spill is also well documented. A long-term study of a heavy fuel oil spill off the coast of Vancouver Island demonstrated that biodegradation accounted for almost all of the removal of n-alkenes in the first year following the spill. In response to a question from the Haisla Nation regarding biodegradation potential in the Kitimat River, Northern Gateway said that specific information regarding the presence of specific hydrocarbon-degrading microbes in the river is not available but such microbes are widely distributed in the environment.

Northern Gateway said that the ability of microorganisms to biodegrade oil is reduced in the absence of oxygen or nutrients, for example when oil is buried by sediments. It said that this can be offset by limited bioavailability of buried oil.

Northern Gateway summarized potential recovery of the terrestrial and freshwater environment as follows:

- Effects to land would generally be localized in extent, with the greatest risk being groundwater contamination in the immediate area of a condensate spill.
- Wetlands are likely to recover in two or three growing seasons after cleanup, and effects would generally be limited to the wetland itself. The spatial extent of impact would depend on site-specific topography and proximity to watercourses.
- Hydrocarbons that reach rivers and other watercourses could result in adverse effects to aquatic organisms and terrestrial biota along the shorelines. Historical studies show that habitat recovery typically occurs within 3 years for water quality and benthic invertebrates. Fish populations typically recover after one or more generations.
- Human activities such as traditional harvesting and subsistence, commercial and recreational activities may also be adversely affected.

Northern Gateway also provided a more detailed review of the recovery of the biophysical and human environments from oil spills, in reply to participants' assertions that biophysical and human environments do not recover from spill events. The company used a case study approach and reviewed the scientific literature for environments similar to the project area. The review examined 48 spills, including the Exxon Valdez oil spill in 1989, and 155 valued ecosystem components from cold temperate and sub-arctic regions. Northern Gateway said that the scientific evidence is clear that, although oil spills have adverse effects on biophysical and human environments, ecosystems and their components recover with time.

Northern Gateway said that there is no consensus on a definition for "recovery," and that definitions have changed over the years. It said that the common element in most definitions involves a post-disturbance return of the ecosystem or valued ecosystem component to some desirable state.

Northern Gateway defined recovery as a return to the conditions that would have prevailed had the oil spill not occurred. It said that this definition

recognizes the need to account for natural variability and for the influence of natural and man-made factors other than the spill, as these can obscure the signal from the oil spill. It said that recent scientific literature indicates that the goal of spill cleanup should be help restore the ecosystem to a functional state that provides valuable ecological goods and services.

Pacific herring, killer whales, and pink salmon were species that were extensively studied following the Exxon Valdez spill and were discussed by numerous participants in the Panel's process.

As referred to by the Haisla Nation, Pacific herring are listed as "not recovering" by the Exxon Valdez Oil Spill Trustee Council. The Trustee Council said that, despite numerous studies to understand the effects of oil on herring, the causes constraining population recovery are not well understood. Northern Gateway said that scientific evidence indicates that a combination of factors, including disease, nutrition, predation, and poor recruitment appear to have contributed to the continued suppression of herring populations in Prince William Sound.

Northern Gateway said that 20 years of research on herring suggests that the Exxon Valdez oil spill is likely to have initially had localized effects on herring eggs and larvae, without causing effects at the population level. Northern Gateway said that, even after 20 years, the effects of the spill on herring remain uncertain. It said that there has also been convergence amongst researchers that herring declines in the spill area cannot be connected to the spill. Northern Gateway said that herring stocks along the entire coast of British Columbia have been in overall decline for years and that herring were shown to recover within 1 to 2 years following the Nestucca barge spill. A Gitxaala Nation expert noted the uncertainty in interpreting the decline of herring following the Exxon Valdez oil spill and said that the debate is not likely to ever be settled.

The Living Oceans Society said that the Exxon Valdez Oil Spill Trustee Council reported that some killer whale groups suffered long-term damage from initial exposure to the spill. Northern Gateway's expert said the research leads him to conclude that the actual effects on killer whales of the Exxon Valdez spill are unknowable due to numerous confounding factors. He said that the Exxon Valdez Oil Spill Trustee Council has not definitively said that killer whale mortalities can be attributed to the spill. A Government of Canada expert said that the weight of evidence suggests that the mortality of killer whales was most likely related to the spill.

Northern Gateway said that mass mortality of marine fish following a spill is rare. In response to questions from the Haisla Nation, Northern Gateway said that fish have the ability to metabolize potentially toxic substances such as polycyclic aromatic hydrocarbons. It said that international experience with oil spills has demonstrated that fin fishery closures tend to be very short in duration. Northern Gateway said that food safety programs for fin fish conducted following the Exxon Valdez spill and the Selendang Ayu spill in Alaska indicated that the finfish were not affected by the spill and that the fish were found, through food safety testing programs, to be safe to eat.

The Haisla Nation referred to the Exxon Valdez Oil Spill Trustee Council report that discussed the complexities and uncertainties in the recovery status of pink salmon. It said that, by 1999, pink salmon were listed as recovered and that the report noted that continuing exposure of embryos to lingering oil is negligible and unlikely to limit populations. Northern Gateway said that the long-term effect of the spill on pink salmon survival is best demonstrated by the success of adult returns following the spill. Northern Gateway said that, in the month following the spill, when there was still free oil throughout Prince William Sound, hundreds of millions of natural and hatchery pink salmon fry migrated through the area. It argued that these fish would arguably be at greatest risk from spill-related effects but that the adult returns 2 years later were one of the highest populations ever. Northern Gateway said that sockeye and pink salmon appear to have been unaffected by the Exxon Valdez spill over the long term.

In response to questions from the Council of the Haida Nation and the United Fishermen and Allied Workers Union, Northern Gateway said that effects on species such as seaweed, crabs, and clams have been shown to be relatively short-term, with these species typically recovering within 2 years or less following a spill, depending on circumstances. Northern Gateway said that, based on the Exxon Valdez spill, the level of hydrocarbons dissolved or suspended in the water column would be expected to be substantially lower than those for which potential toxic effects on crabs or fish may occur.

In response to questions from BC Nature and Nature Canada, Northern Gateway said that the Exxon Valdez oil spill indicates which species of

birds are most susceptible to oiling. Seabirds are generally vulnerable to oil spills because many species spend large amounts of time at sea. Diving seabirds such as murres are particularly vulnerable to oiling because they spend most of their time on the surface, where oil is found, and tend to raft together. Thus, these species often account for most of the bird mortality associated with oil spills. More than 30,000 seabird carcasses, of which 74 per cent were murres, were recovered following the Exxon Valdez spill and it was initially estimated that between 100,000 and 300,000 seabirds were killed. However, detailed surveys of breeding murres in 1991 indicated no overall difference from pre-spill levels confirming rapid recovery of this species. Northern Gateway said that, although potential toxicological effects from oil spills on birds have been well documented in laboratory studies, the ultimate measure of recovery potential is how quickly birds return to their natural abundance and reproductive performance. It said that recovery is often difficult to measure due to significant natural variation in populations and the fact that the baseline is often disputed. It said that this can lead to misinterpretation of results depicting recovery.

At the request of Environment Canada, Northern Gateway filed two reports on the susceptibility of marine birds to oil and the acute and chronic effects of the Exxon Valdez oil spill on marine birds. Northern Gateway said that marine birds are vulnerable to oil in several ways such as contact, direct or indirect ingestion, and loss of habitat. It said that many marine bird populations appear to have recovered from the effects of the Exxon Valdez spill, but some species such as harlequin ducks and pigeon guillemots have not recovered, according to the Exxon Valdez Oil Spill Trustee Council. It said these reports demonstrate that marine birds are susceptible to marine oil spills to varying degrees depending on the species, its life history and habitat, and circumstances associated with the spill.

Northern Gateway concluded that:

- Marine, freshwater, and terrestrial environments recover from oil spills, with recovery time influenced by the environment, the valued ecosystem components of interest, and other factors such as spill volume and characteristics of the oil. Depending on the species and circumstances, recovery can be quite rapid or it can range from 2 to 20 years. Other scientific reviews have indicated that recovery of marine environments from oil spills takes 2 to 10 years.
- Different marine ecosystem components recover at different rates. Recovery time can range from days or weeks in the case of water quality, to years or decades for sheltered, soft-sediment marshes. Headlands and exposed rocky shores can take 1 to 4 years to recover.
- Little to no oil remained on the shoreline after 3 years for the vast majority of shoreline oiled following the Exxon Valdez spill,
- The Exxon Valdez Oil Spill Trustee Council concluded that, after 20 years, any remaining Exxon Valdez oil in subtidal sediment is no longer a concern, and that subtidal communities are very likely to have recovered.
- Because sheltered habitats have long recovery times, modern spill response gives high priority to preventing oil from entering marshes and other protected shoreline areas.
- Valued ecosystem components with short life spans can recover relatively rapidly, within days to a few years. Recovery is faster when there is an abundant supply of propagules close to the affected area. For example, drifting larvae from un-oiled marine and freshwater habitats will rapidly repopulate nearby areas affected by a spill.
- Plankton recovery is typically very rapid.
- Seabed organisms such as filter feeders may be subject to acute effects for several years, depending on location, environmental conditions, and degree of oiling.
- Marine fisheries and other human harvesting activities appear to recover within about 2 to 5 years if the resource has recovered and has not been affected by factors other than the oil spill.
- Protracted litigation may delay resumption of fisheries and other harvesting.
- Local community involvement in spill response priorities and mitigation plans can reduce community impacts and speed recovery of fisheries and harvesting activities.
- A long life span typically means a long recovery time, in the case of bird and mammal populations that can only recover by local reproduction rather than by immigration from other areas.
- Fast moving rivers and streams tend to recover more quickly than slow flowing watercourses, due to dispersal of oil into the water column by turbulence, which can enhance dissolution, evaporation, and microbial degradation.
- Drinking water and other water uses can be affected by an oil spill for weeks to months. Drinking water advisories are usually issued. Groundwater use may be restricted for periods ranging from a few weeks to 2 years, depending on the type of use.

- Groundwater can take years to decades to recover if oil reaches it. Groundwater does not appear to have been affected in the case of Enbridge's Kalamazoo River spill, near Marshall, Michigan.
- Freshwater invertebrates appear to have recovered within 2 years in several cases.
- Freshwater fisheries may recover fully in as little as four years, with signs of partial recovery evident after only a few months. The ban on consumption of fish in the Kalamazoo River was to be lifted approximately two years following the spill.
- Human activities are affected by factors such as cleanup activities, safety closures and harvesting bans. These typically persist for months to a few years.
- Appropriate cleanup can promote recovery, while inappropriate cleanup techniques can actually increase biophysical recovery time. Modern spill response procedures carefully consider the most appropriate treatment for the oil type, level of contamination, and habitat type.

The Living Oceans Society noted the following in relation to potential recovery of the marine environment following a spill:

- Physical contamination and smothering are primary mechanisms that adversely affect marine life, particularly intertidal organisms.
- Birds and mammals suffer the greatest acute impact when exposed to oil at or near the water surface.
- Marine communities have variable resiliency to oil spills, from highly tolerant (plankton, kelp beds), to very intolerant (estuaries and sea otters). Impacts to communities and populations are very difficult to measure due to lack of scientific methods to measure long-term, sublethal, and chronic ecological impacts.
- As the return of the marine environment to the precise conditions that preceded the oil spill is unlikely, a measurement of spill recovery can be based on a comparison of un-oiled sites with oiled sites of similar ecological characteristics.
- The Exxon Valdez oil spill killed many birds and sea otters. Population-level impacts to salmon, sea otters, harbour seals, and sea birds appear to have been low. Wildlife populations had recovered within their natural range of variability after 12 years.
- Intertidal habitats of Prince William Sound have shown surprisingly good recovery. Many shorelines that were heavily oiled and then cleaned appear much as they did before the spill. There is still residual buried oil on some beaches. Some mussel and clam beds have not fully recovered.
- The marine environment recovered with little intervention beyond initial cleaning. Natural flushing by waves and storms can be more effective than human intervention.
- Wildlife rescue and rehabilitation efforts had a marginal beneficial effect on the recovery of bird and mammal populations
- The impacted area of Prince William Sound has shown surprising resiliency and an ability to return to its natural state within the range of natural variability.
- The Exxon Valdez oil spill had significant and long-lasting effects on people and communities.

The Panel posed a series of questions to experts representing Northern Gateway, federal government participants, and the Gitxaala First Nation regarding the potential recovery of marine ecosystems following a large oil spill.

Northern Gateway said that past marine spills have demonstrated that, over time, the environment will recover to a pre-spill state, and that most species fully recover. It said that species associated with the surface of the water tend to be most susceptible to oil spills, and that cleanup efforts can help direct and accelerate natural restoration processes.

Federal government experts generally agreed with Northern Gateway's responses, although they stressed that effects could be felt in areas other than the water surface, such as intertidal and subtidal zones. They said that it is difficult to define and assess effects and recovery, depending on the species and availability of baseline information. They said that most species may fully recover over time, and that the time frame for this recovery can be extremely variable depending on species and circumstances.

The Gitxaala Nation's experts noted the potential for effects on species at the water surface and in intertidal areas, and noted exceptions to the notion that the marine environment will naturally restore itself. They said that full recovery can occur, depending on the circumstances, but is not guaranteed. They said that it is difficult to assess spill effects in the absence of adequate baseline information.

7.2.4 BASELINE INFORMATION

Participants told the Panel that a lack of baseline information has often made it difficult to separate spill-related effects from those that were caused by natural variation or other causes not related to a spill. Northern Gateway acknowledged the need for adequate baseline information. Parties such as Coastal First Nations, Raincoast Conservation Foundation, and the Gitxaala Nation said that Northern Gateway had provided insufficient baseline information to assess future spill-related effects. The Kitsumkalum First Nation asked how spill-related effects on traditionally harvested foods could be assessed in the absence of baseline information.

The Haisla Nation noted the importance of collecting baseline data in the Kitimat River valley to compare with construction and spill-related impacts. The Haisla Nation submitted a report outlining important considerations for a baseline monitoring program. One recommendation was that the program should engage stakeholders and be proponent-funded. In response to questions from Northern Gateway, the Haisla Nation noted that a design along the lines of a before/after control/impact model would be appropriate. In response to these comments, Northern Gateway noted its commitment to implement a Pipeline Environmental Effects Monitoring Program (also discussed in Chapter 8). Northern Gateway's proposed framework for the monitoring program indicates that a number of water column, sediment, and biological indicators would be monitored.

The Raincoast Conservation Foundation said that one of the principal lessons learned from the Exxon Valdez oil spill was the importance of collecting abundance and distribution data for non-commercial species. Because baseline information was lacking, spill effects on coastal wildlife were difficult to determine. Environment Canada also noted the importance of adequate baseline information to assess, for example, spill-related effects on marine birds.

Northern Gateway outlined the baseline measurements that it had already conducted as part of its environmental assessment. It also said that is would implement a Marine Environmental Effects Monitoring Program. Northern Gateway said that the initial baseline data, plus ongoing monitoring, would create a good baseline for environmental quality and the abundance, distribution, and diversity of marine biota. In the event of an oil spill it would also help inform decisions about restoration endpoints.

Northern Gateway said that it would provide Aboriginal groups with the opportunity to undertake baseline harvesting studies. In response to questions from the United Fishermen and Allied Workers Union, Northern Gateway said that baseline information gathered through the environmental effects monitoring program would also be relevant to commercial harvest management and for assessing compensation claims in the event of a spill.

The Kitimat Valley Naturalists noted the ecological importance of the Kitimat River estuary and the particularly sensitive nature of the resources there, including eel grass and black oystercatcher. It said that Northern Gateway had not collected adequate baseline data in this area and had ignored important data available from the Kitimat Valley Naturalists. Northern Gateway and the Kitimat Valley Naturalists agreed that these data would be shared as baseline information.

7.2.5 VIEWS OF THE PANEL

CONSEQUENCES AND SIGNIFICANCE OF SPILLS

The Panel heard evidence and opinion regarding the value that the public and Aboriginal groups place on a healthy natural environment. The Panel finds that it is not able to quantify how a spill could affect people's values and perceptions. The Panel finds that any large spill would have short-term negative effects on people's values, perceptions and sense of wellbeing. The Panel is of the view that implementation of appropriate mitigation and compensation following a spill would lessen these effects over time. The Panel heard that protracted litigation can delay recovery of the human environment. The Panel heard that appropriate engagement of communities in determining spill response priorities and developing community mitigation plans can also lessen effects on communities. Northern Gateway has committed to the development of Community Response Plans as discussed in Section 7.4.

All ecosystems are subject to disturbance and change associated with natural and human causes, and have some degree of resilience and recovery capacity. Some ecosystem changes can be attributed to specific events such as a forest fire, a severe storm, or an oil spill. Other changes, such as natural variability in species composition

and populations, or the effects of overharvesting, are more difficult to associate with one particular causal event. Human activities can interact with natural processes or events.

The Panel finds that the effects of small oil or condensate leaks or spills that are confined largely to the pipeline right-of-way, station properties, or the immediate area of the Kitimat Terminal, are not likely to be significant. Spill response, cleanup, and natural recovery are likely to quickly restore affected local ecosystems.

The Panel finds that a large terrestrial, freshwater, or marine oil or condensate spill would cause significant adverse environmental effects and that the adverse effects would not be permanent and widespread. The type and duration of effects would be highly variable and would depend on the type and volume of product spilled, location of the spill, exposure of living and non-living ecosystem components to the product spilled, and environmental conditions. Effects and toxicity would decrease over distance and time from the spill. Short-term, acute environmental effects are likely with any large oil or condensate spill. Chronic effects would be more likely with heavier hydrocarbons such as synthetic crude oil or dilbit.

The Panel finds that the physical characteristics of the Confined Channel Assessment Area, and its potentially lower rates of natural dispersion and degradation, would likely result in longer lasting spill effects on certain living and non-living environmental components in the Confined Channel Assessment Area than for a spill in the Open Water Area. The Panel finds that there is potential for some oil to sink if it interacts with sediment or suspended particulate matter, or over the long term, due to natural weathering processes.

The Panel is of the view that the relatively confined nature of the Confined Channel Assessment Area, and the potential for submerged oil to resurface, increases the potential for oil to reach the shoreline in that area. Submergence and refloating of oil would be likely for a spill in the Open Water Area. Depending on oil trajectory, oil could reach shorelines.

ECOSYSTEM RECOVERY AFTER A SPILL

The Panel finds that a large spill would not cause permanent, widespread damage to the environment. Evidence from past spills indicates that, although each large spill event is a unique event, the environment recovers to a state that supports functioning ecosystems similar to those existing before the spill. There was general agreement on this point amongst parties with expertise in oil spill preparedness, response, and environmental recovery.

The Panel's finding regarding ecosystem recovery following a large spill is based on extensive scientific evidence filed by many parties, including information on recovery of the environment from large past spill events such as the Exxon Valdez oil spill. The Panel notes that different parties sometimes referred to the same studies on environmental recovery after oil spills, and drew different conclusions. In its consideration of natural recovery of the environment, the Panel focused on effects that are more readily measurable such as population level impacts, harvest levels, or established environmental quality criteria such as water and sediment quality criteria.

The Panel finds that the evidence indicates that ecosystems will recover over time after a spill and that the post-spill ecosystem will share functional attributes of the pre-spill one. Post-spill ecosystems may not be identical to pre-spill ecosystems. Certain ecosystem components may continue to show effects, and residual oil may remain in some locations. In certain unlikely circumstances, the Panel finds that a localized population or species could potentially be permanently affected by an oil spill. Scientific studies after the Exxon Valdez spill indicated that the vast majority of species recovered following the spill and that functioning ecosystems, similar to those existing pre-spill, were established. Species for which recovery is not fully apparent, such as Pacific herring, killer whales, and pigeon guillemots, appear to have been affected by other environmental factors or human influences not associated with the oil spill. Insufficient pre-spill baseline data on these species contributed to difficulties in determining the extent of spill effects.

Based on the evidence, the Panel finds that natural recovery of the aquatic environment after an oil spill is likely to be the primary recovery mechanism, particularly for marine spills. Both freshwater and marine ecosystem recovery is further mitigated where cleanup is possible, effective, and beneficial to the environment. Natural processes that degrade oil would begin immediately following a spill. Although residual oil could remain buried in sediments for years, the Panel finds that toxicity associated with that oil would decline over time and would not cause widespread, long-term impacts.

The Panel finds that Northern Gateway's commitment to use human interventions, including available spill response technologies, would mitigate spill impacts to ecosystems and assist in species recovery. Many parties expressed concerns about potential short-term and long-term spill effects on resources that they use or depend on, such as drinking water, clams, herring, seaweed, and fish. The weight of evidence indicates that these resources recover relatively rapidly following a large oil spill. For example, following the Selendang Ayu and Exxon Valdez spills in Alaska, fin fish were found, through food safety testing programs, to be safe to eat. Food safety closures for species such as mussels, urchins, and crabs were lifted within 1 to 2 years following the spills.

The actual time frame for recovery would depend on the circumstances of the spill. Until harvestable resources recover, various measures are typically put in place, such as compensation, harvest restrictions or closures, and provision of alternative supply.

It is difficult to define recovery of the human environment because people's perceptions and values are involved. This was made clear to the Panel through oral statements and oral evidence. The Panel finds that oil spills would cause disruptions in people's lives, especially those people who depend on the marine environment for sustenance, commercial activities and other uses. The extent and magnitude of this disruption would depend on the specific circumstances associated with the spill. The Panel views recovery of the socio-economic environment as the time when immediate impacts and interruption to people's lives are no longer evident, and the natural resources upon which people depend are available for use and consumption.

The Panel heard that assessing the potential recovery time of the environment is often complicated by challenges in separating background or unrelated events from spill-related effects. There can be natural variation in species populations, and other natural and human-induced effects can also make it difficult to determine which impacts are spill-related and which are not. The Panel notes that Northern Gateway has committed to collect baseline data and gather baseline information on harvest levels and values through initiatives such as its Environmental Effects Monitoring Program, Fisheries Liaison Committee, and traditional harvest studies. The Panel finds that these commitments go beyond regulatory requirements and are necessary. This information would contribute to assessments of spill effects on resource harvesting values, post-spill environmental recovery, and loss and liability determinations.

The Panel is of the view that it is not possible to predict a specific time in which overall recovery of the environment may occur. The time for recovery would depend on the type and volume of product spilled, environmental conditions, the success of oil spill response and cleanup measures, and the extent of exposure of living and non-living components of the environment to the product spilled. Recovery of living and non-living components of the environment would occur over different time frames ranging from weeks, to years, and in the extreme, decades. Even within the same environmental component, recovery may occur over different time frames depending on local factors such as geographic location, the amount of oiling, success of cleanup, and amount of natural degradation.

Based on the physical and chemical characteristics described for the diluted bitumen to be shipped and the fate and transport modelling conducted, the Panel finds that stranded oil on shorelines would not be uniformly distributed on shorelines and that heavy oiling would be limited to specific shoreline areas. The Panel accepts Northern Gateway's prediction that spilled dilbit could persist longer in sheltered areas, resulting in longer consumption advisories for intertidal communities and associated invertebrates than in more open areas. Based on the scientific evidence, the Panel accepts the results of the chronic risk assessment that predicted no significant risks to marine life due to oil deposition in the subtidal sediments.

For potential terrestrial and marine spills, the Panel does not view reversibility as a reasonable measure against which to predict ecosystem recovery. No ecosystem is static and it is unlikely that an ecosystem will return to exactly the same state following any natural or human induced disruption. Based on the evidence and the Panel's technical expertise, it has evaluated whether or not functioning ecosystems are likely to return after a spill. Requiring Northern Gateway to collect baseline data would provide important information to compare ecosystem functions before and after any potential spill.

NORTHERN GATEWAY'S RISK ASSESSMENTS

The Panel finds that Northern Gateway's ecological and human health risk assessment models and techniques were conducted using conservative assumptions and state of the art models. Combined with information from past spill events, these assessments provided sufficient information to inform the Panel's deliberation on the extent and severity of potential environmental effects. The Panel finds that this knowledge was incorporated in Northern Gateway's spill prevention strategies and spill preparedness and response planning. Although the ecological risk assessment models used by Northern Gateway may not replicate all possible environmental conditions or effects, the spill simulations conducted by Northern Gateway provided a useful indication of the potential range of consequences of large oil spills in complex natural environments.

7.3 Northern Gateway's spill prevention and mitigation strategy

Northern Gateway said that it is impossible to eliminate all risks associated with the project. It said that it was focused on mitigation measures to reduce the likelihood of oil spills occurring and, if a spill occurs, to limit the consequences through a preparedness and response program that exceeds Canadian standards.

7.3.1 PIPELINE AND TERMINAL SPILL PREVENTION AND MITIGATION

Northern Gateway's approach to pipeline design and other mitigation intended to prevent spills is discussed in Chapter 5.

This section discusses additional measures pertaining to prevention of pipeline spills or minimizing their potential environmental effects through other engineering and planning measures. Northern Gateway said that the objective of pipeline design, engineering, construction, and operations is to mitigate and manage the level of risk over the life of the pipeline with the goal of avoiding spills of any size. It said that the most effective approach to avoid the potential effects of pipeline spills and other malfunctions and accidents is by preventing them from occurring in the first place.

Northern Gateway's semi-quantitative risk assessment concluded that most of the pipeline route has a low risk rating. The Province of British Columbia questioned Northern Gateway about its spill prevention measures and response strategies for high consequence areas. Northern Gateway said that its target release volumes were established not only for tributaries, but along entire zones such as where the pipeline would be constructed parallel to the Kitimat River, Morice River, and other high consequence areas. It said that full-bore rupture modelling provided a worst case unmitigated scenario to help the company prioritize locations for spill response planning. Northern Gateway said that this is a very conservative approach as the system would likely be isolated sooner than its targeted 13-minute valve closure response time because of the signals and alarms that would be activated.

TECHNOLOGY TO LOWER POTENTIAL SPILL VOLUMES

Northern Gateway's semi-quantitative risk assessment identified high consequence areas, such as the Necoslie River, Pitka Creek, the Sutherland River, and Duncan Creek where the potential oil release volume would exceed Northern Gateway's 2,000 cubic metres release guideline. The Panel questioned Northern Gateway on the technologies that would be available in these areas and the additional mitigation measures that could be applied. Northern Gateway said that technologies such as hydrocarbon sensors, diversion berms, culvert flow control devices, and engineered containment systems would be used in these areas and that it was evaluating different technologies to determine their benefits and limitations. This would occur during detailed design and planning with the objective of reducing the overall risk for identified pipeline segments. As an example, Northern Gateway outlined an engineered oil diversion and containment system for a section of the pipeline in the Kitimat River valley with potentially difficult access. The purpose of the

system would be to control and divert potential spills to less harmful locations where products could be contained and retrieved.

Northern Gateway said that such design measures would be refined in consultation with the British Columbia Ministry of Forests, Lands and Natural Resource Operations, participating First Nations, and industry during detailed design and planning. Northern Gateway said that it would consider using similar technology elsewhere on the project.

ROUTING AND SPILL CONTAINMENT IN THE TUNNELS

Northern Gateway said that the company's risk based approach also considers re-routing of the pipeline right-of-way as a mitigation measure to reduce the hazards and consequences to high consequence areas. Northern Gateway said that the pipeline was re-routed in the Morice River area due to concerns of Fisheries and Oceans Canada about the proximity of the pipeline to the Morice River, the importance of the river from a fisheries perspective, and the presence of geotechnical hazards in this area. Northern Gateway said that this re-route would reduce proximity to the river and avoid geotechnical hazards.

Northern Gateway outlined its potential use of the Clore and Hoult Creek tunnels for emergency preparedness and response purposes. In response to questions from the Haisla Nation, it said that the tunnels are a major mitigative measure for addressing geotechnical hazards and potential environmental impacts. Northern Gateway's technical assessment demonstrated that a system could be designed to contain and collect a spill within the tunnels. Further evaluation of the collection and containment measures would be undertaken during detailed design and planning. Northern Gateway also identified the use of the tunnels themselves as access routes for response during difficult conditions such as in the winter.

SAFETY AND SPILL PREVENTION AT THE KITIMAT TERMINAL

Northern Gateway conducted a quantitative risk analysis to assess worker safety at the Kitimat Terminal and public safety in the vicinity of the Kitimat Terminal. The assessment evaluated the hazards associated with over 100 "loss of containment" scenarios and modelled the consequence of each representative release scenario including dispersion, pool and flash fires, and explosions. The results of the analysis would be used by Northern Gateway to develop strategic and tactical measures in the design, layout, engineering, and operations of the facility. Northern Gateway indicated that the results would help the company develop its Emergency Response Plan for the Kitimat Terminal and surrounding areas.

The Haisla Nation stressed the importance of a robust system for mitigation, prevention, emergency response, and oversight of minor incidents and spills at the Kitimat Terminal. In response to questions from Northern Gateway, the Haisla Nation's expert confirmed that most of the reported spills in Prince William Sound were minor releases from tankers at berth at the terminal ranging from less than a teaspoon to a few gallons.

In response to questions from the Haisla Nation, Northern Gateway outlined mitigation such as sump construction, use of drip trays, and dock curbing to prevent potential spills from reaching the water during tanker loading at the Kitimat Terminal. It committed to deploy booms around tankers during loading of oil.

7.3.2 PREVENTION OF TANKER SPILLS

Northern Gateway said that over 1 million barrels of crude oil and petroleum products are safely shipped into and out of Canadian ports on the Atlantic and Pacific coasts each day. These ports include Saint John, New Brunswick, Montreal and Vancouver, as well as Kitimat. The company said that, early in project development, it became aware of significant concern from the public and Aboriginal people regarding the marine transportation component of the project, particularly regarding oil spills. This concern drove the company's consideration of marine shipping issues and its proposed mitigation.

Northern Gateway committed to full compliance with national and international regulatory frameworks, including the requirements for:

- double hulls;
- segregated ballast tanks;
- internationally recognized crew certification;
- pilotage; and
- an electronic chart display and information system

Northern Gateway also committed to implement a number of voluntary measures related to safe terminal and tanker operations that exceed *Canada Shipping Act, 2001* requirements. The Panel refers to these as marine voluntary commitments. These are outlined later in this section.

TANKER FLEET

Northern Gateway is proposing to use three different vessel types to transport oil and condensate:

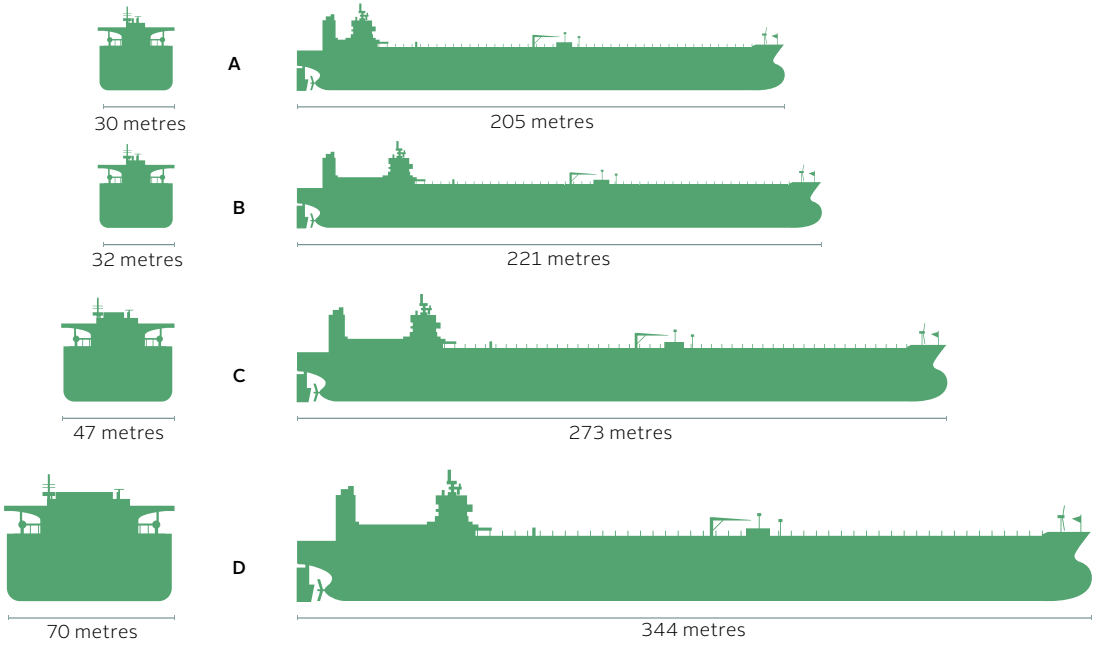
- very large crude carriers (VLCC);
- Aframax tankers; and
- Suezmax tankers.

Aframax and Suezmax tankers would be used to import condensate. Suezmax tankers and VLCCs would be used to export oil. Typical dimensions for these vessels are shown in Figure 7.1. An average of 220, and a maximum of 250, vessel loads per year are projected for the Kitimat Terminal. Suezmax tankers would account for approximately one-half of these loads. Northern Gateway said that increased use of VLCCs would reduce the number of loads.

Northern Gateway said that, as long as the proposed shipping routes are viable for the size of the vessel, vessel size is not particularly relevant to the probability of tanker incidents such as groundings or collisions. Northern Gateway said that VLCCs are slower to stop and maneuver than smaller vessels. It said that larger vessels, such as laden VLCCs, can be easier to handle than smaller unladen vessels, as external forces such as wind, waves, and currents have less influence on VLCC movement.

Northern Gateway assessed current levels of marine traffic in the project area, including size of vessels and number of transits. Generally, vessels currently transiting the Confined Channel Assessment Area are smaller than the project vessels in terms of length and tonnage, although cruise

FIGURE 7.1 **TYPICAL SIZE AND DIMENSIONS OF VESSELS ASSOCIATED WITH THE PROJECT**



A Coastal Tanker **B Aframax** **C Suezmax** **D Very Large Crude Carriers**

ships up to 296 metres in length currently transit Grenville Channel as part of the Inside Passage route. The largest vessel to have come into Kitimat is 50,000 deadweight tonnes. Large coal ships and container vessels up to 350 metres in length transit to the Port of Prince Rupert.

PROPOSED TANKER ROUTES

The shipping routes associated with the project are shown in Figure 7.2. All shipping would take place in already established shipping routes which currently see large vessel traffic. Northern Gateway noted the finding of the TERMPOL review that all shipping routes proposed for the project are suitable for safe transit by a VLCC. The total transit time for a vessel from the pilot boarding station on the northern approach to the Kitimat Terminal would be approximately 15 hours.

Three tanker routing options are proposed by Northern Gateway. They include:

- The Northern Approach, for tankers arriving from or departing to Asian ports.
- The Southern Direct Approach through Caamaño Sound, for tankers arriving from or departing to West Coast ports south of the Kitimat Terminal. This route may be limited to moderate weather use, particularly in winter months, to allow safe boarding of pilots or use of escort tug services. In this case, the Southern Approach via Principe Channel would be used. VLCCs would not typically use the Southern Direct approach.
- The Southern Approach via Principe Channel.

WIND AND CURRENTS ALONG THE PROPOSED TANKER ROUTES

Coastal First Nations and other intervenors expressed concerns regarding weather on the West Coast and its ability to impact the safety of marine shipping. The Panel also heard comments from individuals and groups regarding extreme weather and tidal conditions along the proposed shipping routes. The Panel heard evidence that the West Coast is subject to high winds, large waves, and storms, particularly in the winter months. Oral statements and oral evidence referred to very high winds, in the 100 to 200 kilometres per hour range.

Northern Gateway said that, although winds speeds of between 111 kilometres per hour and 185 kilometres per hour are described in its application, these wind speeds referred to Arctic outflow winds on the coast of British Columbia in general, rather than Kitimat Arm, Douglas Channel or the Confined Channel Assessment Area specifically.

Environment Canada observations, and analyses undertaken by Northern Gateway and the Haisla Nation, demonstrated variability in the data in terms of whether the mean or maximum wind speed was measured, how long the wind blew for, the time of year of measurement, and other factors. These data indicated that, most of the time, winds speeds are in the 40 to 60 kilometres per hour range, or less. These data also indicated that maximum wind speeds in the Open Water Area and Confined Channel Assessment Area have been measured in the 100 kilometres per hour range. Northern Gateway said that wind speeds exceeding 90 to 100 kilometres per hour are rare in the Open Water Area. It also said that wind speeds exceeding 80 kilometres per hour occur between 0.06 per cent and 0.29 per cent of the time at sites in the Confined Channel Assessment Area and the Open Water Area.

The Pacific Pilotage Authority said in a letter of comment that, although the West Coast can have severe weather, the confined channels are often more protected than open water areas. It said that wind speeds on the West Coast are either comparable to, or less than, winds on the East Coast, with maximum wind speeds not exceeding 100 kilometres per hour.

Northern Gateway said that the largest measured significant wave height at Nanakwa Shoal in the Douglas Channel is 2.3 metres. It said that significant wave heights exceeding 4 metres occur nearly 18 per cent of the time in Queen Charlotte Sound, 7 per cent of the time in South Hecate Strait, 3.3 per cent of the time in North Hecate Strait, and 2.1 per cent of the time in Dixon Entrance.

Douglas Channel Watch, the Heiltsuk Tribal Council and others questioned a tanker's ability to operate safely in large waves. Northern Gateway said that tankers are designed to operate in extreme wave environments and such conditions present no problem.

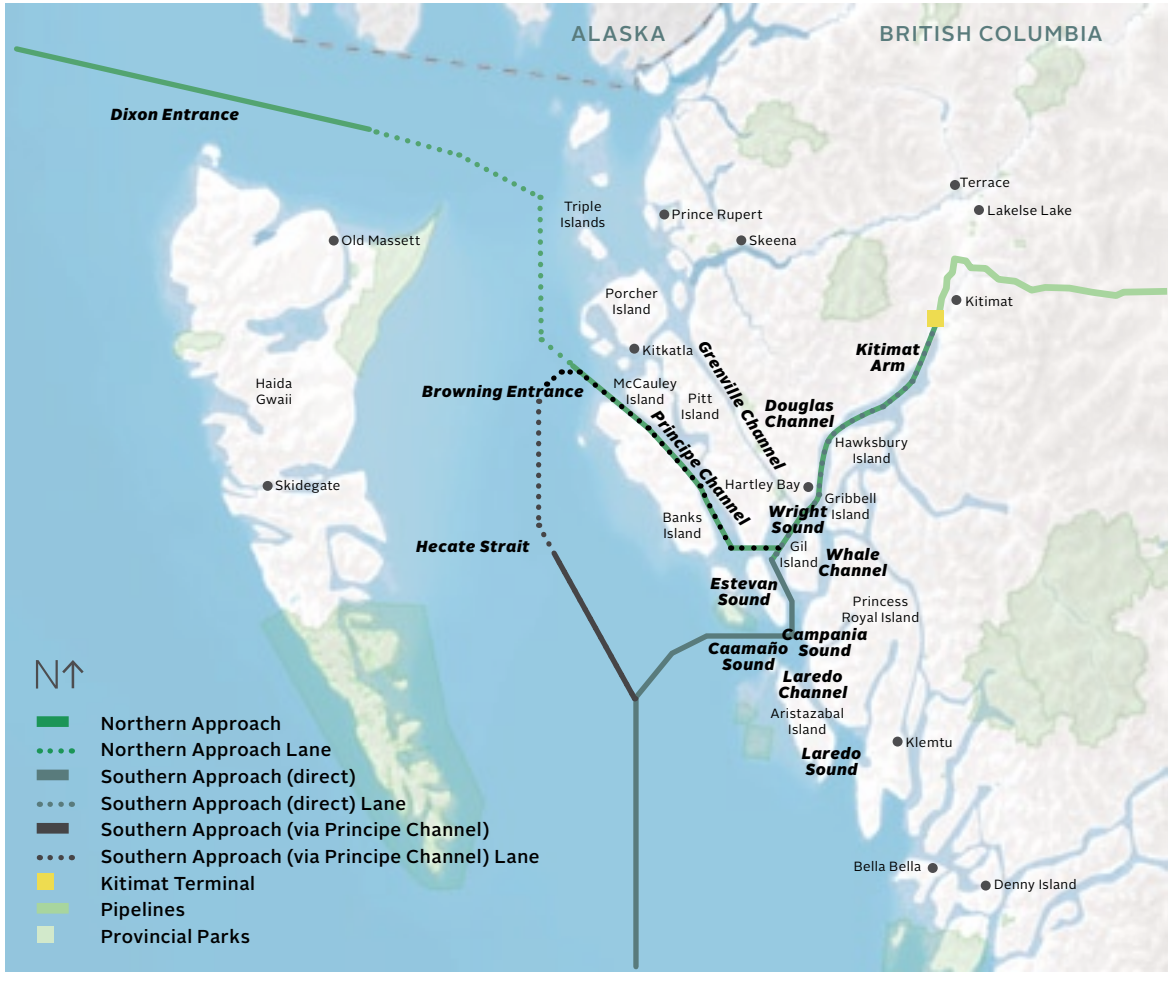
During the oral evidence session in Bella Bella, the Heiltsuk Tribal Council said that waves building up to 30 feet in height had been observed in the Caamaño Sound area. Northern Gateway said that such wave heights could occur but they would be extremely rare and even should they occur, tankers are designed for wave conditions

such as this, and worse. Northern Gateway said that weather conditions producing such waves would be forecast well in advance, and tankers would be advised by Marine Communications and Traffic Services to take appropriate measures. Northern Gateway said that it did not anticipate that tankers would pass through such extreme weather conditions, although they are able to do so. Northern Gateway supplemented existing Environment Canada and Fisheries and Oceans Canada weathering monitoring stations with its own weather monitoring stations. Douglas Channel Watch expressed concerns regarding the validity of the data from these stations. In response to questions from Douglas Channel Watch, Environment Canada said that it had reviewed the locations and settings of Northern Gateway's stations. It said that the stations adequately represented the weather for the Douglas Channel areas where they were placed.

Northern Gateway acknowledged that British Columbia north coast weather conditions can be severe and need to be taken into consideration for all marine operations. The marine shipping quantitative risk analysis performed by Northern Gateway as part of its TERMPOL submissions concluded that weather and ocean conditions in the project area are comparable to other areas of the world with significant tanker traffic. The company said that tankers and marine oil terminals have operated for decades on Canada's east and west coast, and on the coasts of Norway, Scotland, and Japan, all of which experience weather and ocean conditions similar to those on the British Columbia north coast.

FIGURE 7.2 **KITIMAT TERMINAL AND TANKER ROUTES**

The proposed site for the terminal facility is on the northwest side of Kitimat Arm of Douglas Channel. Tankers could follow several possible routes to and from the terminal. The routes would pass through waters used by Aboriginal groups, commercial and recreational fisheries, sailors and kayakers, tourist vessels, ferries, and other shipping. Northern Gateway said that project-associated tankers would represent about 10 per cent of ship traffic in Wright Sound and about one-third of ship traffic in Douglas Channel leading to Kitimat.



In oral statements and oral evidence the Panel heard that there are shallow areas in Hecate Strait. Northern Gateway said that tanker traffic would use established shipping routes. It said that the western part of Hecate Strait is very shallow, and that tankers calling at the Kitimat Terminal would use the eastern half of the Strait where the water is deeper.

Northern Gateway said that there are no water depth constraints to navigation along the Northern and Southern Approaches for the tankers that would call at the Kitimat Terminal. In response to questions from the Heiltsuk Tribal Council, Northern Gateway said that the proposed tanker routes are not in areas of shallow water and that the routes in Hecate Strait are already used by ships navigating in and out of the Port of Prince Rupert.

Northern Gateway said that the narrowest points in the Confined Channel Assessment Area do not restrict navigation. The two narrowest points are near Dixon Island in Principe Channel and at Emilia Island in Douglas Channel. At these points the channel width is 21.5 times the breadth, and 4 times the length, of a VLCC. Northern Gateway said that these ratios are safe for VLCC navigation. The Pacific Pilotage Authority said that Aframax tankers with a width of 42 metres pass under Second Narrows Bridge with a channel width of 136 metres when entering the Port of Vancouver.

In response to questions from the Coastal First Nations, Northern Gateway said that, in practice, pilots would avoid having two ships pass by each other in the narrowest points along the route. This would be achieved by having vessels adjust departure time, arrival time, or speed.

Northern Gateway said that tidal currents are not complex over most of the tanker routes, and that their tanker and tug simulations had incorporated currents. The Gitxaala Nation had concerns about strong currents in Principe Channel and Douglas Channel. Northern Gateway said that the Principe Channel and Douglas Channel have relatively moderate currents with maximums of 1 to 2 knots over the most of the route. It said that there are 6,000 transits a year through Boundary Pass and around Discovery Island at Victoria, where currents often reach 6 knots. Northern Gateway's expert, a former pilot on the West Coast, said that piloting a large vessel in and out of Prince Rupert Harbour and the Port of Vancouver would be more dangerous and challenging, due to natural hazards and tidal currents, than going to Kitimat would be.

TERMPOL FINDINGS AND RECOMMENDATIONS

The TERMPOL report said that the proposed shipping routes are appropriate for the tankers that would load and unload at the proposed terminal, and that there are no charted obstructions on the proposed tanker routes that would pose a safety hazard to fully loaded oil tankers. The report said that the Canadian Hydrographic Service is in the process of updating several charts of the area to ensure the most accurate information is available for safe navigation.

The report said that the Canadian Coast Guard had reviewed the proposed tanker routes taking into account the size of the largest proposed oil tankers, traffic density, and environmental factors affecting tanker manoeuvrability. It found that the waterways comply with Coast Guard guidelines and that the proposed routes provide the clearances and allowances required for good vessel manoeuvrability and safe VLCC navigation. This conclusion was assisted by Northern Gateway's navigation simulations showing that the largest tankers are capable of navigating the entire proposed route unassisted. The report said that this is consistent with opinions of Pacific Pilotage Authority Canada and the British Columbia Coast Pilots.

The report said that, although there will always be residual risk in any project, it had not identified any regulatory concerns for the vessels, vessel operations, proposed routes, navigability, other waterway users, and the marine terminal operations associated with the Enbridge Northern Gateway Project. It said that commitments by the proponent would help ensure that safety is maintained at a level beyond the regulatory requirements.

In response to the TERMPOL Review Committee's findings and recommendations, Northern Gateway said that it was committed to fully implementing the risk mitigation measures that it had submitted to the TERMPOL Review Committee.

TANKER ACCEPTANCE PROGRAM AND TERMINAL REGULATIONS

Northern Gateway committed to develop a tanker vetting program, called the Tanker Acceptance Program, to ensure that tanker owners and operators implement its marine voluntary commitments. Gateway would control access to the Kitimat Terminal through its Tanker Acceptance Program, which would be developed and implemented before the start of terminal operation.

The Tanker Acceptance Program would be in addition to, and would reinforce, other requirements that tanker owners must comply with, such as an initial inspection by a classification society and inspection under Transport Canada's Port State Control inspection program. The Tanker Acceptance Program would use a third party inspection database such as the Oil Companies International Marine Forum SIRE (Ship Inspection Report) Program. The Haisla Nation said that the SIRE program provides a good general framework for tanker vetting.

Northern Gateway said that the results of tanker inspections, wherever those inspections may be performed, would be input to the SIRE database to create a "living record" of the tanker. This allows the Tanker Acceptance Program to identify and reject any tanker that fails to meet the acceptance requirements. The Tanker Acceptance Program and Terminal Regulations also provide the means by which Northern Gateway would monitor and enforce its marine voluntary commitments, such as vessel speed restrictions.

In response to questions from the Province of British Columbia, Northern Gateway committed to have its Tanker Acceptance Program audited by a qualified, competent, independent auditor, and to make the results publically available.

In addition to the Tanker Acceptance Program, Terminal Regulations would be developed by Northern Gateway, specifying rules tankers must follow to be allowed to berth and load or discharge cargo. Northern Gateway said that Terminal Regulations are in effect at most marine terminals worldwide. Tankers that fail to abide by the Terminal Regulations risk being refused service and required to leave the terminal. In addition, a Port (or Terminal) Information Book would be developed to provide the master of the tanker with general information such as the operational regulations, navigation information, general weather, ship and crew services, local customs, and escort requirements.

Northern Gateway said that these documents are an important risk management tool for terminal and tanker operators. In concert with government regulations, they provide a process to assess individual tanker condition and history of operations, and provide pertinent information to tankers on the subject of the port and terminal safety and operations. A Northern Gateway expert said that the tanker industry is a heavily regulated industry and he said that it is probably watched more carefully than any other merchant marine sector. In light of this, he said that there is no incentive for tanker owner and operators to violate regulations, as no one would charter them, and they would not be able to operate.

Transport Canada said that the Tanker Acceptance Program is a voluntary measure, and that there are no provisions in Canadian marine shipping legislation that would make voluntary measures mandatory or enforceable. It also said that the program would be developed, implemented, and enforced by Northern Gateway.

Northern Gateway committed to provide copies of its Terminal Operations Manual and Port Information Book to Transport Canada, Fisheries and Oceans Canada, and Pacific Pilotage Authority Canada for review at least 6 months before the start of terminal operations. Northern Gateway said that it would also provide all oil tankers and their agents with the Terminal Operations Manual and Port Information Book in time for them to understand and fully comply with these documents.

USE OF PILOTS

Local pilots would board tankers at established pilot boarding stations in the outer section of Caamaño Sound and Browning Entrance, either by helicopter or pilot boat, depending on visibility and weather conditions. A minimum of two pilots would board the tankers for transit to and from the Kitimat Terminal and through coastal waters. The Pacific Pilotage Authority said that the number of delays in delivering pilots to vessels in the Prince Rupert/Kitimat area, over the past 10 years, is negligible. It said that it has never had a vessel wait more than 6 hours for a pilot and that it has an on time service delivery of 99.99 per cent. On occasions when the weather does exceed the parameters to launch safely, the vessel is given advance warning and either slows down or takes shelter. Coastal First Nations said that it was not aware of any situations where a pilot could not board due to weather.

Northern Gateway outlined a team approach to navigation of the vessel that includes the pilot, tanker master, and tug master. It said that Canadian law requires the pilot to take navigational control of the vessel if there are differences of opinion.

For voyages longer than 8 hours, or more than 105 nautical miles, 2 pilots are required. Parties raised concerns regarding the potential for pilot

and captain fatigue due to the length of passage. Northern Gateway responded that pilots are often required to make 48-hour transits from Vancouver to Prince Rupert on cargo ships and 30-hour transits from Vancouver to Triple Islands on cruise ships.

TUG ESCORT PROGRAM

Following computer simulation testing, the Pacific Pilotage Authority concluded that a VLCC could safely navigate the entire proposed routes without the use of escort tugs. Northern Gateway's marine shipping quantitative risk analysis concluded that the greatest unmitigated hazard to marine traffic transiting to and from the Kitimat Terminal is unpowered drift or powered grounding. It said that this hazard is most effectively mitigated by the use of escort tugs. In the event that a ship is in need of assistance due to weather conditions or mechanical breakdown, Northern Gateway proposed a tug escort program as follows:

- A close escort tug would be used for all laden and ballasted tankers, beginning at the pilot boarding stations, to and from the marine terminal.
- A tethered tug, in addition to a close escort tug, would be used for all laden tankers in the Confined Channel Assessment Area.
- In the Open Water Area, all tankers (laden and ballasted) would be accompanied by one close escort tug between the pilot boarding station and the Confined Channel Assessment Area.

Northern Gateway said that there are currently no suitable tugs in the project area and that all tractor tugs would be specifically designed for the project. Figure 7.3 shows the preliminary design. It said that such tugs would be designed to provide escort response in all weather conditions in which tankers would be operating in the Confined Channel Assessment Area, and that they would also be available for emergency rescue purposes in the Open Water Area. As open ocean tug rescue service does not currently exist on the British Columbia North Coast, Northern Gateway said that addition of its tugs would not only mitigate hazards to project shipping, but would also increase the overall safety for shipping and protection of the environment on the British Columbia North Coast.

In response to questions from Douglas Channel Watch, Northern Gateway's experts said that studies have demonstrated that escort tugs are very effective in preventing groundings and collisions. In operation, there has never been a case where a tanker tethered to an escort tug has run aground or been involved in a collision.

The TERMPOL Review Committee said that although there are no requirements under the *Canada Shipping Act, 2001* for the use of escort tugs, they are used in some local areas to provide an additional margin of safety. It found that Northern Gateway's commitment to implement a tug escort system that provides immediate and effective action would help mitigate risk if a tanker's steering or propulsion system fails. The TERMPOL Review Committee concluded that the tug escort system would enhance tanker safety.

Northern Gateway estimated that safe operating speeds for the tankers would be between 8 and 12 knots, with an average speed of 9 knots. It said that, if a tanker were to lose propulsion while transiting the Confined Channel Assessment Area, but still had steering, it would be possible to maintain course independently or with the assistance of an escort tug. Depending on whether the vessel was laden or in ballast, an escort tug would, or could, be tethered to the tanker to slow, steer, or stop the tanker. If a tanker were to lose steering, the ship could be slowed to a stop by the escort tug. It said that modern tractor escort tugs are able to steer a ship while stopping it. Northern Gateway's experts said there are alternative ways of stopping a ship, and that the quickest way to stop a ship is to complete a sharp turn as compared to a straight-on stop. Such maneuvers could be safely completed in the narrowest parts of the proposed shipping routes. Northern Gateway said that computer simulations also demonstrated that escorted oil tankers operating at these speeds would have time to complete safe and controlled maneuvers.

Northern Gateway outlined the current and proposed training program for tug masters and pilots. In addition to computer simulations in which these individuals participated, it said that pilots and tug masters already have considerable training and certification. The company said that British Columbia Coast Pilots are Transport Canada certified and complete a rigorous 7-year training program before they can pilot the largest design vessel. Tug masters would also have certifications issued by Transport Canada and considerable operating time on tractor tugs prior to receiving project-specific training. It said that the Pacific Pilotage Authority was already developing a plan

for escort tug training that would be applicable to all energy projects proposed for the Kitimat area. This program could include both computer simulations and live trials.

Following extensive computer simulation training in other areas of the world, the final stage of Northern Gateway's tug escort and pilot training program would involve the use of the project escort and docking tugs, and a tanker in the Suezmax to VLCC size range. Northern Gateway said that this training would be conducted on the planned routes with the tanker being configured to represent both ballasted and loaded conditions. There would be no oil cargo on board the tanker.

Northern Gateway has also committed to completion of a drift study during the detailed design phase of the project. The purpose of this work would be to evaluate the ability of escort tugs to rescue a vessel, disabled in the Open Water Area, that is at risk of running aground. In response to questions from the Panel, Northern Gateway said that the study would be conducted on a probabilistic basis. It said that the intent of the study would be to evaluate whether escort tugs should remain in the area, proceed to an anchorage, or continue to their next assignment.

OPERATION OF TANKERS IN ADVERSE SEA STATES

Northern Gateway said that, because tankers are designed and classified to trade worldwide in all seasons, an assessment of weather operating limits seawards of the proposed pilot boarding stations is not required because tankers are designed to sail these waters in all conditions without tug escort or pilotage. While modern tankers are capable of operating in extreme weather in open water conditions, tanker operators generally avoid these conditions by means such as weather routing. It is a common industry practice to reduce speed on ocean passage to avoid arriving at a pilot station during periods of weather when it would be difficult to board a pilot and complete transit to port. Northern Gateway also simulated holding the ship on station, with or without tug assistance, and anchoring the ship, and said that these tactics could be safely accomplished.

Northern Gateway said that safe operational limits would be specified for vessels associated with the project. Operational limits are common at ports around the world, including Port Metro Vancouver, Sullom Voe in Scotland, and Alyeska's Valdez Marine Terminal. The company said that operational limits would be developed during the detailed design phase of the project in conjunction with operational stakeholders such as shipping companies, the Pacific Pilotage Authority, and Transport Canada. At that time project and vessel design would be in a more advanced stage and tug operators and pilots would have been trained under a variety of normal and emergency operational procedures.

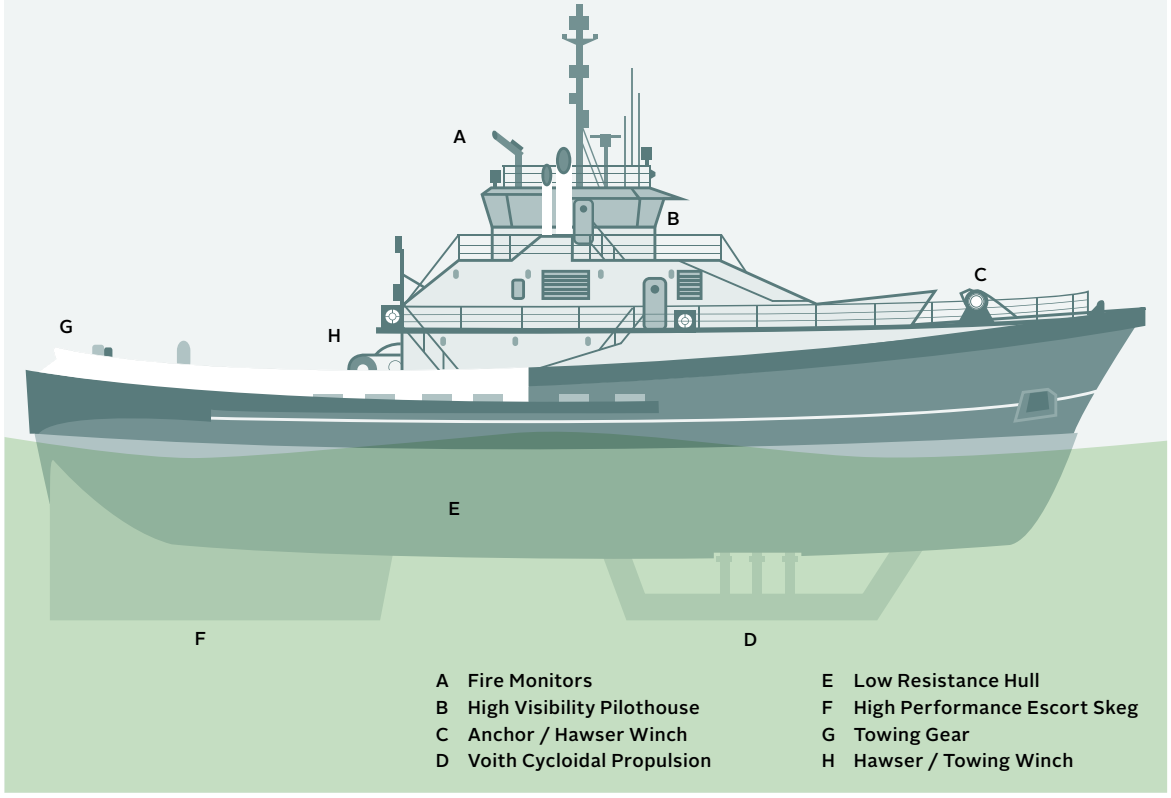
Northern Gateway said that operational limits would be included in the Port Information Book and, consequently, form part of Northern Gateway's Tanker Acceptance Program. It said that transits of the Confined Channel Assessment Area would be subject to the approval of the shipmaster under the guidance of the pilots, and may be influenced primarily by wind. Operational limits would best be determined once pilot and tug master simulation training has been completed, and ship-owner representatives have been consulted. Northern Gateway said that wave conditions recorded in the Confined Channel Assessment Area would not impede tanker and escort tug operations in the channels.

Northern Gateway said that berthing and unberthing operations would be influenced by wind and currents. It said that operating limits may be reduced in the first year of operation and modified as pilots, tug masters, and terminal personnel gain experience.

In establishing operational limits Northern Gateway said that it would assess, among other factors, both the expected frequency of wave heights exceeding the established limits, and the rate at which waves could be expected to build. Northern Gateway committed to setting conservative vessel and operational limits so that, should an unforeseen condition exceeding the limits arise, safety would be maintained. One objective of the operating limits assessment would be to establish procedures to be followed in expectation of worsening weather conditions, to avoid conditions near operational limits. Northern Gateway said that it would be rare for unforeseen conditions to exceed operational limits. It said that such conditions would be forecast well in advance of a tanker's arrival or departure. If conditions potentially exceeding operational limits were forecast, an inbound tanker would delay entry into the Open Water Area, and an outbound would delay its departure from the Kitimat Terminal instead of entering the Confined Channel Assessment Area.

FIGURE 7.3 **ESCORT TUG MODEL DESIGN**

Ocean-going escort tugs would be 46.9 metres long. They would have deep keels and powerful directional drives.



Northern Gateway said that the Environment Canada's marine weather program is a world class operation. In response to questions from the Haisla Nation, Northern Gateway's expert, a former tanker captain, said that most tanker companies also have their own weather routing services and that tanker captains are experts in interpreting weather forecasts to inform navigation decisions.

If environmental operational limits were to be exceeded after a tanker commenced its transit, the master and pilot would assess the available options and apply them as necessary to ensure the safety of the tanker. These options could include slowing and holding the ship in a suitable section of the channel, increasing speed to improve control, requesting assistance from another escort or harbour tug, or anchoring with a tug or tugs in attendance until the weather state abates.

Northern Gateway said that VLCCs are equipped with steering systems and equipment to handle much larger wind forces than they would be likely to experience in the Confined Channel Assessment Area. It said that, because much of the mass of a laden VLCC is below water level, it is not easily moved off course. It said that, conversely, cruise ships and liquefied natural gas carriers, where much of the mass is above water, would be more susceptible to a sudden gust of wind. The Pacific Pilotage Authority said that a deep laden vessel would not be affected by a high wind as much as a passenger vessel, light freighter, or a taller vessel such as a liquefied natural gas tanker.

Northern Gateway conducted extensive computer simulation studies of tanker transits and tug escort operations. It said that these studies indicated that

VLCCs could safely navigate in Wright Sound at wind speeds up to 100 kilometres per hour. The studies also simulated an escort tug successfully towing a tanker in 45 knots of wind and a 4.5 metre significant wave height.

OPERATION OF TANKERS IN POOR VISIBILITY AND AT NIGHT

Concerns were raised through the letter of comment process and questioning regarding the effects on shipping safety and navigation of limited daylight hours along the shipping routes. Northern Gateway said that tankers would be operating in the Confined Channel Assessment Area with modern navigation technology, and that navigation could be undertaken safely 24 hours a day. It said that marine terminals in northern latitudes such as Kitimat, Scotland, Sweden, Norway and Alaska have operated for decades under similar conditions.

The Coalition, Haisla Nation, and others questioned Northern Gateway on the ability of tankers to operate in thick fog and poor visibility conditions. Northern Gateway said that tankers around the world operate in thick fog. Modern tankers have two operating radars with separate power sources, and two completely independent electronic chart display and information systems (ECDIS). Northern Gateway said that one of the radar systems is specially designed to operate in rain and snow. It said that there would also be escort tugs with redundant radar systems and the vessel would also be monitored by Marine Communications and Traffic Services on the Automatic Identification System. The company said that a tanker may reduce speed in fog in order to safely operate in limited or zero visibility. Northern Gateway said that the radar picture in the Confined Channel Assessment Area is excellent due to channel shape. Northern Gateway said that shipping has been carried out safely to Kitimat for two decades and that visibility was not raised as a concern in meetings related to the marine shipping quantitative risk analysis.

Northern Gateway's experts were asked to comment on whether they had ever experienced external environmental conditions such as snow, fog, rain, lightning, or static electricity that had caused a ship's navigational and tracking system to fail or to be severely impaired. In response, they noted the redundancy built into such systems and how they are designed to operate in all weather conditions. They said that they had never experienced a situation where all navigational ability had been lost. They said that, for example, in the event that geographic positioning systems signals were temporarily lost, there are alternative means of navigation available to the tanker master and pilot.

HUMAN ERROR AND SYSTEM REDUNDANCY

Northern Gateway and others said that human factors are responsible for a majority of marine incidents. It said that the contribution of human error to tanker incidents was considered in its marine shipping quantitative risk analysis. Northern Gateway outlined specific measures that it has taken to mitigate against human error that could potentially lead to a malfunction or accident. A team approach is proposed that includes mandatory use of pilots who are familiar with the area and with the ships. It said that the team is monitored by the ship's captain, the bridge team, and the escort tug. The masters and navigators of the tugs would be able to question the actions of the pilot. Marine Communications and Traffic Services would also be able to monitor the actions of the pilot through radar and the Automatic Identification System. Northern Gateway highlighted the need for appropriate qualifications and training and the fact that the shipping regulatory environment also addresses human error.

Northern Gateway identified the layers of redundancy in the marine transportation system it is proposing. It highlighted redundant navigation and steering systems on the tankers, as well as redundant navigation and propulsion systems on the escort tugs. It said that loaded tankers would be escorted by two tugs. Northern Gateway said that the harbour and escort tugs would also be subject to a safety management system that is a part of a third party independently audited system that covers all the management policies and procedures of the company responsible for operating them, including the vessels operating requirements and maintenance program.

The Panel asked Northern Gateway to comment on how confident it was that it could eliminate human error as a contributing factor to tanker incidents, and whether there was other mitigation that could be implemented to avoid incidents. They said that safety management systems in the marine shipping industry play a key role in reducing human error. Northern Gateway's experts responded that, although human error cannot be absolutely eliminated, regulatory changes and Northern Gateway's proposed mitigative measures would provide the best possible solution.

MARINE SHIPPING RISK ASSESSMENT

Marine shipping quantitative risk analysis

Northern Gateway assessed marine shipping risk through its marine shipping quantitative risk analysis, prepared as part of the TERMPOL Review process. Northern Gateway said that the consultant that prepared the quantitative risk analysis, Det Norske Veritas, is a marine classification society that specializes in marine risk assessment. Det Norske Veritas were selected independently of Northern Gateway by a roundtable of stakeholders and First Nations groups who also contributed to the scoping and development of the Terms of Reference for preparing the quantitative risk analysis.

It said that the quantitative risk analysis was prepared following international best practice from the International Maritime Organization's definition of a Formal Safety Assessment. It said that guidelines prepared by this organization refer to the use of the ALARP (as low as reasonably practicable) principle to select risk control measures. Northern Gateway's experts said that the quantitative risk analysis presented a very conservative assessment of potential shipping risks.

A hazard identification workshop was conducted as part of the quantitative risk analysis. This was a systematic, multidisciplinary, team-oriented exercise that required a group of experts to evaluate hazards, the likelihood of incidents occurring, and the probable consequences should an incident occur. The team first identified credible causes of marine incidents based on local knowledge. They then qualitatively assessed the likelihood and probable consequence for each incident that could occur as the result of the hazards identified. The team also evaluated the adequacy of preventative safeguards and mitigation measures. Northern Gateway said that the hazard identification workshop was followed by interviews with local stakeholders to gain further local knowledge of the proposed shipping routes.

The TERMPOL Review Committee's report said that the quantitative risk analysis demonstrated that the unmitigated risk for Northern Gateway oil tankers would be the same as, or less than, world averages for similar oil tanker and terminal operations in similar waters and conditions. The TERMPOL Review Committee concluded that Northern Gateway's risk reduction strategy would enhance the safety of the project's marine transportation components.

The marine shipping quantitative risk analysis estimated mitigated return periods for various sizes of spills from project tankers. The estimated return period for a spill of oil, condensate, or bunker fuel was 250 years. The estimated return period of an oil spill of any size was 350 years. The estimated return period for any condensate spill was 890 years. The estimated return period for "an oil spill of greater than 40,000 cubic metres" was 15,000 years. Northern Gateway said that a return period is an estimate of the time interval between similar events. Northern Gateway said that a return period is the mathematical inverse of probability. It also said that risk assessments like the quantitative risk analysis are not intended to specifically say what the probability of a spill is. They are meant to inform mitigation.

During the Panel's oral statement session in Kitamaat Village, Mr. Marsh provided an analysis of Northern Gateway's calculations of return periods and associated probabilities. Subsequently, Mr. Marsh submitted a letter of comment further outlining his position. In response to this information and to questions from the Coastal First Nations, Northern Gateway said that the probability corresponding to a return period of 250 years is 18.2 per cent in 50 years (the approximate project life), or an annual probability of 0.004.

In response to questions from BC Nature and Nature Canada and the Province of British Columbia, Northern Gateway said that the marine shipping quantitative risk analysis was completed as a requirement of the TERMPOL process and was not intended to be a tool for public communication. Marine risk assessments typically express spill risk in terms of a return period or annual probability rather than a probability over a fixed period of time. Northern Gateway said that the quantitative risk analysis was primarily intended to estimate relative spill probabilities to compare mitigation measures such as the use of the escort tugs.

BC Nature and Nature Canada questioned the data underlying marine vessel casualty statistics, and how it informed the quantitative risk analysis. In response, Northern Gateway's experts said that issues with the data set, such as underreporting of incidents, were addressed through other conservative assumptions built into the quantitative risk analysis. Northern Gateway said that the work was also quite conservative in that it assumed that equipment and safety systems did not improve over time. Northern Gateway's expert said that, in his experience, risks associated with increased ship

traffic had always been outweighed by improvements in ship design and operations over that time period. The expert said that, based on his experience completing many marine risk assessments for different projects, the Enbridge Northern Gateway Project would have more risk mitigation measures in place than he had ever seen.

The Haisla Nation said that a viable and credible risk model may predict an extremely low probability of a major spill over the first year of operations, and yet, a catastrophic failure could still occur during this time frame.

In its critique of the quantitative risk analysis, the Raincoast Conservation Foundation said that the use of return period calculations was inappropriate, as they failed to address rare but catastrophic events. It said that, in theory, an accurate and statistically robust estimate of a 15,000-year spill return period would require about 45,000 years of observations on the transport of oil and the efficacy of mitigation measures.

In response to questions from C.J. Peter Associates, Northern Gateway said that the purpose of its marine shipping quantitative risk analysis was to assess risk and mitigation opportunities for the project, and not to judge risk acceptability. Northern Gateway said that a common way to assess acceptability was to apply the "as low as reasonably practicable" principle, where potential risk reduction measures are compared to the cost and the benefit of those measures.

Probability and consequence

In response to questions from BC Nature and Nature Canada and Environment Canada, Northern Gateway said that it had placed priority on assessing both the likelihood of a spill and associated consequences. It said that there are multiple factors affecting the consequences of a spill. Northern Gateway said it conservatively assumed that all areas in the Confined Channel Assessment Area and the approach lanes were at risk of being oiled in the event of a major spill. Northern Gateway said that any assessment of a major spill in the Confined Channel Assessment Area and Open Water Area would conclude that there would be adverse and significant effects on the marine environment and associated human use.

The Raincoast Conservation Foundation integrated spill probability and consequence on the proposed tanker routes by combining the probabilities used in the marine shipping quantitative risk analysis with potential effects on marine birds, marine mammals, and anadromous salmon in the Queen Charlotte Basin. It concluded that calculated risk to parts of the Open Water Area was higher when consequences to marine mammals and birds was considered in conjunction with probability. Results for salmon were more variable and showed that much of the Confined Channel Assessment Area and parts of the Open Water Area were higher risk.

The Gitga'at First Nation provided an assessment that concluded that any large spill in excess of 5,000 cubic metres, of either dilbit or condensate, would result in significant, adverse, and long-term lethal and sublethal effects to marine organisms. In response to questions from Northern Gateway, the Gitga'at First Nation confirmed that its work did not examine the likelihood of a spill occurring. It said that the purpose was to illustrate that the potential for shoreline oiling at Gitga'at harvesting areas could be demonstrated through simple modelling methods.

The Gitxaala Nation submitted a report on potential spill effects in Gitxaala Nation territory. It concluded that Northern Gateway had not adequately assessed the potential consequences of an oil spill. In response to questions from Northern Gateway, the Gitxaala Nation said that its work was intended to capture potential low probability, high consequence events, and did not assess the probability of a spill actually occurring.

The Gitxaala Nation said that Northern Gateway had not adequately considered Aboriginal people's perception of the risks associated with very low probability, but potentially catastrophic, events. The Gitxaala Nation said that, although there is no established best practice to take into account lay risk assessment, it is important to consider, as much as possible, societal values in the decision making process.

The Gitxaala also said that Northern Gateway's risk assessment techniques were not appropriate for catastrophic spills like the Exxon Valdez event. It said that catastrophic events could undermine the demographic, cultural, and socio economic integrity of the Gitxaala First Nation. It said that Northern Gateway's methods were more suited to assessment of non-catastrophic risks.

Northern Gateway said that, although incorporating people's perceptions into risk assessments is an important consideration, such factors can be beyond the control of Northern Gateway. It said that risk assessments must remain science-based.

The company said that it engaged communities to learn about their perception of risk. It said that the *Canadian Environmental Assessment Act, 2012* required it to consider the environmental effects of malfunctions and accidents. It said that public opinion should be considered but should not influence the outcome of a science-based assessment.

Coastal First Nations said that Northern Gateway had not adequately considered unpredictable, low probability, high consequence events such as a worst case oil tanker spill. It said that Northern Gateway's probability-based methodology ignores the fact that rare events occur regularly and should be anticipated and mitigated.

Coastal First Nations said that it is not easy to compute very low probability, high consequence events. It said that it is easy to get a general idea about the possibility of their occurrence. It said that proper regulations and enforcement can mitigate these events.

In response to questions from the Gitxaala Nation, Northern Gateway distinguished assessment of effects resulting from malfunctions and accidents, from those resulting from routine operations. It said that assessment of routine operations is based on the likelihood that the activity would occur and, therefore, the environmental effects would occur and are predictable. The company said that, in contrast, assessment of malfunctions and accidents is based on hypothetical scenarios that are unlikely to occur during the life of the project.

Northern Gateway said that it assessed effects of routine operations after mitigation was applied. It said that assessment of malfunctions and accidents assumed that no mitigation was applied. The company said that this was to ensure that the assessment was conservative.

Environment Canada made a number of recommendations regarding the need for additional spill modelling. In response to questions from the Coalition, Environment Canada said that its recommendations specifically relate to the assessment of potential consequence of spills. In response to questions from the Haisla Nation, Environment Canada said that, although it had identified information gaps related to its area of expertise, different departments may have different perspectives.

Fisheries and Oceans Canada said that discussion of environmental effects associated with malfunctions and accidents needs to occur in a broad context including likelihood of a spill, oil fate and behavior, and exposure mechanisms. Fisheries and Oceans Canada said that the risk posed by the project to fish and fish habitat in the freshwater and marine environments can be managed by Northern Gateway through appropriate mitigation and compensation measures.

7.3.3 VIEWS OF THE PANEL

The Panel finds that the evidentiary record has provided it with the required information to allow it to come to determinations with respect to the matters below.

PIPELINE AND TERMINAL SPILL PREVENTION AND MITIGATION

The Panel's views on Northern Gateway's approach to pipeline design and other mitigation intended to prevent spills are provided in Chapter 5.

The Panel is of the view that pipeline routing is key to avoiding pipeline spills or lessening potential effects in the event of a spill. The Panel notes that Northern Gateway proposed a reroute of the pipeline in the area of the Morice River due to potential spill concerns. Pipeline routing would continue to be refined during detailed design and as part of the National Energy Board's regulatory process. The Clore and Hoult Creek tunnels are further key routing measures to avoid pipeline spills. In the event of a spill in the tunnels, a spill containment system would substantially lessen potential effects.

At some locations along the planned right-of-way, the semi-quantitative risk assessment showed that the potential oil release volume would exceed Northern Gateway's 2,000 cubic metres release guideline. The Panel requires Northern Gateway's to conduct additional work related to emergency preparedness and response technology, and other site specific mitigation, at high consequence areas such as the Necoslie River, Pitka Creek, the Sutherland River, Duncan Creek, and the Kitimat River valley.

The Panel finds that Northern Gateway has incorporated appropriate mitigation in its design and operation of the Kitimat Terminal to avoid spills or lessen their effects through appropriate containment and recovery measures. Northern Gateway outlined mitigation, such as sump construction, dock curbing, and the use of drip trays to prevent potential spills from reaching or spreading on the water. It also committed to deploy booms around tankers during loading of oil.

PREVENTION OF TANKER SPILLS

Tankers associated with the project would be required to comply with existing regulatory requirements. The Panel notes that many of the issues pertaining to marine shipping navigation, safety, and spill prevention that participants raised in the Panel's process are addressed as part of the existing regulatory regime. Northern Gateway has also committed to exceed regulatory requirements through its marine voluntary commitments and would be held accountable for this.

The Panel recognizes the commitments made by Northern Gateway to implement, monitor, and enforce its marine voluntary commitments and its response to the TERMPOL Review Committee's report. The Panel finds that these voluntary commitments should be mandatory and enforceable as conditions under any certificates which may be issued under the *National Energy Board Act*. These conditions would be enforced by the National Energy Board.

Navigational challenges of the proposed shipping routes have been addressed or mitigated, and tanker design, safety, and inspection requirements are appropriate for the project. This view is informed by the Panel's consideration of the existing regulatory environment, including, but not limited to, the TERMPOL Review Committee's report, Northern Gateway's commitments, the Panel's proposed conditions, and other evidence received from parties.

The Panel notes that shipping on the West Coast currently takes place in the same geographic area and under the same tidal and weather conditions that have been discussed for the Enbridge Northern Gateway Project. Many of the weather-related comments that the Panel heard were made in the context of personal experiences in smaller craft such as fishing boats, and not in the context of a large ship such as an oil tanker or cargo vessel. The evidence indicates that there is a significant difference in the effect of wind and waves on smaller vessels, compared with the vessels proposed for the project.

The Panel recognizes that vessels associated with the project would typically be much larger than those currently operating in the Confined Channel Assessment Area. The evidence indicates that the routes are appropriate for safe navigation and maneouverability of large oil tankers. Also, large oil tankers, due to their design and size, are less affected by wind and wave conditions.

The Panel received a substantial amount of evidence related to marine shipping navigation, safety, and spill prevention. In addition to written submissions, such as written evidence and letters of comment, Northern Gateway, Transport Canada, and Canadian Coast Guard responded to numerous information requests from parties.

The Panel also heard from a number of experts in the areas of marine shipping navigation, safety, and spill prevention during the oral questioning phase of the hearing. These experts represented Northern Gateway, Transport Canada, and Canadian Coast Guard. The Panel finds that they possessed extensive knowledge and practical expertise in marine architecture, navigational safety, marine risk assessment, tug escort procedures, regulatory requirements, vessel inspection, pilotage, and handling of large ships including oil tankers up to the VLCC size. The views of these experts informed the Panel's consideration of the safety of marine shipping associated with the project.

Parties in the process questioned these experts extensively, including questioning on documents and issues that were already addressed as part of the TERMPOL Review Process. The Panel views this part of its process as a public review of marine shipping navigation, safety, and spill prevention associated with the project, supplementing the TERMPOL Review Process. The Panel has not identified anything in evidence that would lead it to believe that the findings and recommendations of the TERMPOL Review Committee were inadequate or in error.

The Panel was concerned that a tanker malfunction or accident may be caused by human error, and it questioned Northern Gateway's experts regarding system redundancy and other measures designed to combat human error. The Panel finds that mandatory and voluntary measures outlined by the company would reduce the potential for human error to the greatest extent possible.

The Panel heard many expressions of concern, particularly in letters of comment, in oral evidence, and in oral statements, regarding dangerous environmental conditions and navigational hazards on the West Coast. Tankers associated with the project would use established shipping channels currently used by large vessels. The evidence indicates that Northern Gateway has appropriately considered potential wind and wave conditions within project planning through wind and wave analyses and its commitment to establish operational limits for shipping and terminal berthing.

The evidence before the Panel indicates that shipping along the north coast of British Columbia is accomplished safely the vast majority of the time, in the absence of many of the mitigation measures that would be in place for the project. These would include reduced vessel speeds, escort tugs, redundant navigational systems, and avoiding congestion in the narrower parts of the shipping channels.

MALFUNCTIONS AND ACCIDENTS

Routine pipeline and tanker operations were found to be unlikely to cause significant adverse environmental effects after mitigation in most cases. Environmental effects of routine operations are discussed in detail in Chapter 8.

The Panel was required to assess the environmental effects of malfunctions or accidents that may occur in connection with the project, and to determine whether such non-routine effects are likely to occur. The Panel focused on malfunctions and accidents that cause oil or condensate spills, and considered both the likelihood of a spill event happening, and the consequences of the spill if it happened. The Panel then considered whether any adverse consequences were likely to be significant. The Panel distinguished between small spills and large spills.

The Panel finds that small spills from the pipeline facilities, terminal, or tankers are almost certain to occur during the life of the project. The Panel finds that small spills are unlikely to cause significant adverse environmental effects. Northern Gateway said that there was a 93 per cent chance of a spill of some size from a tanker, the marine terminal, or the pipeline, in the first 50 years of project operation.

Small spills are not a part of routine normal operations, and would be caused by relatively minor equipment failure or human error. The location would likely be near project facilities such as pump stations, valves, or the Kitimat Terminal. Response personnel and equipment would be nearby in most circumstances. Product recovery would likely be effective, leaving a relatively small proportion of a small spill to be naturally dispersed and degraded. Remediation may be necessary. Environmental recovery would be relatively fast and complete, likely within weeks to months. Any chronic effects would be localized. There would likely be few if any effects to communities. It is possible, but not likely, that smaller spills could also result in significant adverse environmental effects depending on circumstances and success of cleanup.

In the Panel's view, a large spill would involve a volume of oil that spreads beyond the immediate spill area, would require medium to large-scale response measures, and may not be able to be effectively cleaned up. In this case, natural recovery would be the predominant means by which the environment is restored.

A large spill is not a part of routine operations, and would probably be caused by major or multiple equipment failures, probably combined with human error. A full-bore rupture from the pipeline would be an example of a large spill. In the marine environment, Northern Gateway's credible worst case scenarios of spills of 10,000 cubic metres and 36,000 cubic metres, and the Gitga'at First Nation's example of a 5,000 cubic metre spill, would all constitute large spills in the Panel's view.

The Panel finds that malfunctions or accidents leading to large spills from the pipeline facilities, terminal, or tankers are not likely and may not occur during the life of the project. The Panel accepts Northern Gateway's evidence that it can not guarantee that a large pipeline or tanker spill would not occur. In reaching this view the Panel considered the evidence discussed in Chapter 5 related to pipeline design and operation, and evidence related to the marine regulatory framework and Northern Gateway's commitments regarding navigation, safety, and spill prevention, including the findings and recommendations of the TERMPOL Review Committee.

The Panel finds that, in the unlikely event of a large oil spill, there would be significant adverse environmental effects, and that functioning ecosystems would recover through mitigation and natural processes. Product recovery for a large spill, particularly a marine spill, may not be effective due to the size of the spill or due to environmental conditions that limit effective recovery. A relatively large proportion of a large spill is likely to be naturally dispersed and degraded. Extensive remediation would be necessary, particularly in sensitive shoreline habitats. The time for environmental recovery would

depend on the type and volume of product spilled, environmental conditions, the success of oil spill response and cleanup measures, and the extent of exposure of living and non-living components of the environment to the product spilled.

Recovery of different environmental components may occur over different time frames ranging from weeks to years, and in the extreme, decades. Effects to communities and commerce would be significant. Chronic effects are likely in some locations. Compensation would be required for affected persons and communities.

RISK AND CONSEQUENCE

The Panel's views on risk associated with construction and operation of the pipeline and marine terminal are provided in Chapter 5.

Marine shipping is not without risk. Transport Canada said that the *Canada Shipping Act, 2001* seeks to balance shipping safety and marine environment protection while encouraging maritime commerce. In its consideration of this risk for the Enbridge Northern Gateway Project, the Panel carefully considered the project design, proposed mitigation, and the Panel's conditions. The Panel finds that it is not possible to guarantee that a large marine spill would not occur. With this fact in mind, and having regard for the complete evidentiary record, the Panel has concluded that Northern Gateway, and the responsible regulatory authorities who participated in this review, have taken the steps necessary to minimize the risk of a large marine spill. The Panel finds that a large marine spill associated with this Project is unlikely to occur.

The Panel finds that the broad range of preventative measures, including those to reduce the risk of human error, committed to by Northern Gateway reduces the risk of a large spill to as low as practicable. The Panel also finds that, if a large marine spill was to occur, the use of human based spill recovery and remediation tools and natural recovery mechanisms would minimize the effects, to the extent feasible. In looking at all aspects of this Project, as proposed, the Panel is of the view that the spill risk posed by this project is manageable.

The Panel's view on the likelihood of a large marine shipping spill is not based on a specific number that attempts to provide an absolute indicator of the probability of a spill event. The Panel is of the view that it would not be appropriate to do so. The Panel is of the understanding that marine shipping risk assessments, such as Northern Gateway's quantitative risk analysis and the federal government's ongoing Canada-wide risk assessment for oil spills from ships, are intended to provide an indication of spill return periods or probabilities based on potential hazards, and to inform mitigation to address such hazards. These risk assessments are often conducted in the context of existing marine shipping.

The Panel finds that Northern Gateway's approach to its marine shipping quantitative risk analysis was appropriate and was properly applied in accordance with recognized methods. Northern Gateway's marine shipping quantitative risk analysis was a multi-stakeholder exercise completed in accordance with international best practice, by a consultant with recognized international expertise in marine risk assessment. It was considered as part of the TERMPOL Review process. The Panel does not accept parties' arguments that the quantitative risk analysis was improperly prepared or subject to substantial flaws.

In considering whether there is a manageable level of risk associated with the project, the Panel benefitted from the Gitxaala Nation's comments on acceptable level of risk. The Gitxaala Nation argued that the Panel must evaluate three distinct aspects of risk. First, was an appropriate risk assessment methodology chosen? Second, was the methodology properly applied? Third, does the result of the assessment constitute an acceptable risk?

Regarding the first two questions on risk assessment methodology, the Panel notes that for the marine shipping component of the project, Northern Gateway did not provide an overall risk assessment number that integrated probability and consequence. Northern Gateway's approach was to estimate return periods for spills in order to inform appropriate mitigation.

Northern Gateway also undertook a qualitative and quantitative assessment of unmitigated potential spill effects. Northern Gateway said that the true effects of a large oil spill are unknowable other than to conclude that they would be significant and adverse to people and the environment. The Panel finds that recognition of these potential consequences informed Northern Gateway's project planning to take a precautionary approach to reduce risks associated with marine shipping to as low as reasonably practicable. The Panel notes that Northern Gateway has developed mitigation assuming that all areas within the shipping approach lanes and the Confined Channel Assessment Area are at risk of being oiled.

Parties such as Coastal First Nations, the Raincoast Conservation Foundation, and the Gitxaala Nation said that Northern Gateway had not adequately considered low probability, high consequence events. The Panel does not share this view.

The Panel finds that Northern Gateway's approach to assessing risk is appropriate and that it was properly applied. The Panel sees little practical value in an alternative approach that would attempt to derive a hypothetical risk number as a fundamental decision point that indicates whether the project should proceed.

The Panel is of the view that a more practical approach is to determine acceptability of risk based on the totality and weight of evidence before it. This includes a combination of quantitative values, such as those determined through the marine quantitative risk analysis and ecological risk assessment, qualitative information such as the potential for natural recovery and learnings from past spill events, and the existing regulatory environment and mitigation that would apply to the project.

Regarding the Gitxaala Nation's third question, the Panel finds that the marine shipping component of the project presents a manageable level of risk taking into account Northern Gateway's mitigation and commitments, the Panel's conditions, and the existing regulatory environment.

Based on the evidence, the Panel finds that sufficient information has been provided regarding the potential occurrence of a low probability, high consequence event. The Panel accepts that there is a low probability of a large spill occurring. The Panel does not accept that a large spill is inevitable or likely given the available safety technology, management systems and the regulatory regime.

7.4 Northern Gateway's emergency preparedness and response planning

7.4.1 NORTHERN GATEWAY'S OVERALL APPROACH TO EMERGENCY PREPAREDNESS AND RESPONSE PLANNING

Northern Gateway's proposed emergency preparedness and response planning approach is illustrated in Figure 7.4. The company said that the General Oil Spill Response Plan would describe the overall planning framework. Detailed plans relating to marine shipping, the Kitimat Terminal, and the pipeline would be prepared within the general framework. Northern Gateway said that some plans are required by law and others would be voluntarily prepared.

The company said that the various plans would be integrated with each other and with the appropriate provincial and federal contingency plans. It said that its planned environmental protection and spill response capabilities would meet or exceed applicable government regulations and standards.

Northern Gateway said that the goal of its emergency preparedness and response programs is to minimize the effects of incidents and emergencies on the health and safety of the public, employees, property, and the environment. The company said that it envisioned a "world-class response capability" for the Enbridge Northern Gateway Project including the following elements:

- A robust risk reduction strategy through design and operations to mitigate the likelihood of incidents and spills occurring and to limit the consequences if an incident were to occur.
- Preparation of an overarching strategy (the General Oil Spill Response Plan) for a coordinated management and operational approach for emergency response across all operating environments.
- A corporate commitment to "extended responsibility" for emergency response along the marine transportation routes. Northern Gateway would take responsibility for maintaining an enhanced spill response capability in the event of third party tanker spills, beyond the level of responsibility currently required under Canadian regulations.

Northern Gateway said it would establish a spill management team which would be responsible for spill readiness, training, exercises and drills, and implementation the General Oil Spill Response Plan and related project plans. The spill management team would interact with the Unified Command, when required, during a spill emergency.

Northern Gateway said that typical steps undertaken after a spill would include:

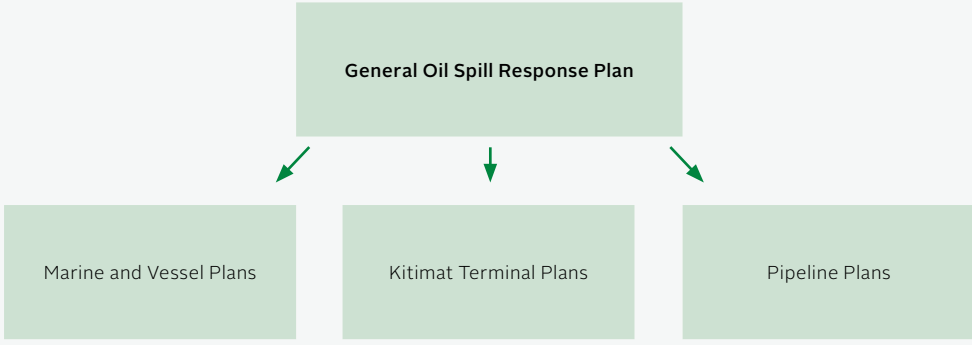
- isolating the source of the spill from the rest of the system;
- notifying other responders and affected or responsible parties, as required;
- assessment and monitoring of the situation;
- identification of safety and environmental risks;
- controlling the source of the spill;
- containing the spill safely;
- recovering spilled hydrocarbons; and
- shoreline cleanup if necessary

The company said that these activities could potentially all occur at the same time.

Northern Gateway said that it would develop its emergency preparedness and response plans following project approval, during the detailed design and planning phase of the project. It said that this would occur over the course of several years leading up to operation of the project.

Several parties expressed concerns about the timing of Northern Gateways detailed spill preparedness and response planning. They said that Northern Gateway had not provided sufficient information or an appropriate level of detail during the application process to demonstrate that Northern Gateway could respond effectively to a spill. They said that the company should provide additional information before the Panel made its recommendations regarding the project.

FIGURE 7.4 **MAIN AREAS OF NORTHERN GATEWAY'S EMERGENCY PREPAREDNESS AND RESPONSE PLANNING**

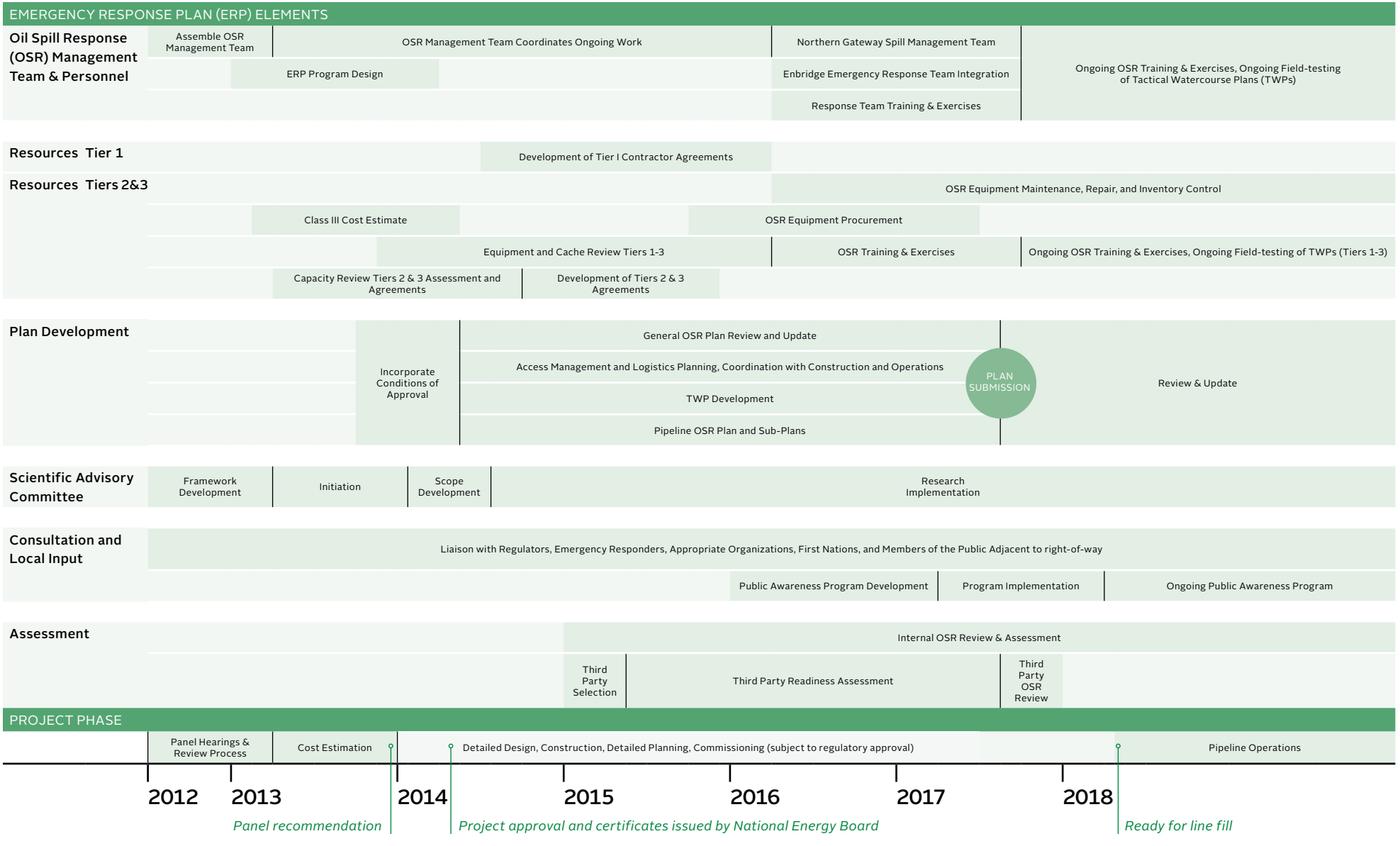


In response, Northern Gateway said that it had already provided a level of detail beyond what would be typically done, and that its level of commitment to the project was demonstrated in this. Northern Gateway said, and the Haisla Nation agreed, that the preparation of emergency response planning documents is typically done following project approval, and prior to project operation. Northern Gateway said that its emergency preparedness and response plans would be filed with the National Energy Board, and other regulators such as Transport Canada, at least 6 months before operation. It also said that it would engage other stakeholders such as the Province of British Columbia as it prepared the plans.

7.4.2 EMERGENCY PREPAREDNESS AND SPILL RESPONSE – PIPELINE AND MARINE TERMINAL

Many parties raised concerns with respect to the risks of an oil spill along the route. They had particular concerns with Northern Gateway's ability to effectively respond to such incidents in high consequence areas such as the Kitimat River valley. Northern Gateway said that it took a risk based approach to its consideration and preparation of emergency preparedness and response initiatives. Based on the results of the semi-quantitative risk assessment, it identified areas of higher risk from both a probability and consequence standpoint for enhanced emergency preparedness initiatives. Candidate watercourses identified included the Athabasca, Smokey, Missinka, Morice, and Kitimat Rivers, and Gosnell Creek. It said that other sensitive areas may warrant consideration for enhanced emergency preparedness initiatives even in the absence of a higher probability of release along the right-of-way.

FIGURE 7.5 **FRAMEWORK FOR NORTHERN GATEWAY'S PIPELINE AND KITIMAT TERMINAL EMERGENCY PREPAREDNESS AND RESPONSE PLANNING**



SPILL RESPONSE PLANNING DOCUMENTS, PROGRAMS, AND PROCEDURES – PIPELINE AND MARINE TERMINAL

Northern Gateway said that, as part of its Emergency Preparedness and Response Program, it would produce the following plans and supporting documents for the pipelines and Kitimat Terminal during detailed design and planning:

- Operating and Maintenance Procedures Manuals for facilities;
- Pipeline Oil Spill Response Plan describing emergency response actions to mitigate the effects of a hydrocarbon spill along the pipeline route;
- Terminal Oil Spill Response Plan describing emergency response actions available to mitigate the effects of a release from the Kitimat Terminal;
- Marine Oil Spill Response Plan describing emergency response actions to mitigate the effects of a hydrocarbon spill along the marine transportation routes;
- Response Tactics for Floating Oil;
- Response Tactics for Submerged and Sunken Oil;
- Response Site Tactic Sheets providing site-specific information on site location, watercourse characteristics such as flow rates, access, winter considerations, and indicative guidance on potentially suitable response strategies and response requirements;
- Tactical Watercourse Plans providing site-specific information on spill risk, watercourse and land use characteristics, accessibility, strategic response areas, local equipment and resources, resources at risk, recommended response strategies and logistical contacts;
- pre-SCAT (shoreline cleanup assessment technique) surveys;
- access management plan for the entire system under various conditions;
- site-specific security plans;
- site-specific fire plans;
- Gateway Emergency Response Directory;
- other supporting materials; and
- site-specific plans such as the Kitimat Valley Design, Construction and Operations Study Report and the Kitimat River Drainage Area Emergency Preparedness Report

Northern Gateway said that it would be guided in its oil spill response by these documents and plans.

Northern Gateway said that it would prepare an emergency response plan for construction activities, to be in place before construction.

Northern Gateway prepared a Framework for Pipeline Oil Spill Preparedness to support development of these plans and documents, and its Emergency Preparedness and Response Program overall (Figure 7.5). The framework identifies key elements associated with the development of a comprehensive emergency response program including:

- Engagement with regulatory agencies, local individuals, other stakeholders, and First Nations.
- A capacity review of response capabilities and identification of locations of equipment caches.
- Identification of strengths and potential gaps for the various emergency response plan elements that may exist along the pipeline corridor.
- Development of a training program which would include specific courses on spill response, integration with some of the existing Enbridge response training activities, and field deployment exercises along the Northern Gateway system.
- Training and exercises for Northern Gateway's Spill Management Team.
- A Scientific Advisory Committee involving Environment Canada and other agencies to provided scientific and technical advice in support of emergency response plans.
- A review of the program by an independent third party.

Northern Gateway said that the third party assessment of its program would be a technical evaluation of the program and response capabilities developed by Northern Gateway. The third party would assess and validate that Northern Gateway had met its approval and regulatory requirements and any commitments made by the company during the review process. Northern Gateway said that the third party assessment is important in helping it achieve its commitment to world-class response capabilities.

The company said that it would look at new emergency response technologies over the next 5 years with the support of its emergency response groups. New technologies that meet the needs of the project would be implemented.

INCIDENT MANAGEMENT AND OPERATIONAL RESPONSE- PIPELINE AND MARINE TERMINAL

Northern Gateway said that, after safety, the first priority for spill response is to stop the source of the release and to limit the spread of the spill.

Northern Gateway said that its intent would be to respond immediately to all incidents, that cost is secondary in an emergency response, and it would bring all necessary resources to bear in order to address an incident. The company said that it would have access to Enbridge's spill response and spill management personnel in the event of a spill. Northern Gateway said that it would establish mutual aid arrangements with oil spill response agencies prior to operation, to ensure that adequate resources would be available to respond to large incidents.

Northern Gateway said that recovery rates of oil spilled from pipelines can vary depending on circumstances. It provided data showing that recovery rates from past spills of greater than 159 cubic metres (1,000 barrels) ranged from 22 per cent to 100 per cent.

Northern Gateway said that, for a spill to which it would respond with internal resources, its emergency response plans would incorporate a target of 6 to 12 hours for personnel to arrive at the site of the spill. It said that pump station personnel would be immediately mobilized, resources at equipment caches would be accessed, and other spill response agencies would be contacted. It would target a response time of 2 to 4 hours at certain river control points. The company said that circumstances could affect response times and the effectiveness of the response.

The Fort St. James Sustainability Group questioned Northern Gateway on its spill response strategies, practices, and learnings from the Marshall, Michigan incident. Northern Gateway said that its Incident Command System is an important focus for the company, and is used to organize spill response under a common structure, language, and planning process during an incident. It said that Enbridge operates and trains under the Incident Command System in a Unified Command structure, which would include regulatory agencies involved in the spill response. Northern Gateway said that Enbridge recognized the magnitude and impact of the Marshall incident and had changed its philosophy and focus to enable it to over-respond to incidents. Northern Gateway said that learnings from the Marshall incident are being incorporated into its emergency response plans.

In response to Douglas Channel Watch questioning on equipment availability, Northern Gateway said that, in addition to its own resources and capabilities, it would have access to the resources of other oil spill response organizations through mutual aid agreements and other local contractors. Northern Gateway said that it would train with these organizations so that, in the event of an incident, it would be able to use all these resources.

ACCESS PLANNING AND RESPONSE UNDER DIFFICULT CONDITIONS

Douglas Channel Watch, the Province of British Columbia, Mr. Izzard, Friends of Morice-Bulkley, and the Haisla First Nation questioned Northern Gateway on the challenges of accessing remote areas of the pipeline and how this might limit rapid response and cleanup.

Northern Gateway said that a spill into a watercourse at a relatively inaccessible location would make cleanup and remediation difficult. It said that portions of the pipeline would be located in remote areas away from populated centers and roads. It said that most of the pipeline would be routed along existing linear disturbances such as roads and cut blocks, and that only a few segments could be considered truly greenfield or remote. It said that only 2.1 per cent of the proposed pipeline route in British Columbia would be more than 2 kilometres from existing road access. The company said that some relatively inaccessible areas had been avoided through route selection, and that the tunnels themselves could be used as access routes for response during difficult conditions such as in the winter.

Northern Gateway said that it would develop an access management plan for the pipeline, including specific access to river control points, as part of its tactical watercourse plans. It said that the access management plan would be informed by Northern Gateway's construction access plan, and that it would evaluate construction access from an emergency response perspective during planning. The company said that it had considered accessibility to valve sites during valve location assessment. It said that Enbridge's experience operating in remote locations, such as its Norman Wells pipeline in the Northwest Territories, would also inform access planning.

Northern Gateway said that new access for pipeline safety and emergency response would need to be designed with regard to potential disturbance of wildlife and traditional harvesting. The company would consider removal of unnecessary access as part of its linear feature removal and management planning.

The Friends of Morice-Bulkley said that limited access, habitat complexity, water velocity, and ice cover would make effective containment of a dilbit spill in the Sutherland River system difficult or impossible. Similar concerns regarding the Stuart River near Fort St. James were raised. The appropriateness of the river control point locations and their effectiveness in a response were also questioned.

Northern Gateway said that it would continue to update and validate access route information, river control point locations, equipment cache locations, right-of-way access, and high consequence areas for emergency response, as part of construction, operations, and oil spill response planning. It said that mitigation measures would also be considered where they could improve accessibility and spill response capability.

The Haisla Nation, Douglas Channel Watch, the Province of British Columbia, and the United Fishermen and Allied Workers Union questioned Northern Gateway on its ability to respond to spills during difficult seasonal environmental conditions such as winter and spring run-off. Northern Gateway said that conditions associated with heavy snow fall or spring melt have the potential to present additional challenges for containment and recovery operations, and response site access. The company said that:

- Low temperatures and snow can slow oil movement by increasing its viscosity and impeding flow towards watercourses, allowing more time for response.
- The pipeline route had avoided avalanche-prone areas to the extent possible, and the company was continuing to work with avalanche experts to select response sites. Where practical, winter access to infrastructure such as pump stations and tunnels along the right-of-way would be maintained by road clearing, use of tracked vehicles, or helicopters.
- Equipment caches, including pre-positioned caches, would include equipment specific to winter response, such as snow removal equipment, and would be transportable by helicopters.

Parties questioned Northern Gateway about locating and recovering oil under ice. Northern Gateway said that Enbridge conducts emergency exercises in winter and that Northern Gateway would learn from those experiences.

Northern Gateway outlined a number of oil detection techniques including visual assessment (at ice cracks and along the banks), drills, probes, aircraft, sniffer dogs, and trajectory modelling. It said that, once located, oil would be recovered by cutting slots into the ice and using booms, skimmers, and pump systems to capture oil travelling under the ice surface.

The company said that oil stranded under ice or along banks would be recovered as the ice started to melt and break up. It discussed examples of winter oil recovery operations during Enbridge's Marshall, Michigan incident, and said that operational recovery decisions would be made by the Unified Command according to the circumstances.

Northern Gateway said that equipment caches would be pre-positioned at strategic locations, such as the west portal of the Hoult tunnel. It said that decisions regarding the location or use of pre-positioned equipment caches would be made during detailed design and planning, based on a number of considerations including, but not limited to, probability of a spill, access, site security, environmental sensitivities, and potential for oil recovery at the response site.

The Haisla Nation and other parties questioned Northern Gateway about the effectiveness of booms and associated oil recovery systems in high velocity watercourses such as the Kitimat River. Northern Gateway said that oil spill response tactics are site-specific and incorporate multiple response sites. It said that current speed and water depth would be considered, and that response locations would be chosen for optimal containment and recovery potential. The company said that it would review new spill response technologies for fast-flowing watercourses during the detailed design phase, procure equipment best suited to the area, and incorporate appropriate strategies in detailed emergency response plans.

OIL SPILLS ON LAND

Northern Gateway outlined a number of techniques to contain spills on land and prevent them from entering watercourses. The company said that response options would vary depending on the local terrain and the potential for the oil to migrate through the soil. Soil, water, and groundwater contamination would require remediation. The Pipeline and Kitimat Terminal Oil Spill Response Plans would address risks to groundwater as part of the sensitivity and consequence area analysis. Remediation of land based spills would generally be completed to applicable environmental quality standards for the area and local land use.

Douglas Channel Watch asked Northern Gateway if it would be looking at the impact of a spill on aquifers, specifically in the Onion Lake Flats. It also asked about the effect of precipitation on groundwater contamination after a spill. Northern Gateway said that, as engineering studies progress and as the company collects additional geological information at the Onion Lake Flats, it would further assess the potential impact of a spill on the Onion Lake Flats aquifer. The company said that it would address the Onion Lake Flats area in its spill response planning.

DOWNSTREAM MOVEMENT OF OIL SPILLS IN WATERCOURSES

The Panel asked Northern Gateway to undertake full-bore rupture modelling to demonstrate potential spill paths into watercourses for each 1-kilometre-long segment of the pipeline. In response to questions from the Province of British Columbia, Northern Gateway said that this modelling was not intended to show the fate of oil or its effects. Northern Gateway said that this work would inform spill response planning and help it understand approximately how far downstream oil could be expected to travel during the modelled time of 12 hours. Northern Gateway said that the modelling conducted as part of the pipeline ecological and human health risk assessment also provided an indication as to how far oil might travel.

In response to questions from Douglas Channel Watch, Northern Gateway said that the time to reach Kitimat for an unmitigated spill at Hunter Creek in the Kitimat River valley could range from 4 hours to a day, depending on flow conditions.

In response to questions from the Province of British Columbia and the Northwest Institute for Bioregional Research, Northern Gateway said that oil from a hypothetical full-bore rupture in the Clore River watershed would not be likely to reach the Skeena River estuary.

The Northwest Institute for Bioregional Research said that Northern Gateway's SIMAP modelling showed that an oil spill on the Morice River would result in oil exiting the last modelled grid at 60 kilometres. Northern Gateway said that a spill on the Morice River system would be likely to travel approximately 76 kilometres along the Morice and Bulkley Rivers, ending south of Telkwa and Smithers. The Northwest Institute said that, as the Morice is a lower gradient, more complex system than the higher gradient, canyon-walled Clore River, one could expect a spill in the Clore to travel further than in the Morice River.

EMERGENCY PREPAREDNESS AND RESPONSE TRAINING AND EXERCISES

In response to questions from the Province of British Columbia and the Panel, Northern Gateway said that it would conduct emergency preparedness and response training and exercises before project operation. It said that training and exercises would be integrated, and would include tabletop, field, and full scale exercises under an Incident Command structure, with a feedback program to support continual improvement.

Northern Gateway said that its spill management team would be activated approximately 1 or 2 years prior to operations to allow personnel to understand the project, regulatory requirements, the right-of-way, operational risks, and spill response strategies and plans. It said that exercises would be conducted approximately 1 year before operations to allow personnel to become familiar with specific areas and with the resources that would be used.

Northern Gateway said that, before operation, company personnel would have experience responding under conditions that might be encountered during a spill. Once the project is operational, the company said that personnel would continue to conduct spill response exercises dealing with a variety of locations, scenarios and response strategies.

RESPONSE TO HEAVY OIL SPILLS

The Province of British Columbia said that recovery and remediation of sunken oil is a major challenge in freshwater environments. The Haisla Nation said that Northern Gateway had not adequately considered the cleanup of submerged or sunken oils in its response planning, and that submerged and sunken oils were difficult to recover. Northern Gateway acknowledged that a spill could result in sunken or submerged oil, and that both situations pose their own spill response challenges. Northern Gateway said that there is industry and joint industry-government research to improve response capabilities for sinking oil. It said that the oil spilled at Marshall, Michigan, like the products that would be transported on the Enbridge Northern Gateway Project, are products transported throughout North America. The company said that one of the outcomes of the Marshall spill was a better understanding of how to respond to sunken oil.

Northern Gateway said that tactics to recover submerged and sunken oil may differ from methods used for floating oil, and may include water column and bottom sediment sampling, silt screens, weirs, dredges, and pumps. It said that specific tactics for entrained or sunken oil would be included in the Terminal and Pipeline operational Oil Spill Response Plans.

Northern Gateway identified a variety of possible response options for submerged and sunken oil in its Preliminary Kitimat River Drainage Area Emergency Preparedness Report. It said that a number of watercourses along the proposed right-of-way, including the Kitimat River, are considered fast flowing, but typically have slower depositional areas. It said that, after a spill, submerged and sunken oil tend to accumulate in depositional areas, and that these are the areas where containment and recovery tactics are most effective. It said that invasive techniques are available for remobilizing, containing and recovering sunken oil, and would be subject to a net environmental benefit analysis. Northern Gateway said that enhanced emergency preparedness initiatives for sunken oil would include pre-shoreline cleanup and assessment surveys, river substrate surveys, meteorological monitoring, sediment monitoring.

In response to questioning from Northwest Institute for Bioregional Research and the Friends of Morice-Bulkley, Northern Gateway outlined measures that Enbridge used to recover submerged oil in the Kalamazoo River during the Marshall, Michigan incident. These included:

- specialized booms, with curtains extending to the bottom of the river, which directed the submerged or entrained oil to various skimmers and capturing devices;
- other measures such as placement of gabion baskets in strategic locations within the river; and
- a geomorphologist was hired to identify key areas where submerged or entrained oil would naturally deposit.

Northern Gateway said that the techniques were effective in removing most of the submerged or entrained oil in the Kalamazoo River. It said that Enbridge continued to look for submerged oil using other methods, such as poles to disturb bottom sediments and release oil sheen, and sediment cores that could be examined for traces of oil.

The Province of British Columbia questioned whether the net environmental benefit analysis for recovery of submerged or sunken oil could show that the most appropriate response is to leave the oil in place. Northern Gateway responded that, in a net environmental benefit analysis, the advantages and disadvantages of available response options are evaluated, and then the response option that has the greatest net environmental benefit is selected.

Northern Gateway said that the decision to consider a net environmental benefit analysis during an incident is typically discussed with the appropriate regulatory agencies, including the Regional Environmental Emergencies Team led by Environment Canada, Unified Command members, Incident Command members, and the spill management team. It said that the decision is made during the contingency planning process and incorporated into operational plans after the majority of oil has been recovered.

The Panel asked Northern Gateway how net environmental benefit analysis was applied to the Marshall incident. Northern Gateway said that a scientific support group with expertise in the application of net environmental benefit analysis was involved in the analysis and the decisions. Northern Gateway said that a project-specific framework for a net benefit environmental analysis would be a component of the General Oil Spill Response Plan for the project.

KITIMAT RIVER VALLEY

Northern Gateway prepared the Preliminary Kitimat River Drainage Area Emergency Preparedness Report in response to concerns raised by various parties such as the Haisla Nation and the Kitimat Valley Naturalists. Northern Gateway said that, of all the watercourses along the pipeline route, the Kitimat River had the highest calculated probability of a full-bore rupture, due primarily to the geohazards in the upper Kitimat River valley. The report outlined Northern Gateway's considerations and commitments regarding enhanced watercourse response for high risk areas along the pipeline, as defined in the semi-quantitative risk assessment, using the Kitimat River drainage area as an example. Northern Gateway said that, during the detailed planning and design phase, other high consequence locations would be also be assessed.

The Preliminary Kitimat River Drainage Area Emergency Preparedness Report served as a case study identifying and describing response tactics suitable for watercourses, difficult conditions, and sites that are difficult to access, beyond the information contained in the General Oil Spill Response Plan. Northern Gateway said that the objective of site-specific response strategies was to minimize adverse effects on downstream resources.

Northern Gateway said that it would conduct pre-SCAT (shoreline cleanup assessment technique) surveys and mapping to support effective shoreline cleanup and assessment in the Kitimat River drainage. It said that standard shoreline cleanup assessment technique procedures have been used extensively worldwide to segment and characterize river and stream banks and shorelines. In response to questions from the Province of British Columbia and the Kitimat Valley Naturalists, Northern Gateway said that the information gained from these surveys can be used during an emergency response to guide access or to plan tactics for a particular reach of river.

The company said that it had already worked with the Province of British Columbia on pre-SCAT surveys for the marine environment, and that there is a comprehensive database for much of the British Columbia shoreline. Northern Gateway said that it has committed to these surveys for high risk watercourses and that consultation with the Province of British Columbia, First Nations and other stakeholders during detailed design could result in other areas being surveyed as well.

The Kitimat Valley Naturalists said that they were concerned about potential spill effects in the Kitimat River estuary. In response, Northern Gateway said that its pre-SCAT surveys and proposed countermeasures, such as containment sites in the Kitimat River valley, would be used to prevent migration of oil and protect the estuary in the event of a spill. It also noted its development of control points and protective booming strategies that would be put in place along the channels to protect downstream areas such as the estuary.

Northern Gateway submitted a preliminary example of a Tactical Watercourse Plan for the Kitimat River drainage area to demonstrate the process Northern Gateway has committed to for this and other similar high risk drainages along the pipeline right-of-way. Northern Gateway said that it would conduct enhanced meteorological and flow monitoring programs along high risk watercourses.

The Haisla Nation questioned Northern Gateway about sensitive areas along the Kitimat River and estuary. It asked whether the company would be able to protect features such as the District of Kitimat water intake and the water intake for the federal fish hatchery.

Northern Gateway said that, in developing the Tactical Watercourse Plans, and as part of its engagement process, it would work with communities to identify priorities and sensitive features such as water intakes to ensure that protective measures would be in place. It said that an early priority after an incident would be to notify downstream water users so that water intakes could be closed.

The Panel asked Northern Gateway to comment on the area of greatest uncertainty or vulnerability in the Kitimat River drainage area as it relates to emergency preparedness and response. Northern Gateway said that highly variable environmental conditions in the area could affect the success of a response. It said that its Tactical Watercourse Plans and pre-SCAT surveys would consider tactics for seasonal changes in weather and river flow. It said that its proposed training and exercise program, and enhanced meteorological and flow studies, would help to address anticipated environmental variation in the drainage.

7.4.3 EMERGENCY PREPAREDNESS AND SPILL RESPONSE – MARINE SHIPPING

NORTHERN GATEWAY'S COMMITMENTS REGARDING MARINE SPILL PREPAREDNESS AND RESPONSE

Northern Gateway proposed a range of mitigative measures to minimize the consequences of a tanker spill. It said that tankers used to transport oil or condensate would fully comply with national and international regulatory frameworks, including the requirement for arrangements with a certified response organization, and the preparation and approval of a Shipboard Oil Pollution Emergency Plan.

Although Northern Gateway said it would not be the responsible party for ship-source spills, it voluntarily committed to extended responsibility for marine oil spill preparedness and response.

These commitments include:

- escort tugs equipped with oil pollution emergency response equipment;
- deployment of a boom around tankers during oil loading operations;
- the use of tug crews trained in emergency response; and
- enhanced oil spill response capabilities including:
  - establishment of a response organization with a 32,000 tonne response capability capable of having 1 major on-water recovery task force at the site of a spill in the Confined Channel Assessment Area within 6 to 12 hours, and at the site of a spill in the Open Water Area within 6 to 12 hours plus travel time;
  - strategic location of oil spill response equipment and vessels to meet the response time capabilities;
  - oil spill response capability at the Port of Kitimat that is equal to or greater than that of a designated port;
  - identification and prioritization of particularly sensitive areas for oil spill response in Geographic Response Plans; and
  - development of Community Response Plans.

Northern Gateway said that its Tanker Acceptance Program and associated Terminal Regulations would provide the means by which it would implement, monitor, and enforce its marine voluntary commitments related to spill preparedness and response. As an example, Northern Gateway said that a tanker owner, as the responsible party, would be obligated to make use of Northern Gateway's response capabilities.

Northern Gateway said that an effective emergency response program is essential to mitigate potential effects of a spill. It said that its commitments regarding marine response well-exceed regulatory standards and would place it within the top marine terminals worldwide. Northern Gateway also committed to an independent, third party audit of any response capability exceeding that which may be ultimately certified by Transport Canada.

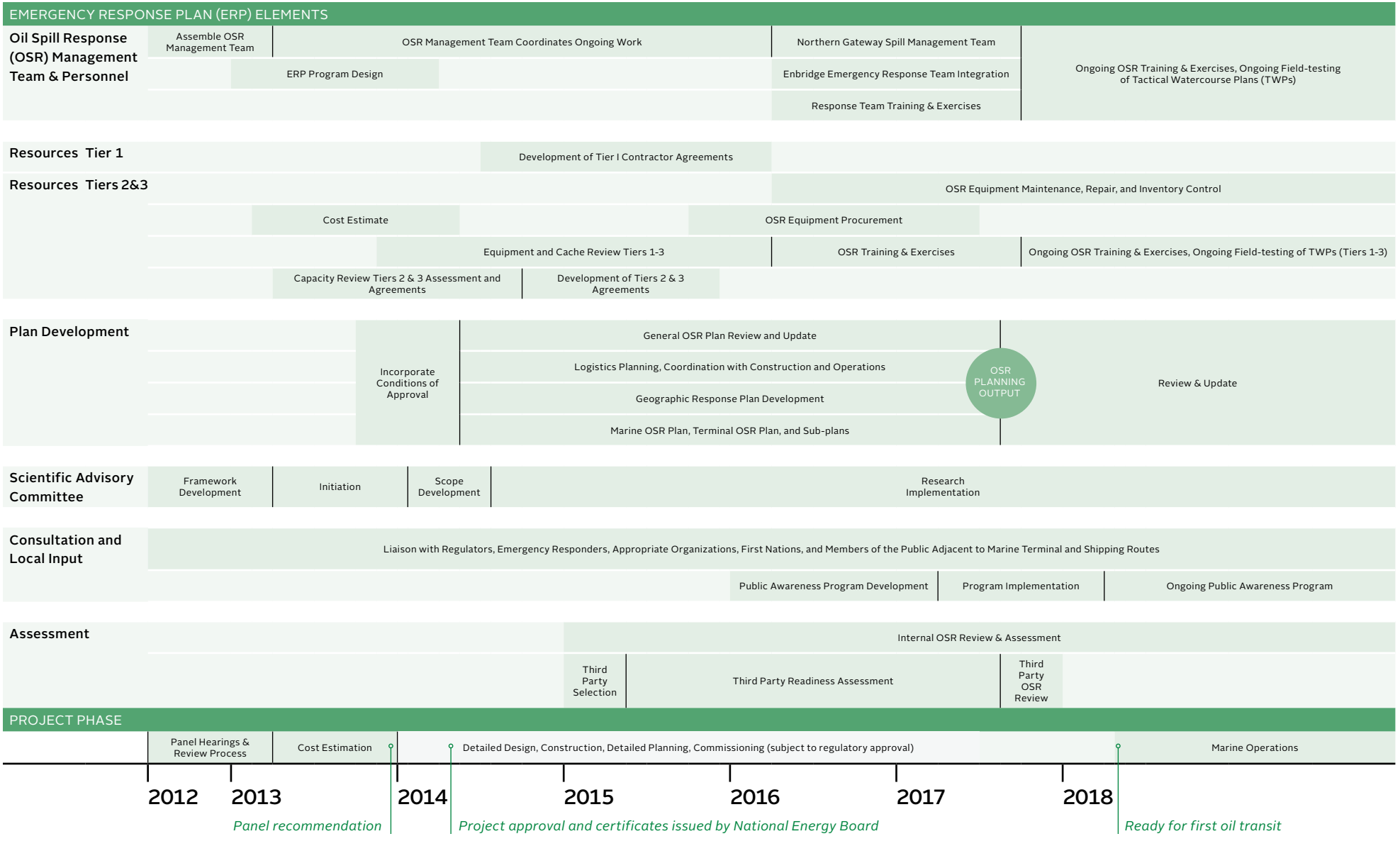
Northern Gateway said that its response organization would be managed as part of its own resources or through contractual arrangement with an existing response organization. Northern Gateway said that it has already been in discussions with Western Canada Marine Response Corporation regarding the types of resources that would be required to meet its response commitments. It said that it was investigating the potential for coastal Aboriginal groups to participate directly in the response organization.

Response equipment would be located in caches at strategic locations along the coast and trained, locally based personnel and equipment would be available for immediate mobilization and deployment. In response to questions from the Kitimat Valley Naturalists, Northern Gateway said that there would be a 10,000 tonne response capacity in Kitimat alone, which would involve more response equipment than any other location in Canada. Northern Gateway also committed to a response capability of 250 tonnes at the Kitimat Terminal, which is in excess of the minimum response planning standard of 44 tonnes. Escort tugs would also have initial response capability in terms of source control and controlling the tanker movement.

In response to questions from the Province of British Columbia, Northern Gateway said that Transport Canada's Response Organization Standards address preparedness and not performance. It said that they should not be interpreted as a guarantee that the planned level of containment and recovery can be met under the conditions present at the time of the spill. Northern Gateway said that the intent of the standards and its related commitments is to ensure that the noted level of response capacity is in place. Its ultimate success would depend on conditions encountered. Similarly, the 6- to 12-hour response capability commitment, while realistic and based on weather data, is a planning standard that may vary according to actual conditions.

Northern Gateway made a number of commitments regarding follow-up and monitoring of environmental resources after a spill. As Northern Gateway would not be the responsible party in the event of tanker spill, the Panel asked the Government of Canada who would be responsible for oversight of these follow-up and monitoring commitments. Environment Canada responded that, for activities beyond those related to response and cleanup, the Regional Environmental Emergencies Team would have a limited role. Environment Canada and Transport

FIGURE 7.6 **NORTHERN GATEWAY'S FRAMEWORK FOR MARINE OIL SPILL RESPONSE PLANNING**



Canada said that such commitments could be linked to any certificates that might be issued by the National Energy Board. They said that the various government departments would be open to further discussion of oversight of these commitments through mechanisms such as a memorandum of understanding.

SPILL RESPONSE PLANNING DOCUMENTS, PROGRAMS, AND PROCEDURES – MARINE SHIPPING

Northern Gateway provided a framework for its proposed marine oil spill preparedness and response planning (Figure 7.6). It committed to engaging Transport Canada early in its detailed marine oil spill preparedness and response planning process.

Transport Canada noted regulations requiring Northern Gateway's plans to include response scenarios and details on training exercises. Transport Canada said that it would participate in the development of these exercises. Northern Gateway also committed to exercise its plans prior to operation of the Kitimat Terminal. Transport Canada recommended that Northern Gateway should ensure an oil spill response capability at the Port of Kitimat equal to or greater than that required for a designated port. It recommended that response times should be based on the assumption that Kitimat would be a designated port as this would increase local spill response resources. Northern Gateway agreed with this recommendation and said that its commitments for response planning actually exceed those required for a designated port in terms of capacity and required response times.

Northern Gateway said that its proposed Scientific Advisory Committee would inform its marine oil spill preparedness and response planning through research on containment, detection, and recovery of submerged oil, sunken oil, and high viscosity oil, under challenging conditions such as cold water, fast currents, and high waves. Northern Gateway said that, should the project be approved, the scope of work for the Scientific Advisory Committee would be developed and refined during 2014, and the research would begin after that. Northern Gateway also said that it expected that follow-up studies would be undertaken throughout the lifetime of the project.

GEOGRAPHIC RESPONSE PLANS, ENVIRONMENTAL SENSITIVITY ATLASES, AND COMMUNITY RESPONSE PLANS

Northern Gateway said that the purpose of a Geographic Response Plan is to guide spill responders during the initial phase of oil spill response in order to reduce adverse effects. Site-specific information is provided on a variety of factors that assist in the response. The company said that its Geographic Response Plans would identify priority protection areas, such as highly sensitive shoreline or shorelines at high risk of oiling, along the marine shipping routes, particularly the Confined Channel Assessment Area. Planning would be guided by a candidate sites work group.

Candidate sites, such as important bird areas, ecological reserves, and the Kitimat River estuary would be ground truthed to ensure that an effective response could be mounted at the site. These assessments would be informed by Northern Gateway's Coastal and Operations Sensitivity Atlases, additional fate and trajectory modelling, consultation with potential stakeholders and Aboriginal groups, and the Marine Environmental Effects Monitoring Program.

Northern Gateway said that Geographic Response Plans may also provide guidance for response at similar sites. It said that specific training and exercises would be developed for priority sites. The Geographic Response Plans would be updated over the life of the project based on these exercises and other changes over time. The Haisla Nation agreed that preparation of Geographic Response Plans is an important component of response planning.

In addition to the detailed information to be included in Geographic Response Plans, Northern Gateway undertook coastal operations and sensitivity mapping for the Confined Channel Assessment Area and the Open Water Area. Northern Gateway said that the purpose of this work was to help decision makers identify and prioritize the protection of areas in the event of an emergency response. Information included shoreline types, shoreline sensitivity, and information pertaining to response operations such as locations of airports, boat launches and anchorages. Northern Gateway said that the information was based on existing information provided by the Government of British Columbia and that the data would be further verified through ground truthing in collaboration with participating local Aboriginal groups.

Northern Gateway committed to the development of Community Response Plans. It said that the purpose of these plans would be to outline how specific members of the community might be involved in an emergency, their roles and responsibilities, and community training that would be needed. The company said that the Community Response Plans would also address issues related to traditional harvesting and related mitigation and compensation.

MARINE INCIDENT MANAGEMENT AND OPERATIONAL RESPONSE

Northern Gateway said that, similar to a pipeline spill, a marine spill would be managed using the Incident Command System. It said that the initial incident commander would typically be the ship's captain, likely followed by the responsible party's representative, and ultimately, a Unified Command consisting of federal and provincial representatives and the responsible party's representative. Northern Gateway said that it also intends to participate in the Unified Command as this would be a condition of acceptance for tankers calling at the terminal.

Northern Gateway said that, in addition to natural dispersion and degradation, there are three response options for marine spills. These are mechanical recovery, application of dispersants, and in-situ burning. The company said that each of these options has specific windows of opportunity and operational limits. Figure 7.7 shows a summary of potential response options and operational limits, according to Northern Gateway.

Northern Gateway said that recovery of oil spilled in marine waters can be very low, ranging from 0 to 15 per cent of the oil spilled, depending on circumstances such as wind and wave conditions. It said that recovery may be much higher for a spill in the Confined Channel Assessment Area due to its sheltered nature and relatively lower wind and wave conditions. The company noted spills where recovery was as high as 90 per cent of the oil spilled.

An analysis conducted by the Haisla Nation indicated that weather and daylight conditions could potentially limit mechanical recovery of oil in the Open Water Area and Confined Channel Assessment Area for approximately half of the year, and 10 per cent of the year, respectively.

A Living Oceans Society's assessment showed that opportunities for mechanical recovery and dispersant application could be limited throughout the project area, depending on wind and wave conditions.

Northern Gateway said that these analyses were in general alignment with its own assessment. It also said that its initial assessments showed that an effective initial response could be mounted approximately 98 per cent of the time in the Confined Channel Assessment Area. The company said that there are very few times in the Confined Channel Assessment Area when wave heights exceed 1 metre, which is within operational limits. Northern Gateway said that new technology allows mechanical recovery operations in wave conditions as high as 2 metres. Northern Gateway committed to additional analysis to inform its equipment selection and response planning.

Canadian Coast Guard and Transport Canada said that the effectiveness of mechanical recovery can be limited by high winds and waves but there have been technology improvements in boom and skimmer systems in recent years that allow response under more difficult conditions.

The Gitxaala Nation said that technology and planning advancements may result in improved response for smaller spills but it said that for large catastrophic spills, the response would be largely ineffective.

Mechanical recovery

Northern Gateway said that mechanical recovery of oil involves a wide range of equipment and techniques, with a combination of booms, skimmers and sorbents likely to be used. It said that mechanical recovery decisions would depend on the circumstances of the spill, including the type and volume of product, and environmental, operational, and logistical considerations.

Dispersants

Northern Gateway undertook tank testing to assess the potential effectiveness of dispersant use on synthetic crude and dilbit. The tests demonstrated that dispersants were likely to be effective on synthetic crude, and possibly dilbit, depending on the product and degree of weathering. Heavily weathered oils become too viscous to be dispersed effectively. Northern Gateway said that, as the dilbit it tested has the potential to emulsify in as little as 12 hours in winter conditions, it may become too viscous for chemical dispersion. Northern Gateway said that any additional dispersant testing would be conducted in consultation with Environment Canada.

Northern Gateway reviewed existing information on the potential effects of dispersant use on the environment. It said that any decision to use dispersants must use net environmental benefit analysis to compare potential environmental trade-offs. The company said that dispersant use can help protect marine mammals and birds by reducing their potential exposure to floating oil. It said that this benefit may come at the expense of a temporary increase in adverse effects to water column organisms from dispersed and dissolved oil and dispersant mixtures.

Northern Gateway said that it was interested in working with Environment Canada during detailed planning to identify zones or areas where pre-approved dispersant use may be considered. Northern Gateway committed to incorporating net environmental benefit analysis on an area-specific basis during detailed spill response planning. This work would be completed in consultation with Environment Canada.

In response to Northern Gateway's request for policy and legal clarification on the use of dispersants, the Government of Canada said that there is currently no approval or pre-approval process for the use of dispersants in Canada. It said that dispersant use can constitute a violation of the *Fisheries Act* and other legislation, and would only be considered on a case-by-case basis in consultation with the Regional Environmental Emergencies Team. The Government of Canada said that regulations regarding the use of dispersants are currently being considered. It said that, to date, Environment Canada had not conducted dispersant effectiveness tests for oil sands products in conditions which might approximate the Confined Channel Assessment Area and Open Water Area.

In-situ burning

Northern Gateway said that large amounts of floating oil can be rapidly consumed and dispersed by burning. It said that the use of in-situ burning would depend on circumstances including weather, sea state, the thickness and degree of weathering of the floating oil layer, and environmental, health, and safety concerns. The company said that the residue created by in-situ burning is highly viscous and likely to sink. It said that, if the residue remains neutrally buoyant, recovery may be possible. Northern Gateway said that the amount of burn residue which could potentially sink would depend on the efficiency of the burn. It said that burning efficiency can be as high as 90 per cent.

Northern Gateway said that, in terms of toxicity, the burn residue is essentially benign. It said that airborne particulate matter from the burn can exceed air quality guidelines in the immediate vicinity of the burn. A decision to conduct in-situ burning of spilled oil would be in the context of a net environmental benefit analysis and with regard to the British Columbia/Canada In-situ Oil Burning Policy and Decision Guidelines.

Shoreline protection and cleanup

Northern Gateway said that, if spilled oil reaches a shoreline, or has the potential to reach a shoreline, it would implement shoreline protection and cleanup measures. Northern Gateway said that shoreline response would be guided by Geographic Response Plans and its coastal operations and sensitivity mapping. Nearshore protection can involve techniques such as exclusion or deflection booming, skimming, in-situ burning, dispersants, and diversion booming.

The company said that, if oil reaches a shoreline, cleanup would also be guided by a shoreline cleanup and assessment team, and subject to a net environmental benefit analysis, in consultation with the Regional Environmental Emergencies Team. Northern Gateway said that rocky headlands are less sensitive than cobble and gravel beaches. A variety of cleanup techniques could be implemented, including letting natural recovery take place. The company said that Canada's response planning standards require a response organization to have the capability to clean up 500 metres of shoreline per day.

Tracking and cleanup of submerged and sunken oil

In response to questions from the Coalition and others, Northern Gateway said that, like heavy fuel oils and heavy crude oils, dilbit is likely to become very viscous as it weathers. It said that this is expected by spill responders. It said that even very light oils, such as those spilled during the British Petroleum Deepwater Horizon incident, weathered into a viscous state with the appearance and consistency of peanut butter.

Living Oceans Society questioned the ability of available spill response technology, designed for recovery of conventional oil, to track and recover dilbit in temperate marine waters. It submitted an overview of spill response technologies for viscous oils that submerge which concluded the following:

- Despite advances in technology used to recover and transfer viscous oils, it is still very difficult to locate, control, and recover submerged oil.

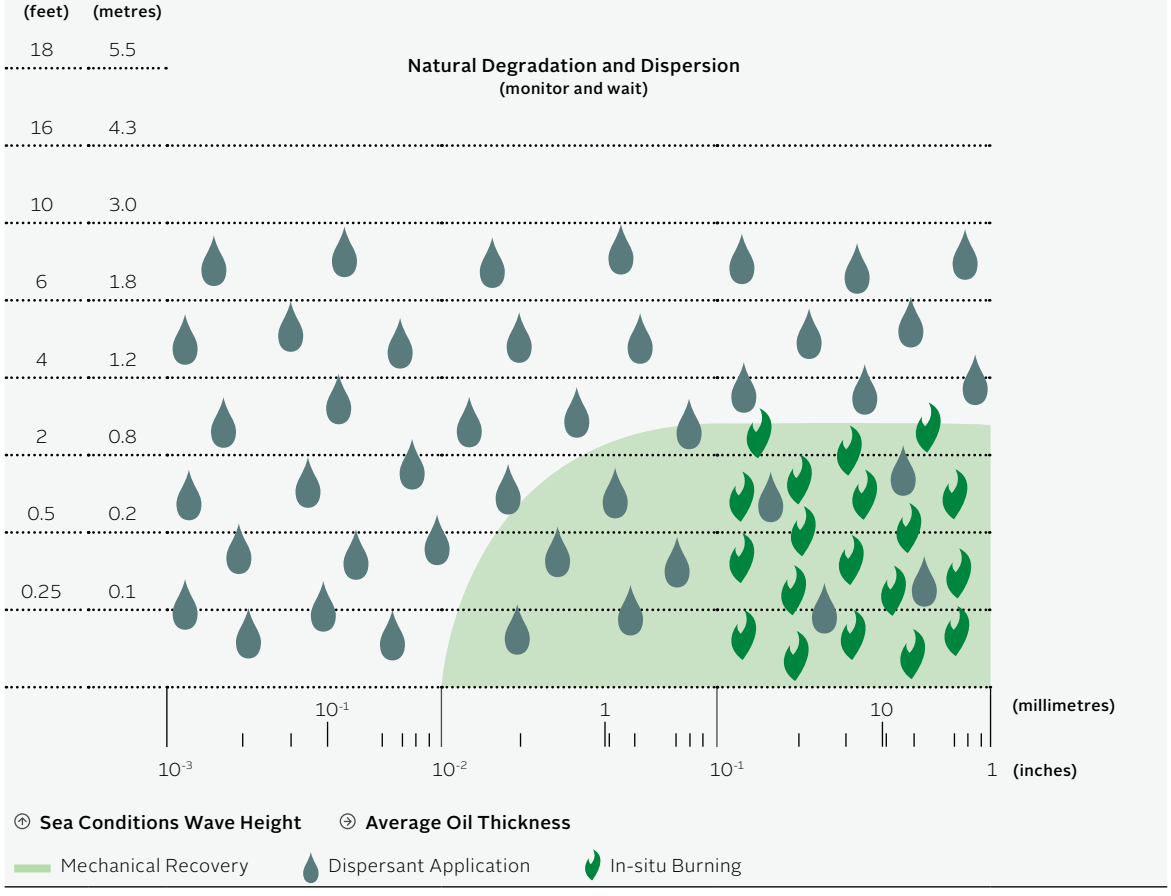
- Technology is available to contain, skim, transfer, and store highly viscous oil from the water surface, as long as environmental conditions allow safe and effective operation of the equipment.
- It is unlikely that existing control and response technologies could be applied successfully to submerged oil. Shoreline cleanup operations would have to be initiated, assuming the oil stranded on shore.
- There are a number of possible recovery techniques for sunken oil, but each has specific limitations.

Northern Gateway said that, under certain conditions, a portion of a dilbit spill may become entrained in the water column, submerge, or sink. It said that sinking would be most likely near shoreline areas if the oil takes on a sufficient sediment load. Northern Gateway said that there are challenges in responding to spills that have a high proportion of entrained, submerged, or sunken oil. It said that this can be the case whether the oil is dilbit, synthetic crude, or conventional crude oil.

Northern Gateway said that response organizations are set up to respond to heavy oil spills. It said that its response organization would also have the capability to recover submerged and sunken oil in nearshore areas.

Northern Gateway outlined technological advances in heavy oil cleanup. It said that there are booms designed for containing submerged oil. It also said that should oil be submerged, it would likely only be slightly overwashed and not likely to submerge to water depths greater than 3 metres.

FIGURE 7.7 **POTENTIAL OIL SPILL RESPONSE OPTIONS AND WINDOWS OF OPPORTUNITY FOR THEIR USE**
(These numbers are an approximation only)



Northern Gateway said that, in the unlikely event that oil were to sink in deeper waters, the oil would probably settle as a patchy distribution of small particles, which would be subject to subsequent natural degradation. Large "mats" of sunken oil on the ocean floor would not be expected.

In response to questions from the Haisla Nation, Northern Gateway said that the Environment Canada field guide for oil spill response on marine shorelines includes a section on submerged and sunken oil which addresses, among other things, the detection of submerged and sunken oils.

The United Fishermen and Allied Workers Union said that submerged oil from the Nestucca Barge spill proved very difficult to track. In response, Northern Gateway said that tracking and surveillance technology had changed since the Nestucca spill. It said that poor weather had precluded effective aerial surveillance of the Nestucca spill. It said that permanently stationed surveillance aircraft are now available on the West Coast. Transport Canada and Environment Canada confirmed that, although there can be limitations, the National Aerial Surveillance Program has the ability to track submerged oil. Similar technology was used in the British Petroleum Deepwater Horizon spill to track submerged, emulsified oil.

Fate and trajectory modelling

To assist in spill response planning, Northern Gateway ran a fate and trajectory model for seven hypothetical spill scenarios at the Kitimat Terminal and in the Confined Channel Assessment Area and Open Water Area. A variety of scenarios, involving different volumes of spilled condensate, synthetic crude, oil, and dilbit were modelled. The largest spill modelled was a 36,000 cubic metre spill of dilbit in Wright Sound.

The model estimated the post-spill distributions of hydrocarbons in the air, water column, sediment, and on the shoreline. Maps were produced to show movements of oil or condensate in response to winds and currents under different oceanographic and meteorological conditions. Northern Gateway said that the fate and trajectory model was linked to the oil properties and fate model (discussed in Chapter 6). The company said that both the fate and trajectory model and the oil properties and fate model used actual time series of wind, water temperature, and air temperature data.

Environment Canada and the Panel requested that Northern Gateway undertake additional modelling for the same seven scenarios under opposite-season meteorological conditions, either winter outflow conditions or summer inflow conditions.

Depending on the scenario modelled, oil trajectories and fate were predicted for periods ranging from approximately 15 minutes to 15 days after the simulated spill. All scenarios were assessed assuming no spill response. The company said the wind was the most influential factor affecting the modelled oil trajectories. It said that tides had an influence on the initial movement of the oil and on small-scale movement at tidal periods. Northern Gateway said that the models could be improved by refining meteorological and hydrologic components.

In response to questions from the United Fishermen and Allied Workers Union, Northern Gateway said that, although its fate and trajectory models were run out to 15 days in some cases, model accuracy declines in longer forecasts. Northern Gateway said that, during an actual spill response, modelling results would be updated regularly with spill surveillance and tracking data, and with meteorological data from its weather monitoring stations. A Gitxaala Nation expert said that traditional trajectory models are typically only run out to 3 days, as wind forecasts are not accurate after approximately 3 days.

Environment Canada said that it had several concerns regarding Northern Gateway's fate and trajectory modelling and risk assessments. It said that it discussed these concerns and related topics with Northern Gateway during the Panel's process and in meetings outside the process. Environment Canada said that its observations regarding Northern Gateway's spill modelling work were provided with the goal of identifying opportunities to strengthen Northern Gateway's modelling and risk assessments as the project advances.

Environment Canada said that, in its current form, the response scenarios included in Northern Gateway's fate and trajectory modelling were of limited value for spill response planning and risk assessment because of uncertainties related to the behavior of the product in the marine environment. Environment Canada said that its review of Northern Gateway's spill modelling did not consider the probability of a spill occurring, as that is beyond Environment Canada's mandate and expertise.

Environment Canada recommended that Northern Gateway undertake additional spill modelling and risk assessment work under the guidance of the

Scientific Advisory Committee. It recommended that the Scientific Advisory Committee include experts in a variety of disciplines including oceanography, meteorology, marine biology, oil spill chemistry, and behavioral and numerical modelling. Environment Canada recommended that additional spill modelling work focus in the following areas among others:

- modelling of additional scenarios and spill volumes;
- better linkages and connections between oil weathering, oil behavior and fate, and trajectory models;
- additional consideration of stochastic or probabilistic modelling approaches to better predict oil fate and behavior;
- an expanded range of environmental and hydrodynamic conditions;
- consideration of other state-of-the art modelling and risk assessment methodologies;
- additional model validation and calibration;
- consideration of remobilization and refloating of oil from shorelines and the water column; and
- consideration of oil-sediment interactions.

The Gitxaala Nation noted similar concerns regarding Northern Gateway's spill modelling.

Northern Gateway agreed with Environment Canada's recommendation and said that such work would provide important information for emergency preparedness and response planning, including the preparation of Geographic Response Plans.

BC Nature and Nature Canada, the Gitxaala Nation, and other intervenors asked Northern Gateway to undertake additional assessment of potential spill consequences, and integrate this information in its spill modelling and risk assessments. They asked that stochastic modelling be undertaken to better understand the ecological effects and significance of an oil spill.

Northern Gateway said that additional modelling would not alter its conclusion that a major spill in the Confined Channel Assessment Area and Open Water Area would have multiple adverse and significant effects to the marine biophysical environment and human use. It said that it also assumed that all areas in the Open Water Area and Confined Channel Assessment Area were at risk of being oiled in the event of a spill. Northern Gateway agreed that stochastic modelling could be useful to inform spill response planning and it agreed to consider it as part of its overall work on enhancing its fate and trajectory models.

Northern Gateway said that most of the key determining factors in an oil spill, such as oil type, spill location, time of year, time of day, weather and oceanographic conditions, cannot be controlled. The company said that, in addition to its measures aimed at preventing a spill from occurring, it was focused on enhanced spill response measures in the Confined Channel Assessment Area and Open Water Area.

Environment Canada and other intervenors said that Northern Gateway had not considered interactions between oil and suspended particles in its fate and trajectory modelling. Northern Gateway said that, except in nearshore areas, oil/suspended particle interactions are likely to account for only a relatively small percentage of the fate of spilled oil. It said that these processes are relatively unimportant from a fate and trajectory modelling perspective. The company said that it would examine the issue further as part of its enhanced fate and trajectory modelling to be conducted under the guidance of the Scientific Advisory Committee.

Trajectory modelling provided by the Gitxaala Nation suggested that oil could reach shorelines before a response organization could arrive. In response to questions from Northern Gateway, the Gitxaala Nation said that its modelling could inform future response planning or an alternative trajectory model could also be used. Northern Gateway said that the model used by the Gitxaala Nation was a relatively simplistic model that could assist spill response planning.

Timing of enhanced marine fate and trajectory modelling

Environment Canada said that its recommendations regarding additional spill modelling could inform both spill response planning and assessment of environmental consequences. It did not specifically recommend when the additional modelling should be done, and said that its recommendations were intended inform the Panel's deliberations. It said that the additional modelling should be completed before the project began operation and that it intended to participate in the Scientific Advisory Committee. It said that Northern Gateway had made specific commitments to provide the information, and that some of the information was more appropriate for detailed spill response planning. It said that another objective of its recommendations

was to enable the Panel to propose conditions for the project.

Environment Canada said that proposed research on oil fate and behavior, which would inform fate and trajectory modelling, would not likely be completed within the timeframe of the Panel's process. It said that a similar research program on the East Coast took place over a period of approximately 6 years, and it anticipated a similar time requirement for its recommended research program.

Northern Gateway said that it had provided sufficient modelling information for environmental assessment and other decisions to be made. It also said that additional modelling would be useful to support development of Geographic Response Plans and emergency response planning.

7.4.4 VIEWS OF THE PANEL

EMERGENCY PREPAREDNESS AND RESPONSE PLANNING

The Panel finds that Northern Gateway's extensive evidence regarding oil spill modelling, prevention, planning, and response was adequately tested during the proceeding, and was credible and sufficient for this stage in the regulatory process.

Parties such as the Province of British Columbia, Gitxaala Nation, Haisla Nation, and Coalition argued that Northern Gateway had not provided enough information to inform the Panel about proposed emergency preparedness and response planning. The Panel does not share this view. Northern Gateway and other parties have provided sufficient information to inform the Panel's views and requirements regarding malfunctions, accidents, and emergency preparedness and response planning at this stage of the regulatory process. In reaching this view, the Panel took into account additional information filed by the company in response to the Panel Session Results and Decision document dated 19 January 2011 as well as Northern Gateway's commitments, conditions set out by the Panel, and the existing regulatory environment.

Information filed by Northern Gateway was also supplemented by extensive information filed by hearing participants through letters of comment, oral statements, and oral and written evidence.

Many parties said that Northern Gateway had not demonstrated that its spill response would be "effective." Various parties had differing views as to what an effective spill response would entail. The Panel is of the view that an effective response would include stopping or containing the source of the spill, reducing harm to the natural and socio-economic environment to the greatest extent possible through timely response actions, and appropriate follow-up and monitoring and long-term cleanup. Based on the evidence, in the Panel's view, adequate preparation and planning can lead to an effective response, but the ultimate success of the response would not be fully known until the time of the spill event due to the many factors which could inhibit the effectiveness of the response. The Panel finds that Northern Gateway is being proactive in its planning and preparation for effective spill response.

The Panel is of the view that an effective response does not guarantee recovery of all spilled oil, and that that no such guarantee could be provided, particularly in the event of a large terrestrial, freshwater, or marine spill.

The oil spill preparedness and response commitments made by Northern Gateway cannot ensure recovery of the majority of oil from a large spill. Recovery of the majority of spilled oil may be possible under some conditions, but experience indicates that oil recovery may be very low due to factors such as weather conditions, difficult access, and sub-optimal response time, particularly for large marine spills.

Although malfunctions and accidents may not be fully predictable, a precautionary approach requires that they be planned for. Specific details regarding the location, extent, and effects of a large spill cannot be known in advance because many relevant factors cannot be quantified. Sufficient information can be known in advance to allow planning, and response preparedness for a wide range of spill scenarios, including credible worst case scenarios.

EMERGENCY PREPAREDNESS AND SPILL RESPONSE – PIPELINE AND MARINE TERMINAL

Emergency preparedness and spill response related to the pipeline and Kitimat Terminal is under the regulatory and enforcement jurisdiction of the National Energy Board. Northern Gateway discussed how it intends to meet regulatory requirements and provided examples of its spill response planning documents.

The Panel finds that Northern Gateway has appropriately identified issues which are particularly important for the project for inclusion in its emergency

preparedness and response planning process. These include issues such as access planning, response under challenging environmental conditions, identification of particularly sensitive and high consequence areas, and response measures for submerged and sunken oil. Northern Gateway's response planning would also be informed by input from the Scientific Advisory Committee and by review by an independent third party. The Panel finds that Northern Gateway's proposed response planning and mitigation is appropriate for the project.

The Panel requires Northern Gateway to report to the National Energy Board on implementation of its emergency response commitments. The company would be required to report on its:

- emergency Response Plan for construction;
- technology and site-specific mitigation related to emergency preparedness and response;
- preparation of emergency preparedness and response planning documents;
- consultation on emergency preparedness and response with interested parties;
- emergency preparedness and response exercise and training program including a schedule for tabletop and full-scale emergency response exercises;
- emergency preparedness and response plan for the pipeline;
- emergency preparedness and response plan for the Kitimat Terminal; and
- emergency preparedness and response exercises after commencing operations.

To verify compliance with Northern Gateway's commitments regarding emergency preparedness and response, and to demonstrate that Northern Gateway has developed appropriate site-specific emergency preparedness and response measures, the Panel requires Northern Gateway to demonstrate that it is able to appropriately respond to an emergency for each 10-kilometre-long segment of the pipeline.

The Panel notes the concerns of intervenors regarding Northern Gateway's ability to respond efficiently and effectively to incidents in remote areas, and its plan to consider this during detailed design and planning. The Panel finds that Northern Gateway's commitment to respond immediately to all spills and to incorporate response time targets within its spill response planning is sufficient to address these concerns. Northern Gateway said that its emergency response plans would incorporate a target of 6 to 12 hours for internal resources to arrive at the site of a spill. It also said that it would target a response time of 2 to 4 hours at certain river control points.

The Panel agrees with Northern Gateway and several intervenors that access to remote areas for emergency response and severe environmental conditions pose substantial challenges. The Panel notes that the company has committed to develop detailed access management plans and to evaluate contingencies where timely ground or air access is not available due to weather, snow, or other logistic or safety issues.

The Panel accepts Northern Gateway's commitment to consult with communities, Aboriginal groups, and regulatory authorities. The objective of this consultation is to refine its emergency preparedness and response procedures by gaining local knowledge of the challenges that would be present in different locations at different times of the year.

Northern Gateway's access management plans would need to balance the effects on wildlife and traditional land use of existing and new access along the right-of-way. The Panel recognizes that Northern Gateway's intent is to be able to access the entire right-of way. The development of access management plans would involve consultation with appropriate parties. The Panel requires these plans to be in place prior to operation.

The Panel notes intervenors' concerns regarding how far an oil spill might travel downstream. The Panel finds that Northern Gateway has provided sufficient information indicating the potential extent of downstream oil transport. Northern Gateway has considered this information in its response planning. The extent of downstream transport would depend on particular circumstances associated with the spill.

Detailed design work and additional research and planning would be required, post approval, to further inform Northern Gateway's emergency preparedness and response planning. Additional information would also be required to ensure that Northern Gateway's emergency preparedness and response plans and capabilities are in place. The Panel's conditions regarding additional research and emergency preparedness and response planning would involve consultation with regulatory authorities, technical experts, Aboriginal groups, and communities potentially affected by an oil spill.

EMERGENCY PREPAREDNESS AND SPILL RESPONSE – MARINE SHIPPING

Emergency preparedness and spill response related to marine shipping is the regulatory and enforcement responsibility of federal departments, and not the National Energy Board. There is an established regulatory regime in place that requires oil spill preparedness and response planning for vessels which would transport oil or condensate in relation to the project. Northern Gateway has committed to file its marine oil spill preparedness and response plans with the relevant departments. The Panel requires these plans to be filed with these departments at least a year in advance to allow for adequate review and comment.

Northern Gateway's voluntary commitments regarding oil spill preparedness and response planning would exceed marine regulatory requirements. The Panel requires Northern Gateway to implement these commitments under any certificates which may be issued under the *National Energy Board Act*. The Panel finds that spill response capability that exceeds the regulatory requirements is appropriate for the project, given the potential consequences associated with a large marine oil spill.

The Panel finds that Northern Gateway's commitments represent a substantial increase in spill response capabilities beyond those required by existing legislation and currently existing on the west coast of British Columbia. They are based on international best practice and continual advances in technology and spill response planning.

Northern Gateway has committed to establishing a response organization with a 32,000 tonne response capability capable of having 1 major on-water recovery task force at the site of a spill in the Confined Channel Assessment Area within 6 to 12 hours, and at the site of a spill in the Open Water Area within 6 to 12 hours plus travel time. Northern Gateway's proposed response organization would be certified by the Minister of Transport up to 10,000 tonnes and the response organization would be subject to audit by an independent third party.

Northern Gateway said that all portions of the Confined Channel Assessment Area may be at risk of being oiled after a large spill, and it planned spill prevention and response measures accordingly. The Panel views this as a precautionary approach, as fate and trajectory models are only one tool to be used in spill response. Northern Gateway's commitments, including source containment, tracking and cleanup of submerged and sunken oil, and geographic response planning, would help mitigate potential effects in the event that on-water recovery is not possible and oil reaches a shoreline. Shoreline cleanup, as appropriate or practicable, would further reduce negative effects.

The success of oil spill response would depend on the circumstances associated with the spill, such as volume spilled, spill location, and environmental conditions. Canada's Response Organization Standards acknowledge that an effective initial response may not always be possible. They require demonstration of a response capability but not a guarantee that spilled oil will be fully recovered.

The Panel accepts Northern Gateway's commitment to conduct additional marine spill trajectory and fate modelling to support spill response and planning. Among other issues, this work would consider oil/suspended sediment interactions, discussed in Chapter 6. The modelling work would be informed by Northern Gateway's research program on the behaviour and cleanup of heavy oils, and is to be completed before project operation, under the guidance of a Scientific Advisory Committee.

The Panel notes that the use of dispersants as an oil spill mitigation measure is under the jurisdiction of Environment Canada. The Panel further notes that this is an area of ongoing development.

7.5 Summary of Panel views and recommendation under the *Canadian Environmental Assessment Act, 2012*

The Panel finds that some level of risk is inherent in the Enbridge Northern Gateway Project, and that no party could guarantee that a large spill would not occur. The Panel finds that a large spill, due to a malfunction or accident, from the pipeline facilities, terminal, or tankers, is not likely. The Panel finds that Northern Gateway has taken steps to minimize the likelihood of a large spill through its precautionary design approach and its commitments to use innovative and redundant safety systems, such as its commitments to address human error, equipment failures, and its corporate safety culture. These commitments and all others made by the company would be enforced under the regulatory regime.

Specific examples of design enhancements required by the Panel to reduce the risk of a large spill, discussed in this Chapter and Chapter 5, include:

- thicker pipe;
- additional block valves;
- complementary leak detection systems;
- re-routing the pipelines away from major rivers where possible;
- trenchless river crossings where possible;
- Tanker Acceptance Program;
- use of escort tugs; and
- navigation safety enhancements.

The Panel finds that, in the unlikely event of a large oil spill, there would be significant adverse environmental effects, and that functioning ecosystems would recover through mitigation and natural processes. The Panel finds that a large oil spill would not cause permanent, widespread damage to the environment. The extent of the significant adverse effects would depend on the circumstances associated with the spill. The Panel finds that, in certain unlikely circumstances, a localized population or species could potentially be permanently affected by an oil spill. Past spill events indicate that the environment recovers to a state that supports healthy, functioning ecosystems similar to those existing before the spill.

It is the Panel's view that, after mitigation, the likelihood of significant adverse environmental effects resulting from project malfunctions or accidents is very low.

The Panel is of the view that Northern Gateway's research commitments regarding the behavior and cleanup of heavy oils spilled in aquatic environments, and enhanced fate and trajectory modelling, would further inform emergency preparedness and response planning for the project. This research would also contribute to other current and proposed research activities in both the public and private sector.

8 Environmental assessment

The Panel conducted its environmental assessment of the project under both the *National Energy Board Act* and the *Canadian Environmental Assessment Act, 2012.*

The Panel is required to recommend whether the project:

- is not likely to cause significant adverse environmental effects;
- is likely to cause significant adverse environmental effects that can be justified in the circumstances; or
- is likely to cause significant adverse environmental effects that cannot be justified in the circumstances.

The Governor in Council will then make a decision on the project taking that recommendation into account.

The assessment of the environmental effects of the project is integrated throughout this report. This chapter focuses on the changes caused to the biophysical environment by routine project activities, including marine transportation. This chapter also describes the cumulative effects of the project in combination with effects from other projects and activities. Chapter 9 addresses the effects of project-related changes to the biophysical environment on people and communities. The effects of malfunctions and accidents on the biophysical and human environments are discussed in Chapter 7. In cases where the Panel recommends that the project is likely to cause significant adverse environmental effects on a biophysical component, the Panel discusses whether or not these effects are justified in the circumstances in Chapter 2.

8.1 Scope of the environmental assessment

The scope of the environmental assessment included the following three elements:

SCOPE OF THE PROJECT
Defines project components and activities the Panel must consider.

FACTORS TO CONSIDER
Environmental and socio-economic elements likely to be affected by the project.

SCOPE OF THE FACTORS
Guidance on the information needs and analysis required.

8.1.1 SCOPE OF THE PROJECT

The scope of the Enbridge Northern Gateway Project includes all project components and all related works and activities that would be part of facility construction and operations, as well as marine transportation of oil and condensate within Canadian waters off the coast of British Columbia.

Part I of the Joint Review Panel Agreement's Terms of Reference (Appendix 4) includes all project components that were considered in the environmental assessment.

Under the Terms of Reference, the Panel considered decommissioning and abandonment of the pipelines and the Kitimat Terminal in a broad context. Any decommissioning or abandonment activities would require separate applications and be subject to future examination under the *National Energy Board Act*. Decommissioning or abandonment would be subject to the regulatory requirements in place at that time.

According to its mandate, the Panel examined a conceptual abandonment plan, an estimate of future abandonment costs, and Northern Gateway's ability to address future abandonment costs. Northern Gateway would be fully responsible and accountable to meet all regulatory standards with respect to abandonment.

8.1.2 FACTORS TO CONSIDER

The Panel assessed the environmental effects of project construction and operations, including the environmental effects of malfunctions and accidents that may occur in connection with the project, and any cumulative environmental effects. The Panel also considered the significance of these environmental effects. Elements considered in this framework included:

- mitigation measures, monitoring plans, and follow-up programs;
- emergency response plans;
- public and Aboriginal people's knowledge and comments;
- purpose of, need for, and alternatives to the project;
- alternative means of carrying out the project;
- capacity of renewable resources; and
- measures to enhance any beneficial environmental effects.

8.1.3 SCOPE OF THE FACTORS

Guidance on information requirements and expectations for the environmental assessment was included in the Joint Review Panel Agreement's Terms of Reference.

8.2 List of Issues

Early in the Panel's process, the Panel established a draft List of Issues to guide its environmental assessment and public interest determination. The Panel subsequently revised this list after receiving input during the Panel sessions. The revised List of Issues was released on 19 January 2011 (Appendix 5).

During the Panel sessions, and throughout its process, the Panel heard from many people and parties, through oral statements and letters of comment. Some expressed views and presented evidence in areas beyond the List of Issues. Issues outside of the Panel's mandate fell under the following topics:

- product refining or upgrading capabilities;
- product transport to markets in eastern Canada;
- upstream oil production in the Alberta oil sands region and its linkage to global climate change;
- views about the end market use of crude oil;
- views about the acceptability of using fossil fuels;
- views about Canadian policy and policy needs related to energy production and use, transportation, refining, and offshore shipping; and
- views about federal government department resourcing, capacity, and legislated responsibilities.

Views of the Panel

The Panel finds that these issues are of importance to Canadians. These issues are not under this Panel's regulatory framework or jurisdiction. These issues can and should be discussed in forums and processes under their respective jurisdictions.

8.3 Purpose of and need for the project

According to Northern Gateway, the purpose of the project is to provide access to the west coast of Canada for oil exports and condensate imports. Northern Gateway said that the project is needed so that Canadian oil producers can obtain full value for their oil production by diversifying market access, providing increased competition, and preventing condensate shortages.

Northern Gateway said that the project, in meeting its purpose, would lead to higher netbacks for all Canadian producers, encourage innovation in Canada's energy sector, and alleviate the condensate supply shortages.

A detailed discussion of the need for the project is provided in Chapter 10. The Terms of Reference required the Panel to consider the purpose of the project and the need for the project in its assessment. These factors are considered as part of the overall benefits and burdens of the project in Chapter 2.

8.4 Alternatives to the project

The Terms of Reference required consideration of alternatives to the project. These are meant to be any feasible, functionally-different ways to meet the need for the project and achieve its purpose. In developing its public interest determination under the *National Energy Board Act*, the Panel can also consider the alternative of not proceeding with the proposed project. Chapter 2 addresses this through the Panel's weighing of the benefits and burdens of the project.

In its application, Northern Gateway considered the general locations of the marine terminal and the eastern terminus as alternatives to the project. The Panel considers these to be alternative means of carrying out the project because, in its view, these alternate locations represent other technically- and economically-feasible ways the project could be implemented. See Section 8.5 for the Panel's discussion on these aspects.

The Panel's intent in evaluating alternatives to the project was to determine if Northern Gateway's preferred approach is reasonable to meet the purpose of, and need for, the project. While the Panel considered these alternatives, it did not require that they be assessed to the same degree as the applied-for project, which remained the focus of the Panel's assessment.

SHIPMENT BY RAIL

Some intervenors questioned Northern Gateway about the ability to transport large volumes of oil by rail to the west coast.

Some intervenors who are potential shippers said that they currently ship oil and diluent by rail. They generally viewed rail transport as filling flexible and specific niche requirements for shipping, supplementing pipeline transportation only when necessary. Some producers said that rail uses more energy, has higher operating costs, and that a pipeline represents a preferable long-term transportation method.

Northern Gateway said that the costs of shipping oil by rail are generally higher than by pipeline. The Province of British Columbia questioned this conclusion.

Northern Gateway said that the Enbridge Northern Gateway Project is proposed in response to shippers' desires to have a safe and economical means to move their oil products to the west coast to access international markets. Northern Gateway acknowledged that larger volumes of oil have been shipped by rail in recent years. It said that it considered rail transport to be less economical and not as safe as pipeline transportation.

PIPELINE EXPANSION

Intervenors, such as Coastal First Nations and Haisla Nation, questioned the feasibility of other projects, primarily Kinder Morgan's planned Trans Mountain Pipeline Expansion project, to meet the purpose of, and need for, the Enbridge Northern Gateway Project. Other participants said in oral statements that Kinder Morgan's project would be a more viable, less risky option.

Northern Gateway said that it had considered whether Kinder Morgan's project was a viable

alternative to the Enbridge Northern Gateway Project. It dismissed it because of the physical limitations of such an expansion in creating additional transportation capacity, the uncertain timing of commercial and regulatory approval, and the fact that it would not provide new condensate service.

Views of the Panel

The possibility of transporting oil to, and condensate from, the west coast by rail on the same scale as that proposed for the Enbridge Northern Gateway Project was generally speculative and not supported by oil producers.

The Panel finds that that adding capacity to other projects to meet the transportation needs of the Enbridge Northern Gateway Project is not a viable option at this time. As Northern Gateway said, part of the project's purpose is to transport condensate from the west coast to Alberta. At this time, this would not be accomplished via the contemplated plans for other potential projects. The Panel finds that the alternatives to the project discussed during its process would not be preferable to the Enbridge Northern Gateway Project proposal, in terms of meeting the purpose and need identified by Northern Gateway.

8.5 Alternatives means of carrying out the project

The Panel also considered alternative means of carrying out the project. Alternative means differ from alternatives to in that they represent the various technically- and economically-feasible ways that an applied-for project can be carried out, and which are within the applicant's scope and control.

For the Enbridge Northern Gateway Project, the Panel considered alternative means related to siting the marine terminal, eastern terminus, intermediate pump stations and valves; establishing the general pipeline route and tanker approaches; and alternate construction methods, timing, and mitigation.

8.5.1 MARINE TERMINAL LOCATION

GENERAL LOCATION

Northern Gateway said that it analyzed alternative marine terminal locations. It initially considered over a dozen potential port sites in Alaska, Washington, and British Columbia (Figure 8.1). It also considered the work that Environment Canada and the Department of Fisheries and Oceans had conducted in the 1970s to compare the relative vulnerability of 11 Pacific coast sites to the effects of an oil spill. That work ranked four sites (Port Angeles, Port Simpson, Prince Rupert, and Kitimat) as having the lowest vulnerability.

Northern Gateway said that location options were narrowed by considering a number of criteria, including:

- the need for year-round, ice-free access;
- channel suitability for large tankers;
- tanker berth areas sheltered from open water conditions;
- land availability;
- feasibility of pipeline and road access; and
- the need to limit environmental effects.

Based on these criteria, Northern Gateway determined that Kitimat and Prince Rupert were the most appropriate locations for a marine terminal, and it evaluated those options further.

Northern Gateway said that it then focused on the suitability of pipeline access to these potential terminals, taking into account pipeline constructability, operability, safety, environmental sensitivity, mitigation measures, and lifecycle costs. Northern Gateway considered various pipeline routes to Prince Rupert and Kitimat.

During the proceeding, Natural Resources Canada and intervenors, such as Haisla Nation, asked about the terminal location selection process and said that there are several existing and approved rights-of-way between the Alberta-British Columbia border and Prince Rupert that could be followed. Through oral statements, several people told the Panel about the existing Pacific Northern Gas pipeline, which has experienced several line breaks due to geotechnical events, many of which were associated with large rainfall events in the area of the Zymoetz and Telkwa Passes, east of Terrace.

FIGURE 8.1 **ALTERNATIVE MARINE TERMINAL LOCATION OPTIONS CONSIDERED**

Northern Gateway said that a route to Prince Rupert would encounter moderate to serious environmental constraints and issues. These included the likelihood of difficult silt and erosion control requirements in high-value fish habitat, and exposure to avalanches and rockslides in the narrow valleys. A route to Prince Rupert would also be hundreds of kilometres longer than one to Kitimat, and the pipelines would be immediately adjacent to the Bulkley and Skeena Rivers and among the many associated geohazards in those areas.

Northern Gateway said that the pipeline route southward to Kitimat through the Kitimat River valley would also not be without challenges. That route would possibly encounter slide-prone clays and likely require watercourse crossings in potentially boulder-prone material.

Northern Gateway determined that both options encounter geohazards and environmental constraints. Based on its assessment, Northern Gateway concluded that Prince Rupert was not a suitable location and that the safest, most effective route with the least potential environmental effects would be to Kitimat through the Kitimat River valley. Its chosen option avoids the geotechnical instability in the areas of Zymoetz and Telkwa Passes. Northern Gateway also said that the project costs would be lower by selecting Kitimat as the marine terminal location, rather than Prince Rupert.

SPECIFIC LOCATION

Northern Gateway ultimately identified and evaluated four alternative sites for the Kitimat Terminal (Figure 8.2).

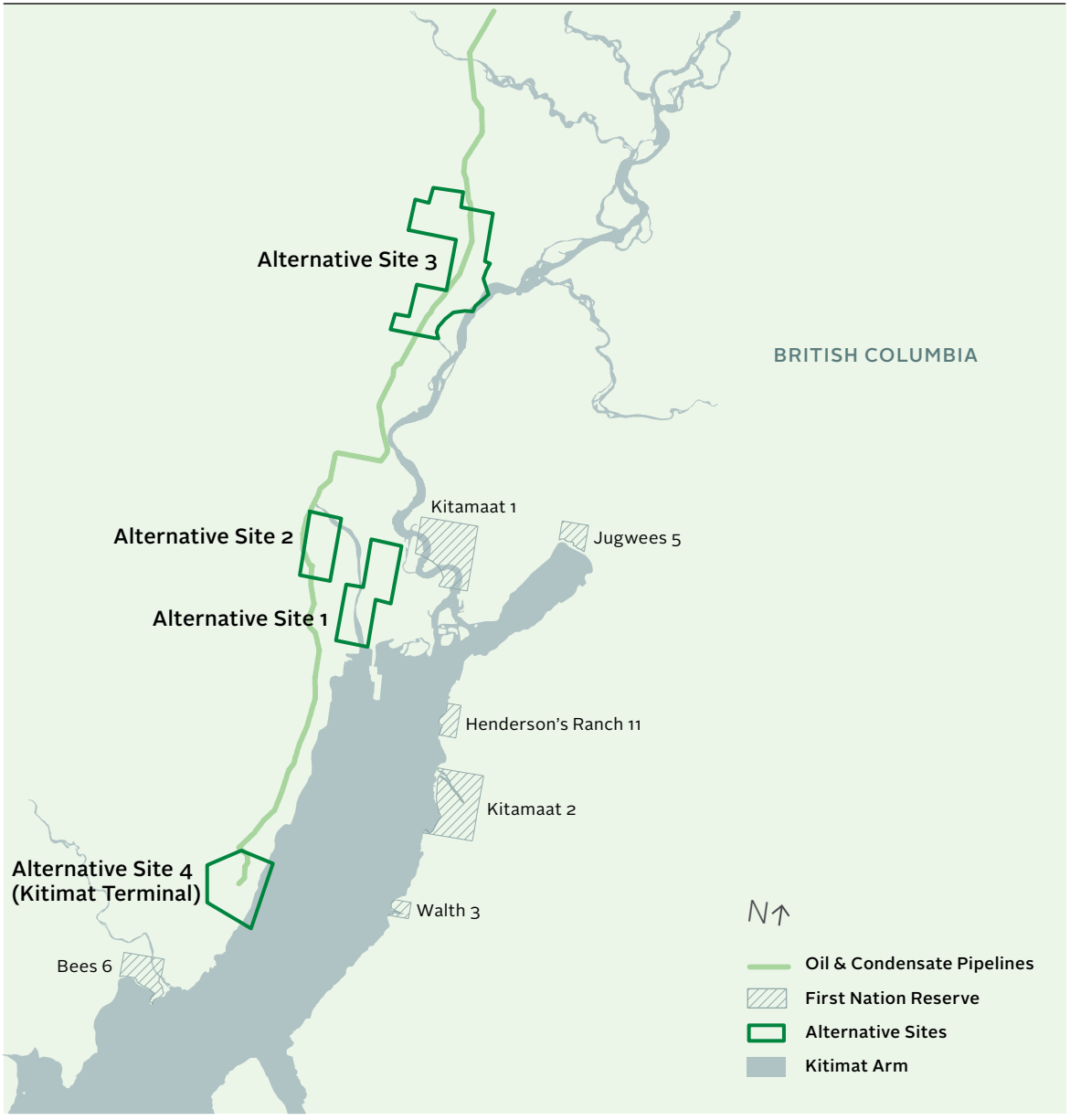
Alternative Sites 1 and 2 are both located adjacent to the Rio Tinto Alcan site on disturbed sites zoned for industrial use. Site 3 is located 4 kilometres northeast of Kitimat, with a potential marine berth near the existing Eurocan Pulp & Paper Co. berth. Site 4 (the Kitimat Terminal site) is in an area that the District of Kitimat has zoned for future industrial development.

Northern Gateway said that its evaluation process considered:

- site suitability for tanks and tanker berths;
- proximity to existing infrastructure;
- pipeline length;
- road access;
- avoidance of parks and recreation areas;
- potential effects on water resources, vegetation, and wildlife habitat;
- potential effects on communities, landowners, land users, and Aboriginal groups; and
- possible effects of shoreline oiling.

Northern Gateway said that it selected Site 4 as its preferred and proposed location for the Kitimat Terminal because, in its view, the site held several advantages over the other alternatives.

FIGURE 8.2 **ALTERNATIVE SITES FOR THE KITIMAT TERMINAL**



Northern Gateway said that Site 4 (noted as Kitimat Terminal Site in Figure 8.2) has been logged and does not contain culturally-modified trees. It is located away from spawning areas and rivers, marine bird concentration areas, sensitive shorelines, and designated reserve lands and recreation areas. It is well-removed from both Kitimat and Kitamaat Village, which would reduce potential air quality, acoustic, and visual effects.

Northern Gateway said that, from a constructability standpoint, the underlying bedrock at Site 4 is at a shallow depth, which provides a suitable foundation for tanks and major structures, and would produce less excavated material requiring disposal. The site's elevation would allow gravity loading of tankers. Northern Gateway said that the harbour area provides a suitable turning basin diameter, while the shoreline provides a good approach for tankers.

Northern Gateway outlined other reasons why the three other alternative sites were not preferred. Sites 1 to 3 would require extended infrastructure (up to several kilometres in length) between the tanks and marine terminal. These sites are also closer to residential areas and adjacent to fish-bearing streams. Part of the terminal footprint at Site 3, in particular, would extend into a floodplain zoned for recreation.

Douglas Channel Watch asked about potential visual effects of the terminal at Site 4. Northern Gateway said that the site has been zoned for industrial development and it committed to follow the British Columbia Ministry of Forests, Lands and Natural Resource Operations' landscape design guidelines. It also said that it would mitigate visual effects, including situating the majority of the facilities behind a ridge to shelter them from view.

Gitxaala Nation said that, although Northern Gateway provided information about alternative marine terminal sites, it did not assess the environmental effects of tankers transiting to and from those sites and the risks associated with those alternative tanker routes.

8.5.2 EASTERN TERMINUS LOCATION

GENERAL LOCATION

Northern Gateway said that the technical, economic, and environmental advantages of locating both pipelines in a single right-of-way supported having a single eastern terminus. It said that terminus siting was based primarily on two criteria: economic feasibility (providing oil receipt and condensate delivery locations that were acceptable to shippers); and technical feasibility (distance to other facilities and suitably-zoned land availability).

These factors led Northern Gateway to consider the Fort McMurray and Edmonton areas. It determined that the Edmonton area was preferable for two primary reasons. First, oil shippers had a preference for a terminus near the Edmonton hub. Second, condensate delivered by the project would need to reach blending terminals in the Edmonton and Hardisty areas.

SPECIFIC LOCATION

Northern Gateway evaluated two potential sites near Edmonton to site the terminus. One site was near the existing Enbridge Edmonton Terminal, on the east side of Edmonton. The other site was near the Stonefell Terminal near Bruderheim, approximately 10 kilometres beyond the northeast boundary of Edmonton.

Northern Gateway selected the site near Bruderheim based on a number of considerations, including access to markets, proximity to existing industrial infrastructure, industrial land availability, and access to potential pipeline corridors to the west. Northern Gateway said that using this site would reduce potential for land and resource use conflicts.

8.5.3 INTERMEDIATE PUMP STATION AND VALVE LOCATIONS

Northern Gateway said that it selected the general locations of the intermediate pump stations to optimize system hydraulics, while considering environmental, stakeholder, and lifecycle cost interests. It said that location refinements were based on:

- the ability to co-locate oil and condensate pump stations;
- proximity to existing roads and electric power;
- site conditions such as topography, drainage, and soils;
- environmental constraints such as sensitive habitat, proximity to water bodies and wetlands, and archaeological sites;
- land ownership and use; and
- proximity to residences.

Northern Gateway said that block valve locations and numbers were revised during the course of the proceeding. In particular, Route Revision U (January 2012) resulted in an additional 39 oil and 52 condensate valves being proposed to provide more protection to high-sensitivity-ranked fish-bearing watercourses. It also said that, although there were no changes to the total number of valves based on Route Revision V (December, 2012), the locations of some of the valves have changed in the Morice River and Fort St. James areas.

8.5.4 PIPELINE ROUTING

Northern Gateway's alternatives analysis focused on pipeline routing because both the Prince Rupert and Kitimat marine terminal locations were deemed suitable from the standpoint of feasibility and marine transport safety.

During the project's preliminary design phase, Northern Gateway considered various route alternatives to connect the Kitimat Terminal to the project's eastern terminus near Bruderheim (Figure 8.3). Northern Gateway selected its preliminary route based on several criteria, including:

- avoidance of parks, protected areas, wildlife areas, archaeological or heritage sites, and other environmentally-sensitive areas;
- avoidance of terrain subject to geotechnical issues;
- limited potential adverse effects on communities, landowners, land users, Aboriginal groups, environmentally-sensitive areas, and culturally-sensitive areas;
- provision of a safe and reliable route for pipeline construction and operations;
- pipeline length;
- provision of suitable locations for watercourse, highway, road, rail, and utility crossings;
- provision of common locations for oil and condensate pump stations and valve sites; and
- reduced lifecycle costs.

EASTERN ROUTE SEGMENT ALTERNATIVE

Northern Gateway said that it chose its preliminary route over the lone eastern route segment alternative because the preliminary route follows existing rights-of-way between Edmonton and Grande Prairie. Northern Gateway said that the preliminary route has better road access for construction and maintenance equipment and avoids some areas with geotechnical concerns, particularly the Narraway River valley. It also avoids the Kakwa Wildland Provincial Park in Alberta and the Kakwa Provincial Park and Protected Area in British Columbia.

WESTERN ROUTE SEGMENT ALTERNATIVES

Northern Gateway said that it chose its preliminary route over the four western segment route alternatives because the preliminary route is significantly shorter than the more northerly alternatives. It would avoid crossing the Kitimat and lower Clore Rivers, the latter of which would require a long, challenging crossing. It would also avoid extensive areas on the east side of the lower Kitimat River valley that are underlain by sensitive marine clays and are prone to slope failure. In addition, the preliminary route would not cross the Sutherland River Park and Protected Area or the Tazdli Wyiez Bin/Burnie-Shea Provincial Park.

In the case of Alternative B, Northern Gateway said that, while there would be advantages in following part of the existing Pacific Northern Gas pipeline right-of-way, it assessed the geohazard risks along this alternative and found them to be too high, with no possibility of mitigating those risks.

ROUTE REVISIONS AND REFINEMENTS

Northern Gateway said that, as engineering and environmental studies and consultation progressed, it made revisions to its preliminary route at select locations prior to filing its application. Northern Gateway cited a variety of reasons for these changes, including establishing suitable watercourse crossing locations, addressing landowner and community concerns, making allowances for Aboriginal group land development plans, improving pipeline constructability and operability, and environmental mitigation. As an example, Northern Gateway said that it would traverse the Coast Mountains by way of the Clore and Hoult tunnels to address geotechnical issues and avoid the sensitive subalpine environment.

Northern Gateway filed various revisions to its applied-for route, including Route Revision V in late 2012 involving four pump station and five pipeline route relocations. One 52-kilometre-long section, relocated in response to requests and concerns of Fisheries and Oceans Canada, Environment Canada, and other stakeholders, would avoid crossing 29 tributaries to the Morice River. Fisheries and Oceans Canada said that it was encouraged that the revision could reduce risks and potential effects on highly-valued areas of fish habitat.

FIGURE 8.3 **ALTERNATIVE ROUTE LOCATIONS**

The alternative route segments Northern Gateway considered are shown in Figure 8.3 as Alternatives A through E. Northern Gateway categorized the alternative east of Fort St. James (A) as the eastern route segment alternative, and the four alternatives west of Fort St. James (B through E) as the western route segment alternatives.

Intervenors and the Panel asked about Northern Gateway's routing through relatively undisturbed areas instead of along existing pipeline and highway corridors, including Highways 16 and 37.

Northern Gateway said that there are generally few areas along the route that can be considered undisturbed and that, only in cases where there is no feasible alternative, would the route traverse undisturbed areas. It said that approximately 69 per cent of the proposed corridor (as proposed in Route Revision V) is routed through disturbed areas or is parallel to linear features such as roads, pipelines, high voltage power lines, and seismic lines. Disturbed areas transited by the route are primarily cutblocks and some agricultural land in British Columbia and Alberta. In certain locations, the route would parallel infrastructure projects and rights-of-way, such as the Pacific Trails Pipeline project. From south of Houston to Kitimat, Northern Gateway said that the route would follow significant lengths of linear disturbance, including forest service roads.

In a letter of comment, an alternative route was suggested through Pine Pass. Pine Pass already includes road, rail, power line, and pipeline features. This letter said that this route would be less detrimental to wildlife populations, including grizzly bear and caribou, and that it would be more appropriate to concentrate all human-created industrial and transportation activities into a single corridor.

8.5.5 TANKER APPROACHES

In its evaluation of tanker approaches to the Kitimat Terminal, Northern Gateway considered, among other things, seasonal variation in navigability, existing traffic volume and frequency, and the presence of topographical features (e.g., shoal patches). Northern Gateway determined that tanker traffic would follow one of three routes to reach or depart the Kitimat Terminal (Figure 8.4).

- northern approach – Tankers would pass Haida Gwaii through Dixon Entrance, and continue through Hecate Strait, Browning Entrance, Principe Channel, Nepean Sound, Otter Channel, Squally Channel, Lewis Passage, Wright Sound, and Douglas Channel.
- southern approach (direct) – Tankers would pass through Queen Charlotte Sound, and continue through Hecate Strait, Caamaño Sound, Campania Sound, Squally Channel, Lewis Passage, Wright Sound, and Douglas Channel.
- southern approach (via Principe Channel) – Tankers would pass through Hecate Strait, Browning Entrance, Principe Channel, Nepean Sound, Otter Channel, Squally Channel, Lewis Passage, Wright Sound, and Douglas Channel.

Northern Gateway said that each of the approach options is deep (often exceeding 365 metres) and wide (generally, several kilometres). The TERMPOL review process determined that all approaches were navigable and feasible for Very Large Crude Carrier (VLCC) transit. Northern Gateway said that the route taken would depend on the tanker origin or destination, as well as on weather conditions. It also said that, within the three approaches, other routing may be feasible. Should circumstances warrant it, and under pilot's advice, the shipmaster would have the option of using viable alternative routes. For example, Cridge Passage, on the northern side of Fin Island, is an alternative to the preferred route of Lewis Channel past Gil Island should Lewis Channel become blocked by fishing boats during a busy fishing season.

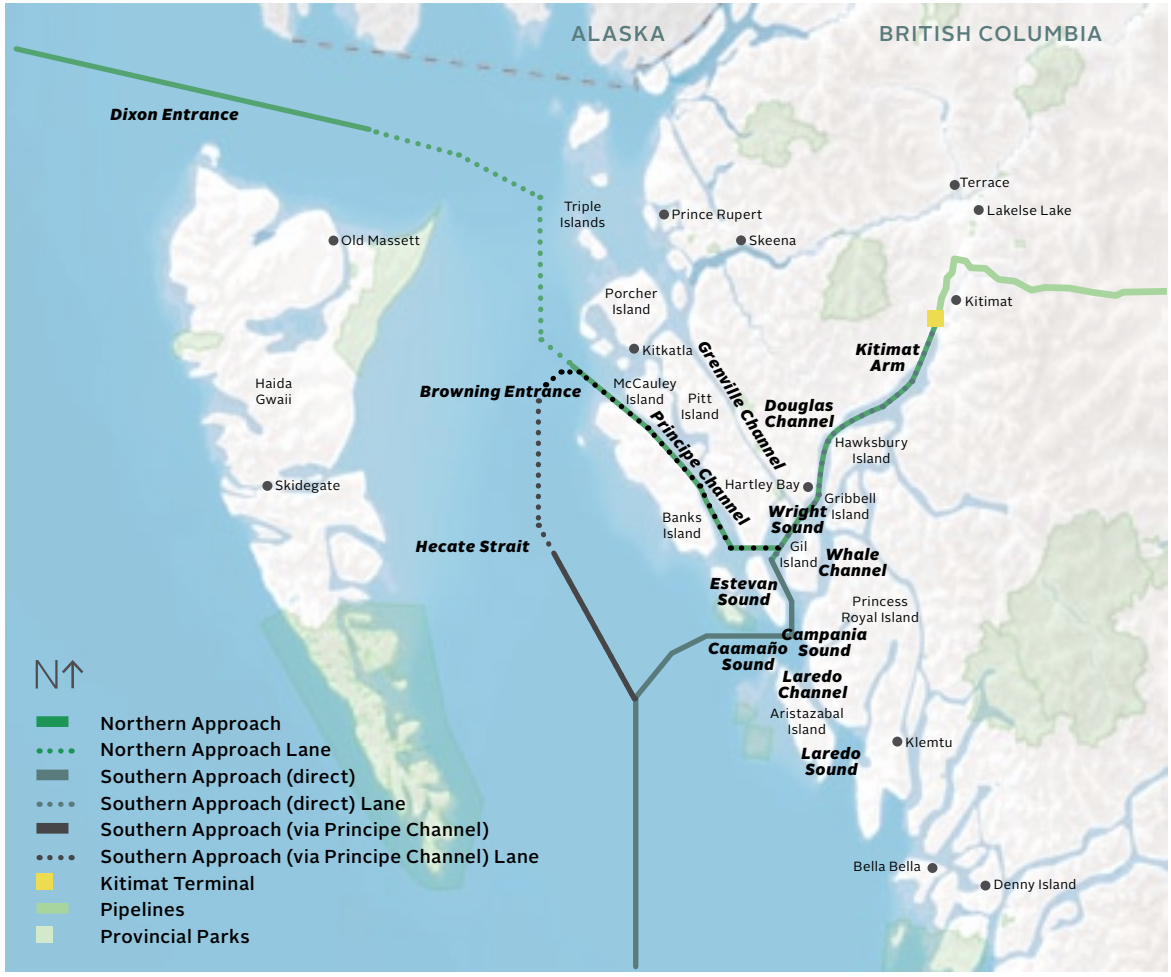
In Northern Gateway's TERMPOL Surveys and Studies, it identified the following alternate routes that were considered and determined to be less viable for tanker navigation:

- Inner Passage (Grenville Channel), due to narrow width of the channels;
- Whale Channel, due to navigation complexity (Lewis Passage would be a better option); and
- Laredo Channel and Laredo Sound, due to increased navigation risk due to shoal patches.

In response to questions from the Coalition about using the above routes, Northern Gateway committed that tankers would not use the Inner Passage or Laredo Channel and Laredo Sound.

FIGURE 8.4 **KITIMAT TERMINAL AND TANKER ROUTES**

The proposed site for the terminal facility is on the northwest side of Kitimat Arm of Douglas Channel. Tankers could follow several possible routes to and from the terminal. The routes would pass through waters used by Aboriginal groups, commercial and recreational fisheries, sailors and kayakers, tourist vessels, ferries, and other shipping. Northern Gateway said that project-associated tankers would represent about 10 per cent of ship traffic in Wright Sound and about one-third of ship traffic in Douglas Channel leading to Kitimat.



8.5.6 CONSTRUCTION METHODS, TIMING, AND MITIGATION

Northern Gateway said that it considered instances where alternative construction methods would reduce potential adverse environmental effects or the risk of malfunctions and accidents.

With respect to tunnelling, Northern Gateway said that blasting may create greater noise disturbance than boring machinery. It said that its environmental assessment was conservative because it was based on the assumption that the higher-effect method, blasting in this case, would be used. Northern Gateway said that both construction methods remain a possibility until detailed engineering is conducted.

Northern Gateway committed to consider alternate timing windows and to schedule certain project-related activities outside of sensitive periods. It proposed to conduct in-stream works within defined least risk periods to protect fish and fish habitat, and to blast outside of kidding seasons in mountain goat habitat. Northern Gateway said that timing constraints would reduce the potential for adverse environmental effects. It said that, if timing windows cannot be used as a primary mitigation mechanism, other site-specific measures can be applied, such as construction timing adjustments or micro-routing around sensitive sites.

8.5.7 VIEWS OF THE PANEL

The Panel finds that Northern Gateway provided sufficient information regarding the processes it used to evaluate alternative means of carrying out the project. It specified the criteria that it used to consider environmental and social concerns, cost, constructability, operability, system safety, and maintenance. In each case, Northern Gateway provided adequate justification for its preferred approach. In many cases, environmental protection and reduced disturbance were key factors.

Northern Gateway considered and incorporated stakeholder concerns in its design refinements. An example is the proposed pipeline re-route in the Morice River area in response to concerns raised about potential effects on fish habitat.

Overall, the Panel finds Northern Gateway's chosen means by which the project would be carried out to be acceptable. Below, the Panel provides its views on specific alternatives.

EASTERN TERMINUS LOCATION

The Panel notes that no parties raised concerns or questions regarding Northern Gateway's decision to locate the project's eastern terminus near Bruderheim.

The Panel finds that the eastern terminus location was largely influenced by shippers' needs and the availability of nearby infrastructure, such as pipelines and blending facilities, to allow the project to function as intended. The Bruderheim site already contains industrial development and the eastern terminus location would be located near the Stonefell Terminal.

INTERMEDIATE PUMP STATION AND VALVE LOCATIONS

Pump stations are a requirement for any liquids pipeline. Typically, the number of pump stations increases with route length. The Panel finds that locating pump stations along any pipeline is primarily a matter of optimizing system hydraulics. Northern Gateway said that other key considerations were related to ensuring that adequate access and power could be used. In addition to these key practicalities, Northern Gateway took environmental and social considerations into account when choosing pump station sites. For example, co-locating oil and condensate stations within the same sites reduces the project's environmental footprint.

The Panel finds that Northern Gateway's commitment to safety and environmental protection was evidenced by the addition of more block valves along the route. By adding 91 valves as part of Route Revision U, more valuable fish habitat would be protected in the event of a pipeline release.

MARINE TERMINAL LOCATION AND PIPELINE ROUTING

The Panel notes that Fisheries and Oceans Canada and Environment Canada have ranked Kitimat (Northern Gateway's preferred location) as one of four Pacific Coast sites with the lowest vulnerability to the effects of a potential oil spill.

The Panel understands that pipeline access was one of the most critical considerations in Northern Gateway's selection of a terminal location. The Panel accepts Northern Gateway's reasoning for selecting Kitimat over the other short-listed location (Prince Rupert). From an environmental perspective, a route to Kitimat would be shorter and result in less disturbance than one to Prince Rupert. A route to Kitimat would also encounter fewer potential hazards and risks to pipeline safety.

The Panel finds Northern Gateway's justification for selecting Site 4 as the proposed Kitimat Terminal location is appropriate. In particular, the site's geological characteristics would reduce the amount of excavated material. Site 4 is zoned for industrial development.

Northern Gateway did not assess the environmental effects of tankers transiting to and from alternative marine terminal sites. The Panel finds that given the relatively small geographic area in which it would be feasible to site a marine terminal in the Kitimat area, potential tanker routes to that terminal are unlikely to vary so much that environmental effects would be materially different among the routes.

Northern Gateway identified that cost was one of the factors in its selection of Site 4. The Panel notes that, while cost is typically considered for business evaluation purposes, cost alone in a regulatory review is not an over-riding factor above safety, environmental, and socio-economic factors.

The Panel finds that any proposed project route would involve significant engineering, environmental, and social challenges. Northern Gateway provided sufficient and clearly-reasoned evidence to justify how and why it chose its preferred route between Kitimat and Bruderheim. The route chosen over the four western route segment

alternatives would be significantly shorter and have fewer environmental effects and safety concerns. Northern Gateway attempted to avoid parks and protected areas. Nearly 69 per cent of the route would traverse disturbed areas or be parallel to linear features.

Northern Gateway considered risks to pipeline safety in choosing its preferred route. The proposed use of non-standard and, in the Panel's view, extraordinary measures, such as tunnelling through the Coast Mountains, suggest a strong commitment on Northern Gateway's part to mitigate routing challenges.

No parties, including Northern Gateway, provided additional discussion regarding a Pine Pass routing alternative, as was suggested in a letter of comment. It is unclear whether such an option would raise new concerns or issues, especially given its location adjacent to a provincial park and the fact that a pipeline spill previously occurred in the area. The Panel finds that Northern Gateway's approach to routing was appropriate. The Panel does not find that a Pine Pass routing alternative assessment is required.

The Panel finds that Northern Gateway's studies to determine the combination of the best pipeline route and marine terminal location were scientifically thorough. The Panel accepts Northern Gateway's rationales for the selections it made.

TANKER APPROACHES

Northern Gateway's primary focus in assessing the various means for tankers to reach and depart the Kitimat Terminal was tanker safety during navigation. This focus is appropriate as it reduces the likelihood of tanker accidents and spills.

The Panel finds that the preferred tanker approaches are the most appropriate for safe routine navigation. Alternative routing within the preferred approaches would be available when conditions reduce safety along the main routes. The Panel recognizes Northern Gateway's specific commitment to not have tankers use certain specific routes, including the Inner Passage – Grenville Channel, Laredo Channel, and Laredo Sound, which were determined to be less viable for navigation.

CONSTRUCTION METHODS, TIMING, AND MITIGATION

Any single construction activity can potentially be completed using a variety of means. Pipelines have been constructed in Canada in a variety of terrains for many decades and, to a substantial degree, standard industrial practices have been developed to build them efficiently while minimizing effects on the environment.

Overall, Northern Gateway's consideration of alternative means related to construction methods, timing, and mitigation was reasonable. Northern Gateway provided an extensive amount of information to justify using the various means it has chosen.

If the project is approved, it is possible that other alternative means may be considered based, for example, on new information determined during field surveys and detailed engineering design. The Panel has set out a variety of conditions that require Northern Gateway to file information about such changes or contingencies in order to demonstrate that the measures considered can mitigate potential environmental effects or safety concerns.

8.6 Environmental assessment methods

8.6.1 SPATIAL AND TEMPORAL BOUNDARIES

Northern Gateway defined spatial boundaries to assess potential project-specific and cumulative environmental effects. The boundaries were based on the probable geographical extent of effects on the valued ecosystem component or key indicator species under consideration and the type of environmental effect. Northern Gateway applied the following general spatial boundaries:

- *Project Development Area:* The terrestrial Project Development Area includes the disturbed area of the pipelines, the area inside the Kitimat Terminal's security fence, and project-related infrastructure and facility sites, such as pump stations, associated roads and power lines, and camps. The marine Project Development Area consists of the disturbed land area of the marine terminal.
- *Project Effects Assessment Area:* The maximum area where project-specific environmental effects can be predicted or measured with a reasonable degree of accuracy and confidence. This includes direct effects, such as habitat alteration, and indirect effects, such as deposition of air emissions, sensory disturbances, and wildlife avoidance. For the marine terminal, the Project Effects Assessment Area encompasses the Project Development Area plus the area potentially affected by the marine terminal's routine operations, including all of Kitimat Arm.
- *Regional Effects Assessment Area:* The area within which cumulative environmental effects are likely to occur, depending on social, physical and biological conditions (e.g., seasonal range of wildlife movements), as well as on the type and location of other past, present, or reasonably foreseeable projects or activities.
- *Confined Channel Assessment Area:* The portions of the northern and southern approaches that bring condensate and oil carriers near land and other resources, and where escort tugs would assist navigation to and from the marine terminal.
- *Open Water Area:* The coastal waters between the Confined Channel Assessment Area and the limits of the territorial sea of Canada.

Northern Gateway applied the following temporal boundaries to assess potential environmental effects:

- *Baseline conditions:* The environment's current biophysical characteristics, including all existing disturbances and past and present projects (i.e., certain to be built by 2015).
- *Construction period:* From initial physical surface disturbance up to commissioning.
- *Operations period:* From commissioning until the end of the project's operating life.
- *Decommissioning:* The duration of project removal.

Part I of the Joint Review Panel Agreement's Terms of Reference defines the spatial boundaries for the marine transportation of oil and condensate as being within:

- the Confined Channel Assessment Area, as defined by Northern Gateway, which includes the marine and shoreline area of Kitimat Arm, Douglas Channel to Caamaño Sound, and Principe Channel to Browning Entrance;
- Hecate Strait; and
- the proposed shipping routes to be used for the project that are within the 12-nautical-mile limit of the territorial sea of Canada.

The Canadian Environmental Assessment Agency issued guidance on the scope of the factors for the project. This guidance suggested that temporal boundaries for the project's marine components should cover construction, operation, maintenance, and, where relevant, closure, decommissioning, and restoration of the sites affected by the project. It was suggested these boundaries should also consider seasonal and annual variations related to environmental components for all phases of the project, where appropriate. The guidance indicated that Northern Gateway should take into account the following elements in defining temporal boundaries:

- the operational period's duration;
- the engineered structures' design life; and
- frequency and duration of natural events and human-induced environmental changes.

8.6.2 VALUED ECOSYSTEM COMPONENTS AND KEY INDICATOR SPECIES

Northern Gateway defined valued ecosystem components as broad components of the biophysical and human environments, which, if altered by the project, would be of concern to regulators, participating Aboriginal groups, resource managers, scientists, and the public. Northern Gateway defined key indicator species as species, species groups, resources, or ecosystem functions that represent components of the broader valued ecosystem components.

Northern Gateway said that it used the following criteria to select valued ecosystem components:

- components that represent a broad environmental, ecological, or human environment component that may be affected by the project;
- components that are vulnerable to the environmental effects of the project and other activities in the region;
- components that have been identified as important issues or concerns by participating Aboriginal groups or stakeholders, or in other effects assessments in the region; and
- components that have been identified by responsible authorities or other federal authorities.

Northern Gateway's chosen key indicator species included species at risk (*Species at Risk Act*, Committee on the Status of Endangered Wildlife in Canada, Red- or Blue-listed in British Columbia, at risk or may be at risk in Alberta), priority species in British Columbia's Conservation Framework, umbrella species, species of interest to Aboriginal groups, and species of socio-economic importance. It said that only those species likely to have an adverse interaction with the project, based on probable range, habitat use, and known occurrence, were included as key indicator species.

The Coalition said that Northern Gateway's selected key indicator species were chosen using subjective criteria, and were not derived from the entire assemblage of species for any specific geographic region. It said that it was not possible to know from the application the effectiveness of the chosen key indicator species in providing umbrella coverage of critical habitats, other than Northern Gateway's assurances that it was sufficient.

TERRESTRIAL WILDLIFE

To represent mammals, Northern Gateway selected three ungulates (woodland caribou, including all five local populations that might be affected by the project, moose, and mountain goat), two large carnivores (grizzly bear and wolverine), and two furbearers (American marten and fisher). To represent birds, Northern Gateway selected four forest-dependent species and one guild (a group that has similar habitat requirements), seven wetland-dependent species, and five grassland- and shrubland-dependent species. The coastal tailed frog and pond-dwelling amphibians represented amphibians.

Northern Gateway selected species designated as Threatened on Schedule 1 of the *Species at Risk Act* as key indicator species or guilds. Northern Gateway identified three species in the Project Effects Assessment Area that are designated as Special Concern on Schedule 1 (band-tailed pigeon, long-billed curlew, and peregrine falcon), but did not select them as key indicator species. Northern Gateway said that peregrine falcon would have limited interaction with project activities since it is migratory through the Project Effects Assessment Area. Northern Gateway provided an assessment of project effects on band-tailed pigeon in response to a request from Environment Canada. Northern Gateway said that long-billed curlew was unlikely to nest in the Project Effects Assessment Area based on its known range. BC Nature and Nature Canada said that the long-billed curlew's range has expanded northward and it may be found in the Project Effects Assessment Area.

Various intervenors, including BC Nature and Nature Canada, Gitga'at First Nation, East Prairie Métis Settlement, Environment Canada, and Raincoast Conservation Foundation, questioned the key indicator species selected to represent terrestrial wildlife, and the methods used to select them. Parties said that Northern Gateway's selection method was neither rigorous nor systematic, and that it included species at risk, but not other species of conservation concern. Parties also said that Northern Gateway included an inappropriate range of key indicator species, and, in some cases, included invasive species. Concerns were also raised about the ability of chosen key indicator species to represent other wildlife species. Various intervenors recommended other species that should be included as key indicator species, or for which an assessment of project effects should be conducted.

Northern Gateway said that the proposed right-of-way crosses a wide range of ecosystems, each with

complex faunal associations, and it is not feasible to assess all species indigenous to the Project Effects Assessment Area to a comparable degree. The key indicator species approach focuses the assessment of project effects on species of greater concern. It said that project effects on species not selected as key indicator species can be inferred from the assessment of project effects on key indicator species representative of those species by similar habitat or biophysical requirements, or by being likely to respond similarly to certain effects. Northern Gateway said that its proposed mitigation measures are typically applicable to a broad range of wildlife habitats and species rather than being species-specific. Northern Gateway committed to collaborate with government authorities, Aboriginal groups, and other stakeholders on the Pipeline Environmental Effects Monitoring Program's methodological details, including selecting additional key indicator species for further baseline information and monitoring.

MARINE BIRDS

Northern Gateway selected marine bird key indicator species based on:

- occurrence and available habitat use in the Project Effects Assessment Area;
- sensitivity to project effects;
- importance to local communities and resource users;
- national or international importance, including status under the *Species at Risk Act*;
- value as indicators of environmental effects for related resources and broader systems; and
- ecological importance.

Northern Gateway selected marbled murrelet, surf scoter, and bald eagle as key indicator species for marine terminal effects on marine birds. It selected marbled murrelet and surf scoter as key indicator species for marine transportation effects on marine birds. Northern Gateway observed peregrine falcon during marine bird surveys, but considered that it would not interact with the project since it is migratory through the project area. Northern Gateway did not select ancient murrelet since it considered that marine transportation effects on ancient murrelet would be similar to that for marbled murrelet.

Several parties, including Environment Canada, BC Nature and Nature Canada, Kitimat Valley Naturalists, Gitga'at First Nation, Coastal First Nations, and Haisla Nation, questioned the number of selected marine bird key indicator species and how those species represent other species. BC Nature and Nature Canada acknowledged that, given the large number of species expected to occur in the Confined Channel Assessment Area, it was not practical to undertake a detailed assessment of each species. It said that it is crucial that species selected as key indicator species are appropriate indicators to ensure effects can be adequately assessed. Various intervenors asked Northern Gateway to explain how certain selected key indicator species represent other marine bird species.

BC Nature and Nature Canada said that it fully supports using additional key indicator species to assess the project's effects on marine birds.

Northern Gateway acknowledged the concerns raised by parties and committed to discuss selecting additional marine bird species with the Canadian Wildlife Service, Aboriginal groups, and other affected stakeholders for further baseline and monitoring studies under the Marine Environmental Effects Monitoring Program.

MARINE MAMMALS

Northern Gateway said that, due to the high ecosystem diversity in the Confined Channel Assessment Area, it selected one key indicator species to represent all toothed whales (northern resident killer whale), all baleen whales (humpback whale), and seals and sea lions (Steller sea lion). Northern Gateway selected these species based on shared similarities of how the project may affect species within each grouping. It selected fin whales to represent the general biology and sensitivities of all marine mammal species in the Open Water Area.

Northern Gateway said that it was unreasonable to attempt to address all possible variations, and impractical to conduct a complete assessment of all marine mammal species that could occur in the Confined Channel Assessment Area and the Open Water Area, given a lack of available information concerning species differences. Northern Gateway said that marine mammals with a medium or high probability of occurring within these areas, and that were not selected as key indicator species, are adequately represented by the selected key indicator species.

Gitga'at First Nation and Coastal First Nations said that the selected key indicator species did not adequately represent all relevant species that could potentially be affected by the project. It argued that Northern Gateway used a sub-set of the species to generalize across the species

as a whole, despite clear differences that would affect such assessment. For example, baleen and toothed whales may respond to project activities very differently between whale species, and even within a species. Coastal First Nations said that, in addition to northern resident killer whales, offshore and Bigg's transient killer whales could be affected by the project, but have different behavior, habitat, and prey than northern resident killer whales.

Coastal First Nations said that fin whales should have been assessed, in addition to humpback whales. Fisheries and Oceans Canada requested that Northern Gateway determine the potential effects of noise on fin whales and provide a list of proposed mitigation measures for identified effects. Northern Gateway responded that, based on available information, the humpback whale is an appropriate proxy to assess the effects of noise on fin whales' hearing and that its proposed mitigation measures for humpback whales would also apply to fin whales.

MARINE FISH

Northern Gateway selected chum salmon, Pacific herring, rockfish, and eulachon as key indicator species to assess project effects on marine fish. It selected Pacific herring to represent acoustic specialists (having adaptations that enhance their hearing bandwidth and sensitivity) in the Project Effects Assessment Area. Rockfish was treated in the assessment as an acoustic specialist, and was also selected as a key indicator species to represent the demersal (near the deepest part of a body of water) fish community in the Project Effects Assessment Area.

Northern Gateway selected chum salmon and eulachon to represent species that are acoustic generalists (without specializations to enhance hearing). Eulachon was also selected because it is a culturally- and ecologically-important species in the region.

Fisheries and Oceans Canada recommended that Northern Gateway plan its project with the knowledge that the Committee on the Status of Endangered Wildlife in Canada could designate additional species, such as rockfish. Northern Gateway included rockfish in its initial selection of key indicator species.

Views of the Panel

The Panel heard a broad range of opinions from parties and from those who provided oral evidence and statements and letters of comment regarding Northern Gateway's selection of valued ecosystem components and key indicator species for its environmental assessment. No compelling evidence was filed on the record as to why Northern Gateway's selections might have led to an inadequate environmental assessment.

The purpose of valued ecosystem components and key indicator species in environmental assessment is not to be all inclusive, recognizing the practical impossibility of analyzing everything, but to look at potential project effects on representative components.

Using species at risk, among other indicators, introduces conservatism to the environmental assessment, which the Panel finds scientifically defensible. By taking the conservative approach of including species at risk as representative species, the Panel finds that Northern Gateway has applied a careful and precautionary approach to its environmental assessment.

Northern Gateway committed to include additional species in its further baseline studies and monitoring programs. It also committed to consult with government authorities, Aboriginal groups, and other stakeholders on the methodological details of those studies and programs, including selecting additional species as key indicator species for monitoring. The Panel believes that Northern Gateway's commitment to collect 3 years of further baseline data in the marine environment before starting project operations exceeds current regulatory requirements. The Panel finds that Northern Gateway's broadening of the species to be monitored is an exemplary approach to using real-time scientific information to best understand the environments and species potentially affected by the project to inform best mitigation practices.

The Panel finds that Northern Gateway's selection of valued ecosystem components and key indicator species meets all regulatory guidance provided for the environmental assessment. Further, the Panel finds that the approach of focusing on species at risk has resulted in a precautionary assessment that fully considers potential project pathways of effects.

8.6.3 SPECIES AT RISK

Views of the Panel

The Panel considered project effects on species listed on Schedule 1 of the *Species at Risk Act,* as well as these species' critical habitat where it is identified in a recovery strategy or action plan. The Panel also considered what measures would be taken to lessen and monitor effects, and whether those measures are aligned with those of any applicable recovery strategies and action plans. In cases where a recovery strategy was not available, or where critical habitat (as defined by the *Species at Risk Act*) has not yet been identified, the Panel considered how species recovery may be impaired or enhanced by project effects. This included considering proposed mitigation, compensation, and compliance with the conditions the Panel has set out. In many cases, Northern Gateway considered listed species as valued ecosystem components or key indicator species.

The Panel notified Environment Canada, Parks Canada, and Fisheries and Oceans Canada that the project may affect listed species, as per obligations under subsection 79(2) of the *Species at Risk Act*. The Panel also considered its duties under section 77, which imposes obligations in cases where a project may result in the destruction of any part of a listed wildlife species' critical habitat.

The Panel considered species of conservation concern and species that have been proposed for listing on Schedule 1 of the *Species at Risk Act* when assessing potential project effects on listed species. Species of conservation concern include those designated by the Committee on the Status of Endangered Wildlife in Canada, Blue- and Red-listed species in British Columbia, and species considered to be At Risk, May Be At Risk, or Sensitive under the general status rankings of wild species in Alberta.

The Panel reviewed the submitted evidence to determine if there would be adverse effects from the project that would incrementally affect a species over and above the existing level of disturbance. The Panel's assessment of listed species in this context considered Northern Gateway's commitments, the implementation of industry best practices, and compliance with the conditions the Panel has set out. The Panel also considered Northern Gateway's commitments to conduct additional research and monitoring in collaboration with independent third parties.

Concerns about effects on listed species often stemmed from existing cumulative effects from other unrelated projects and activities. Landscape development and renewable and non-renewable resource use by a variety of industries, including agriculture, forestry, and oil and gas, has resulted in losses of suitable habitat. This has affected the viability of populations, and led to species being designated as at risk. Many of these existing effects have been developing for decades. Awareness of the importance of these effects is improving with advances in research and effects monitoring, although many uncertainties remain, as is the case with linear feature effects on woodland caribou, or the effects of marine vessel noise interfering with marine mammal communication. The Panel notes that species of concern also continue to be designated on an ongoing basis. For example,

Under the *Species at Risk Act*, "critical habitat" means the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.

whitebark pine, found in the Coast Mountains of British Columbia, was added to Schedule 1 of the *Species at Risk Act* in June 2012, during the Panel's process.

Species-specific discussions of project effects on listed species are provided in Section 8.7.

8.6.4 METHODOLOGY FOR ENVIRONMENTAL EFFECTS ANALYSIS AND SIGNIFICANCE FINDINGS

Section 8.7 sets out the project's potential adverse environmental effects and potential cumulative effects that the Panel examined in detail. It also provides the Panel's recommendations on the significance of those effects.

Views of the Panel

ON PROJECT EFFECTS METHODOLOGY

Northern Gateway said that substantial baseline information was provided through Aboriginal Traditional Knowledge studies, including the importance and use of land, wildlife, and natural resources. Northern Gateway's Aboriginal Traditional Knowledge program is described in Chapter 9.

The Panel considered project effects (i.e., interactions between the project and the environment) resulting from likely potential pathways of effects. The discussion of these effects includes the residual environmental effects (effects remaining after mitigation) that would persist following the full implementation of Northern Gateway's proposed mitigation measures and compliance with the conditions the Panel has set out.

As noted in Chapter 1, the Panel has set out the conditions to be included in any certificates that authorize the project (Appendix 1). Any requirements for the project that the Panel notes in this chapter are addressed by the conditions. If the project is approved, and Northern Gateway decides to proceed, it would be required to comply with all conditions set out in the certificates. The National Energy Board would monitor and enforce compliance during the project's lifespan through audits, inspections, and other compliance and enforcement tools.

In assessing the project effects remaining after mitigation (i.e., residual effects), the Panel considered:

- whether Northern Gateway's proposed mitigation would be effective in minimizing residual project effects to an acceptable level;
- where Northern Gateway proposed compensation for residual project effects, whether the offsets would eliminate adverse effects; and
- whether uncertainty about either residual project effects or mitigation effectiveness would impair the ability to understand either the effects or effect significance.

Northern Gateway and participant views

ON CUMULATIVE EFFECTS METHODOLOGY

Northern Gateway identified potential interactions of project effects remaining after mitigation with environmental effects of past, present, and reasonably foreseeable projects, activities, and actions.

Northern Gateway limited its cumulative environmental effects assessment to circumstances where there was a reasonable expectation that the project's contribution to cumulative environmental effects would affect the viability or sustainability of the resource or value. It characterized two aspects of cumulative environmental effects on a valued ecosystem component or key indicator species: the overall cumulative effect of all past, present, and reasonably foreseeable future projects and activities in combination with the environmental effects of the project; and the contribution of the project to overall cumulative effects.

In a letter of comment, the Dogwood Initiative said that the emphasis on incremental effects in current practices for cumulative effects assessment, which Northern Gateway followed, has led to a linear, sequential approach to cumulative effects assessment that cannot address integrated, ecosystem-level responses to stressors from multiple sources. Similarly, the Coalition argued that an ecosystem-based approach would consider synergistic interactions among activities in coming to conclusions about incremental effects.

Northern Gateway said that it did consider the interactions between valued ecosystem components in its environmental assessment. For example, it incorporated water quality changes into the fisheries analysis, while it considered changes in fisheries populations in the wildlife analysis. Effects on vegetation from altered air quality were also considered. Northern Gateway said synergistic effects are the most difficult to assess and the science on that is poor. Northern Gateway did consider combined effects of the project, cumulative effects, and combined cumulative effects on some valued ecosystem components. As an example, Northern Gateway considered the combined project effect on wildlife to be the sum or interaction of direct and indirect habitat loss, change in movement, and increased mortality risks. Combined cumulative effects reflected the interaction of these effects and those of past, present, or future projects within the Regional Effects Assessment Area. Northern Gateway

said that combined effects are most important for those species for which at least one potential project effect is already important, even before others are considered. Nevertheless, Northern Gateway said that an integrated ecosystem-based approach to environmental assessment has not been used for major projects and is generally more appropriate for land use or conservation planning.

The Dogwood Initiative was also concerned that Northern Gateway assessed cumulative effects only if there was a reasonable expectation that the project's contribution to cumulative effects would affect the viability or sustainability of a resource.

Some participants said that Northern Gateway omitted from its cumulative environmental effects assessment some projects that could overlap spatially and temporally with the project effects remaining after mitigation. These omitted projects or activities included gas pipelines, industrial expansions, and liquefied natural gas plants and associated marine shipping traffic in northwestern British Columbia. Northern Gateway said that projects or activities that were not reasonably foreseeable at the time of the application would be subject to their own regulatory review and cumulative effects assessment, which would have to consider the environmental effects of the Enbridge Northern Gateway Project.

Views of the Panel

ON CUMULATIVE EFFECTS METHODOLOGY

The Panel had regard to the National Energy Board's Filing Manual guidance on the expectations for cumulative effects assessment. Cumulative effects assessment evaluates project effects remaining after mitigation that may interact with other projects and activities that exist or are reasonably foreseeable. Participants often cited cumulative effects as a concern, especially in the context of the effects of increased marine traffic on marine mammals, effects on air quality in the Kitimat area, and effects on a variety of wildlife species' habitat.

The Panel finds that, while it is standard practice to screen out project effects that are not likely to interact cumulatively with other projects or activities, the methods Northern Gateway used in its environmental effects assessment are unique in considering the project's contribution to cumulative effects only if it would affect the viability or sustainability of a resource. In general, the Panel does not accept this test for screening out the need to conduct a cumulative effects assessment. Doing so could screen out circumstances where cumulative effects are of concern despite the project's contribution not affecting the viability or sustainability of a resource or value. The Panel is satisfied, based on the evidence as a whole, that it has the information required to assess the cumulative effects for all relevant valued ecosystem components and key indicator species.

In other respects, the Panel finds that Northern Gateway conducted a cumulative effects assessment that was consistent with guidance in the National Energy Board's Filing Manual and under the *Canadian Environmental Assessment Act, 2012*.

The Panel's assessment of cumulative effects focused on the project effects remaining after applying mitigation that would interact with the effects of other existing, planned, or reasonably foreseeable projects or activities. Typically, future projects or activities are considered to be those for which formal plans or applications have been made.

In this chapter, the Panel does not provide a detailed discussion of cumulative effects where it found that project effects remaining after mitigation would be minor, localized, or acceptably mitigated through Northern Gateway's commitments and compliance with the conditions the Panel has set out, provided the Panel did not consider the evidence to suggest a detailed assessment of cumulative effects was otherwise required. In four cases, the Panel found that a detailed discussion of cumulative effects was warranted (atmospheric environment, woodland caribou, grizzly bear, and marine mammals). For all other effects, the Panel considered cumulative effects and provides a rationale for not including a detailed discussion of cumulative effects in its analysis.

Views of the Panel

RECOMMENDATIONS ON SIGNIFICANCE METHODOLOGY

In reaching its recommendations regarding the significance of adverse environmental effects, the Panel considered Northern Gateway's criteria and assessment of the significance of adverse environmental effects, as well as all other evidence and arguments, including the Aboriginal Traditional Knowledge heard by the Panel. The Panel also considered the applicable thresholds that Northern Gateway identified, and information provided by parties that suggested alternate thresholds.

The Panel lays out its evaluation of the likely significance of adverse project effects using the following tabular format. Any positive effects are discussed in the text of the Panel's views.

In cases where the Panel found that a detailed discussion of cumulative effects was not required, it applied its judgement and made a recommendation on the significance of the project effects. In cases where the Panel found that a detailed discussion of cumulative effects was required, the Panel provides its recommendation on the significance of the project effects, including consideration of cumulative effects, rather than for the project effects alone. This is because the primary concern in such cases is the accumulation of effects from not only the project, but also from other past, present, and future projects.

EVALUATION OF ADVERSE PROJECT EFFECTS AFTER MITIGATION
Temporal extent The Panel considers how frequently and for how long an effect would likely occur, taking into account the frequency of the activities that cause the effect, the duration of the effect after each activity, and whether or not the effect is reversible.
Spatial extent The Panel considers over what area an effect would likely occur, taking into account the potential for local activities to have broader effects, such as for emissions to spread or for disturbances to affect broadly-ranging receptors.
Intensity The Panel considers how serious or intense an effect would likely be, taking into account such issues as the magnitude of the effect, the vulnerability of the receptor, and the ecological context, as well as thresholds to assist in predicting responses.
Recommendation for significance of project effects after mitigation Taking the above into account, as well as the certainty of effects and mitigation effectiveness, the Panel considers whether or not the adverse environmental effects on a valued ecosystem component or key indicator species are likely to be significant.

8.7 Environmental effects

8.7.1 ATMOSPHERIC ENVIRONMENT

Northern Gateway assessed changes in the atmospheric environment, including a modelled assessment of criteria air contaminant, hazardous air pollutant, and greenhouse gas emissions. Its assessment focused on the marine terminal, although it also addressed emissions from pipeline construction. For criteria air contaminants associated with pipeline construction, Northern Gateway concluded that the potential effects would be short-term and localized.

Criteria air contaminants assessed by modelling included sulphur dioxides, nitrogen oxides, carbon monoxide, hydrogen sulphide, and particulate matter. Hazardous air pollutants were also modelled and included total volatile organic compounds (VOCs), benzene, toluene, ethylbenzene, and xylene (combined, BTEX), as well as hydrogen fluoride.

The modelled assessment for the Kitimat Terminal included emissions associated with terminal operations, with the largest sources being vehicle traffic and hydrocarbon storage tanks. Northern Gateway used the conservative assumption of continuous ship berthing (using a fractional emission rate) in order to capture the worst case scenario of concurrent adverse meteorology and maximum potential emissions. From the model results, Northern Gateway predicted that sulphur dioxide associated with operating the Kitimat Terminal would exceed the provincial air quality objectives (Level A) for all time periods. This

was due to the project interacting with nearby topographical features, where the largest sulphur dioxide emissions are from the marine vessels. The highest concentrations were predicted to occur infrequently and immediately adjacent to the terminal fence line.

Northern Gateway, Transport Canada, and the Heiltsuk First Nation discussed how air emissions associated with marine vessels berthed at the Kitimat Terminal would be subject to the reduced sulphur fuel requirements associated with the joint United States-Canada North American Emission Control Area. Based on this, marine fuel sulphur requirements permitted in Canadian coastal waters (200-nautical-mile limit) would be 1.0 per cent in 2012, reducing further to 0.1 per cent by 2015. Northern Gateway predicted that sulphur dioxide emissions from marine vessels should be approximately 96 per cent lower than modelled once these new international fuel standards take effect.

Northern Gateway also predicted exceedances of provincial air quality objectives in the area for carbon monoxide, particulate matter, hydrogen sulphide, and total reduced sulphur. These exceedances were modelled under the base case of existing sources and were not attributable to the Kitimat Terminal itself. Using the provincial emissions inventory from 2000 to characterize the existing industrial operations in Kitimat, Northern Gateway identified that the exceedances modelled would be due to baseline emissions from the existing industrial sources. No exceedances of hazardous air pollutant guidelines were predicted as a result of the project.

Northern Gateway considered greenhouse gas emissions for pipeline construction activities, as well as marine terminal and hydrocarbon storage tank operations. Overall, it concluded that total project carbon dioxide and equivalent emissions would be very low compared to provincial and national emissions. Northern Gateway also provided an assessment of indirect carbon dioxide emissions associated with vegetation loss, and concluded that the addition of direct and indirect carbon dioxide emissions associated with the project would not cause a significant effect.

Environment Canada said that Northern Gateway took appropriate measures in designing and siting its proposed facilities to minimize adverse effects on air quality. It acknowledged Northern Gateway's commitments to adopt best practices and to use economically-feasible best-available technologies in designing the Kitimat Terminal to minimize effects on air quality.

Northern Gateway committed to consult with Environment Canada, applicable provincial authorities, participating Aboriginal groups, and participating stakeholders, as appropriate, regarding ongoing and revised air quality assessments and dispersion modelling.

Mitigation measures

Northern Gateway committed to collaborating with stakeholders in designing and implementing its Air Quality and Emissions Management Plan.

Northern Gateway's proposed plan would include:

1. annual reporting to governments and other stakeholders, as appropriate;
2. adherence to Canada-wide standard principles (or best industry practices), including applying 'best available technology economically achievable' principles;
3. ambient monitoring for contaminants of potential concern (i.e., sulphur dioxide); and
4. emissions tracking for project sources in the Kitimat area.

Monitoring and follow-up

Northern Gateway committed to undertake an air quality program for the 6-month period before commissioning the Kitimat Terminal and at least 1 year after starting terminal operations.

Views of the Panel

By the Kitimat Terminal's proposed in-service date, there will have been significant changes to the number and magnitude of existing air emission sources since the provincial emission inventory of 2000 was compiled, and since Northern Gateway completed its modelling assessment. Regarding the sulphur emissions attributable to the terminal, marine vessel berthing would account for 97 per cent. Given that Northern Gateway used conservative assumptions regarding berthing in the modelling and that regulations coming into force regarding the sulphur content of marine fuels would further decrease predicted emissions, the Panel finds that the modelling results presented in the application and subsequent filings are not predictive of the realistic potential effects on local air quality.

Based on the filed information about sulphur dioxide emissions, the Panel is satisfied that new modelling based on the updated information would indicate that sulphur dioxide associated with the Kitimat Terminal's operations would not exceed provincial air quality objectives.

The Panel requires that further modelling, reflecting the current level of activity, equipment, and marine sources, must inform Northern Gateway's design of the Air Quality Emissions Management and Soil Monitoring Plan for the Kitimat Terminal. Updated modelling would be used to inform the monitoring program's design, as well as to help ensure that the monitors are placed effectively to monitor both human and environmental health.

EVALUATION OF ADVERSE PROJECT EFFECTS ON THE ATMOSPHERIC ENVIRONMENT AFTER MITIGATION

Temporal extent
Effects during pipeline and terminal construction would be temporary. Air emissions during terminal operations would continue throughout operations and may vary through changes in operational management. Effects would disperse as the emissions vary or cease and when the meteorology changes.

Spatial extent
Effects during construction would be localized. Modelling indicates that effects from emissions during terminal operations would be localized due to the complex topography surrounding the Kitimat Terminal.

Intensity
Effects during construction are expected to be short-term and localized. Initial modelling of effects during operations indicated the provincial sulphur dioxide regulatory levels may be met or very rarely exceeded under particularly adverse conditions. The Panel is satisfied that modelling based on the updated information about sulphur dioxide emissions would indicate that sulphur dioxide associated with the Kitimat Terminal's operations would not exceed provincial air quality objectives.

Recommendation for significance of project effects after mitigation
Because there would be adverse project effects remaining after mitigation that could combine with the effects of other past, present, and future projects, and because cumulative effects are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects.

CUMULATIVE EFFECTS ON THE ATMOSPHERIC ENVIRONMENT

Northern Gateway said that, during the Kitimat Terminal's operations, tank maintenance and marine berthing would add a potential measureable contribution to regional cumulative environmental effects from air emissions. Northern Gateway incorporated the existing industrial sources in the Kitimat area in its modelling assessment, using the British Columbia Ministry of Environment's emissions inventory. At the time the modelling was run, the available emission estimates from 2000 were used to characterize the existing sources in the airshed. As noted above, over the course of the Panel's process, it heard of many changes to the industrial make-up of the Kitimat area since the 2000 emissions inventory was developed. Combining these with the predicted project emissions, the model results indicated predicted exceedances of regulatory thresholds for sulphur dioxide, carbon monoxide, particulate matter, hydrogen sulphide, and total reduced sulfur, though not at every averaging period. Northern Gateway said that, due to the existing large emission sources and the region's complex meteorology and topography, the exceedances are primarily attributable to the other industrial activities around Kitimat and not from the project itself.

Views of the Panel

The Panel finds that the emissions associated with the Kitimat Terminal's operation would be minimal compared to the existing sources presented. Although the modelled cumulative emissions exceeded many regulatory thresholds, the exceedances were predicted based on an out-of-date emissions inventory, and were predicted to occur prior to adding emissions from the project. Based on the information about sulphur dioxide emissions on the record, in addition to the modelling included in the application, the Panel is satisfied that new modelling based on updated information would indicate that sulphur dioxide associated with the Kitimat Terminal's operations would not contribute to an increased exceedance of provincial air quality objectives, either through limited emissions or berthing management to limit emissions in particularly adverse conditions.

EVALUATION OF ADVERSE CUMULATIVE EFFECTS ON THE ATMOSPHERIC ENVIRONMENT AFTER MITIGATION

Recommendation for significance of cumulative effects after mitigation

Project effects would generally be localized (limiting cumulative effects spatially) and would disperse as emissions vary or cease or when the meteorology changes (limiting cumulative effects temporally). There have been many changes to the industrial makeup of the Kitimat area since the 2000 emissions inventory that was used in the modelling, and anticipated marine fuel standards will reduce sulphur emissions from shipping. In addition, project effects would be minimal compared to the existing sources presented, and project mitigation would include monitoring and adaptive management.

The Panel recommends that the project is not likely to result in significant adverse cumulative effects with respect to the atmospheric environment.

8.7.2 TERRESTRIAL VEGETATION AND WETLANDS

8.7.2.1 Rare plants and rare ecological communities

Vegetation along the pipeline route varies in accordance with the six physiographic regions that would be crossed by the right-of-way.

Northern Gateway completed field surveys for rare plants and rare ecological communities in the Project Development Area from June to August 2006 and in July 2008. Additional surveys took place in June 2009 for the Kitimat Terminal terrestrial Project Development Area. During these surveys, Northern Gateway did not find any plant species listed under the federal *Species at Risk Act* or designated by the Committee on the Status of Endangered Wildlife in Canada. Whitebark pine was listed later (in June 2012) on Schedule 1 of the *Species at Risk Act* and was identified as potentially occurring in six hectares of the Project Development Area.

In its application, Northern Gateway said that seven plant species of concern can be found in the Project Development Area in Alberta (mostly in the Southern Alberta Uplands region) and two species of concern can be found in British Columbia. In British Columbia, 396 hectares of rare ecological communities considered to be of special concern are located in the Project Development Area, as well as 24 hectares of rare ecological communities considered to be extirpated, threatened, or endangered. No rare ecological communities were identified in Alberta.

Some participants said that Northern Gateway's efforts to collect baseline information on rare plants and rare ecological communities may have understated vegetation diversity because it did not survey the entire length of the pipeline route. They also said that the mapping tool used to describe ecosystems along the pipeline route was not detailed enough to detect rare ecological communities or sensitive ecosystems.

Swan River First Nation said that there were insufficient details regarding the results of field work to verify mapping and classification. Horse Lake First Nation and East Prairie Métis Settlement said that baseline information for rare plants should reflect any recent plant inclusions in the Alberta National Heritage Information Centre and Alberta Conservation Information Management System tracking list. Northern Gateway agreed to this recommendation, and said that it would consider the information included in the two tracking systems when conducting centreline surveys and before selecting the pipelines' final routing. Haisla Nation said that Northern Gateway could not determine whether its proposed mitigation measures would be feasible because it does not have a complete inventory of where rare plants and rare ecological communities are located.

Northern Gateway said that the surveys it conducted sampled only approximately 14 per cent of the total project footprint. Northern Gateway committed to file the results of all additional field surveys with the National Energy Board and to incorporate survey results, including rare plant and rare ecological community locations, in mitigation outlined on its environmental alignment sheets. Northern Gateway said that these additional surveys would increase its confidence in its rare plant and rare ecological community data.

Potential effects on rare plants and rare ecological communities could be caused by changes in ecosystems, plant communities, and species diversity resulting from construction (clearing, grubbing, grading, soil disturbance, and removal) and reclamation activities.

Northern Gateway said that it would take approximately 80 years until vegetation can return to its original ecosystem composition after being disturbed. It said that its assessment of the extent to which vegetation can re-grow and plant diversity can be re-established (reversibility) was based on post-project monitoring for other projects in similar physiographic regions. It said that 5 years are sufficient to restore plant diversity when aided with horticultural techniques, while approximately 80 years are required for vegetation to return to its original ecosystem composition naturally (i.e., without any human intervention). Northern Gateway committed to implement similar measures should the project proceed.

Northern Gateway committed to optimize reclamation and to enhance the ecological integrity of affected lands. Northern Gateway's updated Construction Environmental Protection and Management Plan (EPMP), which it would file with the National Energy Board, would include Northern Gateway's reclamation objectives, measurable goals, and monitoring survey protocol for post-construction reclamation.

Horse Lake First Nation and East Prairie Métis Settlement did not agree with Northern Gateway that affected rare plants and rare ecological communities could be restored after being disturbed. Haisla Nation said that Northern Gateway's measure of reversibility to assess significance was misleading. While Northern Gateway said that effects on rare plants and rare ecological communities would be reversible, long-term effects would not actually be completely reversed until the permanent right-of-way is reclaimed after pipeline decommissioning or abandonment.

Northern Gateway said that any loss of a listed rare plant species or rare ecological community would be considered significant. Its preferred mitigation measure to prevent such loss would be avoidance because the re-establishment of rare plants and rare ecological communities is challenging and the timeframe under which it may happen is uncertain. Environmental and geotechnical constraints, and existing or planned linear features, may limit the feasibility of implementing route refinements at site-specific locations to avoid rare plants and rare ecological communities. Northern Gateway said that its commitment to parallel linear facilities and route the pipelines through disturbed areas to the extent possible would provide an opportunity to reduce its project's footprint.

Mitigation measures

In addition to Northern Gateway's committed-to project design measures and best management practices to reduce potential effects on vegetation, it committed to:

- conduct additional rare plant and rare ecological community surveys after detailed routing has been determined, including power line easements and segments of the pipeline route that extend outside of the corridor assessed in the application;
- avoid rare plants and rare ecological communities through exclusion fencing, routing refinements (such as right-of-way narrowing, re-routing, or micro-routing), drilling or boring underneath, or altering the construction schedule to the winter dormant period;
- implement offset measures, such as transplantation or seed collection for regeneration in other sites, when avoidance is not possible due to environmental or geotechnical constraints;
- implement post-construction vegetation reclamation measures, such as promoting soil stability; encouraging natural plant community re-establishment; and re-establishing drainage patterns, watercourses, and wetland communities;
- use the Hoult and Clore tunnels to avoid sensitive alpine vegetation;
- if cryptic paw is observed, include old growth forest sites in pre-construction field surveys and identify mitigation options and management strategies in consultation with federal and provincial authorities; and
- with respect to whitebark pine, confirm stand distribution during centerline surveys and take site-specific measures to avoid adverse effects.

Monitoring and follow-up

Northern Gateway committed to assess the effectiveness of mitigation measures implemented to protect rare plants and rare ecological communities. It would select and permanently mark sites containing groups or communities of rare plants. It would also collect data about species composition and number of species, health and vigor, site stability, and soil moisture and nutrient conditions. The monitoring program would take place over a 3- to 5-year period, until rare plants have recovered.

Views of the Panel

ON PROJECT EFFECTS ON RARE PLANTS AND RARE ECOLOGICAL COMMUNITIES

Some participants said that Northern Gateway's vegetation surveys have been limited with respect to assessing vegetation diversity and that there is limited information to conclude whether Northern Gateway's proposed primary mitigation measure, avoidance, would be feasible. The Panel accepts Northern Gateway's commitment to conduct additional surveys for rare plants and rare ecological communities before finalizing the pipelines' detailed routing. In order for these additional surveys to be appropriate for the vegetation that may be found along the right-of-way, the Panel requires Northern Gateway to undertake the field surveys in spring, summer, and fall, in the year prior to starting construction, in order to identify the presence of rare plants that flower in early spring or late fall.

Rare plants and rare ecological communities are protected by legislation because they have already been adversely affected and need specific protection. It is important that any further potential adverse effects be prevented, as much as possible, regardless of whether losses from any particular project are minor.

While some vegetation would be allowed to grow on the permanent right-of-way during operations, there is a need to maintain access for aerial and ground patrols to repair and maintain the pipelines. Therefore, there are limitations as to how much or the extent to which vegetation can be allowed to grow back until such time that the permanent right-of-way has been decommissioned or abandoned.

Northern Gateway committed to future surveys and mitigation development for rare plants. The Panel requires Northern Gateway to update its Construction Environmental Protection and Management Plan to reflect the results of these additional pre-construction surveys, and any additional mitigation requirements to protect rare plants and rare ecological communities. The Panel finds that this would increase confidence in rare plant and rare ecological community data. It also finds that project effects on rare plants and rare ecological communities could be adequately reduced given that sufficient information on these elements would be available to be taken into consideration when finalizing detailed routing.

Several site-specific options for protecting vegetation, including rare vegetation, would be available as part of Northern Gateway's Construction Environmental Protection and Management Plan. The Panel is satisfied that such mitigation options can be effective because they are based on standard industry operating procedures and the results of post-construction monitoring programs. Northern Gateway would include information on protecting rare vegetation resources on construction drawings and environmental alignment sheets. The Panel requires Northern Gateway to file with the National Energy Board information reflecting the results of pre-construction surveys and detailed mitigation measures to be implemented for rare plants and rare ecological communities potentially affected during construction.

Environmental and geotechnical constraints might limit the possibility of implementing routing refinements to avoid rare plants and rare ecological communities. Besides spatial avoidance, alternate construction methods (such as drilling or boring

underneath) or temporal avoidance (such as constructing during the winter dormant season) could be used to avoid rare plants and rare ecological communities. Offset measures could also be applied, the details of which Northern Gateway would provide to the National Energy Board before starting construction.

EVALUATION OF ADVERSE PROJECT EFFECTS ON RARE PLANTS AND RARE ECOLOGICAL COMMUNITIES AFTER MITIGATION

Temporal extent
Rare plants and rare ecological communities could be affected during site preparation work or reclamation. Vegetation diversity can likely be restored to its original ecosystem diversity within the project's lifespan for the temporary work areas, but likely not until beyond the project's lifespan (i.e., a number of years after decommissioning or abandonment) for the permanent right-of-way.

Spatial extent
Effects would be relatively local given that vegetation clearing would be limited to site preparation works and project infrastructure areas, and additional surveys would increase confidence that rare plants and rare ecological communities would be avoided.

Intensity
Any loss of a listed rare plant species or rare ecological community would be beyond the regulatory threshold. Mitigation would protect such species and communities through avoidance, as much as possible, and through re-establishment measures, and offsets where this is not possible.

Recommendation for significance of project effects after mitigation
The additional pre-construction surveys would increase confidence that rare plants and rare ecological communities would be avoided, and that offsets would be applied where this is not possible. The Panel recommends that the project is not likely to result in significant adverse effects with respect to rare plants and rare ecological communities.

Views of the Panel

ON CUMULATIVE EFFECTS ON RARE PLANTS AND RARE ECOLOGICAL COMMUNITIES

The Panel finds that the project would result in adverse effects on rare plants and rare ecological communities after applying mitigation. These effects would not be significant. Rare plants and rare ecological communities are generally found in localized, isolated areas (which reduces the potential for interacting with effects from other projects), and detailed route selection would allow for the project's contribution to cumulative effects to be mitigated, if not entirely avoided. For non-avoidable effects, the project's contribution to cumulative effects would diminish over time because vegetation can be restored to its original ecosystem diversity, either naturally or through reclamation techniques. The Panel finds that a detailed discussion of cumulative effects is not required for effects on rare plants and rare ecological communities.

8.7.2.2 Old growth forests

Northern Gateway estimated that 527 hectares of old growth forests could be disturbed within the Project Development Area, with the highest proportion (181 hectares) located in the Coast Mountains physiographic region. Northern Gateway committed to verify all currently-mapped old growth stands within the Project Development Area before starting construction. At that time, updates to the information would identify the various factors that may affect old growth forest distribution, including logging activities and the effects of mountain pine beetle.

Construction activities, including clearing, grading, and disturbing the surface vegetation and soil layers, could affect old growth forests and forest structure. Northern Gateway said that, until it finalizes the pipelines' routing and conducts centerline surveys, it is impossible to estimate the extent of old growth forests that cannot be avoided through route refinements. Because old growth forests are dispersed throughout the project area, Northern Gateway also said that it was unlikely that more than 10 per cent of old growth forests in the Project Effects Assessment Area would be lost after mitigation measures have been applied. The value of 10 per cent was not contested during the Panel's process.

Northern Gateway said that the effects of surface disturbance on vegetation diversity, including old growth forests, would be reversible and not significant. In response to questions from Natural Resources Canada, Northern Gateway said that the assessment of vegetation reversibility was based on extensive research and monitoring information conducted in Alberta and British Columbia. Results of these studies indicate that the vegetation diversity recovery in areas of disturbance from a right-of-way have been successful. Haisla Nation cautioned against relying on Northern Gateway's assessment of reversibility and duration for determining significance because old growth forest re-establishment would occur, if it does occur at all, beyond the project's lifespan. Northern Gateway said that its focus would be on avoiding adverse effects on old growth forests, rather than mitigating them.

Mitigation measures

In addition to Northern Gateway's committed-to project design measures and best management practices to reduce potential effects on vegetation, it committed to:

- verify and update information on the location and extent of old growth forests after detailed routing has been determined;
- avoid old growth forests through routing refinements, such as re-routing or micro-routing;
- conduct additional pre-construction surveys to increase confidence that old growth forests can be avoided;
- if temporary workspace is required, it would consult with government authorities to determine the most appropriate construction strategy; and
- consult with the provinces of Alberta and British Columbia to prepare forest reforestation plans.

Monitoring and follow-up

Northern Gateway committed to measure the effects of routine operations along the proposed pipeline corridor, to confirm predictions made in its application with respect to terrestrial biota, and to assess the effectiveness of project design features and mitigation measures, such as enhanced reclamation and other protective measures for old growth forests, as part of the Pipeline Environmental Effects Monitoring Program.

Views of the Panel

ON PROJECT EFFECTS ON OLD GROWTH FORESTS

The project could alter, degrade, or cause a loss of portions of old growth forest stands within the Coast Mountains physiographic region of British Columbia. This region is where old growth forests are most abundant, and affected old growth forests may take a long time to recover, beyond the project's lifespan and, presumably, over multiple human generations. The Panel finds that the project's effects on old growth forests would be limited due to the relatively small area of old growth forests that could be disturbed.

Northern Gateway's proposed mitigation focusing on avoidance, and on reforestation using measures such as native seeds to support recovery if stands cannot be avoided, would effectively reduce the potential loss of old growth forests. Northern Gateway committed to re-establish ecological plant communities, which are associated with old growth forests. These communities develop as substrata under the old growth forest canopy by collecting seeds and root crowns of rare species. It also committed to plant seedlings on the disturbed portions of the right-of-way. Northern Gateway would monitor the species and undertake remedial measures, as needed. Transplanting seedlings would help address seed survival and emergence challenges, and adaptation to severe soil and specific climate conditions.

EVALUATION OF ADVERSE PROJECT EFFECTS ON OLD GROWTH FORESTS AFTER MITIGATION

Temporal extent
Old growth forests affected by temporary work areas can begin restoration during the project's lifespan, whereas affected old growth forests on the permanent right-of-way would not begin restoration until after decommissioning or abandonment of the project.

Spatial extent
Vegetation clearing in old growth forests would be limited to the permanent right-of-way and to temporary work areas. Mitigation includes additional surveys and avoidance to reduce the area of old growth forests affected.

Intensity
Old growth forests are ecologically sensitive and important. The amount of old growth forests that would be affected is relatively small.

Recommendation for significance of project effects after mitigation
Given Northern Gateway's mitigation, old growth forest losses remaining after mitigation would be localized, even in the Coast Mountains region, and ultimately reversible. The Panel recommends that the project is not likely to result in significant adverse effects with respect to old growth forests.

Views of the Panel

ON CUMULATIVE EFFECTS ON OLD GROWTH FORESTS

The Panel finds that the project would result in adverse effects on old growth forests after applying mitigation. These effects would not be significant. Project effects on old growth forests are expected to be limited and localized, limiting the potential for cumulative effects. The Panel finds that a detailed discussion of cumulative effects is not required for effects on old growth forests.

8.7.2.3 Non-native weed species

Northern Gateway said that surface disturbances created during the project's site-clearing, construction, and reclamation phases may introduce and spread non-native weed species by providing a seedbed for invasion. Non-native weed species may also be carried by pipeline installation and operations equipment, or by natural dispersal mechanisms. Northern Gateway said that, in many cases, these species are resilient, adapted to disturbed habitats, and can reproduce rapidly. Their increased presence can affect the diversity of natural vegetation communities and reduce reclamation program effectiveness.

The goal of Northern Gateway's proposed Weed Management Plan would be to prescribe methods to prevent and control the spread of restricted, noxious, and invasive plants during all project phases. Northern Gateway said that its implementation of best management practices in constructing and reclaiming the right-of-way, as part of its proposed Weed Management Plan, would be effective in preventing and controlling the spread of non-native weed species.

Swan River First Nation and Driftpile Cree Nation asked to be involved in selecting native species seeds for use during reclamation. They made recommendations to avoid using herbicides in maintaining the right-of-way. Northern Gateway said, where practical, it would involve Aboriginal groups in reclamation and maintenance work on the right-of-way and would use native plant species. Horse Lake First Nation and East Prairie Métis Settlement supported completing weed surveys in advance of construction, and incorporating results in weed management planning and environmental alignment sheets.

Mitigation measures

Northern Gateway committed to:

- conduct pre-disturbance reconnaissance surveys to confirm the presence of weed and invasive non-native species (particularly leafy spurge), and to identify mitigation measures to limit their spread;
- implement a Weed Management Plan for construction and reclamation of the right-of-way, based on best management practices, to prevent and control the spread of weed and invasive non-native species; and
- use mechanical and chemical control of weeds and non-native species, when required.

Monitoring and follow-up

Northern Gateway committed to conduct regular inspections to determine the aerial extent of weed problems and to gather the information needed to decide whether treatments are necessary, the best treatment options, and the best timing for treatments.

Views of the Panel

ON PROJECT EFFECTS RELATED TO NON-NATIVE WEED SPECIES

The Panel finds that using best management practices and implementing the Weed Management Plan, which would be informed by the results of pre-construction weed surveys, would effectively reduce the potential for the project to introduce and spread non-native weed species. Such practices have proven successful in the past, and the Panel has confidence that those practices would be successful in this case.

Aboriginal groups expect to be engaged by Northern Gateway for reclamation and maintenance work along the right-of-way. The Panel requires Northern Gateway to demonstrate that it is consulting with potentially-affected Aboriginal groups about its proposed weed management measures. As part of its plan, Northern Gateway would include work to be done along the right-of-way to preserve ecological integrity to the extent possible and, where practical, give priority to protecting native plant species that are of interest to Aboriginal groups, as requested by Swan River First Nation and Driftpile Cree Nation.

EVALUATION OF ADVERSE PROJECT EFFECTS RELATED TO NON-NATIVE WEED SPECIES AFTER MITIGATION

Temporal extent
Non-native weed species may be introduced and spread as a result of construction and reclamation activities, and during pipeline operations. They may also arrive through natural dispersal into areas disturbed by these activities. Any weeds that are introduced would be controlled in the short term through measures in the Weed Management Plan.

Spatial extent
Weeds may occur primarily along the disturbed temporary workspaces and permanent right-of-way. Weed management should prevent any weeds that do establish from spreading further.

Intensity
Considering mitigation that would be applied, effects from weeds would be within the range of baseline conditions or natural variation.

Recommendation for significance of project effects after mitigation
Given the standard mitigation available to address weeds, the Panel recommends that the project is not likely to result in significant adverse effects associated with non-native weed species.

Views of the Panel

ON CUMULATIVE EFFECTS RELATED TO NON-NATIVE WEED SPECIES

The Panel finds that the project would result in adverse effects associated with non-native weed species after applying mitigation. These effects would not be significant. Standard construction practices and weed control measures would effectively reduce the potential introduction and spread of weeds that can be caused by surface disturbances, limiting the potential for cumulative effects. The Panel finds that a detailed discussion of cumulative effects is not required for effects associated with non-native weed species.

8.7.2.4 Soils

Northern Gateway assessed the effects of the project during all project phases, including site-clearing, soil stripping and stockpiling, construction, and acidifying emissions on agricultural and non-agricultural soils during operations. It determined that, in the absence of mitigation, construction activities could result in admixing, compaction, erosion, contamination, changes in soil moisture conditions, and soil loss. Surface soil deterioration and loss could result in short-term loss in agricultural land capability. Activities during operations could also cause compaction and soil contamination, and acidifying emissions from tankers berthed at the Kitimat Terminal could affect soil quality.

In response to questions from the Fort St James Sustainability Group about restoring agricultural soils, Northern Gateway said it would restore areas disturbed by the temporary and permanent right-of-ways to the capability that existed before the project was constructed, as required by provincial soil conservation and reclamation legislation

Northern Gateway said that a number of available mitigation measures that it proposes to implement have proven to be effective on previous projects to reduce the effect of physical disturbances on soils.

Northern Gateway said that soils in the area of the Kitimat Terminal have a high sensitivity to acidification and are susceptible to exceeding the critical threshold suggested for sensitive ecosystems. Northern Gateway also said that industry currently in the Kitimat area generates a large quantity of acid inputs that exceed critical thresholds. Northern Gateway estimated that the effect of the project alone, not acting within current baseline airshed emissions, would result in a very small contribution to acid deposition. Northern Gateway anticipated that acidifying emissions from tankers would be reduced by using low-sulphur marine fuel (discussed in Section 8.7.1), reducing associated effects on nearby soils.

Mitigation measures

In addition to Northern Gateway's committed-to project design measures and best management practices to reduce potential effects on soils, it committed to:

- complete field assessment and soil mapping prior to construction, and to integrate the resulting information into its environmental alignment sheets, along with proposed site-specific mitigation measures;
- implement a Soils Protection and Management Plan;
- identify site-specific reclamation issues in an Enhanced Reclamation Plan to be developed in consultation with appropriate regulatory authorities, participating Aboriginal groups, and stakeholders; and
- use low-sulphur fuel for the tankers calling on the Kitimat Terminal, in accordance with marine fuel and emissions regulations.

Monitoring and follow-up

Northern Gateway committed to:

- confirm erosion control protection of soil stockpile sites during the first growing season after starting operations and to implement additional corrective erosion control until protection is deemed adequate;
- assess the effectiveness of mitigation strategies to control soil loss and deterioration in the White Area of Alberta;
- determine the effectiveness of reclamation measures, and to adjust mitigation measures as a result of monitoring results, as appropriate; and
- evaluate changes in soil quality caused by inputs of acidifying emissions in the area of the Kitimat Terminal, and to verify that using low-sulphur fuels is effective in addressing soil acidification effects.

Views of the Panel

ON PROJECT EFFECTS ON SOILS

The Panel finds that the implementation of Northern Gateway's proposed mitigation measures and using standard construction practices would effectively reduce the potential for the loss of soil productivity and capability that can be caused by surface disturbances.

The limited contribution of the project's effects to atmospheric acid input levels in the area, after mitigation, can be effectively reduced by using low-sulphur fuels. Northern Gateway's soil monitoring program would address potential cumulative effects of acid emissions on soils and verify that using low-sulphur fuels has been effective in addressing soil acidification effects.

EVALUATION OF ADVERSE PROJECT EFFECTS ON SOILS AFTER MITIGATION

Temporal extent
Emissions from tankers would continue as long as the Kitimat Terminal is operational and so effects on soil quality are expected to persist during all project phases and beyond the project's lifespan.

Spatial extent
Adverse effects would be limited to an area surrounding the Kitimat Terminal which already has acid-sensitive soils.

Intensity
Industry currently in the Kitimat area generates a large quantity of acid inputs that exceed critical thresholds. Low-sulphur standards for marine fuel would reduce acidifying emissions of tankers by approximately 96 per cent when they come into effect.

Recommendation for significance of project effects after mitigation
Given the implementation of mitigation measures (including monitoring and follow-up) and the expected new marine fuel standards, the Panel recommends that the project is not likely to result in significant adverse effects with respect to soils.

Views of the Panel

ON CUMULATIVE EFFECTS ON SOILS

The Panel finds that the project would result in adverse effects on soils after applying mitigation. These effects would not be significant. Standard construction practices would effectively reduce the potential for loss of soil productivity and capability that can be caused by surface disturbances, limiting the potential for cumulative effects. Effects of soil acidification would be addressed primarily by managing emissions to the atmospheric environment. Management of these cumulative emissions is addressed in Section 8.7.1. The Panel finds that a detailed discussion of cumulative effects is not required for effects on soils.

8.7.2.5 Wetlands

Northern Gateway estimated that the project could affect approximately 490 hectares of wetlands, mainly swamps and fens located in the Southern Alberta Uplands physiographic region and in the Interior Plateau physiographic region of British Columbia. Proposed power line easements could affect an additional 106 hectares of wetlands, mostly swamps located in the Coast Mountains physiographic region. Surface disturbance resulting from construction and reclamation could affect surface or shallow groundwater flow patterns, reduce wetland sizes, modify wetland types and classes, and, consequently, alter wetlands and wetland functions.

The Project Development Area would be located near the northern limit of the Prairie Pothole Region in Alberta, a wetland area that provides important breeding and staging habitat for several waterfowl species. Environment Canada said that the pipeline route may also affect areas where there has already been an extensive loss of wetlands and wetland function (for example, the White – i.e. settled – areas of Alberta). The effect after mitigation would not be long-term, with compensation for wetland loss. Environment Canada said that, in British Columbia, the right-of-way would cross areas defined as priority wetland conservation areas for migratory birds (between Houston and Prince George). Northern Gateway said that the project has the potential to affect ecological wetland communities listed under British Columbia's legislation.

In response to a request from Environment Canada, Northern Gateway filed a Wetland Function Assessment Framework, providing an assessment of the wetland functions likely to be adversely affected by the project. It also included information on how Northern Gateway proposed to monitor the effects of the project on wetlands and to compensate losses to wetlands and wetland functions, should effects be confirmed. Haisla Nation said that the information to be collected as part of Northern Gateway's proposed Wetland Function Assessment Plan should have been submitted to the Panel in order to justify Northern Gateway's conclusion that the project would not have any adverse environmental effects on wetlands. Northern Gateway said that the information provided in response to Environment Canada's request was based on the pipelines' current location in the centre of the applied-for 1-kilometre-wide corridor. It said that it would complete a detailed assessment prior to construction, after the pipelines' exact location is finalized during detailed engineering.

Northern Gateway said that it can effectively reduce effects on wetlands, including wetlands designated as ecologically important, through its proposed mitigation measures aimed at avoiding or maintaining buffers around wetlands, restoring natural hydrogeological regimes, and using subsurface drainage control measures.

Northern Gateway agreed with Environment Canada's recommendations to achieve a goal of no net loss of wetland functions. Northern Gateway committed to develop a Wetland Compensation Plan if effects on wetlands cannot be avoided, or where there are ongoing effects remaining after mitigation lasting longer than 5 years. This plan would assist in determining the loss of wetland extent and function, areas of replacement and their likelihood of success, involved parties and their responsibilities, maintenance provisions, adaptive management measures, and the provisions of financial assurances.

Northern Gateway's proposed compensation ratio would be 2:1 (area of wetland restored or created to original wetland area affected), except in areas where there has already been extensive loss of wetland and wetland function (for example, the White – i.e. settled – areas of Alberta), where it would implement a 3:1 ratio. These ratios are consistent with those recommended by Environment Canada. Northern Gateway said that lost wetland functions would preferably be compensated on-site or within the same watershed.

Northern Gateway said that project effects remaining after mitigation on wetlands and riparian areas (from surface or shallow groundwater flow pattern disruptions) would be relatively small and not significant and that wetland functions would not be threatened by the project.

Mitigation measures

In addition to Northern Gateway's committed-to project design measures and best management practices to reduce potential effects on wetlands, it committed to:

- collect detailed information about wetlands (such as size, location, status, and function) prior to detailed routing to inform site-specific mitigation plans, and to include this information on environmental alignment sheets;
- adopt a hierarchical preference of (1) wetland avoidance, (2) effects minimization, and (3) compensation of unavoidable effects. It would apply this hierarchy broadly to the project for wetlands and associated riparian areas that support *Species at Risk Act*-listed species or migratory bird breeding populations;
- implement site-specific measures to maintain natural surface and groundwater flow patterns, such as limiting the use of extra temporary workspace, maintaining a buffer around wetlands, using drainage and erosion control measures, limiting grubbing to the ditch line, and using log corduroy alongside riparian areas;
- implement additional site-specific measures as necessary (such as additional culverts, ditches, or berm breaks) should a decline in vegetation health occur from drainage alteration; and
- develop a Wetland Compensation Plan in consultation with regulatory authorities, landowners, participating Aboriginal groups, and other stakeholders

Monitoring and follow-up

Northern Gateway committed to monitor the effects of the project on wetland function in terms of changes in water levels, water quality, and species composition and distribution, and to collect data on the health and vigour of the vegetation species in and next to wetlands. It would monitor wetlands for a period necessary to confirm that the goal of no net loss in function is achieved, taking compensation into account (3 to 5 years until drainage systems have re-established)

Views of the Panel

ON PROJECT EFFECTS ON WETLANDS

Northern Gateway has committed to applying a hierarchical approach to mitigating the effects of the project on wetlands. Its preferred means of mitigation would be avoiding adverse effects, followed by means to reduce adverse effects and, if effects are unavoidable, means to compensate for adverse effects remaining after mitigation, preferably on-site or in the same watershed. The Panel is of the view that compensation has proven effective in other cases.

Prior to detailed routing, Northern Gateway would collect additional site-specific information on wetlands to supplement the information it provided during the Panel's process. It would use this additional information to inform mitigation plans, including how the overlap between the Project Development Area and wetlands can be adequately reduced. The Panel finds that these measures would increase confidence in wetland data and

the effects of the project on wetlands would be adequately reduced, given that information regarding wetland distribution would be available at the time of construction.

The Panel is satisfied that it has sufficient information at this time on which to base its evaluation of the significance of project effects on wetlands. The Panel requires Northern Gateway to develop and file with the National Energy Board its Wetlands Functional Assessment Plan that reflects the results of additional pre-construction surveys, and addresses wetlands mitigation, monitoring, and compensation.

Particular attention should be given to limiting or reducing effects, to the greatest extent possible, on wetlands of provincial and federal conservation concern, or effects on wetlands that provide wildlife habitat, including for migratory birds or species listed under the federal *Species at Risk Act*. The Panel supports Northern Gateway's preference to compensate for lost wetland functions on-site or within the same watershed, while maintaining ecological integrity.

EVALUATION OF ADVERSE PROJECT EFFECTS ON WETLANDS AFTER MITIGATION

Temporal extent
Effects on wetlands disturbed during site preparation or reclamation could extend throughout and beyond the project's lifespan.

Spatial extent
Effects remaining after mitigation would be relatively localized, and mitigation would include surveys, avoidance, and minimization to reduce the spatial extent of effects.

Intensity
Wetlands provide important ecological functions, and it is particularly important to maintain the wetland functions that have important conservation functions. Effects on wetlands would be limited through various mitigation measures, including avoidance and reduction. Offsets would be used for effects that cannot be avoided, with the goal of no net loss of overall wetland functions.

Recommendation for significance of project effects after mitigation
Given mitigation to avoid and reduce effects, and offsets to compensate where effects cannot be avoided, the Panel recommends that the project is not likely to result in significant adverse effects with respect to wetlands.

Views of the Panel

ON CUMULATIVE EFFECTS ON WETLANDS

The Panel finds that the project would result in adverse effects on wetlands after applying mitigation. These effects would not be significant. Effects on wetlands would be limited through avoidance, limiting the potential for cumulative effects. Effects on wetlands that cannot be avoided would be compensated at a ratio of 2:1 (area of wetland restored or created to original wetland area affected), except in areas where there has already been extensive loss of wetland and wetland function (for example, the White – i.e. settled – areas of Alberta) where a ratio of 3:1 would be implemented. The Panel finds that a detailed discussion of cumulative effects is not required for effects on wetlands.

8.7.3 TERRESTRIAL WILDLIFE AND WILDLIFE HABITAT

The proposed pipeline route would cross various types of terrestrial wildlife habitat, including coniferous and mixed-wood forests, forested wetlands, open water ponds and lakes, alpine meadows, rocky canyons, subalpine meadows and forests, agricultural croplands, and pasture.

Northern Gateway said that a wide variety of wildlife species or their signs were observed during route surveys, including:

- Mammals such as woodland caribou, grizzly bear, moose, deer, elk, wolf, coyote, red fox, cougar, Canada lynx, snowshoe hare, mice, red

squirrel, river otter, American marten, fisher, and wolverine. Of these, the boreal and southern mountain populations of woodland caribou are listed as Threatened on Schedule 1 of the *Species at Risk Act*.

- Birds such as songbirds, waterbirds, raptors, woodpeckers, and hummingbirds. Thirteen bird species listed on Schedule 1 of the *Species at Risk Act* were either identified during surveys, selected as key indicator species, or are expected to occur in the project area and to interact with the project.
- Seven species of amphibians, including coastal tailed frog, western toad, and northern leopard frog, all three of which are listed on Schedule 1 of the *Species at Risk Act*. Northern leopard frog is listed as Endangered, and both coastal tailed frog and western toad are listed as Special Concern.

The pipeline corridor would pass through the Burnie River Protected Area and the Herd Dome Special Resource Management Area. The Herd Dome area provides mountain goat and caribou habitat. The Burnie River Protected Area provides habitat for woodland caribou, grizzly bear, and mountain goat. British Columbia Parks provided allowances for the two pipelines to traverse the Burnie River Protected Area, if the project is approved.

Northern Gateway said that the Stuart, Tachie, and Middle Rivers Important Bird Area, located in the Regional Effects Assessment Area, is important for wintering trumpeter swan.

Northern Gateway identified key environmental effects on wildlife as: change in habitat availability (from vegetation clearing and increased sensory disturbance), change in movement (from creation of physical or sensory barriers and lessened wildlife connectivity), and change in mortality risk (from collisions with project vehicles or increased mortality from increased human or predator access). Northern Gateway also considered combined project effects in its assessment as the sum of, or interactions between, direct and indirect habitat loss, changes in movement, and increased mortality risks on wildlife.

Swan River First Nation and Driftpile Cree Nation discussed declines in furbearer populations, such as beaver, which are trapped by members of both Nations, and rabbit and muskrat, which are trapped by the Driftpile Cree Nation. These Nations were concerned about project effects on beaver mortality, movement, and habitat availability. In response to these concerns, Northern Gateway committed to identify beaver dams, ponds, and lodges during pre-construction centreline surveys. It also committed to implement wetland protection measures, including avoidance, year-round setbacks, and reporting to the project environmental inspector any interference with beaver dams, ponds, or lodges.

Various parties were concerned about the project's contribution to altered wildlife movement patterns, linear disturbance, and habitat fragmentation. They recommended that sensitive habitats be avoided and buffered from project activities, and that connectivity between larger habitat patches be maintained. The East Prairie Métis Settlement, Horse Lake First Nation, and Haisla Nation raised specific concerns about sensory disturbance effects on wildlife from blasting activities, and asked about Northern Gateway's plans to monitor wildlife movement patterns.

Northern Gateway acknowledged these concerns and said that avoidance is expected to be temporary and reversible since the most sensitive species, such as caribou, grizzly bear, mountain goat, and wolverine would temporarily avoid construction sites. Regarding disturbance related to blasting, Northern Gateway said that, at any particular point during pipeline construction, blasting would last from only 1 to 2 weeks. Northern Gateway would implement a Blasting Management Plan outlining timing restrictions and mitigation measures. Northern Gateway said that, if disruption of wildlife movement is identified as a concern during detailed routing, appropriate environmental effects monitoring programs would be implemented.

Various parties raised concerns about project effects on wildlife mortality and how the project would affect wildlife populations. Swan River First Nation asked how Northern Gateway would demonstrate that ecological diversity had successfully been re-established along the pipeline right-of-way after construction. Swan River First Nation asked what adaptive management plans would be ready should monitoring programs show an unanticipated negative result. In response, Northern Gateway proposed to conduct follow-up studies related to project effects on wildlife. These studies would include evaluating changes in hunting and trapping patterns, monitoring effectiveness of mitigation measures on wildlife features, tracking direct wildlife mortality, and monitoring the movement of hunted and trapped species through winter tracking and pellet surveys, and remote camera surveys.

Northern Gateway said that it would implement appropriate monitoring and follow-up programs. Its Pipeline Environmental Effects Monitoring

Program would include monitoring to ensure that habitat restoration and removal of linear features are successful to mitigate effects within important habitat areas for key species. Northern Gateway would use data collected through this program as part of an adaptive management program to identify any required changes in pipeline operations or environmental management approaches and on-going monitoring strategies.

Northern Gateway committed to a number of plans under its Construction Environmental Protection and Management Plan that would apply to species at risk, migratory birds, and wildlife in general, and that would include mitigation measures and adaptive management strategies. Site-specific mitigation would be summarized on environmental alignment sheets and the Construction Environmental Protection and Management Plan's effectiveness would be monitored as part of the Pipeline Environmental Effects Monitoring Program.

Views of the Panel

ON PROJECT EFFECTS ON TERRESTRIAL WILDLIFE AND WILDLIFE HABITAT

Northern Gateway's proposed mitigation measures would reduce project effects on wildlife habitat availability, change in movement, and mortality risk. The Panel has considered all of the evidence for all of the species discussed during the Panel's process, and provides a detailed discussion below on four key species that were the subject of debate.

The Panel finds that Northern Gateway's proposal to align the level of its monitoring efforts with the level of prediction confidence for project effects on wildlife is a reasonable approach. The nature and complexity of monitoring and follow-up programs in environmental assessment tend to be aligned with the scale of a project and the sensitivity and complexity of associated issues.

8.7.3.1 Woodland caribou

The proposed pipeline route overlaps with the Little Smoky boreal woodland caribou range at the range's extreme northern extent. It also overlaps with the Narraway, Quintette, Hart Ranges, and Telkwa southern mountain woodland caribou ranges (see Figure 8.5).

Both the boreal and southern mountain woodland caribou populations are listed as Threatened on Schedule 1 of the *Species at Risk Act*. In British Columbia, the Narraway, Quintette, and Telkwa herds are ranked as Blue-listed (special concern) and the Hart Ranges herd is Red-listed (endangered or threatened). The Narraway herd is listed as threatened in Alberta. The Little Smoky herd is declining in population and is considered at risk of extirpation. Environment Canada said that the Bearhole-Redwillow portion of the Narraway herd is also declining. Trends indicate that populations are increasing for the Hart Ranges herd, and are stable for the Quintette and Telkwa herds.

Environment Canada said that the Little Smoky herd was very unlikely to maintain a self-sustaining population over time, in the absence of management intervention, since 95 per cent of the habitat in its range is disturbed. Environment Canada's short-term goal (0 to 50 years) is stabilization of the Little Smoky herd. Critical habitat for the Little Smoky herd of boreal woodland caribou is identified in the boreal caribou recovery strategy as existing habitat that would contribute to at least 65 per cent undisturbed habitat over time. Critical habitat for the southern mountain caribou populations has yet to be determined in a recovery strategy.

Environment Canada said that habitat restoration, reduction of line of sight, access management, and mortality management can play a role in mitigating unavoidable effects of the project on caribou, which is optimally effective when combined with a monitoring and adaptive management approach. Where mitigation objectives and outcomes are not met in the short term, monitoring and adaptive management allow approaches to be modified to ensure success in the mid- to longer-terms.

FIGURE 8.5 **CARIBOU RANGES**

The proposed pipeline route crosses the ranges of the Little Smoky herd of the boreal population of woodland caribou and the Hart Ranges, Telkwa, Narraway, and Quintette herds of the southern mountain population of woodland caribou.

Habitat availability

Northern Gateway said that caribou habitat loss would result from direct clearing of habitat and also from sensory disturbance, which could result in a loss of habitat that is much greater than the physical disturbance of clearing itself.

Northern Gateway said that large decreases in winter habitat are predicted during construction, mainly due to sensory disturbance. Northern Gateway said that the sensory disturbance buffer most often extends 500 metres on either side of the Project Development Area, meaning the entire Project Effects Assessment Area is considered to be affected during construction.

Northern Gateway said that the Project Effects Assessment Area is less than or equal to 1.6 per cent of the total herd area for each of the 5 woodland caribou herds potentially affected by the project. Northern Gateway also said that the relative habitat loss in the Project Effects Assessment Area is a conservative estimate because it reflects habitat loss only within the 1-kilometre-wide corridor containing the pipeline, while most caribou would use larger areas of habitat outside of the Project Effects Assessment Area.

The Province of British Columbia questioned the project's effects on caribou calving areas and requested information from Northern Gateway on its plans to mitigate disturbance effects during critical seasonal periods outside of winter range occupation. Northern Gateway said that it would consult with the British Columbia Ministry of Forests, Lands, and Natural Resources Operations to identify sensitive areas and time periods, as well as actions to mitigate project effects.

Environment Canada questioned the location of the right-of-way relative to core caribou habitats. It said that, since large-scale reclamation of caribou habitat is undemonstrated and uncertain, and the time required for habitat restoration is long-term, habitat destruction should be avoided.

Northern Gateway said that the only place where there would be substantial new right-of-way is the area from Imperial Creek to the Missinka River, which overlaps the Hart Ranges caribou herd. Northern Gateway flagged the area as environmentally-sensitive and said that it would focus on access management measures to reduce human and predator use of the right-of-way. Northern Gateway said that it would apply line-of-sight mitigation (using terrain or right-of-way alignment or vegetation screens to reduce predator line-of-sight) and restore habitat elsewhere in the range.

Northern Gateway said that Route Revision V (December 2012) would be located further away from the wildlife habitat area proposed for the Telkwa caribou herd. Northern Gateway also said that the revised route offers fewer opportunities for the project to use existing rights-of-way, which may increase human access locally. Northern Gateway said that it would apply other methods to minimize linear feature density in this region and would implement additional measures to control access during construction and operations.

Northern Gateway committed to implement a caribou protection plan, a caribou habitat restoration plan (to demonstrate how and to what extent caribou habitat affected by the project would be restored), and a caribou habitat enhancement or offset measures plan (to compensate for effects after appropriate routing and all other mitigation is applied).

Northern Gateway had low to moderate confidence in the effectiveness of its proposed reclamation mitigation measures for habitat availability for woodland caribou. Northern Gateway said that, although it felt that sound reclamation techniques are being developed and tested as part of collaborative regional initiatives, successful large-scale re-establishment of a sustainable landscape has yet to be demonstrated for woodland caribou. Northern Gateway proposed to monitor the effectiveness of mitigation measures for habitat availability and to apply adaptive management measures if results of monitoring indicated that measures were not effective.

Change in movement

Northern Gateway said that, while the Hart Ranges, Telkwa, and Narraway herds migrate annually between winter and summer ranges, the Little Smoky herd is non-migratory. Some components of the Quintette herd make seasonal movements and there is a substantial component of the herd that is resident in higher-elevation areas. Though some herds may show migratory patterns (seasonal movement) and may use locally-important movement corridors, woodland caribou do not use well-defined migratory corridors. Northern Gateway said that, with human use of the pipeline right-of-way reduced through strict access control, caribou would not be deterred from crossing or using the pipeline right-of-way. Northern Gateway also said that caribou within the Narraway herd boundary do cross both intact and disturbed areas.

The Office of the Wet'suwet'en said that the right-of-way would bisect an important caribou migration route connecting the Telkwa range to the southern Bulkley and Tahtsa ranges, where local population abundance is diminished.

Northern Gateway said that it aligned the pipeline route, as much as possible, to be adjacent to or through disturbed areas, such as existing linear features and forestry cutblocks. Northern Gateway would implement mitigation measures, such as reducing line-of-sight along the right-of-way and access management measures (e.g., using large berms, coarse woody debris, re-vegetation, and vegetation screens), to minimize project effects on wildlife movement. Northern Gateway acknowledged that mitigation measures to restrict access may also restrict caribou movement.

Northern Gateway said that directional drilling of watercourses and minimizing riparian disturbance is a key mitigation measure that would reduce impacts on movement corridors for species such as caribou.

Northern Gateway had low to moderate confidence in the effectiveness of mitigation measures to reduce change in movement for woodland caribou during operations. As such, Northern Gateway proposed to develop a detailed monitoring program to gauge the effectiveness of mitigation measures to control access along the right-of-way, which would help to improve confidence in mitigation success.

Mortality risk

Northern Gateway did not expect mortality from direct causes, such as vehicle collisions with project-related traffic, to have a measurable effect on caribou. Northern Gateway said that the project would result in a change in risk of mortality for woodland caribou due to increased human or predator access from increased linear feature density (density of linear development types, such as roads and pipeline rights-of-way).

BC Nature and Nature Canada said that the project would pose a significant risk to the viability of caribou populations. BC Nature and Nature Canada said that most caribou mortality is in the summer and questioned why early- and late-winter habitat was the focus of the assessment on caribou mortality. It added that an assessment of project effects on summer range would likely show a significant risk to the viability of four of the five caribou populations. It said that the risk would be great for the Hart Ranges population range due to fragmentation of the road-less area between kilometre posts 588 and 615. Northern Gateway acknowledged that caribou are more susceptible to wolf predation during the summer than at other times of the year and this is particularly true for the Hart Ranges, Quintette, and Narraway herds. Northern Gateway said that early- and late-winter habitat was the focus of their assessment on habitat change because it is limiting for caribou. This was not used to assess mortality risk. Rather, Northern Gateway used linear feature density as the measurable parameter for mortality risk.

Northern Gateway proposed to route the pipelines through disturbed areas, including existing linear features and cutblocks, to lessen project effects on caribou. Northern Gateway proposed to align the pipeline route adjacent to a major existing pipeline corridor to minimize habitat destruction in the area. In response to Panel questioning, Northern Gateway said that approximately 69 per cent of the route (Route Revision V) would traverse disturbed areas or parallel linear features.

Environment Canada recommended mitigation measures consistent with the boreal woodland caribou recovery strategy, such as locating the pipeline in disturbed areas, avoiding a net gain in access, offsetting affected habitat in the Little Smoky range, and using an adaptive management approach to mitigation.

Northern Gateway had low confidence in the effectiveness of mitigation measures to reduce caribou mortality from increased linear feature density leading to increased access. Northern Gateway proposed to develop and implement a detailed monitoring program to gauge the effectiveness of its Access Management Plan and its Linear Feature Management and Removal Plan. Northern Gateway said that, if measures require improvement, they would be re-examined as necessary.

Mitigation measures

In addition to general mitigation measures outlined in its application, Northern Gateway committed to:

- route the pipeline through disturbed areas including existing linear features and cutblocks;
- develop and implement a Linear Feature Management and Removal Plan within sensitive wildlife areas, including caribou range, with a goal of no net gain in linear feature density within caribou range and a net decrease in linear feature density within Little Smoky population range;
- develop and implement an Access Management Plan that would focus on controlling human and predator access to linear features;
- develop and implement a Caribou Habitat Restoration Plan, an Offset Measures Plan, and a Caribou Protection Plan.

Monitoring and follow-up

Northern Gateway committed to:

- collaborate with provincial wildlife authorities to support programs to monitor and conserve the five woodland caribou herds that could be affected by project activities. Northern Gateway proposed to join the alliance of the British Columbia Ministry of Forests and its industry partners to monitor caribou herds in the Omenica; and
- conduct targeted winter tracking and aerial surveys of affected caribou herds during construction, and periodically during operations as part of its Pipeline Environmental Effects Monitoring Program.

Research

Northern Gateway said that it joined a public-private alliance to monitor woodland caribou and wolf interactions and proposed to fund a research chair to identify gaps in existing information, such as interactions between the Telkwa herd and wolves. Northern Gateway proposed to collaborate with the British Columbia Ministry of Environment on caribou habitat restoration and compensation with respect to linear features and wolf predation of the Telkwa herd. It also proposed to consider additional opportunities in Alberta and British Columbia to support caribou-wolf interaction studies.

Northern Gateway said that it would continue to look for opportunities to fund third party research for caribou studies to look at current and post-construction movement patterns to see if there have been alterations.

Views of the Panel

ON PROJECT EFFECTS ON WOODLAND CARIBOU

The Panel has taken into account the likely risk of project effects on each of boreal and southern mountain caribou populations from habitat loss, change in caribou movement, and mortality risk.

The Panel notes Northern Gateway's mitigation measures to reduce such effects, including access management measures to attempt to avoid increased human and predator access. Northern Gateway said that approximately 69 per cent of the corridor (as proposed in Route Revision V) is routed through disturbed areas or is parallel to linear features. As such, 31 per cent would be constructed through areas that are not already disturbed or that do not parallel existing linear features. Most concerns raised by parties about mortality risk were in relation to cumulative effects and are discussed further below in the Panel's views on cumulative effects.

There is uncertainty associated with the effectiveness of mitigation measures to reduce these effects. Although Northern Gateway has low (or low to moderate) confidence in the effectiveness of mitigation measures on habitat availability, change in movement, and risk of mortality for woodland caribou, it would conduct monitoring to gauge mitigation effectiveness. Northern Gateway said that, if measures require improvement, they would be re-examined as necessary and further actions and measures would be implemented, based on monitoring results.

The Panel finds that it was appropriate for Northern Gateway to use changes in early- and late-winter habitat as the focus for habitat change assessment, rather than for assessing mortality risk, which was considered using changes in linear feature density.

The Panel finds that Northern Gateway's mitigation measures for wildlife movement, such as reducing line-of-sight, are acceptable to reduce project effects on caribou movement.

As for the risk of mortality, while Northern Gateway's goal of no net gain in linear feature density within caribou range and a net decrease in linear feature density in Little Smoky range is admirable, the Panel notes Northern Gateway's low confidence in its mitigation and finds that the likelihood of success is uncertain.

The Panel is of the view that Northern Gateway's plans to support programs to monitor and conserve the five potentially-affected woodland caribou herds and to fund a research chair to identify gaps in existing information, such as wolf interactions with the Telkwa herd, would result in a benefit from the project.

The Panel requires Northern Gateway to prepare a pre-construction caribou habitat assessment, a caribou habitat restoration plan, an offset measures plan, and a caribou habitat restoration and offset measures monitoring program. The Panel also requires Northern Gateway to report on its caribou habitat restoration and offset measures monitoring, and to file its developed Linear Feature Management and Removal Plan with the National Energy Board.

EVALUATION OF ADVERSE PROJECT EFFECTS ON WOODLAND CARIBOU (HABITAT AVAILABILITY) AFTER MITIGATION

Temporal extent
Direct habitat loss would extend for the duration of project operations because the permanent right-of-way would be maintained in a semi-cleared state. The right-of-way would be allowed to regrow after the project is decommissioned or abandoned.

Spatial extent
Thirty-one per cent of the right-of-way would be constructed through areas that are not already affected by other projects, or that do not parallel an existing linear disturbance. There would be a local loss of woodland caribou habitat on the right-of-way, and a broader zone of influence leading to effective habitat loss of approximately 500 metres on either side of new linear disturbances, and a potential influence at the herd's range level.

Intensity
There would be a relatively low level of effect on habitat availability where the proposed pipeline route crosses, or is adjacent to, an existing land disturbance. There would be a larger effect in areas where the route does not cross or parallel an existing land disturbance. Mitigation has been proposed, but confidence in the effectiveness of that mitigation is low to moderate.

Recommendation for significance of project effects after mitigation
Because there are project effects remaining after mitigation that could combine with the effects of other past, present, and future projects, and because cumulative effects on caribou are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects.

EVALUATION OF ADVERSE PROJECT EFFECTS ON WOODLAND CARIBOU (CHANGE IN MOVEMENT) AFTER MITIGATION

Temporal extent
The project is likely to affect woodland caribou movement for the duration of project operations because the permanent right-of-way would be maintained in a semi-cleared state. The right-of-way would be allowed to regrow after the project is decommissioned or abandoned. Project effects on change in movement from sensory disturbance is greater during the construction phase, and would decrease through the operations phase, with less activity on the right-of-way.

Spatial extent
Effects on woodland caribou movement may be felt by caribou herds at the Regional Effects Assessment Area level.

Intensity
There would be little effect on the change in movement for the Little Smoky herd as it is non-migratory. The effect would be greater for the Hart Ranges, Telkwa, and Narraway herds, and some components of the Quintette herd, since these herds would be bisected more centrally by the pipeline route and they show seasonal migratory patterns.

Recommendation for significance of project effects after mitigation
Because there are project effects remaining after mitigation that could combine with the effects of other past, present, and future projects, and because cumulative effects on caribou are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects.

EVALUATION OF ADVERSE PROJECT EFFECTS ON WOODLAND CARIBOU (MORTALITY RISK) AFTER MITIGATION

Temporal extent
Effects would last for the duration of project operations since the permanent right-of-way would be maintained in a semi-cleared state, which could allow for increased access by humans and predators. The right-of-way would be allowed to regrow after the project is decommissioned or abandoned.

Spatial extent
Increased mortality risk for caribou would be highest closest to the right-of-way, which could result in an influence at the range level if caribou mortality increases.

Intensity
There would be an increased risk of mortality to individuals. Northern Gateway has committed to substantial mitigation in an attempt to manage access through its Access Management Plan, although such mitigation may not be totally effective and some access would be required to allow for pipeline maintenance and repair.

Recommendation for significance of project effects after mitigation
Because there are project effects remaining after mitigation that could combine with the effects of other past, present, and future projects, and because cumulative effects on caribou are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects.

CUMULATIVE EFFECTS ON WOODLAND CARIBOU

Cumulative effects significance threshold (linear feature density metric)

Various parties questioned the metric that Northern Gateway used (a 1.8 kilometres per square kilometre measure of linear feature density) to determine significance of cumulative effects on woodland caribou mortality risk. Environment Canada said that a meta-analysis approach that accounts for total area of disturbance, rather than simply linear feature density, is a more appropriate approach.

Northern Gateway said that the linear feature density metric was selected from a study that summarized available information at that time related to landscape metrics for caribou populations and their persistence. Northern Gateway said that the data showed that herds declined with a linear density of 1.8 kilometres per square kilometre or greater, and showed stability at lower levels. Northern Gateway also said that the linear feature density metric it chose can be calculated with a fair degree of certainty using available data and at an appropriate scale for the assessing cumulative effects within the Regional Effects Assessment Area.

Northern Gateway said that, regardless of the threshold used to determine significance of cumulative effects on woodland caribou, linear feature density and associated effects on habitat use patterns and mortality risk are an issue for caribou in general in British Columbia and Alberta. It said that it is committed to managing project access aggressively within the ranges of the five woodland caribou herds that are potentially affected by the project. Northern Gateway would seek opportunities to achieve no net gain in linear feature density as part of its Linear Feature Management and Removal Plan. Northern Gateway committed to achieve a net decrease in linear feature density within the range of the Little Smoky herd.

Cumulative effects on woodland caribou

Northern Gateway said linear feature density can predict mortality risk to caribou from human-caused mortality or predator-related mortality. In this context, a new right-of-way would contribute to greater linear feature density, whereas a route that is alongside existing disturbance would add minimally to cumulative effects.

Northern Gateway said that the project right-of-way would follow an existing right-of-way through Little Smoky range. Similarly, Environment Canada acknowledged that Northern Gateway chose the alignment because it parallels a major existing pipeline corridor, minimizing linear density in the area. Northern Gateway committed to ongoing collaboration with Alberta Sustainable Resource Development regarding detailed pipeline routing in the Little Smoky range.

Environment Canada said that a final recovery Strategy has not yet been released for southern mountain caribou. If Northern Gateway was to decide on the detailed pipeline route prior to the southern mountain caribou recovery strategy being released, Environment Canada recommended that, in addition to managing linear feature density, the pipeline should be routed within or close to existing disturbed areas. It also

recommended that Northern Gateway apply habitat offsets (creation of habitat for habitat destroyed) for the Bearhole-Redwillow population of the Narraway herd.

Swan River First Nation said that cumulative effects of fragmentation already appear to be considerable in the Little Smoky range. Although Environment Canada said that populations are increasing for the Hart Ranges herd, and stable for the Quintette and Telkwa herds, BC Nature and Nature Canada said that the project would exacerbate the current population declines for the Telkwa and Hart Ranges herds, as well as the Little Smoky and Narraway herds, through cumulative increased mortality.

Environment Canada recommended that Northern Gateway implement a 4:1 ratio of habitat restored to habitat destroyed within those ranges of boreal and southern mountain woodland caribou where habitat is relatively more disturbed. Northern Gateway said that the ratio for habitat restoration could be a specific objective in certain areas and committed to a net decrease in linear feature density by removing existing access based on a 4:1 ratio of new access created by the project in the Little Smoky range.

Northern Gateway said that habitat availability and mortality risk are interrelated. In the case of the Little Smoky herd, the combined cumulative effects of development are significant, although the project's contribution to cumulative risk of mortality for caribou is not significant. Using the linear density threshold of 1.8 kilometres per square kilometre, Northern Gateway said that the project would not result in a significant cumulative effect on woodland caribou, including for the Little Smoky herd, in combination with other projects.

Northern Gateway said that it intends to achieve no net gain in linear feature density in sensitive areas for southern mountain caribou and a net decrease in linear feature density in the Little Smoky range. This would be done by developing and applying the Linear Feature Management and Removal Plan. Northern Gateway said that its Pipeline Environmental Effects Monitoring Plan would include monitoring to ensure that habitat restoration and removal of linear features is successful. If monitoring indicates that mitigation measures are not effective, Northern Gateway would consider developing other mitigation measures based on the monitoring results.

Northern Gateway said that it has low confidence in the effectiveness of mitigation measures to reduce caribou mortality from increased linear feature density. Northern Gateway said that it would gauge the effectiveness of its mitigation measures through a monitoring program.

Views of the Panel

ON CUMULATIVE EFFECTS ON WOODLAND CARIBOU

The primary concern for cumulative effects on woodland caribou is the potential for increased risk of mortality due to additional access for predators and humans because of additional linear disturbance from the project, which would act cumulatively with other projects and activities.

The Panel notes that, regardless of the linear disturbance threshold used by Northern Gateway and whether it is exceeded, Northern Gateway would implement substantial mitigation measures, such as a no net gain in linear feature density for southern mountain caribou and a net decrease in linear feature density for Little Smoky range. The Panel finds that Northern Gateway's focus on reducing the project's contribution to new linear features in undisturbed areas and its commitment to reduce linear features on other rights-of-way are appropriate.

The Panel finds that Northern Gateway's proposed measures to mitigate project effects on boreal woodland caribou, which is a listed species under the *Species at Risk Act*, follow Environment Canada's recommendations with respect to the federal recovery strategy for boreal woodland caribou.

Northern Gateway committed to develop an Access Management Plan. This would include a Linear Feature Management and Removal Plan, which would have an underlying objective of no net gain in linear feature density in sensitive areas of the pipeline route. The Linear Feature Management and Removal Plan would also aim for a net decrease in linear feature density where the pipeline corridor overlaps the Little Smoky caribou herd range. Northern Gateway plans to implement a follow-up program to assess the effectiveness of its Linear Feature Management and Removal Plan. The follow-up program would include provisions to apply adaptive management principles when required.

The Panel notes Northern Gateway's substantial mitigation commitments, and also its low confidence in those mitigation measures to reduce caribou mortality from increased linear feature density. The Panel is uncertain if 'no net gain' and a 'net decrease' in linear feature density can be reasonably achieved in a reasonable period of time. The Panel is also uncertain whether the Access Management Plan would achieve its objectives, given that both predators and humans can be difficult to deter from using a linear disturbance and because some access to rights-of-way are required for safety and security reasons.

EVALUATION OF ADVERSE CUMULATIVE EFFECTS ON WOODLAND CARIBOU AFTER MITIGATION

Recommendation for significance of cumulative effects after mitigation

Northern Gateway committed to substantial mitigation, including goals for no net gain and a net decrease in linear feature density. The addition of linear features is a key concern for these threatened woodland caribou populations, and there is uncertainty about the effectiveness of the proposed mitigation to control access and achieve the goal of no net gain or net decrease in linear feature density. As a result, the Panel has taken a precautionary approach and recommends that there would likely be significant cumulative adverse effects on the Little Smoky local population of boreal caribou and on the four populations of southern mountain caribou (Hart Ranges, Telkwa, Quintette, and Narraway).

Recommendation for justification of significant effects

The Panel recommends that there would likely be significant cumulative adverse effects on caribou that can be justified in the circumstances, as set out in Chapter 2.

8.7.3.2 Grizzly bear

The Project Effects Assessment Area overlaps with seven grizzly bear population units in British Columbia and two grizzly bear management areas in Alberta. Local declines have occurred in many grizzly bear population units and bear management areas due to increased mortality, habitat loss, and habitat fragmentation. Grizzly bear is of conservation concern in British Columbia and Alberta, and is considered to be of special concern by the Committee on the Status of Endangered Wildlife in Canada.

Habitat availability

Northern Gateway said that vegetation clearing and sensory disturbance could affect grizzly bears through direct removal of spring and fall feeding habitat, which are limiting habitats for grizzly bears. Northern Gateway said that summer and winter construction activity would avoid most of the spring feeding times. Early emerging vegetation on the rights-of-way during spring may offset some spring feeding habitat lost during construction. The summer construction schedule in some construction spreads could affect fall feeding habitat for grizzly bears due to temporal overlap of construction activities with grizzly bear habitat use. Northern Gateway said that the pipeline corridor outlined in Route Revision V (December 2012) would affect less grizzly bear core habitat.

Northern Gateway also said that human use of the right-of-way would indirectly affect habitat availability to grizzly bears since they avoid human facilities and linear disturbances.

Swan River First Nation said that Northern Gateway's plans to offset grizzly bear habitat loss along the pipeline right-of-way conflicted with Northern Gateway's plans to discourage grizzly bears from the right-of-way by planting non-palatable natural vegetation. Northern Gateway said that, in some areas, grizzly bear use of the right-of-way would be encouraged and, in other areas, such as adjacent to transportation corridors, grizzly bear use would be discouraged.

Michel First Nation said that Northern Gateway should conduct ongoing monitoring to address potential longer-term loss of grizzly bear habitat. Northern Gateway proposed to conduct grizzly bear monitoring during construction and operations, including monitoring grizzly bear activity levels in areas of known and predicted high-quality spring and fall habitat, using camera surveys.

Mortality risk

Northern Gateway said that grizzly bears are at low risk of direct mortality due to collisions with project-related traffic because they are able to evade site-clearing machinery during construction and would avoid areas of concentrated activity. To mitigate direct mortality on grizzly bear from vehicle collisions, Northern Gateway proposed to discourage bears from using rights-of-way located near transportation corridors by planting non-palatable vegetation. Northern Gateway also proposed to conduct pre-construction grizzly bear den surveys during the fall to prevent direct mortality of grizzly bears during construction.

Northern Gateway said that approximately 69 per cent of the route (Route Revision V) would cross disturbed areas or parallel linear features.

Mitigation measures

In addition to general mitigation measures outlined in its application, Northern Gateway committed to:

- an Access Management Plan and a Linear Feature Management and Removal Plan, with a goal of no net increase in linear feature density in sensitive areas, such as grizzly bear habitat;
- conduct pre-construction grizzly bear den surveys in the fall when bears are digging and entering their dens, identify key denning habitat and spring feeding areas on alignment sheets, and avoid those areas during use by grizzly bears; and
- plant palatable vegetation in certain right-of-way areas, and discourage grizzly bears from using rights-of-way near transportation corridors by planting non-palatable vegetation.

Monitoring and follow-up

Northern Gateway committed to:

- collaborate with provincial wildlife authorities, as well as universities and participating Aboriginal groups, to support grizzly bear monitoring and conservation programs. Collaborative monitoring efforts would be applied and could include programs to estimate population size and trends, and to evaluate the effectiveness of conservation measures;
- conduct grizzly bear monitoring during construction and operations, including monitoring grizzly bear activity levels in areas of known and predicted high-quality spring and fall habitat, using camera surveys; and
- implement a follow-up program to monitor and assess the effectiveness of its Access Management Plan, including the Linear Feature Management and Removal Plan. Linear feature management and linear feature removal would be addressed as separate components when assessing effectiveness.

Views of the Panel

ON PROJECT EFFECTS ON GRIZZLY BEAR

The Panel finds the project would have effects remaining on habitat availability after applying mitigation. Northern Gateway's proposed mitigation measures to reduce these effects include a route revision that affects less grizzly bear core habitat, and selecting suitable locations along the right-of-way to encourage or discourage grizzly bear use.

The Panel finds the project would also have effects remaining after mitigation on mortality risk from potential vehicle strikes and from the potential increase in access for humans. Northern Gateway's proposed mitigation measures to reduce such effects include access management measures to attempt to avoid increased human access. Northern Gateway said that approximately 69 per cent of the proposed corridor (as proposed in Route Revision V) is routed through disturbed areas or parallel to linear features. As such, 31 per cent would be constructed through areas that are not already disturbed or that do not parallel existing linear features. Most concerns raised by parties about mortality risk were in relation to cumulative effects and are discussed further below in the Panel's views on cumulative effects.

Northern Gateway's plans for collaborative monitoring efforts, including programs to estimate grizzly bear population size and trends and to evaluate conservation measures, are consistent with Michel First Nation's interest in ongoing monitoring to address the longer-term loss of grizzly bear habitat.

EVALUATION OF ADVERSE PROJECT EFFECTS ON GRIZZLY BEAR (HABITAT AVAILABILITY) AFTER MITIGATION

Temporal extent

Construction activities would lead to direct habitat loss, and sensory disturbance could lead to effective habitat loss, although the latter would diminish when construction activities are completed. Habitat alteration would last for the duration of project operations as the permanent right-of-way would be maintained in a semi-cleared state. Effects would be of shorter duration for temporary work areas. The permanent right-of-way, if maintained with palatable species in some areas, could provide some forage habitat for grizzly bear.

Spatial extent

Effective loss of habitat from sensory disturbance during construction activities would be localized, while habitat alteration would occur along the right-of-way.

Intensity

Habitat alteration is one of the reported causes for some grizzly bear populations being in decline, and so further habitat loss is of concern. While effective habitat loss from sensory disturbance would decrease after construction is completed, habitat alteration on the permanent right-of-way would last for the duration of project operations, although grizzly bears may use areas of the right-of-way planted with palatable species.

Recommendation for significance of project effects after mitigation

Because there are project effects remaining after mitigation that could combine with the effects of other past, present, and future projects, and because cumulative effects on grizzly bear are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects.

EVALUATION OF ADVERSE PROJECT EFFECTS ON GRIZZLY BEAR (MORTALITY RISK) AFTER MITIGATION

Temporal extent

The risk of vehicle collisions, although low, would be reduced post-construction. Mortality risk due to increased access would last for the duration of project operations as the permanent right-of-way would remain in a semi-cleared state, allowing some level of access even with mitigation measures in place to reduce it.

Spatial Extent

The risk of vehicle collisions during construction would be localized. Mortality risk due to increased access would extend along the right-of-way and, if mortality is increased, effects might be seen at the population level.

Intensity

The increased risk of mortality from vehicle collisions is expected to be low with the implementation of mitigation measures. Increases in grizzly bear mortality from additional access due to the project would be greater in those areas where the project is not in already-disturbed areas or parallel to existing linear features. Although effects from the project alone would not likely affect the population level, the primary concern here is cumulative effects, as discussed below.

Recommendation for significance of project effects after mitigation

Because there are project effects remaining after mitigation that could combine with the effects of other past, present, and future projects and, because cumulative effects on grizzly bear are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects.

CUMULATIVE EFFECTS ON GRIZZLY BEAR

Northern Gateway considered linear feature creation, such as the pipeline right-of-way, across the landscape to be a key concern for grizzly bear mortality due to increased human access. Northern Gateway said that an adaptive management approach to refine mitigation measures, an integrated Access Management Plan, and a program to manage linear feature density (its Linear Feature Management and Removal Plan) would together provide the best possible tools to reduce grizzly bear mortality risk.

Northern Gateway said that the project would contribute to an already highly-developed landscape in much of the Regional Effects Assessment Area. In 7 of the 9 grizzly bear units that intersect the Regional Effects Assessment Area, the density of linear features is already above the threshold that Northern Gateway chose for cumulative effects (0.6 kilometres per square kilometre). Northern Gateway adapted this metric from the density threshold used by the Alberta Grizzly Bear Recovery Plan and the British Columbia wildlife management strategy for grizzly bears (for density of open roads at which grizzly bear populations can no longer sustain an increase in direct and indirect mortality).

Swan River First Nation said that cumulative effects of habitat fragmentation on grizzly bear already appear to be considerable. It questioned how Northern Gateway would ensure mitigation is effective in avoiding significant cumulative effects on grizzly bear mortality in Alberta. It also requested information on Northern Gateway's planned follow-up studies to assess the performance of proposed mitigation, and how follow-up programs would inform adaptive management plans. Northern Gateway said that it recognizes the importance of adaptive management, and those principles would be applied where appropriate (e.g., as part of its Linear Feature Management and Removal Plan and its Pipeline Environmental Effects Monitoring Program).

East Prairie Métis Settlement and Horse Lake First Nation questioned how Northern Gateway would work with affected stakeholders to ensure that there is no net gain in linear access in areas with grizzly bear populations. Northern Gateway proposed to engage with Aboriginal groups whose known or core traditional territories overlap the priority areas identified, and to seek and incorporate input from those Aboriginal groups into its Linear Feature Management and Removal Plan.

Swan River First Nation asked for a list of adaptive management options available to Northern Gateway to ensure the success of mitigation and reclamation in the event that monitoring shows unexpected effects. Northern Gateway referred to its Pipeline Environmental Effects Monitoring Program as part of an adaptive management program.

Northern Gateway was asked if its Access Management Plan were to identify a decline in grizzly bear population, what per cent decline would have to occur to trigger action by Northern Gateway. Northern Gateway said that, if measures intended to restrict or inhibit human access are found to be ineffective, Northern Gateway would correct those measures. It did not provide a specific per cent decline that would trigger adaptive management action.

Northern Gateway said that, if effects of other projects are responsible for an already unacceptable state of the resource, it considers the project to contribute incrementally to an already significant cumulative effect. In considering significance of cumulative effects on grizzly bear mortality, Northern Gateway determined that incremental project effects adding to already significant cumulative effects are significant only if the incremental project effects cannot be effectively reduced or mitigated. As a result, Northern Gateway said that, for the seven of nine grizzly bear population units already above the linear density threshold, the project's contribution to cumulative increased mortality risk is not significant. Northern Gateway said that the cumulative effects of other projects are already responsible for a significant effect on grizzly bear mortality in those grizzly bear population units, to which the project effects would contribute incrementally after application of mitigation measures.

Northern Gateway said that, in the Bulkley-Lakes Grizzly Bear Population Unit, the project would increase linear feature density above the linear density threshold. This would result in a significant contribution to cumulative effects on grizzly bear mortality in the absence of effective mitigation and compensation. Northern Gateway said that it does not believe there would be a decline in grizzly bear populations given its commitment to implement its Linear Feature Management and Removal Plan in sensitive areas such as the Bulkley-Lakes Grizzly Bear Population Unit. Nevertheless, Northern Gateway indicated that the residual cumulative effect (after mitigation) for the Bulkley-Lakes Grizzly Bear Population Unit exceeds the linear feature density threshold. Northern Gateway said that its plan would follow adaptive management principles and would include methods to evaluate the effectiveness of linear feature management and removal techniques in reducing human use in sensitive wildlife areas. Northern Gateway said that it would implement the plan in all nine grizzly bear population units.

Swan River First Nation said that, according to Northern Gateway's application, grizzly bear mortality in Alberta should not exceed 4 per cent of the province's population per year, and that the death of 1 grizzly bear could push the direct mortality rate over that threshold. Swan River First Nation asked what response actions Northern Gateway would implement if the mortality threshold is exceeded. Northern Gateway said that it is committed to mitigation measures aimed at minimizing project-related mortality risk for grizzly bears, such as den surveys. It said that it is also committed to reducing the project's contribution to linear feature density (which functions as an indicator of grizzly bear mortality risk). Northern Gateway said that the primary management tool to accomplish this is its Linear Feature Management and Removal Plan. If measures intended to restrict or inhibit human access require improvement, Northern Gateway would re-examine its mitigation measures.

Northern Gateway had low confidence in the effectiveness of its proposed mitigation measures to reduce grizzly bear mortality through access management because human use of the right-of-way is unpredictable. Northern Gateway proposed to monitor the effectiveness of its Access Management Plan and Linear Feature Management and Removal Plan, and to use an adaptive management approach to refine those plans, if required. If measures intended to restrict or inhibit human access (such as placing berms, large woody debris, slash or rock piles, and gates) are found to be ineffective, Northern Gateway would correct those mitigation measures.

Views of the Panel

Cumulative effects are already above the linear feature density threshold for seven of the nine grizzly bear population units, and the project is likely to increase linear density above the threshold for the Bulkley-Lakes Grizzly Bear Population Unit. The Panel finds that the project is not likely to increase the linear feature density measure above the threshold for the Parsnip Grizzly Bear Population Unit.

Northern Gateway made substantial commitments to reduce project effects on grizzly bear, including an Access Management Plan and a Linear Feature Management and Removal Plan, with a goal of no net increase in linear feature density in sensitive areas, such as grizzly bear habitat. Northern Gateway had low confidence in its proposed mitigation measures to reduce grizzly bear mortality risk. The Panel is likewise uncertain as to the likelihood of this mitigation's effectiveness, given that human use of a right-of-way is difficult to control and unpredictable, some access to rights-of-way is required for safety and security reasons, and because of the conceptual nature of the plans provided.

The Panel accepts that the identification of further actions and mitigation measures, as part of an adaptive management approach if monitoring indicates that mitigation measures are not working, would be based on the results of monitoring, and that further mitigation measures cannot always be identified until monitoring helps identify underlying problems. The Panel remains uncertain as to the potential effectiveness of adaptive management to identify and remedy shortcomings in the initial mitigation.

The Panel requires Northern Gateway to develop and implement its Linear Feature Management and Removal Plan that would include no net increase in linear feature density in sensitive areas, such as grizzly bear habitat. The Panel also requires Northern Gateway to develop and implement its Pipeline Environmental Effects Monitoring Program that would include Northern Gateway's monitoring of grizzly bear during construction and operations in collaboration with provincial wildlife authorities, participating Aboriginal groups, and research organizations.

The Panel requires Northern Gateway to develop and implement its Access Management Plan that would include a description of adaptive management measures available and the criteria that Northern Gateway would use to determine if and when adaptive management measures are warranted.

EVALUATION OF ADVERSE CUMULATIVE EFFECTS ON GRIZZLY BEAR AFTER MITIGATION

Recommendation for significance of cumulative effects after mitigation

Northern Gateway made substantial commitments to mitigate project effects on grizzly bear, which include a goal of no net increase in linear feature density in sensitive areas, such as grizzly bear habitat. Grizzly bear is a species of concern and increased access via additional linear disturbances is one of the causes of population declines. There is uncertainty over the effectiveness of Northern Gateway's proposed mitigation to control access and achieve the goal of no net gain in linear feature density. The Panel has taken a precautionary approach and recommends that there would likely be significant cumulative adverse effects on those eight grizzly bear populations that are, or would be over, the linear density threshold (i.e., all population units/management areas overlapped by the Project Effects Assessment Area other than the Parsnip Grizzly Bear Population Unit).

Recommendation for justification of significant effects

The Panel recommends that there would likely be significant cumulative adverse effects on grizzly bear that can be justified in the circumstances, as set out in Chapter 2.

TABLE 8.1 **POTENTIALLY-AFFECTED TERRESTRIAL BIRD SPECIES LISTED ON SCHEDULE 1 OF THE *SPECIES AT RISK ACT***

Species	Status	Critical Habitat / Recovery Strategy
Northern goshawk	Threatened	No recovery strategy, action plan, or management plan available.
*Marbled murrelet**	Threatened	No recovery strategy, action plan, or management plan available.
Common nighthawk	Threatened	No recovery strategy, action plan, or management plan available.
Olive-sided flycatcher	Threatened	No recovery strategy, action plan, or management plan available.
Sprague's pipit	Threatened	Critical habitat is partially identified for Sprague's pipit in southeastern Alberta and southern Saskatchewan.
Canada warbler	Threatened	No recovery strategy, action plan, or management plan available.
Pacific great blue heron	Special Concern	No recovery strategy, action plan, or management plan available.
Yellow rail	Special Concern	No recovery strategy or action plan available. Management plan indicates that major threat to species is from loss and degradation of wetlands.
Long-billed curlew	Special Concern	No recovery strategy or action plan available. Management plan indicates that major threats to species include energy development, leading to habitat loss and fragmentation, and direct morality from collisions with vehicles.
Band-tailed pigeon	Special Concern	No recovery strategy, action plan, or management plan available.
Western screech owl	Special Concern	No recovery strategy, action plan, or management plan available.
Short-eared owl	Special Concern	No recovery strategy, action plan, or management plan available.
Rusty blackbird	Special Concern	No recovery strategy, action plan, or management plan available.

* Marbled murrelet considered terrestrial with respect to nesting habitat.

8.7.3.3 Terrestrial birds

Northern Gateway said that project construction and operations could result in direct habitat loss from vegetation clearing, and indirect habitat loss from sensory disturbance and habitat fragmentation (subdividing continuous habitat into smaller pieces). Northern Gateway also said that the project could result in direct bird mortality from nest destruction and collisions with vehicles.

Northern Gateway said that the right-of-way would not prevent the overall movement of terrestrial birds, though it may temporarily deter movements of some forest birds. Sensory disturbance during construction may cause birds to avoid construction areas. Northern Gateway said that the effects would be short-term, since construction disturbances would last for a period of only days to weeks in a given area and birds would return after the disturbances cease.

Habitat availability

Various participants recommended that Northern Gateway avoid areas of suitable terrestrial bird habitat, to the extent possible, and that it clear vegetation outside of the migratory bird breeding season. Environment Canada recommended that Northern Gateway implement additional species-specific timing restrictions for provincially- and federally-listed bird species.

Environment Canada was concerned about project effects on marbled murrelet nesting habitat and recommended that Northern Gateway avoid clearing within wildlife habitat areas or old growth management areas in British Columbia.

It also recommended that Northern Gateway avoid bisecting large tracts of undisturbed habitat suitable for marbled murrelet.

Environment Canada, East Prairie Métis Settlement, Horse Lake First Nation, and Driftpile Cree Nation recommended that Northern Gateway implement setbacks around nests. Environment Canada recommended that active nests be protected with a suitable buffer until the young have fledged. Environment Canada also recommended that, where very limited construction activities must proceed during the nesting season, a qualified avian biologist survey the habitat within 7 days before starting construction to ensure that nests would not be affected.

Northern Gateway committed to complete a pre-construction breeding bird survey, as well as site-specific surveys of bird habitat and use along the pipeline right-of-way as part of centreline surveys. Northern Gateway committed to prepare environmental alignment sheets that would detail location-specific mitigation measures, such as appropriate clearing windows. Northern Gateway said that it would avoid disturbing sensitive wildlife areas by siting the pipelines and other infrastructure in disturbed or less sensitive areas.

Mortality

Northern Gateway said that the greatest risk of mortality to terrestrial birds during construction is nest destruction and mortality of chicks and eggs associated with vegetation clearing. Sensory disturbance during project operations may also cause mortality of chicks and eggs through exposure if brooding birds abandon nests. Creation of edge habitat from right-of-way clearing may result in increased nest predation and parasitism by opportunistic species like brown-headed cowbird.

BC Nature and Nature Canada said that collisions with power lines are a cause of mortality for many bird species. Waterfowl, including ducks, geese, swans, cranes, and shorebirds, are most susceptible to collisions when power lines are located near wetlands.

Northern Gateway said that adherence to work windows, setback distances, and buffer zones around nests would prevent disturbance and protect terrestrial bird habitat until young are fledged. Northern Gateway also proposed to cover energized areas of power lines to prevent electrocution of birds.

Species at risk

Thirteen terrestrial bird species listed on Schedule 1 of the *Species at Risk Act* could potentially be affected by the project (see Table 8.1). Critical habitat is identified in a recovery strategy for Sprague's pipit only. The identified habitat is located outside of the project area. Recovery strategies are not available for any other terrestrial bird species at risk.

Mitigation measures

In addition to the general mitigation measures outlined in its application, Northern Gateway committed to:

- complete a pre-construction breeding bird survey, as well as site-specific surveys of bird habitat and use along the pipeline right-of-way as part of centreline surveys, and to prepare environmental alignment sheets that would detail location-specific mitigation measures, such as appropriate clearing windows and buffers around activity nests and broods;
- develop a protocol with provincial and federal regulatory authorities to minimize risk to *Species at Risk Act*-listed and migratory nesting birds, if clearing must take place during critical nesting periods. The protocol would include pre-clearing nest searches, monitoring, and adherence to setback distances;
- identify active and potentially-active marbled murrelet nest trees during pre-construction centerline surveys and pre-clearing surveys, if clearing must take place during its nesting period. A buffer zone of 200 metres of undisturbed vegetation would be established around the nest site until the young have fledged or are otherwise no longer present. Northern Gateway would consult with appropriate regulators if disturbance is unavoidable; and
- cover energized surfaces of power lines with protective devices to protect birds from electrocution.

Monitoring and follow-up

Northern Gateway committed to:

- conduct trumpeter swan aerial surveys before and after construction to determine occupancy of sites and implications for the effectiveness of mitigation measures, as part of its Pipeline Environmental Effects Monitoring Program.

Views of the Panel

ON PROJECT EFFECTS ON TERRESTRIAL BIRDS

The Panel finds that Northern Gateway's proposed mitigation measures, including pre-construction surveys, setbacks from active nests, and least risk periods for clearing, would sufficiently reduce project effects on terrestrial bird habitat availability and mortality risk.

With respect to listed terrestrial bird species at risk, Northern Gateway's proposed mitigation measures would sufficiently reduce project effects on *Species at Risk Act* Schedule 1-listed bird species. The project would not adversely affect critical habitat for Sprague's pipit, as the project is sited outside of this species' identified critical habitat.

EVALUATION OF ADVERSE PROJECT EFFECTS ON TERRESTRIAL BIRDS (HABITAT AVAILABILITY) AFTER MITIGATION	EVALUATION OF ADVERSE PROJECT EFFECTS ON TERRESTRIAL BIRDS (MORTALITY RISK) AFTER MITIGATION
Temporal extent Sensory disturbance from construction would diminish quickly as construction proceeds along the right-of-way. Habitat loss would be of shorter duration on temporary work areas, but of longer duration (i.e., project lifespan) on the permanent right-of-way, although grasses and shrub vegetation would be allowed to grow on the right-of-way after construction.	*Temporal extent* The potential for mortality due to vegetation clearing is short-term as construction moves along the right-of-way. The potential for mortality due to edge effects from vegetation clearing leading to increased nest predation and parasitism, and from collisions with power lines, would last for the duration of project operations. Effects are likely to be reversible at the population level.
Spatial extent Both sensory disturbance and clearing would be local to the project area.	*Spatial extent* Localized at sites of vegetation clearing and infrastructure.
Intensity Although habitat would be affected long-term on the right-of-way, mitigation includes siting the pipelines in disturbed or less sensitive areas to reduce effects. Overall bird movement is not expected to be affected post-construction.	*Intensity* Mitigation, such as the pre-construction breeding bird survey, clearing windows, setback distances, buffer zones, and covering energized areas of power lines, would reduce effects. Effects remaining after mitigation would be on individuals and are not expected at the population level.
Recommendation for significance of project effects after mitigation Given the relatively local spatial extent of effects and the mitigation measures that Northern Gateway would apply, the Panel recommends that the project is not likely to result in significant adverse effects with respect to terrestrial bird habitat availability.	*Recommendation for significance of project effects after mitigation* Given the proposed mitigation, the relatively local effects remaining after mitigation, and the expectation that effects are not likely to affect the population level, the Panel recommends that the project is not likely to result in significant adverse effects with respect to mortality risk to terrestrial birds.

Views of the Panel

ON CUMULATIVE EFFECTS ON TERRESTRIAL BIRDS

The Panel finds that the project would result in adverse effects on terrestrial birds after applying mitigation. These effects would not be significant. Sensory disturbance, habitat clearing, and mortality would be localized to the right-of-way and project infrastructure sites, limiting the potential for cumulative effects. Standard mitigation would be applied and effects after mitigation are not expected at the population level. The Panel finds that a detailed discussion of cumulative effects is not required for effects on terrestrial birds.

8.7.3.4 Amphibians

Northern Gateway said that coastal tailed frog, western toad, and northern leopard frog may be found in the project area. Northern leopard frog and western toad are both pond-dwelling amphibians. All three species are listed on Schedule 1 of the *Species at Risk Act*. There are no recovery strategies, action plans, or management plans for either the western toad or coastal tailed frog. A management strategy for the northern leopard frog says threats to the species include filling and draining waterbodies.

Northern Gateway said that losses of individual amphibians or small groups of amphibians would occur, though those losses are not expected to affect the viability of amphibian populations.

East Prairie Métis Settlement and Horse Lake First Nation said that the project may increase amphibian mortality from vehicle collisions on access roads, contamination of wetlands and ponds from road runoff and spills, and from hydrology changes in wetlands and ponds. These parties said that western toads hibernate in the forest ecosystem under loose bark or leaf litter on the forest floor. East Prairie Métis Settlement and Horse Lake First Nation asked if there would be measures in place to protect amphibians hibernating on the forest floor from construction activities. They recommended day-lighting of culverts to prevent amphibians' use of roadways.

Northern Gateway said that, although there may be an effect remaining after mitigation on mortality risk associated with access roads, it expected this effect to be reduced during construction. Northern Gateway would accomplish this by identifying any site-specific issues, such as amphibian road-crossing points, and applying adaptive management practices, such as installing crossing structures and removing artificially-created habitat adjacent to roads.

Mitigation measures

Northern Gateway committed to:

- conduct amphibian surveys as part of centerline surveys, and to target western toads, coastal tailed frog, and other amphibians of concern as part of its Wetland Function Assessment Plan;
- work with provincial authorities to identify correct construction timing constraints for amphibians;
- avoid disturbing wetlands by siting the pipelines and other infrastructure in disturbed or less sensitive areas;
- place large, coarse woody debris on the right-of-way after construction adjacent to streams suitable as habitat for coastal tailed frog;
- maintain setbacks at trenchless watercourse crossings and wetlands;
- salvage and relocate egg masses, tadpoles, juveniles, and adults found in the right-of-way at trenched watercourse crossings; and
- use culverts to avoid creating artificial breeding ponds near active access roads in order to reduce amphibian mortality.

Monitoring and follow-up

Northern Gateway committed to:

- compliance monitoring by a project environmental inspector to confirm that mitigation measures are implemented; and
- conduct surveys of streams into which coastal tailed frogs were relocated before construction.

Views of the Panel

ON PROJECT EFFECTS ON AMPHIBIANS

The Panel finds that Northern Gateway's proposed mitigation measures would adequately reduce project effects on amphibian habitat availability and mortality risk. Its general mitigation measures and specific mitigation measures related to wetland habitat are reasonable in the absence of critical habitat identification in recovery strategies for any of the three amphibian species listed on Schedule 1 of the *Species at Risk Act*.

EVALUATION OF ADVERSE PROJECT EFFECTS ON (HABITAT AVAILABILITY) AMPHIBIANS AFTER MITIGATION

Temporal extent

For coastal tailed frog: Short-term sensory disturbance effects on aquatic habitat during construction activities. These watercourse crossings would be reclaimed after construction.

For pond-dwelling amphibians: Effects from removal of terrestrial habitat would last for the entire project lifespan, or for at least a few years until wetland compensation habitat reaches a functioning state.

Effects are expected to be reversible.

Spatial extent

For coastal tailed frog: Spatial extent is limited to local disturbance at trenched watercourse crossings.

For pond-dwelling amphibians: Direct disturbance would be local.

Intensity

For coastal tailed frog: Disturbance would be relatively minor given mitigation, such as amphibian surveys, avoidance of sensitive areas, and setbacks at trenchless crossings and wetlands.

For pond-dwelling amphibians: Wetlands would be affected by project activities, although they would be reclaimed, post-construction, to previous functioning. Unavoidable effects to wetlands would be compensated.

Recommendation for significance of project effects after mitigation

Given the proposed mitigation and that effects would be localized and not likely to affect the sustainability of coastal tailed frog or pond-dwelling amphibians, the Panel recommends that the project is not likely to result in significant adverse effects with respect to amphibian habitat availability.

EVALUATION OF ADVERSE PROJECT EFFECTS ON AMPHIBIANS (MORTALITY RISK) AFTER MITIGATION

Temporal extent

Amphibian mortality would occur since some groups or individuals would be lost during construction. Coastal tailed frog and pond-dwelling amphibian mortality would likely be restricted to the construction phase. The right-of-way would be maintained after construction, although this is not likely to affect mortality of coastal tailed frog or pond-dwelling amphibians. Hibernating pond-dwelling amphibians are found under leaf litter which would not likely accumulate on the cleared right-of-way.

Spatial extent

Local at the project sites.

Intensity

Losses are expected to be relatively small given mitigation, such as salvage and relocation at trenched watercourse crossings. Losses are not expected to affect the viability of amphibian populations.

Recommendation for significance of project effects after mitigation

Given proposed mitigation and that effects would be localized, the Panel recommends that the project is not likely to result in significant adverse effects with respect to amphibian mortality risk.

Views of the Panel

ON CUMULATIVE EFFECTS ON AMPHIBIANS

The Panel finds that the project would result in adverse effects on amphibians after applying mitigation. These effects would not be significant. Project effects would be localized to the project sites and relatively minor and are not likely to interact cumulatively with other projects. Watercourse crossings and wetlands would be reclaimed after construction to previous functioning. The Panel finds that a detailed discussion of cumulative effects is not required for effects on amphibians.

8.7.4 FRESHWATER FISH AND FISH HABITAT

Background

The pipeline route would cross six major watershed drainages, including drainages of the North Saskatchewan, Athabasca, Peace, Fraser, Skeena, and Kitimat Rivers (Figure 8.6). Within these drainages, there are nearly 1,000 defined watercourses that would be crossed by the pipeline right-of-way, temporary and permanent access roads, power lines, and the Kitimat Terminal. Larger watercourses flow year-round, while most of the smaller ones are seasonal.

The majority of watercourses that would be crossed support fish populations. Results from Northern Gateway's literature reviews and field programs indicate the occurrence of 58 fish species near the pipeline right-of-way. These include 27 species commonly targeted by recreational anglers, such as salmonids, walleye,

Watercourse crossing methods

Selecting a watercourse crossing method is an exercise in striking a balance among geotechnical, environmental, and economic considerations to derive the most practical solution. Two primary watercourse crossing methods are trenchless and trenched crossings.

Trenchless techniques require limited or no in-stream construction, and so cause little to no disturbance to the watercourse bed and banks. Trenchless techniques, such as drilling under a watercourse (Figure 8.7) or installing an aerial crossing above a watercourse, are designed to limit disturbance to the streambed and riparian area. These methods often require a longer time frame to complete.

Trenched techniques affect the watercourse bed and banks and are typically referred to as either "wet open-cut" or "isolation" techniques. During an open-cut installation, the pipe trench is excavated and backfilled using either a backhoe or dredging equipment in the stream channel. Wet open-cut crossings are undertaken in a flowing stream and typically result in some degree of short-term, increased sedimentation downstream. Isolation techniques, on the other hand, separate the construction activities from stream flow using high volume pumps, dams, culverts, or other methods to divert stream flow around the trench excavation and pipe installation.

FIGURE 8.6 **WATERSHED BOUNDARIES**

The proposed pipeline route would cross six major watersheds between Alberta and the West Coast.

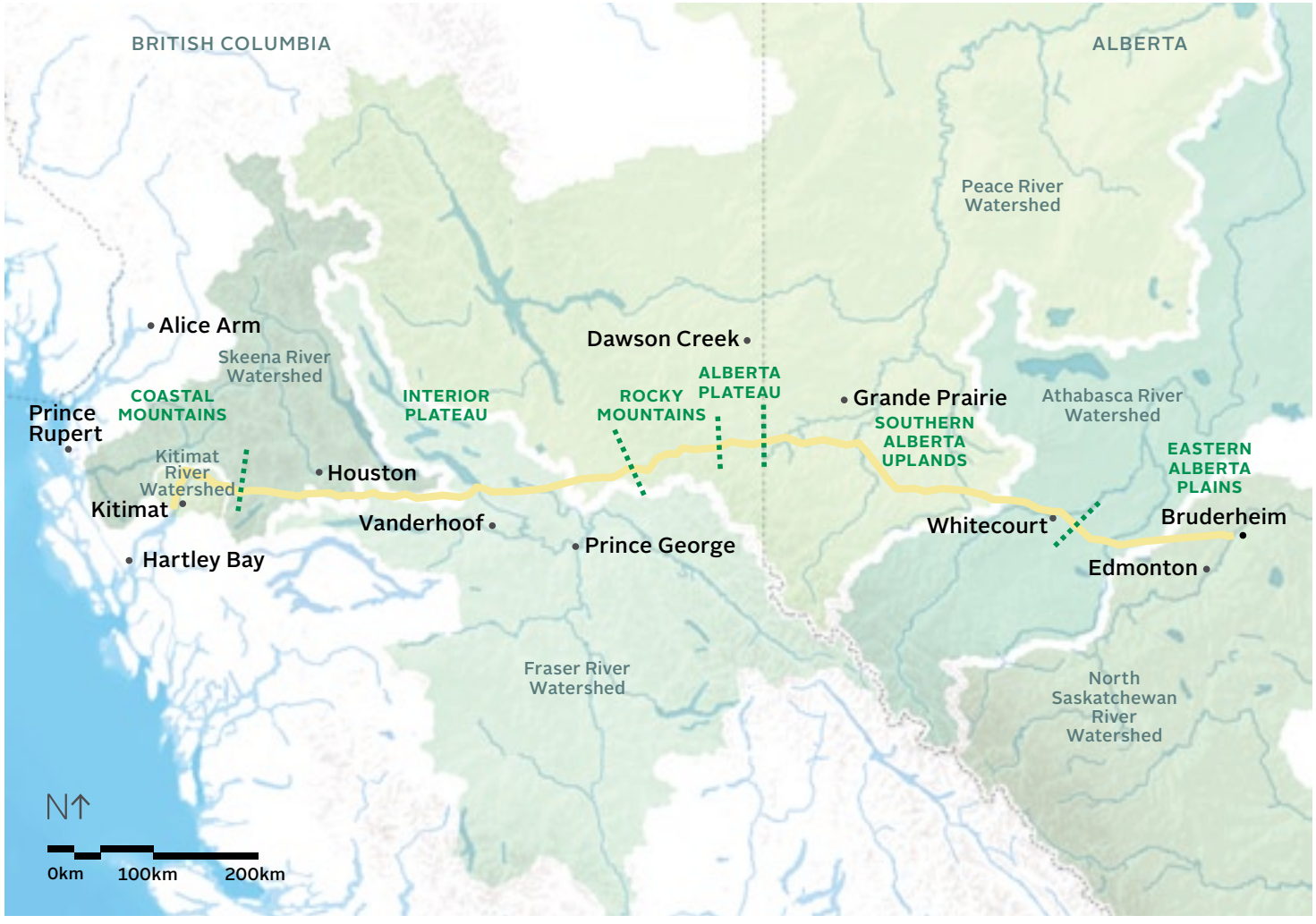
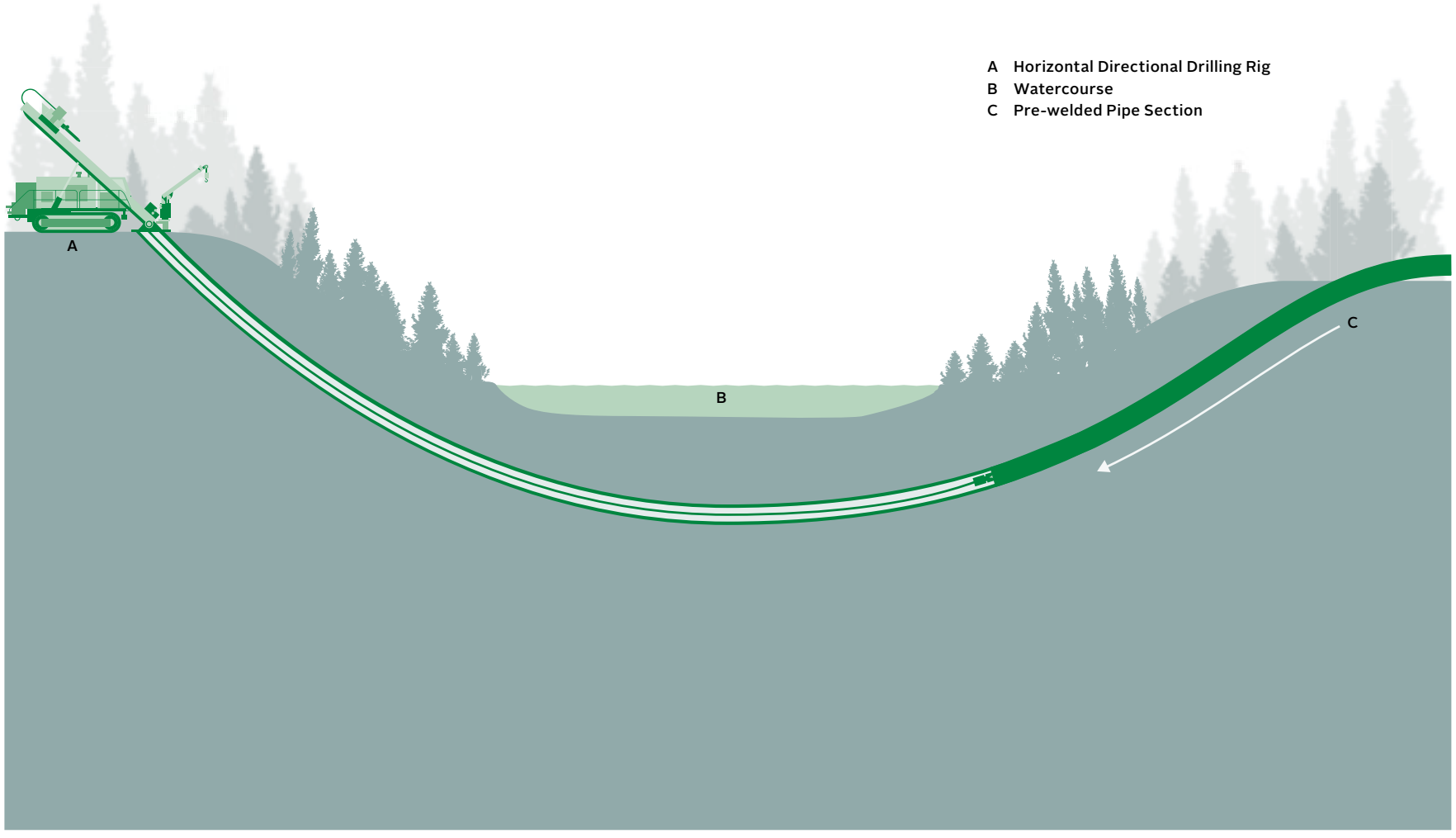


FIGURE 8.7 **HORIZONTAL DIRECTIONAL DRILLING**

Directional drilling or boring would avoid disturbing the bed and banks of fish-bearing watercourses.



sturgeon, sauger, and northern pike, as well as other large-bodied species that are not targeted for sport fishing, and small forage fish serving as prey items for larger fish.

Salmon is a regionally-important species that contributes to sport, commercial, and traditional use fisheries throughout coastal and interior British Columbia. All five Pacific salmon species (chinook, coho, sockeye, pink, and chum) and steelhead are found in the Skeena and Kitimat River drainages. Chinook, sockeye, and coho salmon are also present along the pipeline route within the Fraser drainage. The Morice River is a major fish-producing tributary of the Skeena River that supports important populations of salmon, trout, steelhead, and char species.

The white sturgeon is the largest freshwater fish in Canada. The Nechako River white sturgeon population is in a critical state of decline and is listed as Endangered on Schedule 1 of the *Species at Risk Act*, making it illegal to kill, harm, harass, or capture individuals. Sturgeon habitat is protected from degradation, disruption, or destruction under the federal *Fisheries Act*. The Nechako River white sturgeon is present in the Stuart and Endako Rivers in British Columbia.

Baseline data

Northern Gateway completed standard baseline fish and fish habitat surveys for most of the proposed watercourse crossings. Additional habitat surveys to verify site-specific fish use information and spawning habitat potential were conducted at potential high-risk crossings (where in-stream activities were likely to result in a harmful alteration, disruption, or destruction to fish habitat) and at selected watercourse crossings with high habitat sensitivity. Where field data was not collected, Northern Gateway relied on published information or information extrapolated from public data for nearby sites. Where insufficient data existed to verify fish presence or absence, fish habitat was assumed to be present. Northern Gateway proposed completing field work at unsurveyed sites and potential compensation sites prior to the *Fisheries Act* permitting phase and project construction.

Several parties were concerned that the baseline data presented by Northern Gateway was inadequate. Haisla Nation requested baseline information on the timing and use of habitat by life stage of each fish species inhabiting the Kitimat River. Fisheries and Oceans Canada said that incomplete or dated information is a key area of uncertainty, though Northern Gateway provided processes or methods to address this.

Northern Gateway said that the flow volumes during the proposed construction season for all crossing locations with no available survey or supplemental data were less than 0.5 cubic metres per second and rated as low-risk. Northern Gateway would survey unsurveyed watercourse crossings prior to submitting regulatory permitting applications and during detailed design.

Assessment approach

Northern Gateway said that interactions between fisheries resources and construction, operations, and decommissioning activities for pipelines, power lines, roads, and terminal development are well understood. Within all three project phases, there are activities with the potential to affect the productive capacity of fish habitat, fish mortality and health, and fish migration.

Northern Gateway followed Fisheries and Oceans Canada's Risk Management Framework to evaluate the project's potential for a harmful alteration, disruption, or destruction of fish habitat, based on habitat sensitivity and potential severity of adverse environmental effects.

The Coalition and the United Fishermen and Allied Workers Union questioned Northern Gateway's application of a habitat-based assessment, rather than focusing on conservation units. Conservation units are defined as groups of wild salmon sufficiently isolated from other groups that, if lost, would be unlikely to re-colonize naturally within an acceptable time frame. The United Fishermen and Allied Workers Union said that the proposed pipeline route would run through a number of salmon fisheries conservation units and many important spawning areas.

Northern Gateway responded that, while conservation unit status is an important consideration, the only way to have an adverse effect during construction and operations is through habitat alteration. Northern Gateway said that there would not be adverse effects to habitat as a result of the project and, therefore, there would not be effects on the fish.

Project effects

Northern Gateway said that potential effects of construction on fish habitat productive capacity include changes to habitat structure and cover, sediment concentrations, water temperature, nutrient concentrations, food supply, and in migration or access to habitats. The extent to which fish habitat productive capacity may be altered by the project's pipeline watercourse crossing construction activities depends on the crossing method, construction windows, duration of in-stream construction and habitat restoration, as well as the sensitivity of the habitat to disturbance (e.g., species sensitivity, habitat dependency and resiliency).

Freshwater fish habitat

Northern Gateway said that fish-bearing watercourses would be affected by power line, road, and pipeline crossings, and by construction of the Kitimat Terminal. Northern Gateway said that power line and road crossings can be completed without a harmful alteration, disruption, or destruction of fish habitat, by applying best management practices.

The Kitimat Terminal would require substantial modification or infilling of approximately 1,500 metres of the tributaries of Renegade Creek in the Douglas Channel watershed, resulting in a direct loss of fish habitat. Northern Gateway said that no fish were observed in either tributary, though there is connectivity to known fish-bearing reaches of Renegade Creek. The permanently lost sections of these two tributaries would be compensated for through Northern Gateway's Freshwater Fish and Fish Habitat Compensation Plan. The development would also result in flow reductions in Renegade Creek from these watercourses, resulting in reduced quality of habitat downstream.

Sediment concentrations

Northern Gateway predicted little to no effects at watercourse crossings where trenchless methods are used. Project effects would be greater at trenched crossings (isolated and open-cut), where construction activities would occur in or adjacent to active channels.

Of the potential identified effects at trenched crossings, Northern Gateway said that increased sediment concentrations pose the greatest risk to the productive capacity of watercourses to be crossed by the right-of-way. High levels of turbidity and suspended sediments can affect the ability to feed, increase susceptibility to predation, suppress immune function and reproduction, and, in extreme levels, cause the direct mortality of fish.

The Coalition said that salmon are highly sensitive to sedimentation increases, which can cause adverse effects ranging from increased mortality to changes in behavior. Northern Gateway said that sedimentation increases can be effectively mitigated using appropriate watercourse crossing techniques, avoiding crossings with unstable channel beds and banks, and re-vegetating channel banks after construction to increase bank stability.

Least risk periods

During certain time periods and seasons, effects of in-stream work and habitat alteration can be particularly harmful to fish egg incubation and fish growth and development. Northern Gateway characterized its preferred timing of in-stream works to avoid these times as "least risk periods." Northern Gateway's defined least risk periods are based on known or suspected fish species present in the stream or watershed. Northern Gateway committed to establish a provisional least risk period for streams with no established least risk period.

Fisheries and Oceans Canada said that least risk periods are a best management practice and are not specifically required. It also said that other mitigation measures may be applied to protect fish and fish habitat.

Northern Gateway said that 77 watercourses along the project route have no established least risk period due to overlapping spawning and incubation times of various salmon, trout, char, and whitefish in the watersheds. As a result, any in-stream works would pose potential risks to fish health and may result in increased mortality risk to spawning fish or developing embryos.

Horse Lake First Nation questioned Northern Gateway's ability and commitment to work within least risk periods. Fisheries and Oceans Canada said that it expects the majority of in-stream works, particularly those in more sensitive and valuable fish habitats, to be scheduled during least risk periods. Fisheries and Oceans Canada recognized that, in some cases, this may not be possible. For this project, it acknowledged that Northern Gateway may apply other applicable mitigation measures to protect fish and fish habitat. Mitigation options include alternate crossing methods and other mitigation measures outlined in Northern

Gateway's Construction Environmental Protection and Management Plan.

Fisheries and Oceans Canada said that it was generally satisfied with Northern Gateway's approach to selecting construction techniques and that the risk to fish and fish habitat in the freshwater environment could be managed by implementing appropriate mitigation and compensation measures, provided that Northern Gateway meets its commitments to mitigate and offset effects.

Northern Gateway made commitments with respect to the Nechako River white sturgeon population in the Stuart and Endako Rivers, including a commitment to use trenchless crossing methods for both rivers. Northern Gateway identified mitigation measures in its White Sturgeon Environmental Protection and Mitigation Plan.

Mitigation measures

Northern Gateway committed to:

- primary and contingency watercourse crossing techniques based on sensitivity of the fish and fish habitat, channel size, and expected discharge at the proposed time of construction;
- leave shrubs, stumps, and root systems in place within 16 metres of pipeline watercourse crossings. Riparian areas, banks, and in-stream habitats would be stabilized immediately, upon completion of work, to reduce erosion risks following construction;
- mitigation measures with respect to watercourse crossings included in its preliminary Construction Environmental Protection and Management Plan;
- a White Sturgeon Environmental Protection and Mitigation Plan to minimize potential effects on the Nechako River white sturgeon population, and trenchless crossing methods for the Stuart and Endako Rivers, where white sturgeon are known to occur;
- conduct in-stream works during the least risk periods that have been identified for each particular crossing or variance approved by federal and provincial fisheries authorities;
- conduct additional site sampling on streams with no established least risk period to establish a provisional least risk period that reflects actual habitat use by fish during that period;
- where adverse effects cannot be avoided or mitigated, develop a Freshwater Fish and Fish Habitat Compensation Plan in cooperation with Fisheries and Oceans Canada, according to its policies and mandate, to offset the corresponding loss of habitat productive capacity. A final plan would be developed prior to construction and would be submitted as part of Northern Gateway's application for a subsection 35(2) *Fisheries Act* authorization for any harmful alteration, disruption, or destruction of fish habitat that might occur because of the project.

Monitoring and follow-up

Northern Gateway committed to provide full-time construction monitoring for in-stream works, or works that pose moderate- to high-risk to fish habitats. Monitoring commitments with respect to watercourse crossings are outlined in the preliminary Construction Environmental Protection and Management Plan.

Northern Gateway did not propose a follow-up program for project effects on fish and fish habitat. It would undertake post-construction follow-up programs if Fisheries and Oceans Canada determines that a harmful alteration, disruption, or destruction of fish habitat would occur, or if an unanticipated environmental effect occurs.

Views of the Panel

ON PROJECT EFFECTS ON FRESHWATER FISH AND FISH HABITAT

The Panel finds that Northern Gateway has provided an adequate level of information to understand the likely effects of the project on fish and fish habitat, and whether project effects would be significant. Given the risk management approach undertaken by Northern Gateway, and its commitment to continued watercourse crossing refinements, the Panel is satisfied that Northern Gateway can manage risks to fish and fish habitat resulting from the project by applying appropriate mitigation measures. The Panel requires Northern Gateway to develop site-specific watercourse crossing plans to demonstrate that the potential adverse effects to fish and fish habitat can be kept sufficiently small.

Northern Gateway committed to work within established least risk periods. Limiting in-stream works to least risk periods reduces risks for some of the more vulnerable life stages of fish by avoiding times of spawning and egg incubation. Least risk periods are a best practice and not specifically required under the federal *Fisheries Act*. Northern Gateway may still apply other applicable mitigation measures if needed, such as alternate crossing methods, to protect fish and fish habitat in watercourses that do not have an established least risk period.

The Panel requires Northern Gateway to specify its provisional least risk period for each watercourse crossing without an established least risk period, the rationale for the provisional period, any additional mitigation measures to be applied, and a summary of its consultation on the provisional period and proposed mitigation measures.

Northern Gateway has used Fisheries and Oceans Canada's Risk Management Framework to evaluate the project's potential for a harmful alteration, disruption, or destruction of fish habitat. Northern Gateway's habitat-based approach is appropriate. Fisheries resources can be protected through appropriate mitigation and by protecting fish habitat, provided Northern Gateway meets its commitments to mitigate and offset adverse effects.

The Panel finds that Northern Gateway's proposed mitigation measures, including its commitment to use trenchless crossings for the Stuart and Endako Rivers, which are habitat for the Nechako River white sturgeon population, are sound.

Pipeline construction pathways of effects on fish and fish habitat are well understood and standard mitigation measures can be used to minimize adverse effects to habitat. The Panel finds that the project would not result in a long-term adverse effect on fish populations.

EVALUATION OF ADVERSE PROJECT EFFECTS ON FRESHWATER FISH AND FISH HABITAT AFTER MITIGATION

Temporal extent
Effects are anticipated to be limited to the construction season and predicted to be reversible for most crossings except two tributaries to Renegade Creek, which would be in-filled for terminal construction.

Spatial extent
Effects would be localized to each crossing and its zone of influence.

Intensity
Given the proposed mitigation (including appropriate crossing techniques, least risk periods, and stabilization to control erosion), no measureable reduction in numbers of any fish species is anticipated, and any serious harm to fish and fish habitat would be offset through the Freshwater Fish and Fish Habitat Compensation Plan.

Recommendation for significance of project effects after mitigation
Given the proposed mitigation (including offsets) and the localized nature of effects, the Panel recommends that the project is not likely to result in significant adverse effects with respect to freshwater fish and fish habitat.

Views of the Panel

ON CUMULATIVE EFFECTS ON FRESHWATER FISH AND FISH HABITAT

The Panel finds that the project would result in adverse effects on freshwater fish and fish habitat after applying mitigation. These effects would not be significant. Pipeline construction pathways of effects on fish and fish habitat are well understood, effects would be localized, and standard mitigation measures can be used to minimize adverse effects to habitat, limiting the potential for cumulative effects. The Panel finds that a detailed discussion of cumulative effects is not required for effects on freshwater fish and fish habitat.

8.7.5 SURFACE AND GROUNDWATER RESOURCES

The primary concern about surface and groundwater resources is that the project could lead to increased acidity in runoff and seepage water by exposing rock that contains reactive sulphide minerals, such as pyrite.

The Office of the Wet'suwet'en were concerned about the exposure of potentially acid-generating rock at the Clore tunnel site because it is located upstream from high-value salmon habitats with pristine water quality.

Northern Gateway said that a priority for water management is avoiding mixing pristine waters with waters potentially affected by acid-generating material. Surface water can be diverted around exposed rock or drain pipes can be installed to drain groundwater. Under certain circumstances, drainage channels can be lined with limestone to provide added neutralization capacity.

Environment Canada was satisfied that the implementation of Northern Gateway's commitments would protect surface water quality from acid rock drainage. Environment Canada recommended that Northern Gateway engage appropriate regulatory authorities, including Environment Canada, in developing final acid rock management procedures and mitigation measures prior to construction.

Mitigation measures

In addition to the general mitigation measures outlined in its application, Northern Gateway committed to:

- implement site-specific measures and mitigation strategies that would be developed after detailed design, as stated in the Acid Rock Management Plan that was submitted as part of the preliminary Construction Environmental Protection and Management Plan;
- complete annual aerial right-of-way reconnaissance to confirm the effectiveness of the drainage mitigation measures implemented during construction;
- undertake annual groundwater quality monitoring at pump stations and the Kitimat Terminal during operations;
- carry out blasting activities as outlined in the Blasting Management Plan, which includes identifying and collecting data from groundwater wells within 500 metres of blasting.

Monitoring and follow-up

Northern Gateway committed to:

- monitor for acid rock drainage during construction, as outlined in its Acid Rock Drainage and Metal Leaching Field Investigation Report;
- post-construction monitoring to confirm the potential effects on surface water and groundwater quality from exposure of potentially acid-generating rock, based on conditions identified during construction;
- Northern Gateway proposed a follow-up program to determine the water quality of groundwater drainage from the portals of the Hoult and Clore tunnels.

Views of the Panel

ON PROJECT EFFECTS ON SURFACE AND GROUNDWATER RESOURCES

In the context of this project, acid rock drainage potential is a key water quality issue. The extent of potentially acid-generating rock has not been fully determined. Northern Gateway said that it would develop site-specific mitigation measures for acid rock drainage during detailed engineering and it committed to engaging appropriate regulatory authorities, including Environment Canada, in developing final acid rock management procedures and mitigation measures. The Panel finds that site-specific mitigation measures for acid rock drainage are sufficiently well-known and it is satisfied that effective site-specific mitigation can be developed.

Subsection 36(3) of the *Fisheries Act* prohibits the deposit of deleterious substances in water frequented by fish. The *Fisheries Act* defines a deleterious substance as any substance that, if added to water, makes the water deleterious to fish or fish habitat. Environment Canada is responsible for administering this subsection.

To prevent environmental degradation from acid rock drainage, the Panel requires Northern Gateway to develop and implement an acid rock drainage monitoring and follow-up program. This program would determine the post-construction water quality of groundwater drainage from the Hoult and Clore tunnel portals, all acid rock storage sites, and receiving water bodies.

EVALUATION OF ADVERSE PROJECT EFFECTS ON SURFACE AND GROUNDWATER RESOURCES AFTER MITIGATION

Temporal extent
Hydrological effects are generally reversible, with the exception of groundwater drainage from the Hoult and Clore tunnels, which is expected to be permanent.

Spatial extent
Limited to areas of high potential for acid-generating rock, such as the Hoult and Clore tunnels.

Intensity
Only preliminary estimates of groundwater discharges from the Hoult and Clore tunnels are available. Appropriate mitigation measures are understood and would be implemented to prevent environmental degradation from acid rock drainage.

Recommendation for significance of project effects after mitigation
Given that appropriate mitigation would be developed, the Panel recommends that the project is not likely to result in significant adverse effects with respect to surface and groundwater resources.

Views of the Panel

ON CUMULATIVE EFFECTS ON SURFACE AND GROUNDWATER RESOURCES

The Panel finds that the project would result in adverse effects on surface and groundwater resources after applying mitigation. These effects would not be significant. Mitigation measures for acid-generating rock would effectively reduce the potential for effects on surface and groundwater resources and potential for interaction with effects of other projects is limited. The Panel finds that a detailed discussion of cumulative effects is not required for effects on surface and groundwater resources.

8.7.6 MARINE MAMMALS

Northern Gateway said that interactions between marine mammals and project-related marine transportation are expected to occur in the Confined Channel Assessment Area and Open Water Area during construction, operations, and decommissioning. Potential marine transportation issues that Northern Gateway identified in its application include physical injury or death from vessel strikes and behavioural effects due to underwater noise from vessels. Northern Gateway said that reporting traffic in Wright Sound can vary, but project-associated tankers would represent 10 per cent of reporting traffic. Project-associated tankers would represent approximately one-third of reporting traffic in Douglas Channel.

Baseline data

Northern Gateway said that there is limited knowledge concerning the abundance, distribution, and critical habitat of many marine mammal species, particularly for those that are rare or that inhabit remote, seldom-visited areas. Northern Gateway reviewed data sources for marine mammals from government documents, journal articles, regulatory sources, and personal communications. Northern Gateway also conducted surveys for marine mammals to inform its assessment of the environmental effects of the project by describing the presence, distribution, and relative abundance of marine mammals potentially affected by project-related marine transportation. Northern Gateway said that the amount and quality of baseline information it collected was appropriate for the purposes of its environmental assessment.

Raincoast Conservation Foundation, Coastal First Nations, North Coast Cetacean Society, and Gitga'at First Nation said that Northern Gateway's marine mammal surveys were technically inadequate to provide the necessary information about seasonal marine mammal densities and distribution to understand potential effects of the project. Intervenors said that more comprehensive marine mammal surveys should be conducted prior to making a decision on the project so that effects can be fully appreciated. For example, Raincoast Conservation Foundation said that baseline surveys should have provided population and density estimates for all species present in the project area to allow regional comparisons.

Northern Gateway committed to conducting additional marine mammal surveys of the Confined Channel Assessment Area, if the project is approved. Trained observers would complete additional surveys using appropriate survey techniques 6 to 12 times per year during the terminal construction period, and for a minimum of 3 years before starting terminal operations, and 3 years into operations. The purpose of these surveys would be to determine which species occur in the Confined Channel Assessment Area and approaches, how these species are using the habitat, the frequency of use, seasonality and timing of occurrence, density, and distribution. The presence of any marine mammal species, whether the species was selected as key indicator species or not, would be recorded during monitoring surveys as part of the Marine Mammal Protection Plan. In addition, Northern Gateway committed to undertaking a cooperative marine mammal research initiative and broad-scale regional assessment program in collaboration with other interested parties to fill gaps in baseline information and increase confidence in significance predictions. Northern Gateway said that the results of its additional marine mammals surveys, and research conducted by a collaborative marine research program, would inform its Marine Mammal Protection Plan and the plan would be adapted as needed to reflect the results.

Fisheries and Oceans Canada said that Northern Gateway's completed baseline surveys were inadequate to be able to currently assess the risk of serious injury or mortality to whales from vessel strikes. Northern Gateway said that it could not begin its proposed quantitative vessel strike risk analysis until it completed additional marine mammal surveys and more complete baseline information for marine mammal densities was available post-approval. Fisheries and Oceans Canada agreed with Northern Gateway's proposal to design and implement a post-approval study that better describes the spatial and seasonal occurrence and densities of marine mammals in the Confined Channel Assessment Area. It said that, although there is uncertainty regarding the potential effects of the project, they can be managed through research, monitoring, mitigation, as well as adaptive management, where additional measures can be implemented to avoid effects.

North Coast Cetacean Society and Raincoast Conservation Foundation filed detailed marine mammal survey evidence regarding seasonal abundance and marine mammal distribution in the Confined Channel Assessment Area. Northern Gateway said that it wanted to work with these and other parties with expertise and information to fill remaining data gaps. It said that it is in discussions with Raincoast Conservation Foundation to develop, finalize, and implement Marine Mammal Protection Plans. North Coast Cetacean Society said that it does not intend to participate in marine mammal surveys or research initiated and funded by Northern Gateway.

Views of the Panel

ON MARINE MAMMAL BASELINE DATA

Northern Gateway has collected only a limited amount of baseline data for the purpose of predicting and mitigating adverse effects on marine mammals, but it said that it is committed

to conducting additional marine mammal surveys, if the project is approved. A cooperative marine mammal research initiative could have value in bringing together multiple partners to conduct resource-intensive research on marine mammals and filling existing data gaps to mitigate the effects of shipping in the region, from the project and otherwise.

The Panel finds that Northern Gateway's voluntary commitments to gather further baseline data, and to implement mitigation and monitoring to reduce its contribution to the effects of shipping on marine mammals, are above and beyond industry standards. Requiring Northern Gateway to conduct comprehensive marine mammal surveys, to the extent and intensity suggested by some participants, before knowing whether the project was allowed to proceed, would place an undue burden on a single prospective shipper. Despite Northern Gateway's plan to delay additional marine mammal surveys until after any approval, the Panel finds that Northern Gateway's overall approach remains careful and precautionary in the face of uncertainty. Its marine mammal surveys would provide important information on which to base refinements of mitigation and monitoring measures in Northern Gateway's Marine Mammal Protection Plan for use during project operations. It would also fill existing data gaps that would benefit current and prospective shippers in the region.

The Panel requires Northern Gateway to develop Marine Mammal Protection Plans for construction and operations in accordance with its proposed plan framework. The required plans would identify mitigation to be implemented during each phase, as well as details regarding survey design and analysis, and how ongoing monitoring and research results will be, and have been, incorporated into the plans. The Panel also requires Northern Gateway to report on its monitoring and research results, and how it is adaptively managing effects on marine mammals, for the project's operational life.

As part of its plan development, the Panel requires Northern Gateway to consult with stakeholders, regulatory authorities, and Aboriginal groups. Robust survey design and analysis, developed through consultation with marine mammal experts, would allow collected data to be used with as much statistical certainty as possible. It would also help reduce adverse effects to the greatest extent possible through informed mitigation and adaptive management.

By communicating and reporting on the results of its marine mammal mitigation and monitoring activities, the project would also contribute to increased knowledge about marine mammals along the northwestern coast of British Columbia. This could potentially improve mitigation measures for a variety of marine users in the area, resulting in improved species protection.

Given the current limited knowledge about marine mammals, the Panel has confidence that Northern Gateway's commitments to monitoring and research would provide valuable information to allow it to develop additional mitigation, if needed, based on the results.

Species at risk

Throughout the Panel's process, including in letters of comments and oral statements, many participants expressed concern about the potential effects of tanker traffic on threatened or endangered marine mammals and their habitat. Table 8.2 identifies species listed under the *Species at Risk Act* that occur in the project area.

Northern Gateway said that it conducted its assessment of marine mammal species at risk occurring in the project area to the best of its abilities, given available science. While no critical habitat under the *Species at Risk Act* had been formally designated for marine mammals in the project area at the time of the Panel's review, the Panel heard evidence on important habitat areas that may be considered for critical habitat status.

Northern Gateway's assessment identified northern resident killer whales (toothed whales), humpback whales (baleen whales in the Confined Channel Assessment Area), fin whales (baleen whales in the Open Water Area), and Steller sea lions (seals and sea lions) as key indicator species for marine mammals. Northern Gateway selected these species based on shared similarities of how the project may affect species within each grouping.

Northern Gateway assessed the risk of vessel strikes on the viability of the entire North Pacific population of humpback whales, as a representative of all baleen whales. Humpback whale numbers have been increasing and, in 2011, the Committee on the Status of Endangered Wildlife in Canada proposed to downgrade the humpback whales'

status from Threatened to Special Concern. Fisheries and Oceans Canada has requested that the Committee on the Status of Endangered Wildlife in Canada re-assess its proposal to downgrade the status of the species. It said that, while the *Species at Risk Act* recognizes a single North Pacific humpback whale population, new information from ongoing research shows the possibility that discrete sub-populations of humpback whales may exist in British Columbia waters.

Fisheries and Oceans Canada said that the formal designation of critical habitat for humpback whales, which would include the biophysical features and attributes necessary for the species to carry out specific functions associated with its life processes, was imminent with the finalization of the recovery strategy for the North Pacific humpback whale population. Designated critical habitat would become legally-protected under the *Species at Risk Act* once a final recovery strategy is released. Fisheries and Oceans Canada said that any project activity that could interfere with a species' foraging efficiency, or cause displacement from important feeding sites as a result of disturbance, would be considered as affecting designated critical habitat in a harmful manner. It said that it is difficult to quantify what constitutes habitat destruction.

Views of the Panel

ON SPECIES AT RISK

The Panel's analysis considered effects on all of the marine mammal species listed under the *Species at Risk Act* that occur in the project area. Where specific details about a particular species are relevant, they are discussed in this chapter. The analysis that follows with respect to the significance of adverse effects on marine mammals is relevant to all of the listed species identified above.

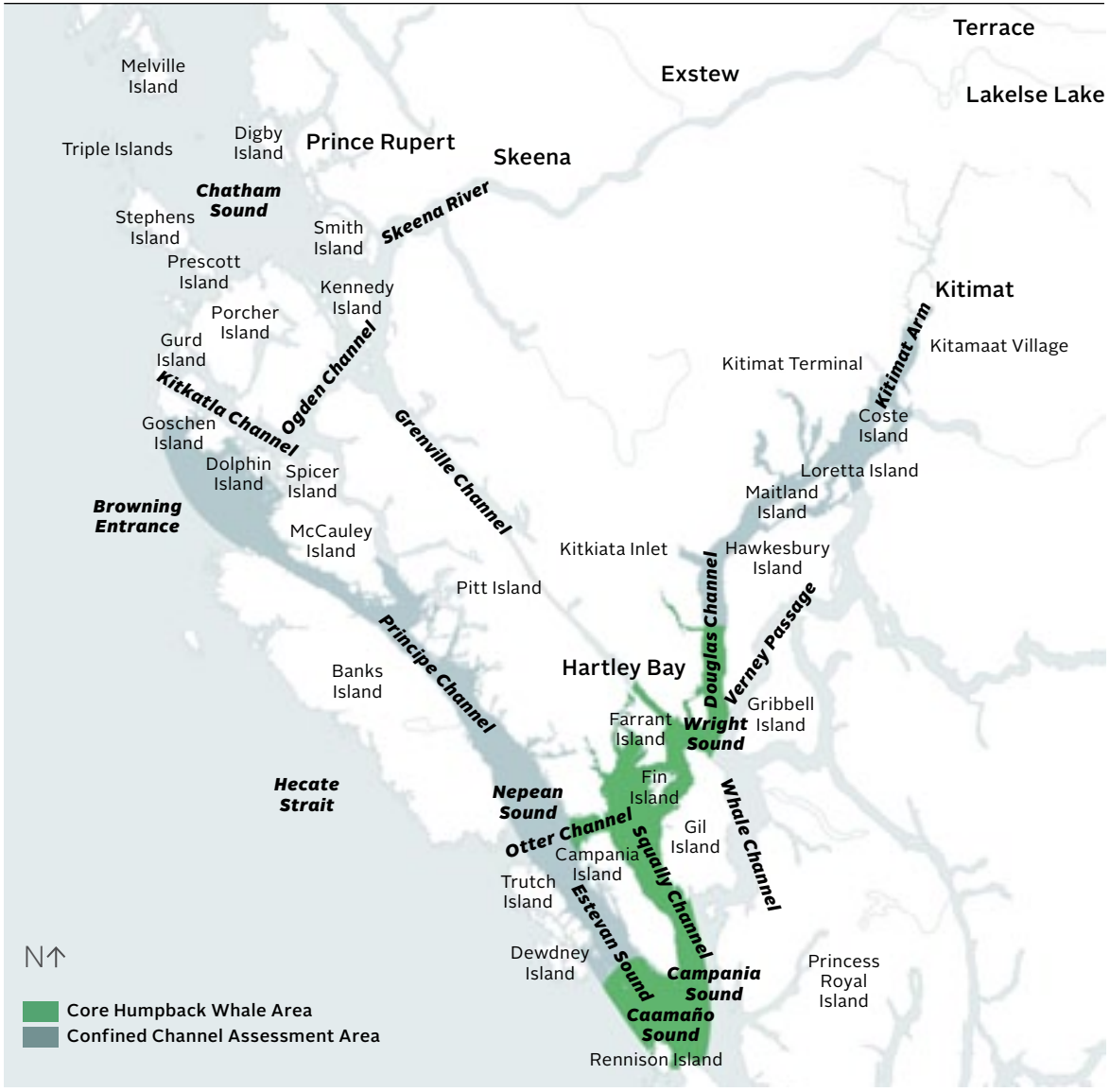
TABLE 8.2 **MARINE MAMMAL SPECIES LISTED UNDER THE *SPECIES AT RISK ACT* THAT OCCUR IN THE PROJECT AREA**

Species	Schedule 1 Status
Harbour porpoise	Special Concern
Northern resident killer whale	Threatened
Transient (Bigg's) killer whale	Threatened
Offshore killer whale	Threatened
Humpback whale	Threatened
Gray whale	Special Concern
Fin whale	Threatened
Blue whale	Endangered
Sei whale	Endangered
North Pacific right whale	Endangered

PROJECT EFFECTS OF VESSEL STRIKES ON MARINE MAMMALS

Northern Gateway said that it is not possible to completely eliminate the risk of marine mammals being struck by vessels and potentially injured or killed. Implementing mitigation measures would reduce the likelihood of strikes occurring. Northern Gateway said that, along the coast of British Columbia, humpback whales are the most commonly struck whale species reported in Fisheries and Oceans Canada's marine mammal vessel strike database. Fourteen confirmed strikes were reported between 2003 and 2008 along the coast of British Columbia; an average of approximately three per year. Fisheries and Oceans Canada's database is not corrected for effort and likely underestimates actual strikes due to a general lack of reporting. Northern Gateway said that, in the Confined Channel Assessment Area, baleen humpback and fin whales would be the species most likely to be struck. Northern Gateway said that whale strikes have been reported in the Confined Channel Assessment Area (Wright Sound and Estevan Sound). It said that toothed whales, seals, and sea lions are rarely struck by vessels since these marine mammals are fast swimming and agile, enabling them to avoid approaching vessels. While it is unknown how many individuals could actually be struck, Northern Gateway said that the likelihood and frequency of this happening would be low. Fisheries and Oceans Canada said that humpback and fin whales are more vulnerable to vessel strikes because they are found closer to shorelines where shipping is concentrated.

FIGURE 8.8 **NORTHERN GATEWAY'S DEFINED CORE HUMPBACK WHALE AREA WITHIN THE CONFINED CHANNEL ASSESSMENT AREA**



Northern Gateway said that modelling of British Columbia waters has predicted areas where vessel strikes are most likely to occur, based on current vessel traffic patterns and a systematic cetacean survey of the Inside Passage. This modelling cannot estimate how many strikes might occur. A study cited by Northern Gateway predicted that Dixon Entrance and areas coincidental with elevated vessel movement patterns in Hecate Strait were areas of relatively high-risk for vessel strikes of fin and humpback whales. The same study reported that, between 1998 and 2000, there were 8 fin whale strikes (all fatal) and 10 killer whale strikes (5 fatal) in British Columbia and Washington waters.

The increase in vessel strikes of whales resulting from the project is unknown. Northern Gateway committed to conducting a quantitative vessel strike risk analysis. The risk analysis would predict the likelihood and frequency of vessel strikes in both the approach lanes and the Confined Channel Assessment Area, the potential effects of vessel strikes on marine mammal populations, and the best mitigation measures to reduce the risk of strikes. A working group of technical experts would guide the study, and would include participation from various stakeholders, including Fisheries and Oceans Canada, Aboriginal groups, third party marine mammal experts, and other shippers.

Gitga'at First Nation said that the quantitative vessel strike risk analysis should have been completed and submitted as part of the Panel's assessment, prior to project approval.

Northern Gateway committed to developing a Marine Mammal Protection Plan in consultation with interested stakeholders. It said that it would adhere to it during the life of the project and modify it to address unanticipated effects or ineffective mitigation measures, if monitoring shows that it is needed. It would include mitigation measures identified as a result of the quantitative vessel strike risk analysis in its Marine Mammal Protection Plan.

Northern Gateway would adapt its proposed mitigation measures to the area where tankers are navigating and the time of year. For example, in the core humpback area (Figure 8.8), which Northern Gateway defined based on Fisheries and Oceans Canada's proposed (2010) approximate boundaries of candidate critical habitat for humpback whale, Northern Gateway proposed implementing specific vessel speed restrictions. It also proposed using a dedicated whale monitoring vessel to survey the area before tanker passage. As part of an adaptive management approach, the boundaries of the core humpback area could change as a result of future monitoring results. Additional areas could be defined for other species.

Northern Gateway's marine voluntary commitments would require tankers to modify their speed in the areas through which they would navigate to reduce the risk of marine mammal strikes. Northern Gateway said that serious or lethal vessel strikes of whales are infrequent at vessel speeds of less than 14 knots and are rare at speeds of less than 10 knots. The speed restrictions would take into consideration seasonal variations in habitat use, such as migrating and feeding season.

Fisheries and Oceans Canada said that 23 per cent of all internationally-confirmed vessel strikes causing death or serious injury to whales took place at speeds of 10 knots or less. It said that slowing vessel speeds would prolong marine mammal exposure to noise, albeit at a lower level, and potential effects such as noise masking may not be fully mitigated. It said that not enough is known about the behavioral responses of whales to vessels at different speeds, and that there is uncertainty as to what extent speed limits reduce the vulnerability of the animals to be struck.

Gitga'at First Nation said that lethal strikes increase significantly from 10 to 14 knots and suggested that 10 knots would be a more appropriate speed limit to reduce the incidence and severity of vessel strikes of baleen whales. It said that speed limits should be applied year-round since marine mammals, including listed species, are present during the winter months, although in lesser numbers. It also said that toothed whales are also vulnerable to vessel strikes and that killer whales should be included in mitigation plans.

Northern Gateway's commitments to speed restrictions are outlined in the table of mitigation measures at the end of this section. Northern Gateway said that its commitment to a focused marine mammal monitoring and survey program is unprecedented in Canada. It said that other large vessels moving through the area travel at speeds of 14 to 18 knots, and that cruise ships travel at speeds as high as 22 knots. ForestEthics said that it would be beneficial if all operators adopted the same mitigation measures that Northern Gateway committed to.

Northern Gateway committed to using remote detection technology to detect the presence of

vocal marine mammals during conditions of poor visibility. North Coast Cetacean Society said that Northern Gateway's commitment to use passive acoustic monitoring to monitor the seasonal presence and vocal characterizations of marine mammals in the Confined Channel Assessment Area would be of limited value as a mitigation measure. This was due to the lack of vocalizations of some species and the uncertainty regarding the actual location of the whale whose sound was detected. As an example of remote detection technology effectiveness, Northern Gateway presented one case study where a real-time passive acoustic monitoring system informed vessel operators of whale presence in order to reduce the risk of a vessel strike.

Northern Gateway said that large vessel traffic has been occurring along the British Columbia coast for many years, and marine mammals continue to be commonly observed. Some species numbers, such as humpback whales, are increasing. Northern Gateway offered information from other parts of the world where shipping traffic is high to demonstrate that mitigation measures can be effective in reducing lethal vessel strikes. For example, Northern Gateway said that mitigation has been successful for effects of shipping (from vessel strikes and noise) on the endangered North Atlantic right whale population in Boston harbour, where shipping traffic is 10 to 20 times higher than all current and proposed tanker traffic in the region of this project. Fisheries and Oceans Canada said that it has been participating in studies to better understand what mitigation measures work best to reduce lethal vessel strikes of North Atlantic right whales.

Coastal First Nations, Gitga'at First Nation, and North Coast Cetacean Society questioned the proven effectiveness of Northern Gateway's proposed mitigation, and the lack of detail and preliminary nature of its proposed Marine Mammal Protection Plan regarding vessel strike mitigation measures. For example, Raincoast Conservation Foundation and Gitga'at First Nation said that tankers may not be able to adjust their routes to avoid marine mammals when navigating in confined inlets and channels, and that this would increase the risk of marine mammal vessel strikes in these confined areas.

Northern Gateway filed a summary of key literature sources for relevant scientific studies to show how its proposed mitigation measures have been implemented elsewhere to minimize or prevent environmental effects on marine mammal populations in proximity to industrial activities caused by underwater noise and vessel traffic comparable to that predicted for the project. It also provided examples of other projects and regulatory authorities that have adopted these strategies. Northern Gateway said that it would use the results of its proposed marine mammal monitoring to assess the effectiveness of its measures and, if required, it would adaptively modify mitigation measures or implement new measures to address unanticipated effects.

Northern Gateway said that the effects of injury or mortality from vessel strikes would be within the range of baseline or natural variation and would not have a significant effect on marine mammal populations, given the implementation of its proposed mitigation measures. Some intervenors said that Northern Gateway has not quantified or substantiated this conclusion. Fisheries and Oceans Canada said that it also could not accurately predict what the ship strike risk was because of a lack of high resolution spatial information for the Confined Channel Assessment Area. Northern Gateway said that identifying project effects with statistical significance is often not possible due to the multiple natural and anthropogenic factors that may influence marine mammal species density and distribution. Northern Gateway said that it was interested in collaborating with stakeholders on study designs and methodologies that would allow for statistically-significant monitoring of project effects.

Northern Gateway said that the potential effect of vessel strikes, after mitigation, would be not significant in both the Confined Channel Assessment Area and the Open Water Area. Northern Gateway defined a significant environmental effect remaining after mitigation as one that would affect the long-term viability of a species' population or delay its recovery. Northern Gateway said that an environmental effect on an individual or group within a species (or its habitat) in a manner similar to natural variation would not be considered significant. It also concluded that, even if some marine mammals are struck and killed by project-related vessels, these mortalities would not affect the recovery or survival of threatened or endangered species. Northern Gateway did not support this conclusion with data. It said that it would not conduct a quantitative analysis of the risks of vessel strikes until post-approval.

Some participants said that even a single individual marine mammal being injured or killed by a vessel strike should be considered a significant effect.

Mitigation measures

Northern Gateway committed to:

- conduct a quantitative vessel strike risk analysis in both the approach lanes and the Confined Channel Assessment Area in collaboration with interested stakeholders;
- adapt the spatial extent of tanker approach lanes and vessel speeds, based on results of the quantitative vessel risk analysis;
- avoid candidate humpback whale critical habitat through the preferential use of the Northern approach;
- from 1 May to 1 November, use observers on a dedicated whale monitoring vessel to survey the core humpback area before tanker passage and to recommend site-specific tanker route adjustments, depending on the number of whales present, to be followed unless otherwise required for safe navigation;
- require tankers and tugs to adhere to the following vessel speeds:
    - in the core humpback area – 8 to 10 knots from 1 May to 1 November;
    - in the core humpback area – 10 to 12 knots for the remainder of the year;
    - in the Confined Channel Assessment Area – 10 to 12 knots year-round;
    - in the approach lanes to the Confined Channel Assessment Area – less than 14 knots from 1 May to 1 November; and
    - in the approach lanes to the Confined Channel Assessment Area – 14 to 16 knots for the remainder of the year; and
- use remote detection technology, such as passive acoustic monitoring, to detect the presence of vocal marine mammals during conditions of poor visibility.

Monitoring and follow-up

Northern Gateway committed to:

- implement a follow-up program to verify predictions made in its assessment of potential effects on marine mammals and to determine mitigation measure effectiveness, including untested ones, such as the use of a whale monitoring vessel;
- have trained observers conduct monitoring surveys using appropriate survey techniques, 6 to 12 times per year through the terminal construction period, and for a minimum of 3 years prior to starting terminal operations, and 3 years into operations; and
- conduct a passive acoustic monitoring study to monitor the seasonal presence and vocal characterizations of marine mammals in the Confined Channel Assessment Area for 2 years before starting marine terminal operations and 2 years after starting operations, with the option of additional years, if required.

Research

Northern Gateway committed to:

- conduct research on remote detection technology effectiveness; and
- undertake cooperative marine mammal research initiatives and a broad-scale regional assessment program in collaboration with other interested parties to fill gaps in baseline information and increase confidence in effects prediction.

Views of the Panel

ON PROJECT EFFECTS OF VESSEL STRIKES ON MARINE MAMMALS

The Panel finds that vessel strikes, from both project-related tankers or from any other tankers or vessels navigating through the region at the present time or in the future, cannot be completely avoided. Some individual marine mammals may be injured or killed if struck by project-related vessels. Large vessel traffic has been occurring along the British Columbia coast for many years and marine mammals continue to be commonly observed. Some species numbers, such as humpback whales, are increasing.

Northern Gateway has voluntarily committed to a number of mitigation measures that would reduce, but not eliminate, the potential for vessel strikes along the tanker routes. It said that these measures are unprecedented in Canada. For example, Northern Gateway committed to using remote detection technology during conditions of poor visibility, marine mammal observers in the core humpback area, and speed limits along tanker routes. Given that these commitments go beyond what is industry standard for the rest of shipping along the British Columbia coast, the Panel finds that these voluntary commitments are commendable.

The Gitga'at First Nation disagreed with the speed limits Northern Gateway proposed for tankers and tugs. The Panel finds that Northern Gateway's proposed speed limits are appropriate, given their basis on currently-available science, the relative decrease in speed compared to other marine traffic, and the ability to adaptively manage speed limits based on the outcomes of future research, monitoring, and follow-up.

The Panel finds that Northern Gateway's assessment of the risk of vessel strikes to affect the viability of the North Pacific population of humpback whales, as a whole, may not adequately capture the effects of the project on humpback whales present in Canadian waters. Fisheries and Oceans Canada raised the possibility that there might be distinct sub-populations of humpback whales along the coast of British Columbia. It would be more appropriate from a precautionary perspective to specifically assess the risk of vessel strikes to affect the viability of British Columbia's humpback whale populations. Northern Gateway should implement measures, such as those it has already identified, that would decrease the risk of strikes from project-related vessels to the greatest extent possible, with the goal of preventing significant population-level adverse effects along the coast of British Columbia.

Northern Gateway would determine additional areas where it would apply mitigation as it develops its final Marine Mammal Protection Plan post-approval, in collaboration with stakeholders. Northern Gateway committed to modifying the boundaries of the core humpback area, or identifying new important areas, as more information was collected post-approval. Required annual reporting to the National Energy Board for the first 5 years of operations would describe the studies conducted on the distribution and abundance of marine mammals in the project area and any adaptations to the core humpback area.

The core humpback area's boundaries were based on the distribution of candidate critical habitat areas, as they were defined by Fisheries and Oceans Canada at the time of the project application. The Panel requires Northern Gateway to adjust these boundaries and associated mitigation measures to reflect critical habitat areas once they are formally designated under the recovery strategy process of the *Species at Risk Act*.

The Panel requires Northern Gateway to develop a Marine Mammal Protection Plan describing mitigation for vessel strikes. This plan would include how the results of the quantitative vessel strike risk analysis have informed these measures. The Panel also requires Northern Gateway to report on the monitoring results and its adaptive management for the project's operational life.

Even with a robust monitoring program, it would be difficult for Northern Gateway to determine project effects as distinct from natural variability of populations in the marine environment. Vessel strikes are often undetected or, if detected, unreported. As a result, mitigation measure effectiveness may be difficult to monitor. The Panel requires Northern Gateway to develop a plan for reporting any marine mammals struck, injured, or killed during construction and operations.

Northern Gateway would not be operating the vessels that call at the Kitimat Terminal, but Northern Gateway would require tankers transporting condensate and oil to and from the Kitimat Terminal to operate in an environmentally responsible manner. This would include requiring tankers, through implementation of the Tanker Acceptance Program and Northern Gateway's marine voluntary commitments, to modify their speed according to location and time of year to reduce the risks of marine mammal strikes. The National Energy Board has no regulatory authority over the enforcement of vessel speeds to prevent marine mammal strikes, except through oversight of the execution of Northern Gateway's Tanker Acceptance Program and compliance with Northern Gateway's marine voluntary commitments.

EVALUATION OF ADVERSE PROJECT EFFECTS (VESSEL STRIKES) ON MARINE MAMMALS AFTER MITIGATION

Temporal extent
Vessel strikes could occur throughout the time that the marine terminal is operational with tankers travelling to and from it.

Spatial extent
Vessel strikes could occur along the marine transportation routes. Impacts on individuals would occur in that localized area, resulting in a potential impact on a population with a larger range.

Intensity
Vessel strikes may be fatal to a marine mammal, or an individual may recover. Mitigation (such as speed limits, avoiding candidate critical habitat, and using a dedicated whale monitoring vessel) should reduce the number of vessel strikes. Although vessel strikes are expected to be restricted to a small number of individuals, there are uncertainties in predicting how many strikes would occur. The species most likely to be struck include humpback whale and fin whale, which are both listed as Threatened under the *Species at Risk Act*.

Large vessel traffic has been occurring along the British Columbia coast for many years and marine mammals continue to be commonly observed. Some marine mammal numbers are increasing. Project-related tankers would make up approximately one-third of reporting traffic in Douglas Channel and Kitimat Arm, where the project would result in the greatest relative increase in shipping traffic. Project-related tankers would implement mitigation that is not currently in use for other shipping.

Recommendation for significance of project effects after mitigation
Because there are adverse project effects remaining after mitigation that could combine with the effects of other past, present, and future projects, and because cumulative effects are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects.

PROJECT EFFECTS OF UNDERWATER VESSEL NOISE ON MARINE MAMMALS

Marine mammals produce and use underwater sounds for spatial orientation, migration, communication, predator and prey detection, and mating. Based on its acoustic modelling, Northern Gateway determined that underwater noise produced by the project would not cause physical injury to marine mammals, but their behavior could potentially be affected. Examples of potential behavioral effects as a result of underwater noise include habitat avoidance, herding, reduced foraging efficiency, increased energy expenditure, reduced survival, and reduced reproduction.

In its application, Northern Gateway said that vessel-based underwater sound typically increases with speed; the greater the vessel speed, the greater the propeller cavitation noise. It said that there is a reduced underwater noise decibel level with a reduction in speed.

Northern Gateway said that the individual- and population-level consequences to marine mammals from potential behavioral effects of underwater noise are difficult to determine. Fisheries and Oceans Canada also said that there is uncertainty about what effects underwater noise could have on marine mammals because not enough is known about how marine mammals use sound.

While small behavioural changes can be expected as a result of underwater sound, Northern Gateway said that these changes would not likely affect the long-term viability of any populations of marine mammals because:

- noise from transiting vessels would be restricted to limited areas of the Confined Channel Assessment Area and approach lanes at any given time;
- the amount of time that a whale may be exposed to levels capable of inducing behavioural change would be limited (from minutes to hours of a passing vessel); and
- it is assumed that whales detect an approaching vessel and move away from it, thereby limiting the duration of exposure.

Fisheries and Oceans Canada said that it would be important to consider the effects on individual whales from noise and mitigate them to the greatest extent possible, rather than only focusing on population-level effects. Northern Gateway said that its proposed Marine Mammal Protection Plan would outline mitigation measures to reduce potential behavioural changes in individuals within the Confined Channel Assessment Area and approach lanes due to underwater noise from project-related vessels.

Northern Gateway said that environmental effects of underwater noise from project-related vessels remaining after mitigation may lead to changes in the distribution and abundance of some marine mammals within the Confined Channel Assessment Area or approach lanes, but that permanent displacement of whales would be unlikely. Northern Gateway provided examples of other locations with high amounts of vessel traffic that have not been abandoned by marine mammals, such as the North Atlantic right whales in Boston harbour. It said that vessels have been operating in northern British Columbia waters for extensive periods of time, traffic volumes have varied considerably during

this time, and whales are still commonly observed in Prince Rupert and in southern British Columbia where traffic is more frequent.

Raincoast Conservation Foundation and Gitga'at First Nation disagreed with Northern Gateway's view that marine mammals would not be permanently displaced due to disturbance from vessel noise. They provided examples of marine mammals abandoning habitat due to noise disturbance from commercial shipping or cruise ships. This included gray whales abandoning breeding lagoons at Laguna Guerra Negro between 1957 and the early 1970s, and humpback whales using Glacier Bay (Alaska) less.

In addition to the above-noted potential effects of underwater noise on marine mammals, Gitga'at First Nation said that almost no information is available in literature on sound-induced stress in marine mammals, on its potential (alone or in combination with other stressors) to affect the long-term reproductive success of marine mammals, or about effects of chronic noise on baleen whales. Raincoast Conservation Foundation said that marine mammals that remain in noisy habitat can also suffer significant adverse effects, including chronic stress and impaired communication, navigation, orientation, feeding, and predator detection.

Northern Gateway said that effects of underwater noise remaining after mitigation may elicit temporary behavioural response and communication masking in baleen whales, such as humpback whales. Northern Gateway said that potential underwater project-related noise effects on individual humpback whale behaviour and habitat use in the Confined Channel Assessment Area or Open Water Area would not affect the viability of the broader North Pacific humpback whale population (given its large size), or delay the continuing recovery of the Canadian portion of this population. It said that the North Pacific population of humpback whale is recovering well and affected individuals would not impair the recovery or survival of the species. North Coast Cetacean Society said that, due to humpback whales' strong site-fidelity to regional areas along the coast of British Columbia, they would likely be hesitant to inhabit new locations if displaced. It said that anthropogenic effects, such as those that may result from the project, could affect the recovery of the population within British Columbia waters.

With respect to the northern resident killer whale, Northern Gateway said that its population is small, threatened, and potentially limited by prey, and that the amount of potential critical habitat for this species in the Confined Channel Assessment Area is not known. Given these uncertainties, and the potential for behavioural changes from underwater noise to limit prey availability (a threat identified in the species' national recovery strategy), Northern Gateway determined that using a precautionary approach was merited. It said that a confident determination of significance for residual effects was not possible.

Northern Gateway committed to monitoring, marine mammal surveys, and ongoing work with Fisheries and Oceans Canada to refine monitoring and mitigation programs, as well as to conduct studies on underwater noise. Northern Gateway also committed to further collaborative research with stakeholders on northern resident killer whales post-project approval to fill information gaps and increase confidence in significance predictions. North Coast Cetacean Society said that Northern Gateway's commitment to fill these gaps post-approval contradicted the purpose of environmental assessment and did not allow, prior to the project being approved, a determination of whether the risks to northern resident killer whale are acceptable.

Mitigation measures

Northern Gateway committed to:

- incorporate best commercially-available technology at the time of tug design and construction;
- ensure, through the Tanker Acceptance Program, propeller maintenance, avoidance of unnecessary rapid acceleration, and the use of specified vessel transit approaches so that noise disturbances are restricted to similar and predictable areas during marine transportation;
- from 1 May to 1 November, use observers on a dedicated whale monitoring vessel to survey the core humpback area before tanker passage and to recommend site-specific adjustments to tanker routes, depending on the number of whales present, unless otherwise required for safe navigation; and
- require tankers and tugs to adhere to vessel speed restrictions, as described previously under the mitigation measures for project effects on marine mammals from vessel strikes.

Monitoring and follow-up

Northern Gateway committed to:

- the monitoring and follow-up measures described previously for project effects on marine mammals from vessel strikes, and cooperative marine mammal research initiatives, including collecting observations of behavioural reactions upon exposure to tanker sound; and
- conduct field studies of underwater noise levels.

Research

Northern Gateway committed to undertaking cooperative marine mammal research initiatives and a broad-scale regional assessment program in collaboration with other interested parties to fill gaps in baseline information and increase confidence in effects prediction.

Views of the Panel

ON EFFECTS OF UNDERWATER VESSEL NOISE ON MARINE MAMMALS

The Panel finds that noise from project-related tankers or from any other tankers or vessels navigating through the region at the present time or in the future cannot be completely mitigated. Large vessel traffic has been occurring along the British Columbia coast for many years and marine mammals continue to be present. Some species numbers are increasing.

Both Northern Gateway and participants have expressed uncertainties as to how underwater noise generated by the project may affect marine mammals. Positions expressed by Northern Gateway and participants about the extent to which noise could affect marine mammals were not well-supported by evidence on the record.

In the face of this uncertainty, Northern Gateway applied a careful and precautionary approach: it has anticipated potential harmful environmental effects by committing to designing and operating the project in a way that avoids these adverse effects to the greatest extent possible. For example, Northern Gateway committed to numerous measures to fill knowledge gaps and mitigate effects from noise adaptively, including conducting noise modelling, using a whale monitoring vessel, and implementing an extensive, multi-party research program. The Panel requires Northern Gateway to develop Marine Mammal Protection Plans describing its marine mammal mitigation during construction and operations, and to report on its monitoring results and adaptive management for the project's operational life.

The Panel finds that Northern Gateway stands out among shippers by committing to these types of measures, many of which go beyond established industry standards. These include, for example, establishing a core humpback area, implementing speed restrictions, and research commitments. The results of many of these initiatives would be available publicly and could contribute to a greater understanding of how shipping noise may affect marine mammals on the north coast of British Columbia.

Similar to the mitigation for vessel strikes, the Panel requires that Northern Gateway's Tanker Acceptance Program ensures that all tanker

operators adhere to all of Northern Gateway's marine mammal mitigation measures with respect to reducing underwater noise. The Panel requires Northern Gateway to implement, or cause to implement, all of its voluntary commitments related to marine tanker traffic before loading or unloading any oil or condensate tanker at the Kitimat Terminal.

With the implementation of these mitigation measures, the Panel finds that noise from the project-related vessels could lead to short-term displacement or behavioral changes. The Panel also finds that, with mitigation and considering the success of other ports in mitigating effects, displacement is unlikely. If displacement did occur, it is likely that whales would move to other feeding areas in other locations along British Columbia.

Feeding humpback whales occur in other locations along the coast of British Columbia and feeding habitat is available to individuals potentially displaced from the project area. The Panel finds that there is uncertainty as to whether those individuals may remain displaced or return to the area when the noise disturbance has passed.

EVALUATION OF ADVERSE PROJECT EFFECTS (UNDERWATER VESSEL NOISE) ON MARINE MAMMALS AFTER MITIGATION

Temporal extent
Individuals would encounter underwater vessel noise on a regular basis along the tanker routes as one or two vessels would be transiting every day throughout the project's lifespan, although the noise would be temporary as the vessel passes. There is uncertainty as to how quickly behaviour would return to baseline.

Spatial extent
Most underwater noise would be limited to the area within the corridors used by the tankers.

Intensity
It is uncertain how noise may affect marine mammal behaviour. Large vessel traffic has been occurring along the British Columbia coast for many years and marine mammals continue to be commonly observed. Some marine mammal numbers are increasing. Project-related tankers would make up approximately one-third of reporting traffic in Douglas Channel and Kitimat Arm, where the project would result in the greatest relative increase in shipping traffic. Project-related tankers would implement mitigation that is not currently in use for other shipping.

Recommendation for significance of project effects after mitigation
Because there are adverse project effects remaining after mitigation that could combine with the effects of other past, present, and future projects, and because cumulative effects are of primary concern, the Panel's significance recommendation is given below in its analysis of cumulative effects

CUMULATIVE EFFECTS ON MARINE MAMMALS

Vessel strikes

Northern Gateway said that the residual environmental effect of physical injury to humpback whales would be sufficiently low to conclude that the contribution of marine transportation to the cumulative environmental effects would not reasonably affect the viability or recovery of the North Pacific humpback whale population. Northern Gateway said that its proposed quantitative vessel strike risk analysis would take into consideration vessel traffic from other operators to determine the risk of vessel strikes on marine mammals.

Raincoast Conservation Foundation said that growing shipping traffic is increasing the risk of vessel strikes on whales and other marine mammals. It said that, by 2020, container traffic travelling to Asia from British Columbia is expected to increase by 300 per cent from 2007 levels. It said that marine mammal populations along the coast of British Columbia could be adversely affected by incremental and combined effects of vessel strikes and vessel noise, incidental catch from fishing gear, depletion of prey from overfishing, chemical pollution, introduced species and diseases, and increased carbon dioxide inputs. North Coast Cetacean Society said that Northern Gateway did not incorporate cumulative effects of other proposed projects into its assessment of effects on marine mammals.

Underwater vessel noise

Northern Gateway said that interference of underwater noise with marine mammal behavior, including hearing and communication (known as masking), is possible over large areas of the Confined Channel Assessment Area and Open Water Area due to cumulative noise effects from project-related vessels and other current and future vessels travelling through these areas. Northern Gateway said that it is not currently possible to determine a threshold sound level at which masking may begin, or how such masking may affect individuals or populations of marine mammals. It said that it was beyond the scope of its application to undertake a large-scale cumulative underwater noise modelling exercise for all vessels in the Confined Channel Assessment Area and Open Water Area to determine what such a threshold might be. Northern Gateway said that, if the project is approved, it is open to collaborating with other shippers and noise-producing industries to study cumulative underwater noise and its potential effects on marine mammals through its proposed marine research program.

Raincoast Conservation Foundation said that the current levels of traffic along the coast of British Columbia are already degrading the communication space of humpback and killer whales, including through masking, and may be having an effect on other marine mammal species. Fisheries and Oceans Canada said that it cannot say with any certainty the noise levels beyond which whale critical habitat may be affected, or marine mammal species may be displaced, due to the cumulative effects of marine shipping and noise. Nevertheless, Fisheries and Oceans Canada said that most marine mammals are able to adapt to a certain level of underwater noise because it is constantly present in most of the world's oceans today. Fisheries and Oceans Canada research about the potential effects of commercial vessel traffic on marine mammals along the coast of British Columbia is ongoing.

Northern Gateway said that potential cumulative noise effects on individual humpback whale behaviour and habitat use in the Confined Channel Assessment Area would not affect the viability of the broader North Pacific humpback whale population (given its large size), or delay the continuing recovery of the Canadian portion of this population.

Northern Gateway said that it is not known whether the cumulative behavioural effect on northern resident killer whales from all shipping traffic would affect the long-term viability of a pod of northern resident killer whales, or the recovery of this population. It said that the northern resident killer whale population is small, threatened, and potentially limited by prey availability. Based on scientific uncertainty, Northern Gateway did not make a prediction of significance and said that a precautionary approach in evaluating the significance of cumulative vessel-based underwater noise effects on northern resident killer whales was merited. Raincoast Conservation Foundation said that increased tanker traffic from all operators in coastal waters could affect the ability of killer whales to forage and, ultimately, affect their reproduction and recovery.

Views of the Panel

ON CUMULATIVE EFFECTS ON MARINE MAMMALS

Vessel strikes

The Panel finds that vessel strikes on individuals, from both project-related tankers or from any other tankers or vessels navigating through the region at the present time or in the future, cannot be completely avoided. Northern Gateway has committed to a number of measures intended to limit vessel strikes that exceed industry standards. It would be beneficial if all tankers operating in the region adopted similar mitigation to that committed to by Northern Gateway to reduce the cumulative risk of vessel strikes. The Panel encourages further research, in general, on the issue and potential innovations for addressing it.

Underwater vessel noise

The Panel finds that, in the context of underwater vessel noise, the effect of increasing unmitigated shipping traffic, combined with Northern Gateway's mitigated shipping traffic, is unknown, particularly in confined inlets. The Panel notes that large vessel traffic has been occurring along the British Columbia Coast for many years and marine mammals continue to be commonly observed, and that some species numbers are increasing.

EVALUATION OF ADVERSE CUMULATIVE EFFECTS ON MARINE MAMMALS AFTER MITIGATION

Recommendation for significance of cumulative effects after mitigation

Multiple vessel strikes are likely to occur from a combination of mitigated project-related vessels and unmitigated non-project-related vessels. In addition, individuals would encounter underwater vessel noise on a regular basis from these sources. Such effects would occur for as long as vessels use the areas in question.

While there has been vessel traffic in this area for many years and marine mammals have continued their presence, there are multiple unknowns, such as the number of ship strikes in the past and expected in the future, and how quickly marine mammal behaviour returns to baseline after vessel noise passes by. The severity of behavioral changes (short-term or long-term) from cumulative underwater shipping noise, and its effect on the reproduction of individuals and the viability of populations along the coast of British Columbia, is uncertain.

Large vessel traffic is ongoing and anticipated to increase along the coast of British Columbia. Northern Gateway stands out among shippers through its commitments to mitigate the effects of project-related ships, and to improve the information available concerning marine mammal populations, effects of shipping, and mitigation effectiveness. Northern Gateway would invest substantially in these efforts relative to its potential contribution to the effects of shipping. Increased knowledge from Northern Gateway's efforts could be beneficial in managing the effects of shipping, in general, on marine mammal populations. The Panel finds that Northern Gateway is taking a precautionary approach related to marine mammals, which are important to all Canadians.

The Panel views the risk to marine mammals from cumulative effects as manageable, particularly with the benefit of additional knowledge about marine mammals and effects mitigation that would be gained and available for use broadly if the project were to proceed.

The Panel recommends that the project is not likely to result in significant adverse cumulative effects with respect to marine mammals.

8.7.7 MARINE FISH AND FISH HABITAT

Background

The Queen Charlotte Basin area provides habitat for several commercial species and invertebrates. Coves, estuaries, and other nearshore areas provide rearing habitat for larval and juvenile fish, and serve as a transition zone and holding area for anadromous fish travelling in and out of rivers. Freshwater spawning species, such as salmon and eulachon, travel through Douglas Channel en route to freshwater spawning channels in the Kitimat River, Gardner Channel, and Kildala Arm. Several fish species within Kitimat Arm are important commercially and recreationally and are used for food, and social and ceremonial purposes. Fish species commonly harvested include chum, coho, chinook, and pink salmon; steelhead; eulachon; and herring.

Species diversity within Kitimat Arm's rocky intertidal community is generally low. Barnacles, mussels, periwinkles, and limpets can be found on rocky substrate. Sea urchins, moon snails, sea anemones, sea stars, and sea cucumbers are in shallow subtidal areas. Sandy areas are inhabited by commercially-harvested bivalves such as butter clams and cockles.

There are no *Species at Risk Act*-listed fish species within the Project Effects Assessment Area. The bocaccio (a rockfish species found in Douglas Channel) is currently under review for potential designation as Threatened on Schedule 1 of the *Species at Risk Act.* In May 2011, eulachon were designated as Threatened by the Committee on the Status of Endangered Wildlife in Canada because of its limited range and long-term declines. Within the Confined Channel Assessment Area, *Species at Risk Act*-listed northern abalone and green sturgeon are suspected to occur.

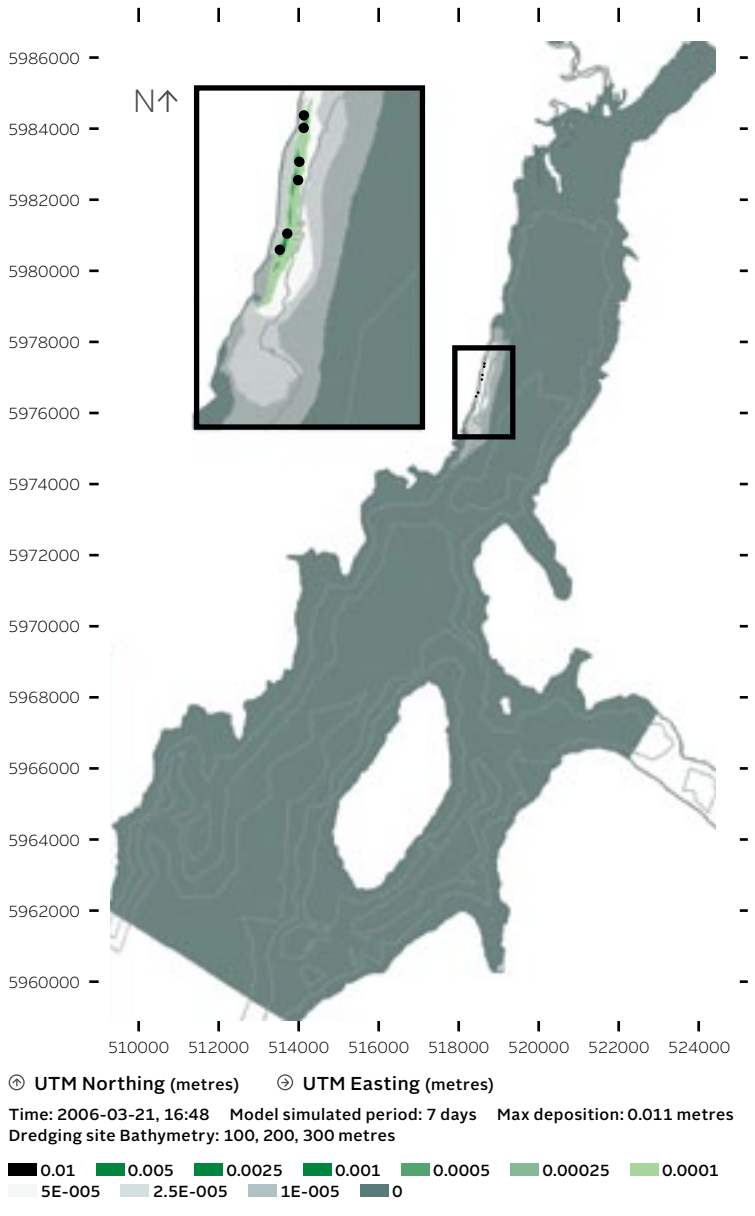
Baseline data

Northern Gateway completed baseline surveys in the Project Development Area and Project Effects Assessment Area over a period of 5 years (2005 to 2009) to supplement existing information on marine fish and fish habitat. Surveys included intertidal and subtidal habitat characterizations, nearshore fish surveys, and a nearshore crab survey. It also conducted a literature review and data search to determine fish species potential in the Project Effects Assessment Area and the Confined Channel Assessment Area.

Several participants said that the quality and scope of Northern Gateway's completed baseline surveys were insufficient to fully characterize benthic invertebrates within Kitimat Arm and to assess the status of fish populations in the Project Effects Assessment Area. Haisla Nation said that determining baseline conditions of a dynamic system, such as the upper Kitimat Arm, can require long periods of data collection in order to capture natural variability. Fisheries and Oceans Canada recommended that future surveys cover a greater depth range and be conducted at several different times of year.

Northern Gateway said that there is good historical information about the marine environment within the Project Effects Assessment Area and that it conducted surveys only to address knowledge gaps that were relevant to its assessment

FIGURE 8.9 **SEDIMENT PLUME DISPERSION MODELLING FOR DREDGING AT MARINE TERMINAL SITES IN KITIMAT ARM**



of effects on the marine environment. It did not complete field surveys if sufficient information was already available. In response to a Fisheries and Oceans Canada request for further information on sponge abundance and distribution in Kitimat Arm, Northern Gateway undertook additional subtidal surveys in May 2011. Northern Gateway committed to sampling for 3 years prior to beginning project operations, and 3 years of sampling after operations start, as part of its Marine Environmental Effects Monitoring Program.

Fisheries and Oceans Canada said that Northern Gateway provided a comprehensive list of construction activities and correctly linked them to pathways of effects for fish and fish habitat. It said that Northern Gateway has provided sufficient information for this portion of the department's Habitat Risk Management Framework.

Project effects on changes in habitat quality

Northern Gateway said that dredging and blasting for marine terminal construction would result in a sediment plume that would extend over an area of 70,000 square metres for the duration of blasting activities.

Approximately 400 square metres of the assessed area of the marine terminal is expected to receive more than 1 centimetre of sediment deposition due to dredging. Outside of this area, typical sediment deposition levels alongshore where sediment is widely dispersed (a band approximately 4 kilometres long and 400 metres wide) are very low; in the range of 0.001 to 0.1 centimetres (Figure 8.9). Dredging and blasting activities are expected to occur over a period

of approximately 18 weeks. Northern Gateway expected most of the sediment plume created by construction activities to be minor in relation to natural background levels.

Northern Gateway said that physical effects from suspended sediment on marine fish and invertebrates could include abrasion and clogging of filtration mechanisms, which can interfere with ingestion and respiration. In extreme cases, effects could include smothering, burial, and mortality to fish and invertebrates. Direct chemical-related effects of suspended sediment on organisms, including reduced growth and survival, can also occur as a result of the uptake of contaminants re-suspended by project construction activities, such as dredging and blasting, and as a result of storm events, tides, and currents.

Haisla Nation and Raincoast Conservation Foundation questioned Northern Gateway's sediment and circulation model and its evidence related to contaminated sediment re-suspension at the terminal site. Both parties said that the sediment model was applied for the spring, when the increase in total suspended solids would be negligible compared to background values. In the event of delays, blasting and dredging would likely occur at other times of the year when effects would likely be higher, and these scenarios were not modelled.

Northern Gateway said that tolerance for periods of high sediment loads is a trait essential for fish to survive in naturally-fluctuating environments such as the Kitimat Arm. As a result, exposure to a temporary and localized sediment plume is not expected to hinder access by marine fish (e.g., for anadromous fish such as eulachon and salmon) to upper Kitimat Arm and its associated rivers. Because of the uncertainty in scientific data and the cultural importance of eulachon to coastal Aboriginal groups, Northern Gateway committed to undertaking a 3-year follow-up program to track potential project effects on eulachon populations.

Northern Gateway would use bubble curtains to reduce pressure and acoustic effects of blasting, and silt curtains to reduce the effect of sedimentation from dredging. It said that bubble curtains are used extensively for other activities, such as pile driving, to reduce the effect of high pressure pulses that can cause injury to fish. It added that bubble curtains have been tested extensively with blasts, and literature shows they are effective.

Project effects on changes in habitat availability

Northern Gateway said that construction, operations, and decommissioning of the marine terminal would result in both permanent and temporary alteration of marine fish habitat. Dredging and blasting, and installing physical structures in the water column for the marine terminal would permanently alter marine fish habitat. Based on the current terminal design, in-water site preparation would result in the physical alteration of approximately 1.6 hectares of subtidal marine habitat and 0.38 hectares of intertidal marine habitat. Northern Gateway expected approximately 353 square metres of subtidal marine habitat and 29 square metres of intertidal habitat to be permanently lost. This habitat would be compensated for by marine habitat offsets.

Northern Gateway said that dredging and blasting would also result in the physical alteration of subtidal habitat. Specifically, the removing soft sediment overburden and the creating rock benches would expose vertical and horizontal rock faces, increasing the amount of bare rock in the Project Development Area. The project's in-water vertical structures that would support the mooring and berthing structures could create new habitat, offsetting potential adverse effects. The structures may act as artificial reefs, providing marine fish habitat, food, and protection from predation. Although organisms currently inhabiting the work area would be killed, the exposed bedrock would be available for colonization as soon as the physical works are completed.

Project effects on acoustic disturbance

Northern Gateway said that ambient background noise levels in the marine environment are composed of the noise produced by natural physical processes (e.g., winds, waves, rainfall, seismic activity), biological activities (marine organisms, such as whales), and human activities (e.g., shipping, industrial activities). The main source of human-generated noise in the Confined Channel Assessment Area is vessel traffic, which is highest in summer.

Northern Gateway said that the ability of fish to hear and discriminate among the sounds in the marine environment is important to fish survival because fish must distinguish between sounds of predators and those of prey. Adding anthropogenic sounds to the background noise can make the environment so loud that fish are not able to detect important signals because of masking.

Acoustic disturbance from marine terminal

During marine terminal construction, operations, and decommissioning, underwater acoustic emissions would be produced by various activities: blasting, dredging, pile installation, and project-related vessel noise. During operations, berthed vessels at the marine terminal and tanker traffic would be the primary source of acoustic disturbance from the project.

Northern Gateway said that, although construction activities would not likely induce a physical effect on marine fish, fish may avoid the immediate area of the marine terminal. Based on known information on rockfish responses to construction noise and blasting, it is likely that rockfish would move out of the area during peak periods of acoustic disturbance and construction activity. Since rockfish show high habitat fidelity and often stay within one defined home range for most of their lives, it is expected that displaced individuals would return to their home ranges after disturbance. Northern Gateway committed to conducting follow-up surveys to confirm that rockfish re-inhabit the terminal site after loud construction activities and during regular vessel noise.

For most project activities, Northern Gateway expects acoustic emissions to dissipate to tolerable levels within several hundred metres. In response to questions from the United Fishermen and Allied Workers' Union, Northern Gateway said that the perceived noise level from dredging on the other side of Douglas Channel, an area through which Pacific herring migrates, would not be significantly above natural sounds present from wind and wave energy. It said that it is unlikely this would have any effect on Pacific herring.

Acoustic disturbance from marine transportation

While marine fish would be able to detect, and may have a behavioural response to, underwater noise from marine transportation, Northern Gateway said that the zone of influence for such effects would be limited both spatially and temporally. Temporal overlap would be limited to tens of minutes every 1 to 2 days, the time during which tankers would transit in any one location. Marine fish would be expected to return to and use affected areas shortly after the noise disturbance has ceased. Northern Gateway said that the environmental effect of acoustic disturbances from marine transportation on marine fish populations would not be significant.

Coastal First Nations were concerned about the effect of underwater noise from large vessels on fish during migration and that the significance of such an effect may have been underestimated. It disagreed with Northern Gateway's conclusion that, because vessel transits are transitory, effects from project-related traffic, including in combination with other sources of traffic, would be site-specific, short-term, and reversible. It said that an increase in acoustic disturbance caused by added project-related traffic could cause a displacement or other behavioural effect in fish.

Northern Gateway said that it was important to view vessel traffic and its potential associated effects in the context of existing traffic. Large numbers of commercial and government vessels have been operating within the North Central Coast region for an extensive period of time. Northern Gateway said that studies of sounds produced by large ocean-going vessels found some evidence of localized avoidance and changes in school structure and swim depth. It said that there is no evidence that vessel traffic interferes with the migratory behavior of fish. It said that, although viability of fish populations may not be affected, changes in fish stock distribution could alter catch success at certain locations.

Mitigation measures

Northern Gateway committed to:

- select a dredging system, such as a clamshell dredge, that limits sediment release, and to using silt curtains to reduce the dispersion and duration of suspended sediments;
- use bubble curtains during marine construction, where practical, to limit underwater noise propagation;
- dredge and blast within timing windows determined in consultation with Fisheries and Oceans Canada, where practical, to avoid sensitive seasonal periods;
- further develop its Blasting Management Plan and Sediment Monitoring Plan in consultation with Fisheries and Oceans Canada and other appropriate parties;
- maintain and regularly inspect propellers of all construction support vessels for damage since poorly-maintained propellers are known to increase underwater noise; and
- implement habitat restoration, enhancement, or creation where marine habitat loss related to the Kitimat Terminal's construction cannot be avoided, to compensate for any harmful alteration, disruption, or destruction of marine fish habitat, as required under subsection 35(2) of the *Fisheries Act*. Northern Gateway filed a conceptual Marine Habitat Compensation Plan in July 2012 that quantified the areal extent of habitat expected to be affected by project activities and described options for physical works that could be undertaken for compensation. Northern Gateway would develop the final plan in consultation with Fisheries and Oceans Canada, participating Aboriginal groups, and potentially-affected stakeholders.

Monitoring and follow-up

Northern Gateway committed to:

- monitor the sediment plume in the marine environment during dredging and blasting as part of its Water Quality and Substrate Composition Monitoring Plan; and
- 3 years of sampling before beginning project operations, and 3 years of sampling after starting operations, as part of the Marine Environmental Effects Monitoring Program;
- undertake a 3-year follow-up program to track potential project effects on eulachon populations; and
- conduct follow-up surveys to confirm that rockfish re-inhabit the terminal site after loud construction activities and during regular vessel noise.

Views of the Panel

ON PROJECT EFFECTS ON MARINE FISH AND FISH HABITAT

Northern Gateway provided a general description of the baseline setting related to marine fish and invertebrates and assessment of potential effects. The Panel finds that the level of information provided at this time is sufficient.

Fisheries and Oceans Canada did not identify any high-risk activities associated with the project's construction and routine terminal operations. It considered that dredging, blasting, and pile driving would be low- to moderate-risk activities. Increases in suspended sediment can cause a wide range of potential effects and the Panel is encouraged by Northern Gateway's commitment to continue to work with Fisheries and Oceans Canada in developing its Blasting Management Plan and Sediment Monitoring Plan. Where habitat loss is unavoidable, Northern Gateway has committed to offset losses through restoration, enhancement, or compensation of marine fish habitat.

There are two types of vessel traffic associated with the project: barge traffic associated with terminal construction, and tanker traffic associated with its operations. Marine transportation has a historic presence in the Confined Channel Assessment Area and marine fish are known to use the area despite being exposed to acoustic disturbance. The overlap of fish and acoustic disturbance by transiting vessels would be limited to tens of minutes every 1 to 2 days. Although behavioural responses of marine fish are not well understood, adverse effects of existing vessel traffic on marine fish in the Confined Channel Assessment Area have not been documented.

The Panel finds that effects to fish and fish habitat in the marine environment can be managed by implementing appropriate mitigation and offset measures, provided Northern Gateway meets its commitments to mitigate and offset any effects remaining after mitigation. Northern Gateway has committed to developing a long-term monitoring plan to measure the effects of project activities and mitigation measure effectiveness, and to develop an appropriate response should adverse effects be identified.

EVALUATION OF ADVERSE PROJECT EFFECTS ON MARINE FISH AND FISH HABITAT (HABITAT QUALITY AND AVAILABILITY) AFTER MITIGATION

Temporal extent
Effects such as increased sedimentation during construction, dredging and blasting would be temporary (expected for approximately 8 to 9 weeks during construction) and would revert to pre-project conditions once construction is complete. Alteration of the seabed and foreshore areas at the Kitimat Terminal would be permanent.

Spatial extent
Given mitigation, elevated suspended sediment would be confined to a limited area surrounding construction activities. Permanent habitat loss would be limited within the terminal area.

Intensity
Most of the sediment plume is expected to be minor in relation to natural background levels. Permanent loss of habitat is relatively small and would be compensated for by marine habitat offsets.

Recommendation for significance of project effects after mitigation
Due to the relatively localized and minor effects, together with offsets for permanent losses, the Panel recommends that the project is not likely to result in significant adverse effects with respect to marine fish and fish habitat (quality and availability).

EVALUATION OF ADVERSE PROJECT EFFECTS ON MARINE FISH AND FISH HABITAT (ACOUSTIC DISTURBANCE) AFTER MITIGATION

Temporal extent
Acoustic disturbance during construction would be temporary and effects are expected to be reversible. Although acoustic disturbance from marine transportation would continue throughout the project's lifespan, these effects would be limited to tens of minutes every 1 to 2 days (i.e., the time during which tankers would transit in any one location). Marine fish are expected to return to and use affected areas shortly after the noise disturbance has ceased.

Spatial extent
Given mitigation, acoustic disturbance from construction is expected to be localized. Acoustic disturbance from tankers would occur along the marine transportation routes.

Intensity
The intensity of acoustic disturbance is expected to be relatively low.

Recommendation for significance of project effects after mitigation
Given the temporary and reversible nature of acoustic disturbance during construction, and the transitory and low-intensity effects from shipping for any one location along the marine transportation routes, the Panel recommends that the project is not likely to result in significant adverse effects with respect to marine fish and fish habitat (acoustic disturbance).

Views of the Panel

ON CUMULATIVE EFFECTS ON MARINE FISH AND FISH HABITAT

The Panel finds that the project would result in adverse effects on marine fish and fish habitat after applying mitigation. These effects would not be significant. Large numbers of commercial and government vessels have been operating within the North Central Coast region for an extensive period of time. Project effects on marine fish and fish habitat related to acoustic disturbance from marine traffic and during marine terminal construction are expected to be minor and temporary. Sedimentation from marine terminal construction would also be temporary and can be mitigated with standard and established mitigation measures. The Panel finds that the nature of expected project effects after mitigation limits the potential for cumulative effects and a detailed discussion of cumulative effects is not required for effects on marine fish and fish habitat.

8.7.8 MARINE WATER AND SEDIMENT QUALITY

Background

Sediment quality in the marine environment is important because sediment provides habitat for benthic aquatic organisms. Northern Gateway's baseline data for the area immediately surrounding the marine terminal indicated some contamination of water, sediments, and benthic organisms from previous industrial activity. Industrial activities in the

Kitimat area have released contaminants through air emissions and effluent discharges since the 1960s. Sources of contaminants to Kitimat Arm include effluent from a municipal wastewater treatment plant, the Alcan smelter, Methanex Corporation's methanol plant, and the Eurocan pulpmill, as well as storm water runoff from these operations and the municipality.

Sediment influx in the Project Effects Assessment Area is largely controlled by natural outflow from the Kitimat River with suspended sediment levels being highest during peak river runoff (May to July, and October) and lowest during winter. Storm events, tides, and currents can also suspend sediments. Levels of total suspended solids fluctuate seasonally and in response to climatic variations, but are generally highest during the summer. Commercial and recreational vessels currently operating in the area may increase suspended solids by creating water turbulence that disturbs sediments.

Project effects on marine water and sediment quality

Northern Gateway said that, as with any industrial operation taking place near water, small quantities of grease and oil (i.e., less than 15 parts per million, as a regulatory standard) could be released into the marine environment as a result of surface runoff from the Kitimat Terminal. These would be associated with the normal operation of industrial equipment (e.g., operation and maintenance of motor vehicles, hydraulic equipment, or the very small releases associated with normally functioning oil-water separators). Environment Canada and Gitga'at First Nation were concerned about maritime oil pollution resulting from frequent, but typically small, oil discharges at the marine terminal.

Northern Gateway said that its contribution to oiling from routine operations would be negligible, given that its vetting process and operating requirements for shippers (as discussed in Chapter 7) would minimize risks of oil releases during marine transportation and that terminal operations and design would also limit such releases. Regular water and sediment quality monitoring would allow for detection of small oil releases. If detected, Northern Gateway would implement changes to operational procedures to eliminate the release causes.

Northern Gateway said that it would comply with applicable regulations with respect to water quality, such as the *Petroleum Storage and Distribution Facilities Storm Water Regulation,* the *Ballast Water Control and Management Regulations* under the *Canada Shipping Act, 2001*, the *Waste Management Act,* and the *Special Waste Regulation*.

Mitigation measures

In addition to complying with applicable regulations, Northern Gateway committed to:

- direct surface water runoff from the terminal tank and manifold areas to the impoundment reservoir. Before being released to the marine environment, excess water from the impoundment reservoir would be tested; and
- use tanker and platform drip trays at the terminal to minimize the risk of oil releases.

Monitoring and follow-up

Northern Gateway would conduct monitoring during construction to verify the predicted effects on sediment and water quality for both contaminants and total suspended solids, and to determine the effectiveness of mitigation measures used to limit sediment and contaminant release during dredging.

Views of the Panel

ON PROJECT EFFECTS ON MARINE WATER AND SEDIMENT QUALITY

Given the current sediment contamination levels and the limited area over which sedimentation from construction activities would be expected to disperse, the Panel finds that the risk posed by disturbed contaminated sediment is low. Northern Gateway has committed to monitoring during construction to verify the predicted effects on sediment and water quality for both contaminants and total suspended solids.

Appropriate regulations are in place governing the handling and verification of ballast water.

EVALUATION OF ADVERSE PROJECT EFFECTS ON MARINE WATER AND SEDIMENT QUALITY AFTER MITIGATION

Temporal extent
Changes in water and sediment quality in the Project Development Area may occur during dredging and construction, but suspended particles would settle within a few days. Minor contamination could occur from routine activities throughout the project's lifespan.

Spatial extent
Site-specific.

Intensity
Because of the small amount of contaminated sediment that could be released, there is not expected to be a measureable increase in the amount of contaminants dissolved in seawater. And contamination from routine activities is expected to be minor.

Recommendation for significance of project effects after mitigation
Given the short duration of localized and low-intensity effects, the Panel recommends that the project is not likely to result in significant adverse effects with respect to marine water and sediment quality.

Views of the Panel

ON CUMULATIVE EFFECTS ON MARINE WATER AND SEDIMENT QUALITY

The Panel finds that the project would result in adverse effects on marine water and sediment quality after applying mitigation. These effects would not be significant. Project effects on marine water and sediment quality at the marine terminal site would be temporary, site-specific, and minor, limiting the potential for cumulative effects. The Panel finds that a detailed discussion of cumulative effects is not required for effects on marine water and sediment quality.

8.7.9 MARINE VEGETATION

Relatively undisturbed marine riparian vegetation runs continuously along the shorelines of the Confined Channel Assessment Area, except for the more developed areas in Kitimat Arm. Marine riparian vegetation (e.g., shrubs, trees, grasses, forbs) grows at the interface between terrestrial and marine environments on land bordering tidewater. Northern Gateway said that the marine riparian zone adjacent to the marine terminal is densely populated with western hemlock, western red cedar, Amabilis fir, Sitka spruce, and some Douglas fir.

The nearshore benthic habitat of the Confined Channel Assessment Area is characterized by a range of coastal features including primarily rocky shores. There are also sandy beaches (11.75 per cent) and estuaries (3.73 per cent). The species diversity of the rocky intertidal community is generally lower in inland waters than along the Pacific coast, where kelp and other species can also be present. In Kitimat Arm, rockweed and sea lettuce are the dominant seaweeds while red algal turf and sparse kelp cover comprise the lower intertidal flora.

The soft bottom estuaries of Kitimat Arm are dominated by eelgrass, a marine vascular plant that provides important habitat for many juvenile fish and invertebrates. Eelgrass is deemed a "sensitive habitat" by Fisheries and Oceans Canada and is threatened by coastal development worldwide. The steep and rocky characteristics of the shorelines at the marine terminal hinder eelgrass growth within the Project Development Area.

Northern Gateway said that subtidal surveys indicated that sponge reefs are not present in the Project Effects Assessment Area and that routine effects from transportation would not affect glass sponges.

Project effects on marine vegetation

Northern Gateway said that the construction of the marine terminal and the installation of associated infrastructure would result in the loss of up to 1.8 hectares of marine riparian vegetation and approximately 3.8 hectares of suitable habitat for marine algal species such as rockweed. Northern Gateway does not expect altered habitat to affect the survival of rockweed populations or the species that use rockweed as habitat. The installation of berthing structures would create additional hard substrate at suitable depth and light conditions for colonization by some algal species. Northern Gateway said that most of this area, with the exception of areas that would be in direct contact with vessels, would be suitable for colonization.

Winds blow over greater distances in Hecate Strait than inland and, coupled with storm-force winds, can produce waves of 6 to 8 metres in height. In contrast, at the south end of Kitimat Arm, wave heights are generally less than half a metre. Maximum wave heights have been recorded in this area up to 2 metres.

Northern Gateway examined the wake effects of very large crude carriers and escort tugs and concluded that wave heights for normal escort speeds between 8 and 12 knots would be minimal at the shorelines because of the relatively deep and open waters of the Northern and Southern Approaches. Natural Resources Canada expressed concern that the initial predicted wake wave heights were too low and requested that Northern Gateway verify calculated results. Gitga'at First Nation questioned the validity of the simplified wake wave analysis undertaken and requested a more sophisticated analysis be done. In response to the concerns expressed, Northern Gateway provided a second tanker wake study which verified the results presented in the application. The wind-wave modelling results showed that wind-waves of similar height occur about one order of magnitude more frequently than the vessel generated waves.

Douglas Channel Watch expressed concern regarding the effects of vessel wake on shorelines and marine vegetation of marine parks and conservancies within the Confined Channel Assessment Area. Northern Gateway said that the wake produced by the very large crude carriers and escort tugs, as well as other vessels, would be well within the natural range of wave heights in the area. The increase in vessel traffic as a result of project-related marine transportation would not alter the present wave motion characteristics sufficiently to alter the present distribution or growth of the marine vegetation that inhabits intertidal areas, where wave effects would be greatest.

Mitigation measures

Northern Gateway committed to the following:

- given that marine vegetation provides important habitat for nearshore fish and migratory juvenile salmon, Northern Gateway's conceptual Marine Habitat Compensation Plan outlined potential mitigation measures to reduce potential effects of the project on marine vegetation loss in the Project Effects Assessment Area. Options presented included transplanting eelgrass from healthy donor beds to a suitable restoration site to create valuable habitat for invertebrates and juvenile fish species. A final plan would be developed prior to construction through discussions with Fisheries and Oceans Canada, participating Aboriginal organizations and potentially-affected stakeholders.
- vessels would transit the confined channel at reduced speeds between 8 and 12 knots, limiting wake effects to the shoreline.

Monitoring and follow-up

Northern Gateway committed to sampling for 3 years prior to beginning project operations, and 3 years of sampling following initiation of operations, as part of the Marine Environmental Effects Monitoring Program. Data collected through the Marine Environmental Effects Monitoring Program would be used as part of an adaptive management program to identify any changes needed in operations or environmental management approaches and ongoing monitoring strategies.

Views of the Panel

ON PROJECT EFFECTS ON MARINE VEGETATION

The Panel accepts Northern Gateway's conclusion that the marine terminal area would be suitable for recolonization post-construction.

Marine riparian habitat loss can be mitigated through compensation, as would be set out in Northern Gateway's Marine Habitat Compensation Plan.

The Panel finds that the effects of the wake produced by the very large crude carriers and escort tugs, as well as other vessels are not significant because the waves generated are within the range of naturally occurring waves in the marine transportation area and are not expected to cause adverse effects. Northern Gateway provided a second tanker wake study which verified the results presented in the application.

EVALUATION OF ADVERSE PROJECT EFFECTS ON MARINE VEGETATION AFTER MITIGATION

Temporal extent
Clearing of vegetation for the marine terminal would persist for the life of the project and would not be reversible until after reclamation of the site.

Spatial extent
Site specific: the construction of the marine terminal and the installation of associated infrastructure would result in the loss of up to 1.8 hectares of marine riparian vegetation and approximately 3.8 hectares of suitable habitat for marine algal species such as rockweed.

Intensity
Although vegetation would be cleared for the terminal site, it is a relatively small area, recolonization is expected, and Northern Gateway plans to compensate for vegetation loss.

Recommendation for significance of project effects after mitigation
Given the localized effects and compensation, the Panel recommends that the project is not likely to result in significant adverse effects on marine vegetation.

Views of the Panel

ON CUMULATIVE EFFECTS ON MARINE VEGETATION

The Panel finds that the project would result in adverse effects on marine vegetation after application of mitigation. These effects would not be significant. The Panel finds that effects on marine vegetation would be localized to the marine terminal site and marine vegetation affected by project would be compensated for by offsets, limiting the potential for cumulative effects. The Panel finds that a detailed discussion of cumulative effects is not required for effects on marine vegetation.

8.7.10 MARINE BIRDS

There are 2 designated Important Bird Areas, 2 ecological reserves, 12 conservancies, and 5 provincial parks located in or adjacent to the Project Effects Assessment Area and the Confined Channel Assessment Area. A total of 124 marine and coastal bird species are known to occur in the Confined Channel Assessment Area and Open Water Area. Large flocks of ducks and geese frequent the estuarine areas during fall and spring migrations, while the many small channel estuaries provide habitat for wintering, migrating, and breeding waterfowl.

During surveys, Northern Gateway observed 14 marine bird species of conservation concern, including great blue heron, Peale's peregrine falcon, marbled murrelet, and ancient murrelet, all 4 of which are listed on Schedule 1 of the *Species at Risk Act*. Marine bird species not observed, but that are expected in the project area, include two species listed on Schedule 1 of the *Species at Risk Act*: short-tailed albatross (Threatened) and black-footed albatross (Special Concern), both of which would inhabit offshore open waters. There are no associated recovery strategies, action plans, or management plans available for any of the observed or expected species at risk, except for the short-tailed albatross. Critical habitat is not defined in the short-tailed albatross' recovery strategy.

Baseline data for marine birds

Several parties questioned Northern Gateway's survey methods and the baseline data collected for marine birds. Environment Canada said that data collected on marine birds did not provide a sufficient baseline, and it requested that Northern Gateway collect a comprehensive set of biological baseline information prior to operations. It said that, ideally, the baseline should be completed over a minimum of 3 years prior to construction. Gitga'at First Nation said that the level of survey intensity was inadequate. Kitimat Valley Naturalists said that the survey results did not accurately represent marine birds found in the vicinity of the Kitimat estuary.

Northern Gateway committed to develop and implement a Marine Environmental Effects Monitoring Program collaboratively with participating Aboriginal groups, government authorities, and other stakeholders. As part of the program, Northern Gateway would conduct marine bird surveys for 3 years prior to starting project operations and up to 3 years after beginning operations. It would conduct the surveys in the Confined Channel Assessment Area and some of the Open Water Area, such as approaches to the Confined Channel Assessment Area and important habitat areas.

Environment Canada said that the Marine Environmental Effects Monitoring Program framework forms a good foundation for developing a rigorous monitoring program for marine birds.

Project effects on marine birds

Northern Gateway said that marine terminal construction could result in a change in marbled murrelet breeding habitat and loss of breeding sites. It said that sensory disturbance to marine birds could result from in-air and underwater noise, site clearing, land and marine blasting, dredging, artificial lighting at night, transiting and presence of ships, marine terminal operations, and wave turbulence from moving vessels.

Northern Gateway did not assess direct mortality of marine birds from routine marine transportation activities because it predicted that only a small number of individuals (single to tens of birds per year) would be killed in any 1 year. Northern Gateway did assess direct mortality risk to marine birds from nest destruction and collisions with power lines and lights.

Northern Gateway said that project effects on marbled murrelet breeding habitat, loss of breeding sites, and avoidance of industrial activities during construction would be limited to areas where project activities overlap with preferred nesting habitat within 70 kilometres of the coast. Although the project would affect approximately 1,000 metres of shoreline habitat, none of the habitat would include that used by prey species important to marbled murrelet.

Coastal First Nations and BC Nature and Nature Canada were concerned about sensory disturbance to marbled murrelet from tanker traffic, and the extent to which interactions with tankers might ultimately affect marbled murrelet populations. The Council of Haida Nation also said that some species of colonial marine birds are highly susceptible to human-related disturbances. Coastal First Nations said that Northern Gateway did not adequately consider stress increases or changes in foraging behaviour of marine birds.

Northern Gateway said that effects of sensory disturbance on marine birds, in general, would be localized and short-term. It said that, although it expects individual birds to be affected, once vessels pass, birds are expected to resume their normal behaviour. Northern Gateway said that there is little evidence of a strong effect of vessel traffic on marbled murrelet, except where sudden and rapid increases in vessel traffic might occur, which is not predicted to occur as a result of the project.

BC Nature and Nature Canada said that the negative effects of artificial lights on marine birds are well-documented, and effects could include increased energetic costs, deviation from normal migratory pathways, delayed migration, collisions with lighted structures, and disorientation. It said that red light is attractive to marine birds and causes disorientation. It also said that artificial light could increase the risk of predation of nocturnal species at breeding colonies and at sea since the proposed shipping route for the project passes in close proximity to significant marine bird breeding colonies.

Mitigation measures

In addition to general mitigation measures outlined in the application, Northern Gateway committed to:

- limit night lighting – use of lighting at night would be limited, as practical. Where permissible under safety and navigation requirements, outdoor lights would be upward shielded to reduce attraction by birds in flight. All unnecessary outside lights would be extinguished at night. Indoor lights would be blocked by blackout blinds. Work periods would be scheduled during daylight hours whenever possible to limit the need for staging lights.
- protection on power lines – energized surfaces would be covered with protective devices manufactured for wires, conductors, power line insulators and power line bushings.

Monitoring and follow-up

Northern Gateway committed to:

- develop and implement a Marine Environmental Effects Monitoring Program for the marine terminal and marine transportation, in advance of terminal operations, to assess mitigation effectiveness and to adapt as necessary; and
- undertake, as part of its Marine Environmental Effects Monitoring Program, continued marine bird surveys in the Confined Channel Assessment Area and some of the Open Water Area, such as approaches to the Confined Channel Assessment Area and key habitat areas. It would conduct marine bird surveys in accordance with Canadian Wildlife Service standards and they would take into consideration the ecology of the specific indicator species.

The Marine Environmental Effects Monitoring Program would be a follow-up program. Northern Gateway would use data collected through the Marine Environmental Effects Monitoring Program as part of an adaptive management program to identify any required changes in project operations, or environment management approaches and ongoing monitoring strategies.

Research

Northern Gateway committed to undertake further research and monitoring, and to fund independent third party research on disturbance and developing measures to minimize vessel effects on marine wildlife, including marine birds.

Northern Gateway said that lighting from the marine terminal, vessels, or other infrastructure would result in a negligible amount of avian disorientation and mortality for short periods of time. It would limit night lighting, to the extent practical, to reduce the risk of marine bird disorientation or collisions associated with light disturbance.

Northern Gateway said that the marine terminal may contribute to marine bird mortality through collisions with overhead power lines and infrastructure. It said that electrocution poses a threat to bird safety when power lines are used as perches. Nesting platforms and wires can pose collision hazards. Northern Gateway committed to mitigation measures to minimize electrocution risk to marine birds.

Environment Canada said that potential effects from ship lighting, or disturbance effects from ship traffic, would not be likely to cause population level effects.

Views of the Panel

ON BASELINE DATA AND ON PROJECT EFFECTS ON MARINE BIRDS

Considering Northern Gateway's commitment to conduct further baseline and monitoring studies, the Panel finds that appropriate information would be available for the purposes of assessing mitigation and, if required, adaptive management.

The Panel requires Northern Gateway to develop its Marine Environmental Effects Monitoring Program that would include marine bird sampling for 3 years before starting project operations and up to 3 years after beginning operations. Environment Canada said that the program framework was a good foundation for developing a rigorous monitoring program.

The Panel notes Environment Canada's view that potential effects from ship lighting or disturbance effects from ship traffic would not be likely to cause population-level effects on marine birds. The Panel finds that, given Northern Gateway's commitments to reduce sensory disturbance through vessel propeller maintenance and vessel speed restrictions, as well as to apply light disturbance mitigation, the project is likely to have little effect on direct mortality of marine birds from project construction and routine operations.

EVALUATION OF ADVERSE PROJECT EFFECTS ON MARINE BIRDS (HABITAT AVAILABILITY) AFTER MITIGATION

Temporal extent
Direct loss of habitat from terminal construction would last for the duration of project operations. There would be short-term sensory disturbance from blasting and dredging during construction. Sensory disturbance from vessel operations would continue throughout the project lifespan, although each event would be of short duration.

Spatial extent
Habitat loss and sensory disturbance from construction would be limited to the project area, while sensory disturbance from vessels would be along the marine transportation routes.

Intensity
Marine birds do not substantially rely on the habitat within and near the Project Development Area, and sensory disturbance from vessels is expected to have a negligible to low effect on marine bird populations.

Recommendation for significance of project effects after mitigation
Given the low intensity of effects, the Panel recommends that project construction and routine operation are not likely to result in significant adverse effects with respect to habitat availability for marine birds.

EVALUATION OF ADVERSE PROJECT EFFECTS ON MARINE BIRDS (MORTALITY RISK) AFTER MITIGATION

Temporal extent
Mortality risk related to nest destruction would be limited to the marine terminal's construction period. Mortality risk from collisions with power lines and lights (and from routine transportation activities) would last for the duration marine terminal operations.

Spatial extent
Generally localized (the marine terminal area).

Intensity
Mortality events due to routing transportation activities, nest destruction, and collisions with power lines and lights are expected to be rare and have a small effect on marine bird populations.

Recommendation for significance of project effects after mitigation
Considering the low intensity of effects, together with planned surveys, mitigation, and monitoring, the Panel recommends that project construction and routine operation are not likely to result in significant adverse effects with respect to mortality risk to marine birds.

Views of the Panel

ON CUMULATIVE EFFECTS ON MARINE BIRDS

The Panel finds that the project would result in adverse effects on marine bird habitat availability and mortality risk after applying mitigation. These effects would not be significant. These effects would be localized and population-level effects are not expected. Direct mortality of marine birds from vessels is expected to be rare. The proposed mitigation measures for direct mortality of marine birds from nest destruction and electrocution risk are standard. The Panel finds that the nature of expected project effects after mitigation limits the potential for cumulative effects and a detailed discussion of cumulative effects is not required for effects on marine birds.

8.8 Capacity of renewable resources

The Panel's environmental assessment included consideration of the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

The Panel identifies those elements of the biophysical environment that, as renewable resources, have either an existing or anticipated use by the public and Aboriginal groups (both consumptive and non-consumptive use) and that can be replaced or replenished on an ongoing basis by natural or human actions. In Chapter 9, Panel considerations include effects on the human environment from project-related changes to the biophysical environment.

During its evaluation of significance for each of the environmental effects identified, Northern Gateway examined the capacity of renewable resources likely to be significantly affected by the project to meet the needs of the present and those of the future. It did so by considering whether the resource would be able to sustain itself, should the project proceed. Northern Gateway analyzed environmental effects on biophysical renewable resources, including atmospheric environment, water resources, freshwater and marine fish, marine mammals, vegetation, wetlands, and terrestrial wildlife. It also identified and analyzed effects of the project on land and resource use.

Other parties commented on specific project effects on environmental components addressed in this chapter. Limited comments were made by other parties specifically with respect to the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future. The United Fisherman and Allied Workers Union said that one of the renewable resources that would be significantly affected by the project is the fisheries resource. It said that the determination of the effects of the Enbridge Northern Gateway Project on the capacity of the fisheries resource to meet the needs of Canada's fishing industry and future seafood markets is key.

Views of the Panel

ON CAPACITY OF RENEWABLE RESOURCES

The Panel considered renewable resources that have the potential to be significantly affected by the project, and whether the ecosystems of which these renewable resources are a part would be able to maintain the processes on which these renewable resources depend, should the project be built.

Various sections of this chapter provide consideration of whether significant adverse effects to the capacity of those resources to meet the needs of the present and those of the future are likely to occur. The nature of potential effects on the capacity of renewable resources was considered along with criteria for evaluating significance, such as the length of time for recovery.

For the majority of the effects considered in this report, the Panel is of the view that, given the mitigation measures to be implemented and Northern Gateway's compliance with the conditions that Panel has set out, the project is not likely to cause significant adverse environmental effects on renewable resources.

In the cases where the Panel recommends that effects are likely to be significant (related to cumulative effects on woodland caribou and grizzly bears), careful management of the cumulative effects from all projects is important if the use of such renewable resources is to be maintained for present and future generations.

For the terrestrial portion of the project, once the pipelines are decommissioned or abandoned, the land would be available for former uses, further reducing any residual effects to the capacity of renewable resources. For the marine and freshwater portions of the project, should the project cause losses to fishery resources, one option would be compensation.

8.9 Environmental protection

Northern Gateway submitted a preliminary Construction Environmental Protection and Management Plan that includes mitigation and monitoring commitments aimed at avoiding potential adverse effects during the project's construction phase, or minimizing them when they cannot be avoided. The plan would be the primary reference to document Northern Gateway's environmental protection commitments and requirements for contractors, environmental inspectors, and project personnel. Northern Gateway would track the implementation of all of its environmental obligations and requirements during construction using tools such as environmental alignment sheets, a compliance database, and an environmental issues tracking database.

Northern Gateway said that its final Construction Environmental Protection and Management Plan, which it would file with the National Energy Board for approval before construction begins, would outline protection measures for environmental components that were identified through the environmental assessment process and in consultation with regulators, participating Aboriginal groups, resource managers, scientists, and the public, including members of the Community Advisory Boards. It said that input received from participating Aboriginal groups was assessed and incorporated where appropriate into its preliminary plan, and that input from Aboriginal groups would continue to be collected and incorporated into the final plan, as appropriate.

Northern Gateway proposed a number of environmental management plans as part of its Construction Environmental Protection and Management Plan. Northern Gateway said that it would include contingency plans in the Construction Environmental Protection and Management Plan that would outline proposed responses to exceptional or unexpected events such as:

- routine spills (including fuel, hydraulic fluid, or chemical releases);
- fires;
- environmental damage shutdown or work modification (e.g., if heavy rains or unexpected thawing of frozen soils lead to rutting, which may damage the soil structure or result in admixing, work may have to be suspended until conditions improve);
- weather event siltation (including unanticipated storm water management);
- unplanned heritage resources discoveries;
- personnel-wildlife interactions; and
- horizontal directional drilling failures.

During the project Panel's review, Northern Gateway identified other environmental management plans, including:

- Air Quality Emissions Management and Soil Monitoring Plan
- Caribou Habitat Offsets Measures Plan
- Caribou Habitat Restoration Plan
- Caribou Protection Plan
- Environmental Management and Protection Plan for Nechako Sturgeon
- Freshwater Fish and Fish Habitat Compensation Plan
- Linear Feature Management and Removal Plan
- Marine Environmental Effects Monitoring Plan
- Marine Habitat Compensation Plan
- Marine Mammal Protection Plan
- Pipeline Environmental Effects Monitoring Plan
- Quality Management Plan
- Sediment Monitoring Plan
- Watercourse Crossing Contingency Plans
- Wetlands Function Assessment Plan

Northern Gateway included commitments to environmental inspections and audits in its preliminary Construction Environmental Protection and Management Plan. Environmental inspections would involve monitoring compliance with environmental commitments, undertakings and conditions of authorizations, applicable environmental regulations, and Northern Gateway's own policies, procedures, and specifications. Environmental audits would assess the effectiveness of the Construction Environmental Protection and Management Plan's implementation and would examine conformance to environmental protection plans and commitments, and consistency among all aspects of the environmental inspection programs. Northern Gateway envisioned environmental inspectors to be either employees or contractors of Northern Gateway. It said that it would specify in the Pipeline Environmental Effects Monitoring Program whether environmental audits would be conducted by an environmental inspector or by a third party.

The Coalition said that third party inspections and audits, as opposed to those conducted by employees or contractors of Northern Gateway, would be preferable from an accountability and transparency point of view. Northern Gateway said that its approach to compliance verification, through inspections and audits, would be integrated within its overall environmental management system and quality assurance practices. In response to questions from the Fort St. James Sustainability Group, Northern Gateway said that it has not yet confirmed the details of its auditing program.

Views of the Panel

ON ENVIRONMENTAL PROTECTION

It would be necessary for Northern Gateway's activities to be subject to a series of environmental protection measures to ensure compliance with environmental commitments and requirements, in order to avoid significant adverse environmental effects.

The Panel requires Northern Gateway to develop its final Construction Environmental Protection and Management Plan. The plan would encompass a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in the project application, subsequent filings, evidence collected during the Panel's process, or that Northern Gateway otherwise committed to during questioning or in its related submissions during the review. The Construction Environmental Protection and Management Plan must include the contingency plans and environmental management plans, as outlined in the preliminary Construction Environmental Protection and Management Plan.

If the project is approved, and Northern Gateway decides to proceed, Northern Gateway would be required to comply with all conditions that are set out in the certificates. The National Energy Board would monitor and enforce compliance during the project's lifespan through audits, inspections, and other compliance and enforcement tools.

8.10 Follow-up and monitoring

In addition to the various follow-up programs noted throughout Section 8.7 of this report, Northern Gateway said that it would meet its commitments related to follow-up and monitoring through its implementation of the following broad programs:

- the Pipeline Environmental Effects Monitoring Program, the purpose of which would be to describe the current status of terrestrial and freshwater biota and their habitat, and any potential change in species diversity, abundance and distribution, and habitat quality in the Project Effects Assessment Area due to direct effects of routine project activities or potential oil spills; and
- the Marine Environmental Effects Monitoring Program, the purpose of which would be to describe the current status of marine biota and their habitat, and any potential change in species diversity, abundance and distribution, and habitat quality in the Project Effects Assessment Area, Confined Channel Assessment Area, and Open Water Area due to direct effects of routine project activities or potential oil spills.

Data collected through each of these programs would be used as part of an adaptive management program to identify any required changes in project operations, or environmental management approaches and ongoing monitoring strategies.

Northern Gateway said that the project environmental inspector would conduct compliance monitoring to determine whether project activities adhere to proposed mitigation measures. Northern Gateway would monitor mitigation measure effectiveness as needed to confirm that they are effective, implementing adjustments as necessary, as part of adaptive management.

The Coalition asked, with respect to monitoring project effects, who would "monitor the monitors." Northern Gateway said that it has outlined detailed plans for environmental inspection during construction, and verification by third parties that all components of the final Construction Environmental Protection and Management Plan are being considered and implemented. It would file its monitoring plans with the National Energy Board.

Northern Gateway said that it would implement follow-up measures in situations where it has a low to moderate certainty level regarding its predictions of environmental effects, and a low confidence level in the effectiveness of its proposed mitigation measures. It would also apply follow-up measures in instances where proposed mitigation measures have not been fully tested.

Northern Gateway committed to an adaptive management approach by which it would implement alternate or additional mitigation measures if the results of its proposed follow-up programs showed that effects were greater than expected, or if mitigation was not achieving the anticipated results.

Some participants, including the Coalition, characterised Northern Gateway's proposed follow-up programs as late attempts to identify environmental effects and mitigation measures; a process that should have occurred during the course of the

review process, instead of post-approval. Coastal First Nations concurred and said that, in the case of marine mammals for example, Northern Gateway's commitment to conduct monitoring and follow-up post-approval to gather additional information cannot adequately inform the Panel's recommendation as to whether the project should be approved or not. Similarly, Haisla Nation said that Northern Gateway's reliance on follow-up and monitoring to determine significance of adverse effects or effectiveness of mitigation would prevent the Panel from effectively making significance determinations for potential environmental effects.

Northern Gateway said that using follow-up programs does not render the environmental assessment incomplete or insufficient. Instead, it makes the environmental assessment adaptable. For example, Northern Gateway said that the purpose of the Marine Environmental Effects Monitoring Program would be to refine its project with respect to mitigation, timing for least risk periods, and for obtaining pre-construction baseline information. The proposed program reflects the moderate level of certainty that Northern Gateway has in terms of its predictions and would help it determine its proposed mitigation measures' effectiveness. It is not meant to provide more information to inform the environmental assessment.

Northern Gateway reiterated, in final argument, that its proposed follow-up commitments are consistent with the purpose of follow-up programs under the *Canadian Environmental Assessment Act, 2012.* This was notably with respect to modifying or implementing new measures where warranted by follow-up results, supporting the implementation of adaptive management measures, addressing previously-unanticipated adverse environmental effects, and supporting environmental management systems used to manage the environmental effects.

Views of the Panel

ON FOLLOW-UP AND MONITORING

Northern Gateway committed to the specific follow-up and monitoring measures outlined in this chapter for each assessed valued ecosystem component.

The Panel has considered the need for, and requirements of, follow-up as part of its environmental assessment. Should the project be approved, follow-up programs should be implemented for valued ecosystem components for which there is uncertainty or low confidence in how the project may adversely interact with them, or if there is uncertainty or low confidence in the effectiveness of the proposed mitigation measures. Follow-up programs may also be appropriate when new or unproven technologies are being considered to bring adverse environmental effects below a significance threshold. Finally, the Panel took into consideration that the National Energy Board has regulatory oversight throughout the entire project lifespan. Through conditions, the Panel requires Northern Gateway to file the results of these follow-up programs with the National Energy Board.

Some participants considered Northern Gateway's proposed follow-up programs as a late attempt to identify environmental effects and mitigation measures and that its environmental assessment was incomplete.

The Panel finds that the information to be collected as part of the follow-up programs is intended to provide a more comprehensive baseline upon which to determine if the predictions made in the environmental assessment are accurate and to verify mitigation measure effectiveness. The Panel does not view collecting further baseline information under the follow-up programs as an attempt to fill a gap in baseline information for the environmental assessment. The Panel finds that the follow-up programs that Northern Gateway proposed fit the intent of a follow-up program under the *Canadian Environmental Assessment Act, 2012*.

The Panel requires Northern Gateway to develop and describe its proposed environmental component-specific follow-up programs, such as for linear feature management and removal, and acid rock drainage. The Panel also requires Northern Gateway to develop its final Marine Environmental Effects Monitoring Program and Pipeline Environmental Effects Monitoring Program.

8.11 Summary views of the Panel

In this chapter, the Panel looked at the environmental effects of routine project activities, including marine transportation, on the biophysical environment. The Panel considered all of the evidence in coming to its recommendations as to whether the project's predicted adverse environmental effects would likely be significant.

Some participants questioned whether sufficient evidence had been provided and argued that certain surveys, plans, or analyses that Northern Gateway proposed undertaking or developing in the post-approval stage should have been provided before or during the environmental assessment. The Panel concluded that it had all evidence required to make its recommendations on all matters relevant to the environmental assessment of the project. In particular, the Panel finds that all relevant pathways of effects were adequately considered, that appropriate key indicator species were chosen, and that sufficient evidence on the likely effectiveness of mitigation and adaptive management was provided to allow the Panel to understand the current state of knowledge. The Panel accepts Northern Gateway's environmental assessment as sufficient for the purposes for which it was intended.

The Panel considers that Northern Gateway's mitigation measures would provide environmental protection to species present in the project area, whether they are terrestrial, freshwater, or marine species. The degree of protection afforded by mitigation measures would increase if a species is already at risk. The Panel finds that Northern Gateway generally took a precautionary approach and has made commitments related to additional research that could result in benefits.

The Panel is of the view that, even when considering Northern Gateway's proposed mitigation measures and its compliance with the conditions the Panel has set out, the project would cause adverse environmental effects, after mitigation, on a number of valued ecosystem components. These include the atmospheric environment, rare plants and rare ecological communities, old-growth forests, soils, wetlands, woodland caribou, grizzly bear, terrestrial birds, amphibians, freshwater fish and fish habitat, surface and groundwater resources, marine mammals, marine fish and fish habitat, marine water and sediment quality, marine vegetation, and marine birds. The Panel does not conclude that potential effects, from the project alone, are likely to be significant for any of these valued ecosystem components.

The Panel also considered cumulative effects for each valued ecosystem component, and provided a detailed discussion of effects where such a discussion was warranted. In most cases, the Panel recommends that project effects, in combination with effects of past, present, and reasonably-foreseeable projects, activities, or actions, are not likely to be significant.

In two cases, the Panel recommends that project effects, in combination with effects of past, present, and reasonably foreseeable projects, activities, or actions, are likely to be significant. The first relates to effects on woodland caribou and, specifically, for the Little Smoky herd of boreal woodland caribou, and the Hart Ranges, Telkwa, Narraway, and Quintette herds of southern mountain caribou. The second relates to grizzly bear and, specifically, the eight grizzly bear populations that are or would be over the linear density threshold (i.e., all population units and management areas overlapped by the Project Effects Assessment Area, other than the Parsnip Grizzly Bear Population Unit).

In each of these two cases, despite substantial mitigation proposed by Northern Gateway that generally surpasses industry norms and commitments to undertake research to fill knowledge gaps, uncertainties related to the effectiveness of that mitigation led the Panel to take a precautionary approach and recommend a finding of significance. In Chapter 2, the Panel considers the overall benefits and burdens of the project, and recommends that significant effects in these two cases be found to be justified in the circumstances.

The Panel's recommendations are dependent on the full implementation of Northern Gateway's proposed measures and its compliance with the conditions the Panel has set out. Most of the Panel's conditions regarding the biophysical environment are intended to ensure that, if the project proceeds, biophysical baseline information is enhanced and detailed design and mitigation plans are developed and made available before construction begins. This would increase the probability of mitigation success, inform interested or affected parties, and support regulatory oversight by the National Energy Board, in particular. Implementation of Northern Gateway's commitments and its compliance with the conditions the Panel has set out with respect to follow-up, monitoring, and adaptive management would verify the accuracy of environmental assessment predictions and mitigation effectiveness. The commitments and conditions would inform and track effective corrective measures where they are required.

9 People and communities

The Panel has considered the potential effects of the Enbridge Northern Gateway Project on people and communities along the right-of-way and in coastal areas. The Panel heard from concerned citizens, Aboriginal groups, governments, and organizations throughout Alberta and British Columbia regarding both the potential benefits and adverse effects the project may have on their communities. The Panel listened to their concerns and sought to understand how they felt the project could affect them. This chapter discusses evidence related to the socio-economic elements of Northern Gateway's application and the Panel's views related to these topics.

9.1 Occupancy and resource use

Northern Gateway said that project development would occur in an area subject to numerous land uses, including commercial fishing, forestry, resource extraction, hunting and trapping, and recreational pursuits. It said that the project has the potential to affect local communities, Aboriginal groups, and other stakeholders engaging in these types of activities.

9.1.1 COMMERCIAL FISHING

Northern Gateway filed detailed baseline data on commercial fisheries, including landed weight, dollar value, gear type, and fishing efforts within the marine Project Development Area and the Confined Channel Assessment Area over a 10-year period (1998-2008). Northern Gateway noted the economic and employment importance of the commercial fishery to British Columbia's coastal communities. It also said that the potential effects of terminal construction, operations, and project-related marine transportation on commercial fisheries could include restriction of access to fishing grounds, loss of or damage to fishing gear, changes to distribution and abundance of harvested species, and aesthetic, visual, and noise disturbances.

Many intervenors were concerned with the effects that fishery closures due to construction, operations, or a spill might have on their employment or income gained from commercial fishing. The United Fishermen and Allied Workers Union said that there are over 2,000 shore-workers and fisherman along the central and north British Columbia coasts. It indicated that the fishing industry is the largest private sector employer on the North Coast and that, in 2010, the landed value of the commercial fishery along the central and north coasts was $330 million. It also said that the north and central coast commercial fishery accounts for approximately 50-75 per cent of British Columbia's total commercial fisheries revenue. The salmon fishery alone totaled over $41 million in 2010. The Union said that its specific concerns regarding the project's shipping operations include the inability to eat shellfish from areas where vessels tie up, vessel wakes destroying shorelines, interference with shoreline harvesting, and the introduction of invasive species from hull fouling. It was also concerned about increased vessel traffic in fishing and diving areas that would endanger fishermen and their boats, and the effects that marine loading and transport operations, including spills, leakage, and bilge pumping of vessels would have on members' access to marine foods.

Aboriginal intervenors from the coast said that commercial fisheries and seafood processing represent the largest proportion of Aboriginal employment and are key components of their local communities. Aboriginal groups, such as the Gitga'at First Nation, Council of the Haida Nation, and Coastal First Nations, said that, if commercial catches drop due to routine project activities, there would likely be significant losses in Aboriginal employment, vessel ownership, and income. They said that an accidental spill scenario resulting in a commercial fisheries closure would also have a significant effect on their livelihood.

Northern Gateway said that, where individuals or businesses can demonstrate a quantifiable loss as a result of restrictions imposed on marine or foreshore access or activities as a result of a spill, it would provide compensation to offset these losses. The company said this could include compensation for loss of revenue, damage to boats or equipment, or any costs for having to travel to alternate sites to pursue commercial fishing.

Northern Gateway committed to establish a Fisheries Liaison Committee (FLC) to facilitate effective communication among all types of marine fisheries, along with regulators and other interested parties, in a forum to address specific fisheries issues and develop mutually acceptable solutions. Northern Gateway said that the FLC could play a role in reducing any potential economic losses due to reduced fishing opportunities as a result of construction and operations.

Northern Gateway said that the FLC members themselves would determine the committee's full mandate and structure, and that the proposed committee framework anticipates using a consensus-based model. As a result, the company said that the full spectrum of activities that the committee would engage in would be determined by the committee itself, once it is formed, but could include:

- scheduling vessel movements to avoid peak fishing activity during some commercial fishery openings (e.g., the salmon and herring fisheries);
- implementing measures to reduce conflicts with other fishing activities, including recreational and Food, Social, and Ceremonial (FSC) fisheries;
- initiatives to improve fishing in other areas outside the marine Project Development Area;
- developing protocols for reporting loss of or damage to fishing gear due to shipping operations;
- determining appropriate compensation for loss of or damage to fishing gear due to shipping operations;
- developing methods to communicate construction and tanker traffic schedules to marine users;
- developing protocols for the whale spotting vessel to alert pilots and vessel captains of specific fishing activity locations, as well as means to notify or alert fishers of approaching vessels;
- developing methods to communicate fishing openings and locations to pilots and vessel captains; and
- discussing monitoring programs, including catch monitoring programs, for commercial-recreational, recreational, and FSC fisheries.

Northern Gateway anticipated that the first FLC meeting would be scheduled 6 months prior to commencing in-water construction of the marine terminal and it expects the FLC to remain an integral part of the project throughout its lifespan.

Several intervenors expressed concerns about the FLC's long-term funding and viability, how it would address compensation for damaged fishing equipment, how it would resolve conflicts between fishers and the project, as well as its mandate and structure.

Northern Gateway committed to funding the FLC's initial operating costs and ongoing administrative costs for the life of the project. Although committee membership has yet to be identified, Northern Gateway said that it should reflect individuals and groups in the best position to identify potential conflicts and that have the most at stake to see conflicts successfully resolved. The FLC would have an independent chairperson and administrative support. Northern Gateway said that it envisioned that there would be one or two representatives from each affected sector or interested party and that the committee may include, but not necessarily be limited to, participation by:

- Northern Gateway;
- representatives from each fishery (commercial, commercial-recreational, FSC, and recreational), including associations and unions;
- representatives from each coastal Aboriginal group in proximity to the Confined Channel Assessment Area and Open Water Area;
- government agencies (Fisheries and Oceans Canada, Transport Canada, the Canadian Coast Guard);
- other affected parties; and
- any other shippers and vessel operators in the area that are interested.

Northern Gateway said that, while not all fishers have committed to participating, it would go ahead with establishing the FLC and seek to include groups such as the British Columbia Coast Pilots, the British Columbia Chamber of Shipping, and the Government of Canada. It would also encourage other large operators to participate, with the hope that, ultimately, other stakeholders, including commercial fishers, would join the committee. If fishers choose not to participate, Northern Gateway said that it would retain consultants to provide technical advice on sighting methods, timing and locations of different fisheries, associated key life history phases of harvested fish, and vessel operations. Northern Gateway also indicated that it would look at ways to ensure that funding is not a barrier to participation, particularly for Aboriginal groups.

Responding to intervenor concerns, Northern Gateway referred to two successful liaison organizations being used in Atlantic Canada to assist the petroleum and fishing industries in identifying potential conflicts and arriving at mutually acceptable solutions. It said that the FLC would be distinct from the Atlantic programs in that its focus would be on transiting tankers, as opposed to offshore exploration. Lessons learned by these other organizations would help develop the FLC's objectives, priorities, and management structures and mechanisms. Regarding the FLC's feasibility, Northern Gateway said that nothing like the FLC currently exists on the North Coast and it believes that, if the various fishing industry sectors (commercial, FSC, and recreational) can sit down together with shippers, the effects of ship movements on these groups can be reduced.

9.1.2 FORESTRY

Northern Gateway said that, in Alberta, the pipeline right-of-way would intersect five forestry management areas. In British Columbia, it would intersect five major timber supply areas, 3 tree farm licenses, 3 community forest licences, and 12 woodlots.

Northern Gateway said that, during construction, key potential effects on forestry activities could include a reduced forestry land base, merchantable timber loss, contributing to the spread of mountain pine beetle, intersecting high-priority forestry plots, and forestry access disruption or improvement.

Northern Gateway indicated that timber clearing for the pipeline right-of-way, roads, power line easements, pump stations, other infrastructure, and the Kitimat Terminal would represent a loss of harvestable forestry land base for the duration of the project, plus at least 1 harvest-regeneration cycle for forest recovery (60 to 100 years). Northern Gateway estimated that the total land base loss in Alberta and British Columbia would be 7,253.3 hectares, leading to an estimated loss of approximately 1 million cubic metres of timber. This represents 0.04 per cent of forestry stakeholders' land base and 0.06 per cent of their net productive forestry land base.

Northern Gateway's planned mitigation for reducing the forestry land base includes:

- compensating each affected timber tenure holder, where necessary, and in accordance with provincial standards;

- providing maps and early notification of the pipeline right-of-way and other physical work to potentially-affected regional forestry stakeholders;
- coordinating and integrating advanced harvesting of Project Development Area timber into forestry stakeholders cut plans, where possible; and
- considering, where requested by the forestry stakeholders, localized right-of-way re-routing to avoid and eliminate the loss of long-term research plots and silviculture sites.

Natural Resources Canada said that the risk of the project contributing to the spread of mountain pine beetle through clearing and transporting infested logs could be efficiently mitigated by adhering to provincial forest management practices. Northern Gateway committed to abide by all provincial requirements.

Aboriginal intervenors with forest licences, such as the Kitselas First Nation, expressed concerns about the loss of merchantable timber along the right-of-way and how timber would be salvaged. Northern Gateway said that it would work with stakeholders to integrate forest clearing for the project into their harvest plans. Northern Gateway also committed to working with timber tenure holders and Aboriginal communities to develop a Timber Salvage Plan that would include opportunities for Aboriginal groups to harvest timber. This plan's purpose would be to have local industry use as much Project Development Area timber as feasible.

Northern Gateway said that it would follow Enbridge's tree-for-tree and hectare-for-hectare program where, for every merchantable tree that is cut down, another tree would be planted. Tree planting would occur initially on temporary work space areas disturbed by construction. Northern Gateway said that it would then work with appropriate resource agencies to identify areas where replanting would provide the most benefit, either to communities or wildlife. For its hectare-for-hectare program, the company said that it would work with appropriate agencies and stakeholders to focus on the best locations for conservation in western Canada. Northern Gateway said that it would work to restore ecosystems similar to those the project would potentially be disturbing. It also said that the hectare-for-hectare program would focus on legacy disturbances, such as roads or other linear features that are found on Crown land.

9.1.3 TRAPPING, HUNTING, AND RECREATIONAL FISHING

In its application, Northern Gateway indicated that the right-of-way would intersect 38 registered trapping areas in Alberta and 52 trapping management units in British Columbia. Northern Gateway said that hunting and recreational fishing are important activities and sources of food for local residents and tourists along the proposed right-of-way as well as near the Kitimat Terminal and within the Confined Channel Assessment Area.

Northern Gateway said that, during construction, noise and the presence of people, equipment, and materials could cause a temporary thinning-out of furbearers and game species near the right-of-way, and that project activities might encroach on, or obstruct access to, trappers' trail systems, staging areas, trapping sites, and cabins. The company said that project activities might also temporarily obstruct access to prime recreational fishing locations and sites during construction. Northern Gateway said that it does not expect any interruption to trapping, hunting, and fishing along the right-of-way during operations, as wildlife would return to the area when construction ends.

Aboriginal intervenors and other land users expressed concerns about access disruption, effects on furbearing animals, and the potential loss of income. For example, Driftpile First Nation said that the project would permanently affect the traplines and fur management areas that it intersects as construction noise and activities would likely drive animals away from the area. Northern Gateway said that it has planned a variety of measures to mitigate trapping, hunting, and recreational fishing disruptions, including, but not limited to:

- during construction, avoiding, where possible, furbearing species' prime denning and breeding habitats;
- notifying trappers, guide-outfitters, and the Alberta and British Columbia fish and wildlife branches of schedules and locations, with maps, well before clearing and construction begins, as well as including updates within the Environmental Protection Management Plan for construction as to how the notification process is proceeding; and
- compensating affected trappers according to established industry and provincial protocols when reduced fur harvest and lost revenue are established, as well as for any disturbance to trails, staging areas, and parking sites.

9.1.4 REGIONAL LAND USE AND MARINE PLANNING

Northern Gateway said that the proposed pipeline route would cross nine land use planning areas: two in Alberta and seven in British Columbia. The company said that, from east to west, the route would cross the White Area and Green Area in Alberta, and the Dawson Creek, Prince George, Fort St. James, Vanderhoof, Lakes, Morice, and Kalum South Land and Resource Management Plan areas in British Columbia. Northern Gateway provided a list of all land use and ecosystem management plans that would apply to the project. It said that these plans specify resource management and land use objectives, and provide general mitigation strategies. Northern Gateway said that it used these in its project effects assessment, in selecting valued ecosystem components, and in establishing related specific parameters and thresholds.

The following Aboriginal groups submitted land and marine use planning documents during the proceeding:

- Council of the Haida Nation;
- Daiya-Mattess Keyoh;
- Gitga'at First Nation;
- Gitxaala Nation;
- Heiltsuk Tribal Council; and
- Kitasoo/Xaixais Integrated Resource Authority.

In their plans, Aboriginal groups described how these provide integrated approaches to land and marine planning. The Kitasoo/Xai'xais First Nation said that its marine use plan sets out to balance culture, the economy, and ecosystems to ensure a future for the younger generation. It also said that its marine use plan supports other plans, such as the Klemtu Tourism Strategic Plan, that describes mechanisms to increase revenues in industries such as marine tourism, wildlife viewing, and aquaculture, all of which are important employers in the community. The Council of the Haida Nation said that its integrated marine use planning efforts help support existing economic activities such as commercial and recreational fisheries, seafood processing, marine tourism, marine transportation, and research, monitoring, and enforcement activities.

In its oral evidence, the Kitselas First Nation shared information regarding its Land and Resource Stewardship Policy, which describes community objectives and sets out both general principles and more specific policies for land and water resource development and use. It said that the policy informs economic activity within their traditional territory, including the Kitselas forestry harvesting business that has harvested 400 cubic metres of timber over the last 5 years. The Daiya-Mattess Keyoh said that its forestry management plan took its values into consideration with the goal of protecting culturally-significant areas and wildlife.

Coastal Aboriginal groups said that these plans are based on co-management principles developed with provincial and federal government bodies to revitalize the marine-based economy. Their concerns are that the project could derail these plans. Aboriginal groups also expressed concerns about how Northern Gateway had taken existing marine use plans into consideration in its application. They questioned Northern Gateway's awareness of the Pacific North Coast Integrated Management Area (PNCIMA) initiative, including how this initiative's atlases and data incorporate indigenous customs and practices.

Aboriginal groups said that they are participating in the PNCIMA initiative. They described the initiative as a new mechanism to improve decision-making and as a collaborative approach to integrated management planning in an effort to minimize conflicts among ocean users. They said that the goal of PNCIMA is to provide an opportunity for federal, provincial, First Nations, and local governments, as well as stakeholders, to address environmental, social, cultural, and economic issues in an integrated manner.

Northern Gateway said that it is also participating in the PNCIMA initiative, uses the same maps provided by Fisheries and Oceans Canada, and has identified the same biologically important areas in its project assessment. Northern Gateway said that it respects that Aboriginal groups feel a responsibility to protect the coastal areas and waters.

9.1.5 USE OF DESIGNATED RECREATION AREAS, PROTECTED AREAS, AND NON-CONSUMPTIVE AREAS

Northern Gateway said that it identified 11 formally-designated protected and recreation areas within the Project Development Area. In its project assessment, Northern Gateway said that it considered outdoor recreation stakeholders and their activities in these areas, including:

- ecotourism businesses;
- snowmobiling;
- skiing;
- mountaineering and hiking;
- mountain biking; and
- conservation, naturalists, canoeing, and rafting groups.

The company said one such area is the proposed Burnie River Protected Area in British Columbia that was planned by provincial authorities in consultation with, and in consideration of, the project, making allowance for the right-of-way to pass through it. The company said this area falls under the Morice Land and Resource Management Plan that is aimed at promoting wilderness recreation and protecting ecological values, while restricting motorized access.

Northern Gateway said that visual and noise disturbances could disrupt outdoor recreational ecotourism activities or valued wildlife (e.g., grizzly bear, caribou, and mountain goat). As mitigation, Northern Gateway said that it would include sensory and noise management measures within its Environmental Protection Management Plan for construction. It said that it would also consult with stakeholders to limit and control motor vehicle access for valued wildlife in the proposed Burnie River Protected Area, and consider provincial landscape design guidelines.

Many individuals submitted their concerns related to project effects on recreational and protected areas through oral statements, oral evidence and letters of comment. Individuals described the many recreational activities that are available to users along the right-of-way, including hiking, boating, fishing, snowmobiling, biking, and camping. They expressed their concerns about interruption to these activities during construction as well as the effect potential spills may have on their ability to enjoy these recreational areas. The District of Fort St. James said that community members are strongly devoted to living in Fort St. James largely for the quality of life they enjoy as a result of access to clean water and vibrant wilderness.

Individuals said that they had specifically moved to northwestern British Columbia because of the natural amenities it has to offer, as they were looking for experiences that only the mountains, the rivers, and the ocean could provide. Douglas Channel Watch described how local citizens use the recreational trails and waters in and around Douglas Channel and the Kitimat River valley. It said that it was important to protect the environmental integrity of Douglas Channel for the present and future generations. Aboriginal groups, local citizens, and people who had visited the project areas described the deep connection they felt to the land and the coast. They talked about Northern British Columbia's unique ecosystem, stating that it is a natural resource like no other and that the Great Bear Rainforest, extending from north of Vancouver Island to southeastern Alaska, are irreplaceable. One letter noted that it is more than a place – it is spirit, soul and pristine in the most literal sense. People described how they travelled to the North Coast to experience life in an area largely untouched by human activity, to connect with nature. They described the diversity and abundance of wildlife along the route, which they felt could change with increased industrial activity. One individual noted that she finds peace and power in the wilderness, while another spoke of the awe and admiration he had for the beauty and the natural richness of the land.

Aboriginal groups described the spiritual connection they have with the land and the waters. The Kelly Lake Cree Nation said that many of the rivers, lakes and mountains that the pipeline would travel through are sacred and spiritual areas. The Office of the Wet'suwet'en described how they look after their traditional territories because as a people they are a part of the land. The Council of the Haida Nation said that the foundation of Haida culture is based in the spiritual, emotional, mental, and physical relationship with the lands and waters, that this spiritual connection relies on continuity, and that it is passed on from generation to generation. Gitxaala First Nation said that coastal waters are their place in the world and expressed the importance of the spiritual nature of their relationships with the environment that surrounds them. Haisla Nation said that family and community livelihood depends on natural resources and it said that it was concerned that a spill would destroy the relationship between the land, families, and the community. Both the Gitga'at First Nation and the Kitasoo/Xai'xais First Nation noted that the Kermode bear, which is only found within the Great

Bear Rainforest, is of great cultural and spiritual importance to them. They also noted that this area is a central part of future ecotourism plans and that the protection of the rainforest is part of their stewardship responsibilities.

9.1.6 AGGREGATE, MINERAL, AND OIL AND GAS RESOURCE ACTIVITIES

Within the Project Development Area in Alberta, Northern Gateway said that there are 2 coal lease applications, 444 oil and gas sector pipeline agreements, 63 mineral surface leases, 15 pipeline installation leases for infrastructure such as pump stations or metering facilities, and 8 right-of-entry agreements granted to pipeline operators by the Surface Rights Board.

In British Columbia, the company said that the Project Development Area bisects one mineral claim, but does not cross any active mines. It also said that there is 1 private aggregate pit within the Project Development Area – the Canfor 737 kilometre pit situated 10 metres from the proposed pipeline centreline.

Northern Gateway said that project activities might conflict with planned activities by mineral, oil, and gas tenure holders, including the Canfor 737 kilometre pit in the Project Development Area. To reduce any conflicts, Northern Gateway said that its proposed mitigation included notifying all tenure holders to coordinate planned activities and secure any necessary agreements, negotiating with existing pipeline right-of-way holders to route the project parallel to, or partially on, those rights-of-ways to limit disturbance, and consulting with the holder of the Canfor 737 kilometre pit.

9.1.7 LAND RIGHTS AND ACQUISITION

In its application, Northern Gateway said that, in order to construct, operate, and maintain the pipelines, facilities, and project infrastructure, it must acquire land rights from the Crown and private landowners in both Alberta and British Columbia. It identified a 1-kilometre-wide corridor for the proposed 1,178-kilometre-long pipeline route. Northern Gateway said that it was seeking approval to locate the project within this 1-kilometre-wide corridor to allow a certain amount of flexibility as it addressed technical issues and landowner and other stakeholder concerns. The permanent pipeline right-of-way would be 25 metres wide in most locations within the corridor and occupy 2,921 hectares. Northern Gateway said that the exact location of the pipelines' shared 25-metre-wide right-of-way would be determined after detailed engineering, if the project were to be approved. The company indicated that, during construction, an additional 25 metres of temporary workspace would be required along the entire length, representing a total of approximately 2,886 hectares.

Northern Gateway said that extra temporary workspace would be required at specific locations for construction activities such as watercourse, road, and utility crossings, and timber storage. Northern Gateway said that these locations would be identified during detailed engineering design, and construction planning. Each location's width would depend on site-specific needs, but might range from 5 to 20 metres on either side of the construction work area. Northern Gateway estimated that the cumulative total of extra temporary workspace would be approximately 10 per cent of the total right-of-way required during construction.

Northern Gateway said that 254 hectares would be required for land at pump stations and land within the Kitimat Terminal fence line. Infrastructure such as access roads, construction camps, stockpile sites, excess cut disposal areas, and power line easements would require 1,634 hectares. The company indicated that developing the Kitimat Terminal and the Clore and Hoult tunnels would require a combination of blast and haul techniques, generating a large volume of waste soil and rock. This waste would be transported to already-identified excess cut disposal areas. For the tunnels, each disposal area would require 20 hectares.

Northern Gateway estimated the total land area required for the project to be 8,276 hectares. It said that approximately 516 kilometres of the right-of-way is in Alberta, with about half on Crown land and half on private land. The company said that, in British Columbia, more than 90 per cent of the 656-kilometre-long right-of-way is on Crown land.

As described in Chapter 3, Northern Gateway has commenced consultation with landowners and occupants within the applied-for 1-kilometre-wide pipeline corridor, as well as those within 1.5 kilometres of a pump station location. As of March 2013, Northern Gateway said that there were 1,438 landowners and occupants within these areas. Northern Gateway indicated that it would seek all necessary land rights and approvals by negotiating for easement of statutory right-of-way agreements, temporary workspace agreements, access agreements, and fee simple purchase agreements. Northern Gateway said that it would not commence the land acquisition process until it received approval for the project, and that all land acquisition would comply with the provisions of the *National Energy Board Act*. Northern Gateway indicated that

compensation for land would be paid in accordance with industry standards and applicable legislation, and would be dealt with on a one-on-one basis with each landowner along the route.

Northern Gateway said that, as part of its consultation process, it met directly with 99 per cent of identified landowners and occupants and mailed information to the remaining 1 per cent. The company said that it has discussed issues and received feedback from these stakeholders and would compile all commitments made to landowners and occupants within the construction line list, to be provided to the relevant construction team for routine tracking and reporting. It said that all of these records would be maintained for review purposes. Northern Gateway said that stakeholder input would be considered and incorporated, as appropriate, into the final Construction Environmental Protection and Management Plan before the document is finalized.

Throughout the hearing process, Northern Gateway filed updated information relating to ongoing consultation including tables noting issues of concerns and examples of information sent to landowners. Northern Gateway said that the general concerns of landowners and occupants focused on detailed routing of the pipeline, compensation for land rights, potential environmental effects, safety of pipelines, and effects on industrial development.

Two landowners raised concerns during the hearing regarding routing on their lands. One landowner requested that Northern Gateway consider rerouting the proposed project to avoid his land. He also questioned the timeliness of response to his request for alternative routing. In response, Northern Gateway indicated that it evaluated both northern and southern route alternatives, and concluded that the proposed route across his lands was preferred because it significantly minimizes grading and associated disturbances, provides favourable watercourse crossings, and would cost less to construct and maintain. Northern Gateway agreed to develop and provide a geotechnical investigation work proposal to the landowner for review and approval, including investigation of a horizontal directional drill.

A second landowner expressed concerns in her oral presentation to the Panel that the proposed routing of the pipelines would intersect, or be near to, cultivated berry fields and orchards, fenced pastures and corrals, a water well, and the house and farm buildings located on her property. In response, Northern Gateway said that its route refinements filed with the Panel in December 2012 would relocate the proposed pipelines approximately 230 metres from her residence.

Northern Gateway also responded to requests from Aboriginal groups regarding routing on reserve land. It relocated the pipelines onto Alexander Indian Reserve Nos. 134 and 134A as a result of negotiations with Alexander First Nation, relocated the Whitecourt pump station onto the Alexis Indian Reserve No. 232 as requested by the Alexis Nakota Sioux Nation, and moved the Bear Lake pump station and pipelines off the Sas Mighe Indian Reserve No. 32 as requested by the McLeod Lake Indian Band.

When the application was initially filed, Northern Gateway labelled the applied-for route "Route R." Three route updates were subsequently filed: "Route T" in December 2010, "Route U" in August 2012, and "Route V" in December 2012. Some intervenors said that the route revisions made it difficult to remain fully informed and respond to these updates. Northern Gateway said that some of the route revisions have been as a direct result of the input of landowners and that the pipeline route could be subject to further adjustments to respond to landowner input. Northern Gateway said that it is attempting to be proactive, to meet with landowners, Aboriginal groups, and other stakeholders along the route, to identify opportunities to modify and change the route to address some the concerns that these groups have. It said that the route planning is ongoing as a result of continued dialogue, consultation, engagement, and the receipt of additional technical information.

9.1.8 NAVIGATION AND NAVIGATION SAFETY

Prior to 3 July 2013, Transport Canada was the 'appropriate authority' to approve National Energy Board-regulated pipeline crossings of navigable waters under the *National Energy Board Act*. The Panel notes that *National Energy Board Act* amendments, which came into force on that date, now require the National Energy Board, when making its recommendation report, to take into account the effects that the issuance of a certificate in respect of a pipeline that passes in, on, over, under, through, or across navigable waters, might have on navigation, including safety of navigation. Jurisdiction over shipping safety remains with Transport Canada.

As a result of these changes, the Panel has considered the potential of the pipeline crossings, marine terminal, and ancillary works related to the project to adversely affect navigation and navigation safety at navigable waters.

Northern Gateway said that nearly 1,000 defined waterbodies would be crossed with either trenched or trenchless crossing methods. Vehicle and equipment crossings of waterbodies would be required along the right-of-way, power lines would be constructed to supply electrical power for the pump stations, and a marine terminal would be constructed at Kitimat. Northern Gateway also said that all proposed waterbody crossing methods are preliminary and it would finalize the crossing methods during detailed engineering.

Prior to the transition of responsibilities for navigation and navigation safety, Transport Canada requested information from Northern Gateway on waterbodies proposed to be crossed by the pipeline and ancillary works, as well as information on contingency plans for proposed horizontal directional drill crossings of navigable waters. Transport Canada also requested information on the proposed specific location, timing, and methodology of marine terminal construction. Northern Gateway said that information on waterbodies at pipeline and ancillary work crossings would be available after detailed engineering, which would inform detailed routing. Northern Gateway also said that it provided drawings of the proposed Kitimat Terminal and marine terminal facilities as part of the TERMPOL studies, that preliminary contingency plans for alternate crossings were provided in the project application, and that it did not anticipate any project effects on navigation arising from power line crossings.

Transport Canada also asked Northern Gateway whether it had discussed, with any potentially-affected Aboriginal groups, specific concerns related to project components to be built in, on, under, over, through, or across any navigable waters. Northern Gateway said that it had not yet discussed the particulars of project effects on navigable waters with Aboriginal groups, as particulars of navigable waters could not be ascertained before detailed routing. Northern Gateway said that few, if any, concerns had been raised on waterbody navigation. Northern Gateway also said that, during detailed route selection, it would provide an opportunity for participating Aboriginal groups to review the specific routing and exact crossing locations. Northern Gateway said that, if issues are raised regarding effects on navigation, they would be addressed.

Northern Gateway committed to make all reasonable efforts to limit impediments to navigation prior to, and during, project construction. Northern Gateway committed to inform user groups on a regular basis, and to clearly and safely mark hazards to navigation.

9.1.9 AGRICULTURE AND PRIVATE LAND USE ACTIVITIES

Northern Gateway's application indicated that the right-of-way crosses agricultural lands in both Alberta and British Columbia. The company said that the lands in Alberta intersect the White Area and fall within lands that are zoned primarily for industrial use. In British Columbia, the company said that the Project Development Area includes an area of Agricultural Land Reserve near Fort St. James. As part of the land acquisition process for these lands, Northern Gateway said that it would apply for reclassification of the agricultural lands in British Columbia. Northern Gateway committed to provide advance notification of the reclassification proposal to owners of this land, as well as notify other agricultural stakeholders in both provinces of the construction schedule.

Northern Gateway said that less than 1 per cent of the White Area in Alberta and less than 1 per cent of the total Agricultural Land Reserve in British Columbia would be used during construction activities. It said that this temporary disturbance would last only during the construction period, after which the lands would be reclaimed to their original state before construction. The company also said that permanent operational infrastructure during the life of the project would require 1.9 hectares of White Area land in Alberta and 30.4 hectares of the re-classified Agricultural Land Reserve lands in British Columbia.

Northern Gateway also said that it considered the effects on the movement of livestock and farm machinery on private agricultural property along the pipeline route, noting that project activities might restrict movement of livestock and farm equipment across the Project Development Area or cause unwanted livestock movement. To mitigate these effects, Northern Gateway committed to, among other measures, notify livestock owners of the construction schedule well in advance of construction activities, provide temporary fencing along the right-of-way, require vehicle operators to close gates properly, and compensate for disturbance activities if necessary.

9.1.10 VISUAL AND AESTHETIC RESOURCES

Northern Gateway's application indicated that the pipeline right-of-way crosses 17 high visual sensitivity areas, as defined by the British Columbia Ministry of Forests, for a combined distance of 29.1 kilometres. In order to determine the effects to visual and aesthetic resources as a result of the construction and operation of the Kitimat Terminal, Northern Gateway selected various viewpoints within the 6-kilometre radius of the Project Effects Assessment Area, which included both land and water areas. Using 3D modelling, Northern Gateway concluded that views from three trails with recreation sites might be affected by the project. The company said that marine users and Kitamaat Village residents would also have a partial view of the Kitimat Terminal. In response to questioning from the Douglas Channel Watch, Northern Gateway noted that it was aware of visual concerns and that the implementation of certain mitigation would minimize visual effects.

To lessen the visual disturbance along both the right-of-way and in the vicinity of the terminal, Northern Gateway committed to revegetate disturbed land after construction, consider provincial landscape design guidelines, and continue to consult with relevant stakeholders to inform them about project activities and schedules. Northern Gateway committed to evaluate the effectiveness of these efforts and adapt them as appropriate.

9.1.11 MARINE PARKS, PROTECTED AREAS, AND RECREATION AREAS

Northern Gateway said that there are no marine parks or protected areas within the Project Effects Assessment Area and that there would be no project-related effects on such areas. Northern Gateway said that, within the Confined Channel Assessment Area, the movement of tankers to and from the marine terminal may result in a low-level restriction of marine access to parks, protected areas and recreation areas, including those within the region described as the Great Bear Rainforest. The company said that the potential for this interference is considered to be extremely low, as the tankers would be sailing within the centre of the channel whenever possible. Northern Gateway said that any disruption of access would be site-specific, short-term, and reversible within the timeframe of minutes to less than an hour after the tanker passes the locations.

Views of the Panel

The Panel heard about the many ways in which people live on, use, and enjoy the land and waters within the project area. The appreciation of natural areas and the value that people and communities place on these was evident during oral statements and oral evidence. The Panel recognizes that the project would pass through areas of great significance to Aboriginal groups, landowners, community members, tourists, and recreational users, among others. The information and views provided to the Panel were thoughtfully crafted and the Panel thanks all participants for providing their many well-articulated, heartfelt viewpoints.

One of Northern Gateway's proposed mitigation measures is the Fisheries Liaison Committee. The applicant said that this committee could facilitate effective communication between the project and all marine fisheries. As proposed, the FLC would also work, along with industry and other interested parties, to address specific issues related to interactions with marine fishing and to work to develop mutually acceptable solutions. The Panel finds that the FLC has the potential to be successful, as it is intended to be inclusive, collaborative, solution-oriented, and based on programs that have been successful in other parts of Canada. The Panel sees the FLC as a visionary program, as it is proposed to be a broadly-based forum that is intended to offer benefits beyond the project.

The Panel recognizes there may be a number of challenges to establishing and successfully maintaining the FLC. The program is still at the conceptual stage and has not been fully committed to by potential participants. The Panel

acknowledges that some Aboriginal groups and commercial fishers expressed skepticism about the program and were concerned about both the financial burden and time commitments required to participate. While some concerns were expressed by parties, the Panel commends Northern Gateway for proposing this program and supports its proposed vision and outcomes. The Panel notes that the program's potential to successfully achieve its intended outcomes is demonstrated by Northern Gateway's commitments to fund start-up costs and to proceed with the various activities as set out in its evidence.

The Panel encourages all interested parties to participate in the FLC. The Panel is of the view that the FLC, as proposed, would be of value to the shipping and fishing industries in coastal British Columbia, to Aboriginal communities, as well as to other industries and stakeholders that share the use of coastal waters.

The land along the right-of-way, in both Alberta and British Columbia, is used for many purposes, including forestry, mining, farming, fishing, trapping and hunting, and various recreational uses. The Panel notes that Northern Gateway's Construction Environmental Protection and Management Plan (EPMP) includes measures that would be implemented to mitigate potential adverse effects on these uses. The Panel notes that, in order to mitigate potential adverse effects on existing land users, Northern Gateway has committed to notify and consult with current land users and landowners. Northern Gateway indicated that all land acquisition would comply with the provisions of the *National Energy Board Act* and would not begin until after project approval. The Panel has reviewed Northern Gateway's anticipated requirements for permanent and temporary land rights and finds these to be appropriate. The Panel also finds that Northern Gateway's process for the acquisition of land rights is appropriate.

In the case of forestry, the Panel finds that, with the implementation of the mitigation measures proposed by Northern Gateway, the use of standard construction practices, and the adherence to provincial requirements, the potential loss of timber resources as a result of the project would be effectively reduced. The Panel also finds that the contribution of the project to the spread of the mountain pine beetle would be effectively mitigated. The Panel requires Northern Gateway to file an updated Construction Environmental Protection and Management Plan reflecting details of Northern Gateway's Timber Salvage Plan and measures to limit the spread of the mountain pine beetle.

The Panel acknowledges the concerns that groups and individuals along the right-of-way have regarding the potential interruption, due to project activities, of their land uses. In the case of the Kitimat Terminal, the Panel notes that, although the terminal area may no longer be available for other land uses during construction and operation, land use restrictions would be well-marked and Northern Gateway has committed to consider landscape design guidelines to limit the disturbance of public viewscapes. Northern Gateway also committed to provide advance notice to trappers, guide outfitters, and the relevant provincial authorities prior to construction and to compensate affected trappers if lost revenue is proven to be directly attributable to project activities. Prior to construction, Northern Gateway would notify all affected oil and gas and mineral tenure holders to coordinate planned activities, and would work with agricultural and private landowners to minimize interference with their operations. The company also committed to consult with recreational land users in order to mitigate potential disruptions to outdoor recreation and ecotourism activities.

The Panel finds that access along the right-of-way may be interrupted or restricted during construction and routine operations. The Panel also finds that, with the exception of the Kitimat Terminal, where land use restrictions may be in place for the operational life of the project, restrictions or interruptions to land use along the proposed pipeline route would be limited and temporary. The Panel finds that, with Northern Gateway's proposed mitigation measures and the Panel's conditions, there would be no significant adverse effects to forestry, mining, agriculture, commercial and recreational fishing, trapping and hunting, and other recreational uses as a result of the project during construction and routine operations.

Without the application of appropriate mitigation measures, physical project components such as pipeline and power line crossings of watercourses, ancillary work placement and crossings of watercourses, and construction of the marine terminal could affect navigation and navigation safety. The Panel notes that Northern Gateway must abide by non-negotiable design criteria for power line crossings of waterways under the Canadian Standards Association standards for overhead systems (CSA C22.3). The Panel acknowledges Northern Gateway's commitment to make reasonable efforts to limit project impediments to navigation, to inform user groups on a regular basis, and to mark hazards to navigation.

The Panel requires Northern Gateway to submit to the National Energy Board for approval, prior to construction, a listing of navigable waterways proposed to be crossed by the pipeline or affected by any ancillary components proposed to support the pipeline project. Northern Gateway is also required to provide an assessment of project effects on navigation and navigation safety (outside of marine shipping) and proposed mitigation measures. This would include a listing of any issues raised by waterway users and Aboriginal groups regarding navigation use, how issues have been addressed, and proposed mitigation measures to address project effects on navigation and navigation safety for each navigable waterway.

The Panel finds that, with the implementation of standard mitigation, the project is not likely to result in significant adverse effects on navigation and navigation safety resulting from placement of project components in, on, under, over, through, or across navigable waters.

The Panel recognizes that some land users and landowners struggled to understand the many route changes proposed since the project was announced. While these route changes may have been confusing for the public, the Panel notes that a number of these were the result of input from Aboriginal groups, landowners, and communities along the right-of-way, as well as government stakeholders. The Panel encourages Northern Gateway to continue discussions with interested parties, and to continue to be responsive to their concerns regarding the pipeline route.

During oral evidence, the Panel heard about the multigenerational stewardship that Aboriginal groups have over the lands and waters in which they practice their traditional activities. The Panel recognizes the responsibility that Aboriginal groups feel for the lands and waters in the project area. The Panel heard how this stewardship is being incorporated into newly developed land and marine use planning documents. The Panel acknowledges the goals expressed by Aboriginal groups for developing a sustainable balance between environmental protection, social and cultural wellbeing, and current and future economic development. The Panel finds merit in the collaborative approach of management programs such as Pacific North Coast Integrated Management Area initiative. The Panel supports the aims of programs that foster and build cooperation among different interests in the project area, and reiterates its encouragement to all parties to participate in collaborative programs such as the Fisheries Liaison Committee.

9.2 Heritage resources

Northern Gateway said that heritage resources include historical, archaeological and palaeontological sites. The company said that in Alberta, heritage resources are administered under the *Alberta Historical Resources Act*, and that palaeontological resources are recognized as a heritage resource in Alberta. The company also said that in British Columbia, archaeological sites predating AD 1846 are administered under the *British Columbia Heritage Conservation Act*. Northern Gateway said that the potential effects to heritage resources from project activities include the degradation, contamination, and/or physical loss of:

- identified archaeological and historical material, interpretive context, or both;
- historic Aboriginal structures, remnant features, and culturally modified trees; and
- physical loss of burial sites.

The company said that oversight for the protection of heritage resources falls under provincial legislation and that site-specific mitigation measures would be required by the provincial regulatory agencies based upon their review of the applicant's Heritage Resources Impact Assessment and Archaeological Impact Assessment documents. Northern Gateway committed to meeting the requirements of provincial legislation and noted that mitigation would have to be completed before clearance or site alteration permits are issued.

At the time of the application, Northern Gateway said that it had identified a total of 89 heritage sites that might be affected by the project, including

57 in Alberta and 32 in British Columbia. It also said that 55 trails have been identified along the route. Northern Gateway said that additional sites might still be identified during detailed engineering studies, further route refinements, and any site specific information brought forward by Aboriginal groups.

Northern Gateway said that it identified 51 areas along the pipeline route with known or high probability of palaeontological sites. The company said that its primary mitigation would be to avoid known sites whenever possible and committed to construction monitoring by a professional palaeontologist in areas of high palaeontological potential. It also committed to provide a palaeontological education program to teach workers what to do in the event of site discovery during construction, and to enforce a ban on fossil collecting by project personnel.

Aboriginal groups in Alberta shared information about the sacred area at Lac Ste. Anne. Samson Cree Nation described the pilgrimage every July to pick medicinal plants and berries, as well as the sun dance ceremony that takes place nearby. It spoke of Lac Ste. Anne's healing waters and the trading and prayers that take place between different Aboriginal groups on-site. Enoch Cree Nation described how children, parents, and grandparents make the annual pilgrimage and that Lac Ste. Anne is an important site where traditional knowledge is passed on to the younger generation. The Dene Nation also said that thousands of Dene people travel to Lac Ste. Anne for traditional gatherings along with other Aboriginal and non-Aboriginal people from across Canada. The Métis Nation of Alberta provided information on the history of the healing powers of Lac Ste. Anne, saying that the annual pilgrimage dates back to 1899, and approximately 50,000 people visit during a 1-week period each July.

The Métis Nation of British Columbia said that it has concerns about the project's effects on the historic pack trail between Fort St. James and Fort Fraser. It said that, while it welcomes the proposed mitigation measures, Northern Gateway's lack of specificity does not clearly address their desire for the protection of the trail.

The Haisla Nation submitted evidence relating to the large number of Culturally Modified Trees (CMTs) near the proposed terminal site. The Haisla Nation said that the CMTs near the Terminal site are of great cultural importance to the Nation and it is concerned about the extent to which these resources would be placed at risk by the project. The presence of CMTs reflect traditional Aboriginal use and occupancy, and are in effect "living monuments to Aboriginal history and presence." It was noted that the presence of these trees show Aboriginal occupancy.

Northern Gateway said that, in British Columbia, post-1846 CMTs are not protected under the British Columbia *Heritage Conservation Act*. Northern Gateway provided a summary of all the post-1846 CMT sites recorded along the proposed pipeline route, including those which are within the terminal boundaries.

Northern Gateway committed to conduct additional field studies to further establish the heritage value of known sites at the Kitimat Terminal, including shovel testing and dating of CMTs. Mitigation would include avoidance, and Northern Gateway said that every effort would be made to undertake this work in cooperation with the Haisla Nation. For other areas along the route, Northern Gateway said that it would work with each Aboriginal community where there are CMTs to develop protocols for how site dispensation would be approached should avoidance not be possible.

Aboriginal groups along the coast raised concerns regarding other coastal heritage sites. Metlakatla First Nation said that known features in Metlakatla Pass include house depressions, old village sites, shell middens, petroglyphs, canoe runs, and historic cemeteries. It said that the number of archaeological resources in the Pass resulted in it being designated a National Historic Site in 1972.

The Gitga'at First Nation said that much of the recorded archaeological data along the coast is of poor quality and insufficient to allow for proper management. It also said that undocumented archaeological sites are located along or very close to the shoreline, that data gathering should be completed prior to project approval, and that this would require several months of inventory work. Both Gitxaala Nation and Coastal First Nations expressed concerns regarding how Northern Gateway would include heritage and archaeological information in coastal sensitivity maps.

Northern Gateway said that it would undertake to verify and refine existing maps which would then be subject to ground-truthing in coordination with local communities. It said that information from Aboriginal groups regarding heritage resources and archeological site locations would be included in the geographic response planning process.

Views of the Panel

Participants shared with the Panel information about historical, archaeological, and palaeontological sites that are of significance and value to them. The Panel acknowledges the value of heritage resource preservation to both Aboriginal and non-Aboriginal communities. The Panel carefully considered the concerns raised about potential effects to archaeological and heritage sites along the pipeline right-of-way and in coastal areas, as well as the company's commitments to mitigate potential effects of the project on these heritage resources.

The Panel notes that the management of archaeological and heritage resources is the responsibility of provincial governments in the project area. Before construction can begin, Northern Gateway must obtain clearances from the relevant provincial agencies with respect to archaeological and heritage resources. Any permits issued by the provinces may identify any conditions of approval or mitigation measures that Northern Gateway would be required to meet. The Panel requires Northern Gateway to file copies of correspondence from the relevant provincial ministries confirming that all archaeological and heritage resource permits and clearances have been obtained.

The Panel finds that the work that Northern Gateway has already completed, including the identification of potential sites of concern and its commitment to avoid all sites whenever possible, is sufficient at this point in the process. Northern Gateway indicated that additional heritage resources could be identified during centreline surveys and coastal sensitivity mapping. The company has committed to work with Aboriginal groups to record these sites and to avoid the resources where possible. Northern Gateway has also committed to continued consultation with Aboriginal groups to confirm that appropriate and acceptable mitigation studies and conservation actions are undertaken.

The Panel notes that CMTs are of great value and concern to Aboriginal groups. The Panel also notes that post-1846 CMTs are not protected under British Columbia's *Heritage Conservation Act*, and that Northern Gateway has committed to develop protocols with Aboriginal groups to identify the location of and measures to protect post-1846 CMTs. Given the importance of these resources to Aboriginal communities as demonstrations of their historical and continuing use, occupation, and cultural affinity with the land, the Panel requires Northern Gateway to file, with the National Energy Board, a plan to protect and manage post-1846 CMTs. The company is required to demonstrate in its plan how it consulted with Aboriginal groups about the management and protection of these resources and how mitigation measures have been incorporated into its Construction Environmental Protection and Management Plan for the project.

The Panel notes the concerns raised by Aboriginal groups about the current availability of data regarding known and previously unrecorded archaeological sites along the coast. Northern Gateway has committed to further refine and verify the data that are available as part of its Geographic Response Plans and has committed to include information from Aboriginal groups regarding coastal heritage resources and archeological site locations in the geographic response planning process. The Panel understands that Aboriginal groups will have knowledge and information that is relevant to this process, and that their participation would help to ensure that the geographic response planning process is as comprehensive as possible. The Panel therefore encourages Aboriginal groups to consider participating in the geographic response planning process in order to help identify those sites and values of interest and concern.

The Panel finds that, with the company's obligation to meet provincial requirements, its commitments, and the Panel's conditions, there would be no significant adverse effects to heritage resources, including any heritage resources of significance to Aboriginal groups during construction and routine operations.

9.3 Infrastructure and services

Northern Gateway said that, during public consultation, very few people raised specific concerns about project effects on community services and infrastructure. The company said that there were general questions about what demands would be placed on communities and the potential costs faced by municipal governments to address these demands. These concerns were also raised by individual intervenors including Mr. Vulcano and Ms. Brown, as well as the Fort St. James Sustainability Group.

Northern Gateway said that, during construction, all non-local workers would be housed in self-contained camps, thereby reducing potential effects on housing, infrastructure, utilities, and recreation and leisure facilities. Northern Gateway said that it expects, once the project is operational, that regional residents would make up the majority of the project workforce, and any ongoing project effects on population, housing, utilities, infrastructure, and recreational and leisure facilities are expected to be minimal.

9.3.1 HOUSING, ACCOMMODATIONS, AND WORK CAMPS

Northern Gateway said that, during construction, all non-local workers would be housed in self-contained camps for 11 of the 12 construction spreads as well as for the construction of the Kitimat Terminal. The company said that there would be no construction camp for Spread 1 in the Edmonton area as the majority of the workers would be regional residents who live within commuting distance, and the remainder would use available commercial accommodation. In Kitimat, Northern Gateway said that it expects that there may be some additional housing requirements for the peak non-local construction workforce. Northern Gateway committed to work with the local government in Kitimat to find the best way for accommodating these workers given other possible competing demands for housing from tourism and other construction projects that may be underway at the same time.

Northern Gateway also said that it would develop policies for construction camps to limit adverse interactions between project workers and local communities, especially related to time-off activities of project construction workers. The company said that these policies would be developed during detailed engineering and construction planning and would be finalized 6 months prior to construction. Northern Gateway committed to consult with organized labour associations and unions, Aboriginal communities, municipal authorities, local business communities, police, emergency responders, and health care authorities so that all camp requirements, related strategies, and camp management policies can be finalized.

Swan River First Nation expressed concerns about the potential for a work camp being built in an undisturbed area near Whitecourt, Alberta. In response, Northern Gateway said that it was consulting with Swan River First Nation as well as other Aboriginal groups and communities in developing detailed execution plans for campsites and other infrastructure. Northern Gateway also said that it would make every effort to use pre-disturbed areas and previously existing facilities for work camps.

9.3.2 UTILITIES AND INFRASTRUCTURE

Northern Gateway said that its construction camps would result in increased demands for liquid and solid waste disposal and water supply services in various areas, but that all communities along the right-of-way, with the potential exception of Kitimat, have sufficient infrastructure capacity to support these demands. In the case of Kitimat, Northern Gateway said that there is some uncertainty about the adequacy of the wastewater treatment system during spring runoff.

Intervenors, including the Province of British Columbia and the Fort St. James Sustainability Group, raised concerns related to project-related transportation effects. Northern Gateway said that it has assessed current and future project-related traffic volumes, and concluded that existing highways have the capacity to handle additional traffic. The company said increased project-related traffic would have minimal effects.

Northern Gateway's proposed mitigation measures include both a detailed traffic management plan and waste management strategy which would be included in the Construction Environmental Protection Management Plan for the project. As part of its housing strategy for Kitimat, Northern Gateway committed to developing a plan to ensure that waste materials generated by project construction and operations do not exceed the capacity of the regional waste and wastewater treatment facilities. It also committed to make alternative arrangements if required for waste disposal or other services.

9.3.3 RECREATIONAL AND LEISURE FACILITIES

Northern Gateway said that workers would require access to recreation and leisure facilities for stress relief and exercise between work shifts. The company said that its construction camps might address some of these requirements, but that project workers could still potentially place additional demands on recreational and leisure facilities within local communities.

As part of its assessment, Northern Gateway said that it reviewed all recreational facilities in the major communities along the proposed pipeline route to determine the range of recreation facilities available, and their existing capacity. Northern Gateway said that the construction workforce would result in a small increase in demand on existing facilities. Northern Gateway said this would be addressed through its policies for construction camps to limit adverse interactions between project workers and local communities. In developing the policies, Northern Gateway said that the company and its contractors have committed to work with the community administrations to find ways to accommodate the recreational demands of the workforce without adversely affecting use by local residents.

Views of the Panel

The Panel heard from individuals and parties living along the right-of-way who were concerned about the potential effects of the project on their communities, including an increased burden on existing infrastructure and services. The Panel notes that, with the exception of Kitimat, construction workers for the project would be housed in closed camps, and that Northern Gateway has committed to developing and enforcing policies restricting interactions between project workers and local communities. The Panel notes that Northern Gateway is still in discussion with local authorities in Kitimat and other industrial users in the region to develop an appropriate housing strategy for workers that would be housed in that community during construction. The Panel finds Northern Gateway's commitments to use closed construction camps and to develop and enforce camp policies to be effective measures for minimizing the potential effects of the project on the infrastructure and services of local communities.

The Panel holds Northern Gateway accountable for the conduct of its workforce. The Panel notes Northern Gateway's commitment to liaise with local and regional social services, police, and local governments, to identify and address issues related to the potential negative effects of the project on housing, utilities, and the delivery of social services in local communities within the project area. In addition to the company's commitments, the Panel requires Northern Gateway to file plans and reports for monitoring and addressing the potential negative socio-economic effects related to interactions between the project's workforce and adjacent communities.

The Panel finds that, with Northern Gateway's commitments and the Panel's conditions, the project's potential effects on the infrastructure and services of communities in proximity to the project can be effectively addressed.

9.4 Social and cultural wellbeing

During its public consultation activities, Northern Gateway said that it heard from communities along the right-of-way and near the terminal about their views and concerns relating to potential project-related effects on individual, family, and community wellness. It said that these concerns included whether working long hours and earning higher wages would contribute to increased alcohol consumption, drug abuse, gambling, stress, and divorce. The company said that it had heard from individuals that potential project effects, emerging on top of existing issues, could cause problems in some communities.

Intervenors raised concerns about community cohesion and continuity. Several groups were concerned that the project itself was proving to be a source of anxiety and creating division in communities. They also said that the effects of a potential spill could lead to a break up of communities and disenfranchisement of workers due to lack of economic opportunities. The United Fishermen and Allied Workers Union filed a report that included survey results from its members. The survey indicated that almost two-thirds of respondents said that the project was a source of stress to them and their family and that, as a result of the project, they were uncertain about their family's future and were feeling depressed at the thought of the project. The Union also noted concerns relating to an influx of outside workers contributing to increased crime, alcohol use, and other undesirable social dynamics throughout north coast communities. Ms. Brown expressed concerns about the potential for social problems in the Kitimat area as a result of the cumulative effect of the Enbridge Northern Gateway Project with other major projects, and about monitoring of potential effects.

Prince Rupert City Council raised concerns about how potential effects of the project on the marine environment could jeopardize the desired quality of life for the city of Prince Rupert. The Council provided an excerpt from its Quality of Life Official Community Plan, which emphasizes that a healthy community is one that not only has a healthy physical environment but also has quality employment opportunities, appropriate services, and a supportive social network.

Aboriginal groups also provided evidence relating to social disruption and community stress. The Gitga'at First Nation filed a social impact assessment of the project that described community concerns about an increase in interpersonal conflicts between those who choose to work for the applicant or other businesses associated with the project, as well as concerns about increase in drug and alcohol use to deal with depression, stress, helplessness, and anger in the event of a spill. Within this report, a survey noted that almost one-quarter of respondents would move from Hartley Bay if the project were to be approved, leading to concerns about the vitality of the community, the diminishing of the village's social and human capital, as well support networks.

During oral evidence, the Gitga'at First Nation expressed concerns about the stress its community experienced in the aftermath of the sinking of the Queen of the North ferry. It spoke about the distress that the Gitga'at had to live through in regard to the harvesting of their traditional food as a result of the sinking of the ferry off of Gil Island, which it states is still leaking diesel fuel. It also indicated that a World War II US Navy Ship – the Zalinksy – which sank over 50 years ago is still leaking contaminants into its territory. The Nation noted its concerns about food contamination and effects of oil on burial sites, and the fact that certain harvesting areas are still closed. It also talked about the responsibility its members felt to respond to the sinking and the fact that economic development plans that had been proposed came to a halt once the Queen of the North sank.

Other coastal Aboriginal groups expressed similar views. Groups said that their communities have experienced many hardships over the years but they have survived because of the resilience and integrity of their territories, cultures, and traditions. The Heiltsuk Tribal Council said that, over the last 35 years, there has been significant growth and development in its community. It said that this increase in capacity building has led to a social development office, a health building, and an Elders building, all of which are reflective of the Heiltsuk as a progressive, independent, and proud nation. The Metlakatla First Nation spoke of its community's vision statement, which permeates everything it does, that the Metlakatla is a progressive community recognized as a leader in improving the lives of members while strengthening Tsimshian identity and culture. The Metlakatla First Nation said that it is celebrated for being proactive in meeting community needs, for making decisions that lead to a healthy sustainable future and for having a positive relationship with others.

In response to concerns related to the potential effect of spills on communities, Northern Gateway filed information related to the recovery of the biophysical and human environments from oil spills. This included an assessment of the potential effect on traditional and cultural activities. Northern Gateway said that, in previous spills, there were short-term negative effects related to the availability of resources to share within communities. Northern Gateway also said that, over the long term, cultural transmission between Elders and youth continued, as did food sharing patterns, and ultimately the basic fabric of society remained unchanged.

Northern Gateway said that there is no single measure of wellbeing, either for individuals, families, or communities. Instead, Northern Gateway said that it attempted to assess changes in social and cultural wellbeing using a variety of indicators that describe project effects in terms of changes in the incidence of selected social characteristics. Although some positive indicators of wellness are used, including income and increased educational training, many of the indicators used in the company's assessment describe undesirable social conditions.

Northern Gateway said that its assessment of project effects on social and cultural wellbeing examined three specific effects:

- changes to wellbeing and delivery of social services;
- changes to health conditions and delivery of health care services; and
- changes to educational opportunities.

9.4.1 CHANGES TO DELIVERY OF SOCIAL SERVICES

Northern Gateway said that as most of the construction workers for the project would be housed in closed camps, interaction with local communities and the use of social services would be limited. In order to limit any potential adverse interactions with local communities, which could result in increased workloads for police and social workers, Northern Gateway said that it would implement various construction camp policies and workforce management measures. The company said that these policies would prohibit alcohol and substance abuse and provide clear guidance for firing problem workers who do not adhere to Northern Gateway's Code of Conduct. Northern Gateway said that it would file a copy of its Code of Conduct with the National Energy Board 6 months before construction begins. It said that the work camps would provide a full range of recreational amenities, high quality meals, telephone and internet access, social and recreational programs, and access to counsellors. Northern Gateway committed to work with police, social service providers, and local government to establish criteria for monitoring workers so that any demands on social services are reduced and corrective actions are taken so that project-related effects are limited.

Northern Gateway indicated that several large construction projects have been identified for the Kitimat area and said that, depending on whether the construction schedules overlap, there is the potential for this project to act in a cumulative fashion with other projects. It also said that management of potential social problems in the Kitimat area would require Northern Gateway and all other companies proposing major developments to work with the regional government and service agencies so that opportunities for effects management are identified, implemented early, and are modified as required.

9.4.2 CHANGES TO HEALTH CONDITIONS AND DELIVERY OF SERVICES

Northern Gateway said that it expects most of the anticipated project effects on health conditions and health care facilities to be related to accidents, injuries, and infections. To limit any adverse interaction between the workforce and local communities, Northern Gateway said that it plans to provide health care facilities in construction camps, to develop health care protocols and procedures with regional health care authorities so that workers who cannot be treated at the construction camps would be taken to the appropriate health care facilities, and to promote accident prevention measures related to driving, personal hygiene, and workplace safety. Northern Gateway also said that it would monitor the use of regional health care facilities by project workers so additional resources could be made available in order to avoid overburdening local facilities.

9.4.3 CHANGES TO EDUCATIONAL OPPORTUNITIES

Northern Gateway said that construction could have both positive and negative effects on the education of regional residents. The company said that negative effects could occur if the opportunity to work on project construction and earn a high wage encouraged young people to leave school before graduating. Conversely, it said that the project might have a beneficial effect if actions are taken to encourage young people to stay in school. Northern Gateway committed to posting education requirements before construction starts and liaising with educational institutions and authorities so that appropriate training and education programs are offered. It said that it believes this would limit potential negative project effects and would potentially result in a positive effect as the educational attainment of regional residents would be improved.

Northern Gateway said that it has heard concerns from communities along the route who are not supportive of the project, but that it is still very interested in being a part of those communities. The company committed to investing in the community infrastructure of these areas through its Education, Training, and Employment Strategy and as well as its Community Investment Fund. Northern Gateway said that it sees an opportunity to work together to enhance the health and welfare of the communities where it operates, by being innovative, responsive, and responsible.

As part of its commitment to enhance the regional and local benefits of the project, Northern Gateway has implemented an Education, Training, and Employment Strategy, which it views as a mechanism to help local community members develop the essential and transferable skills necessary to work in the growing pipeline and construction sectors. The Strategy also includes an Education and Training fund, which, as of December 2012, had a budget of over $3 million.

The Fort St. James Sustainability Group raised a number of questions about Northern Gateway's skills training programs. Northern Gateway provided examples of the programs it is supporting, including:

- Training to Employment Projects – Northern Gateway is participating as a partner and is in the planning stages of seven community-based projects including essential skills, introduction to trades, heavy equipment operator, entry level surveyor, safety watch, and construction craft and labourer training.
- "Leading Spirits" Youth Achievement Award – a pilot initiative to support and celebrate youth from grades 7–12 who are working towards grade 12 completion.
- Sponsorship of Women Building Futures – which works with women pursuing careers in the construction, mining, and oil and gas industries to help them achieve economic independence through training, employment, and mentorship.
- Alberta Chamber of Resources Aboriginal Workforce Development Pilot Project – Northern Gateway is assisting with the delivery of the pilot project designed to link work-ready and trades-exposed Aboriginal youth to job opportunities with ACR member companies.
- Career Fairs – Northern Gateway has participated in a variety of career fairs to provide information on opportunities with Enbridge and within the pipeline and construction sector in general. There are plans for fairs in the future that would partner with contractors and union organizations to deliver career and job fairs in local communities.
- Guiding Circles Facilitator Training – an Aboriginal-focused career development tool designed to assist professionals working with Aboriginal job seekers in managing obstacles to employment.

Northern Gateway said that linking the training with immediate employment is key to its overall strategy. It said that it has been working closely with trade unions, contractors associations, and community colleges along the route to make them aware of its plans in an effort to match specific skills to potential jobs. Northern Gateway said that, since mid-2011, over 500 people have been affected by skills and training activities. Northern Gateway explained that it is not a trainer, only a funder, and recognizes that, should individuals be trained as part of their various programs, there is no guarantee that they would ultimately work on the project.

Northern Gateway said that it is using the "community as expert" model, which means that the community is to be the leader in the training process, as it knows what the demands are, where the interest lies, and who the partners could be. For Aboriginal groups in particular, Northern Gateway said that this means focusing on essential skills and engaging with youth programs. The company also said that it is working with four

craft unions and in partnership with the Pipeline Contractors Association of Canada on a Training Advisory Committee initiative to collaborate on training opportunities and develop employment strategies in construction for Aboriginal communities.

The company said that its discussions with Aboriginal groups along the coast are not as advanced as some of those along the route, but that it looks forward to engaging more coastal communities in discussions. It said that it has heard from them, through the joint review process and in community meetings, that they have a real interest in getting back on the water, working in jobs that are related to marine services. As a result, Northern Gateway committed to a marine services and benefits portfolio which it anticipates would facilitate the involvement of coastal First Nations in employment and progressive business ownership in relation to marine services activities and joint ventures between coastal First Nations and well-established marine service providers.

Northern Gateway said that its commitment to its Community Investment Fund is another way to support the wellbeing of the communities along the route and in coastal areas. The company said that the fund would become operational upon completion of construction and extend over the lifetime of the project. It said that it would be funded on an annual basis with 1 per cent of pre-tax profit, which the company anticipates to be approximately $3 million. Northern Gateway said that proceeds from the fund would be distributed toward programs deemed to be of benefit to both Aboriginal and non-Aboriginal groups. As the program is still under development, Northern Gateway said that it would work with communities to determine how exactly the funds would be allocated, and expects that to depend on the needs of the communities and what is most valuable to them.

Views of the Panel

The Panel heard concerns from potentially-affected communities about the project's potential effects on the strength and cohesion of their community and the wellbeing of individuals. The Panel particularly acknowledges the concerns raised by Aboriginal groups regarding the effects the project may have on their ability to maintain healthy and vibrant cultures and communities. The Panel recognizes the historical context from which Aboriginal groups are speaking and acknowledges their desire to preserve and strengthen their cultures. The Panel notes the evidence on the recovery of Aboriginal and other communities in historic and modern contexts along the pipeline route and in the coastal areas.

The Panel heard evidence with respect to the stress that increased industrial activities can have on individuals and communities. In particular, coastal Aboriginal groups shared their concerns with respect to potential stress placed on their communities by the marine aspects of this project. The project would result in increased industrial activity, including additional vessel traffic off the west coast of Canada. The Panel notes that there is already vessel traffic in this area including commercial fishing, cargo movements, cruise ships, and ferries. The Panel was presented with evidence that Aboriginal groups continue to use the land and waters in this area for traditional purposes. The Panel finds this evidence demonstrates that there is a current compatibility for multiple uses in this area.

The Panel heard about the stress that some groups feel at the prospect of the project. The Panel also heard from Aboriginal groups that a potential spill would have significant effects on the social and cultural viability of their communities. The Panel acknowledges the path that coastal Aboriginal communities are on in relation to economic development and cultural vitalization, and their fear that a spill could affect this path. The Panel also heard evidence from Northern Gateway about the recovery of marine areas and their resources following a spill and how communities continued to function. Taking all of this into consideration, the Panel is of the view that the project would not have significant adverse effects, during construction and routine operation, on the socio-cultural fabric of these communities. A large spill would cause significant effects, and is discussed in Chapter 7.

The Panel notes that a number of Northern Gateway's commitments and programs extend beyond the direct effects of the project. Northern Gateway's education and training strategy has already begun and many of its commitments are aimed at enhancing the development and vibrancy of the communities in the project area. The strategy includes measures that are aimed at helping individuals acquire the basic skills that would enable them to qualify for jobs in various industries throughout Alberta and British Columbia. The programs and funds available could assist

groups to achieve their aspirations for education and economic development if they choose to take advantage. Northern Gateway's education and training programs as proposed are not limited to participation in the project and the Panel notes that these could assist individuals and communities acquire new skills and contribute to individual success, as well as to the success of their community. The Panel finds that Northern Gateway's commitments to education, training, and employment, and its commitments to make these available to interested individuals and communities, could create new education and business opportunities throughout Alberta and particularly in northern British Columbia.

Notwithstanding Northern Gateway's commitments to education and training, the Panel believes that the success of these programs requires the ability to effectively gauge their ongoing success as they are designed and implemented. The Panel therefore requires Northern Gateway to track the success of its training and education strategy, and has included conditions addressing the implementation and outcomes of Aboriginal, local, and regional education measures and opportunities for the project.

The Panel finds that, with Northern Gateway's commitments and the Panel's conditions, the project's potential effects on the socio-cultural wellbeing of communities can be effectively addressed.

9.5 Employment and economy

Northern Gateway said that project construction and operations could directly or indirectly affect people living in cities, towns, villages, rural areas, and Aboriginal reserves adjacent to the project area. The company said that it estimated the potential economic effects of directly constructing and operating the project, including the economic effects resulting from total employment, procurement and contracting requirements, and the potential for these requirements to be met by local, regional, and Aboriginal populations. The company prepared an Economic Impact Analysis for the project, which provided information relating to the macroeconomic effects on Canadians such as Gross Domestic Product (GDP), incomes and jobs, and their distribution over time and geographically. The company also prepared a social Cost Benefit Analysis (CBA), which provided an assessment of the net economic benefits stemming from the project. The company said that its CBA measured the "efficiency of deploying economic resources such as labour and capital in order to earn a series of benefits," and considered other effects which may not be considered by a private investor, such as certain benefits (reduction of unemployment or oil price uplifts for producers) and the cost expectations that may occur from environmental effects.

9.5.1 TOTAL ECONOMIC EFFECTS

Northern Gateway said that its estimate of the total economic effects of the project included the positive economic effects on Canadian and regional investment, labour income, GDP, employment, and government revenues. Northern Gateway said that its estimates of direct, indirect, and induced effects were derived using Statistics Canada's 2008 Inter-provincial Input-Output Model, and represent:

- effects arising from the construction expenditures associated with the pipelines and related facilities;
- effects arising from the annual revenues and operating expenditures associated with the operation of the pipelines and related facilities over a 30-year period;
- an adjustment to account for anticipated losses from other pipelines moving oil out of the Western Canadian Sedimentary Basin (WCSB). The additional cost associated with lost revenues on other pipelines was estimated at $857 million;
- effects arising from the expected increase in revenues to oil producers associated with gains in the netback prices on Western Canadian oil production, after deducting all increases in transportation costs and after deducting the increased feedstock costs for Canadian refineries as a result of the higher oil prices; and
- effects arising from reinvestment of a portion of the incremental oil revenues in the energy sector (based on historical patterns) and from the associated gains in production.

Northern Gateway said that construction costs associated with the project used in the analysis were estimated to be $6.393 billion. It said that about 90 per cent of these expenditures would take place in the first 3 years of construction. It said that estimated annual operations and maintenance expenditures for the pipelines and related facilities average $341 million per year (including property taxes but excluding other taxes).

The company said that the oil price uplift attributable to the project was estimated to be an incremental revenue gain of $114.8 billion over 30 years, or an annual average of $3.8 billion, after deducting the higher costs imposed on Canadian refineries. Northern Gateway said that, based on historical reinvestment patterns, it expects that a significant portion of the net cash flow derived from these incremental revenues would be reinvested in some combination of energy projects across the country. The company said that this was assumed to generate further increases in national income, employment, and government revenues.

TABLE 9.1 **TOTAL ESTIMATED ECONOMIC EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS OVER 30 YEARS**
(in millions of dollars)

Total Effects	British Columbia	Alberta	Ontario	Quebec	Sask.	Other	Canada
Investment/revenues	52,841	208,047			30,006	10,483	301,376
Labour income	18,302	36,394	6,778	1,904	4,697	1,872	69,948
Gross domestic product	55,163	207,501	10,774	3,063	24,544	10,468	311,514
Federal government revenue	6,627	30,962	2,016	404	3,277	1,027	44,314
Provincial government revenue	8,623	36,884	1,302	557	5,179	1,459	54,005
Total government revenue	15,251	67,846	3,319	960	8,457	2,486	98,319
Employment in person years	263,037	401,147	104,069	34,099	72,320	32,395	907,067

The company said that the total economic effects expected from the construction and operating expenditures associated with the project facilities include:

- a gain of almost $312 billion in Canadian GDP, or an average annual gain of $9.2 billion;
- an increase of $70 billion in Canadian labour income, or an average annual increase of $2.1 billion;
- a gain of $98 billion in government revenues, or an average annual increase of $2.9 billion. Of this amount, roughly $44 billion would accrue to the federal government and $54 billion would accrue to provincial or territorial governments; and
- an increase of 907,000 person-years of employment, or an average annual increase of over 27,000 person-years of employment.

Northern Gateway said that, to put these numbers into perspective, "$312 billion in GDP is equivalent to about 2 months of output of the entire Canadian economy at current levels or the annual effect is equivalent to an increase of 0.5 percentage points in the growth rate for Canadian GDP at current levels. The average annual increase in employment as a result of Northern Gateway is equal to approximately 6 per cent of the average annual increase in total Canadian employment over the years 2005 to 2008, a period of strong growth. And, the $98 billion in government revenue would be equivalent on an annual basis to more than half of 1 per cent increase in total annual federal plus provincial government revenues."

The company said that the estimated effects would be widely distributed across the country as a result of the extensive linkages associated with the project, including the purchases of goods and services, the distribution of gains in resource revenues, government taxes, and gains arising from the reinvestment activities of the energy sector. The values and distributions of the total estimated economic effects of the project are summarized in Table 9.1.

9.5.2 DIRECT ECONOMIC EFFECTS DURING CONSTRUCTION

Northern Gateway provided detailed estimates of the direct economic effects that would result from project construction. Northern Gateway said that it estimated the effects of construction in each of six regions across the project area, including:

- direct employment through the hiring of engineers and other specialists to complete final design and manage the project construction;
- direct on-site employment of construction workers who would be on-site to build the pipelines and facilities;
- direct employment resulting from purchases of contracted supplies and labour; and
- estimated values of contracted goods and services.

Northern Gateway said that it estimated the potential effects of project construction for Aboriginal people, including person-years of employment for Aboriginal residents and contractors and companies in each region, and the types of procurement opportunities that would potentially be available to Aboriginal businesses and joint ventures. Northern Gateway committed to a target of 15 per cent Aboriginal employment for construction labour. The company said that it expects to reach its 15 per cent target in the first year of construction, and that it would strive to get the highest possible level of Aboriginal employment for the construction of the project. It also said that the 15 per cent target was its minimum objective and that previous pipeline projects in northern Alberta and along the prairies had reached 22 per cent Aboriginal employment.

The company said that its estimation of the direct on-site employment of regional residents to directly construct and operate the project involved taking the total employment requirements for each aspect of the project and applying assumptions about the percentage of labour requirements that could be filled by the local and Aboriginal populations within each region. The company said that, for project construction, these percentages were based on its previous experience with similar past pipeline projects as well as the commitments that Northern Gateway has made regarding training and hiring of regional residents. For project operations, the company said that it assumed that all jobs in each region would be filled by local residents.

The company said that additional direct employment effects were estimated through predicting the purchases of construction goods and services from local and Aboriginal businesses in each of the six regions. These effects were estimated by:

- determining the total value of spending to construct the pipelines and facilities in each region;
- adjusting these amounts to reflect the source of purchase (purchases for construction in one region may occur in larger communities in an adjacent region); and
- estimating the percentages of these goods and services that can be supplied by local and regional businesses.

Northern Gateway said that the potential direct employment generated by this spending, and indirect and induced employment effects, were then estimated using input–output models for both Alberta (Alberta Finance – Statistics 2009) and British Columbia (BC Stats 2008). It said that both provinces have input–output models that reflect interactions among industries in 2004 (the base year for the British Columbia model) or 2005 (the base year for the Alberta model).

The company said that project construction is expected to require 10,335 person-years of employment in British Columbia, while 3,535 person-years of employment would be required to construct the Alberta portion of the project. It said that direct employment, including on-site employment and jobs created through expenditures on project engineering and management and contracted goods and services, is estimated to provide about 9,225 person-years of employment. The company said that this represents 66 per cent of project construction requirements. Aboriginal residents, contractors, and companies (including joint ventures) are expected to provide 37 per cent of regional labour requirements.

Northern Gateway said that the largest regional employment benefits will occur in central and coastal British Columbia, where extensive construction activities are required. It also said that activities in these 2 regions are scheduled to last over at least 2 years.

Northern Gateway said that between 500 and 940 direct construction workers would be required for each of the 12 pipeline spreads across the project, with an average of 230 workers for the Kitimat Terminal.

Northern Gateway said that it would spend nearly $1.1 billion on various contracted goods and services during pipeline construction, and that these expenditures would generate additional direct employment opportunities for regional residents. It said that this spending includes $791 million in contracted goods and services for the pipelines and $274 million for the pump stations, the tank terminal, and the marine terminal.

Northern Gateway said that it would enhance the regional and local benefits arising from the project through a number of measures, including:

- identifying and communicating details about project employment, contract, and procurement requirements to regional and Aboriginal residents and businesses in a timely way;
- communicating opportunities early, so regional residents can upgrade their education, training, and skills to respond to opportunities;

- assessing and inventorying the availability of regional skills and labour resources, and the ability of businesses to supply the required goods and services;
- working with contractors to give first consideration for employment opportunities to qualified regional and Aboriginal residents, with appropriate skills and training, and to qualified regional suppliers of goods and services, where possible;
- applying Northern Gateway's regional employment and procurement policies to its contractors;
- identifying barriers to regional employment (e.g., education, training, work experience) and procurement, and participating with others (e.g., communities, government departments, educational institutions) in capacity-building initiatives (e.g., training programs, scholarships, on-the-job training) designed to overcome these barriers;
- dividing contracts into manageable sizes for smaller regional firms and incorporating sufficient lead time to permit local assembly of resources, where possible;
- applying a tendering and bid system (of prequalification, evaluation, selection, and award) that treats regional and Aboriginal contractors equitably;
- participating in initiatives to build the capacities of regional businesses (e.g., supporting regional and Aboriginal business development, establishing alliances);
- committing to hiring qualified regional workers with appropriate skills and training; and
- developing strategies to enhance opportunities for regional Aboriginal populations.

9.5.3 DIRECT ECONOMIC EFFECTS FROM OPERATIONS

Northern Gateway said that the number of permanent jobs during operations would total 268. This includes permanent workforce requirements in Edmonton, Fox Creek, Whitecourt, Grande Prairie, Tumbler Ridge, Prince George, Burns Lake, and Kitimat. It said that this also includes people expected to be employed in Kitimat to supply services associated with operations of the Kitimat Terminal, including tug operators, pilots, emergency response staff, and various other service providers.

The company said that annual spending on project operations is expected to total about $192 million. The company said that this includes $94.8 million in British Columbia, $77.6 million in Alberta, and $19.5 million in federal corporate income taxes.

The company said that jobs related to operations are expected to provide opportunities for residents and offer long-term sustainable employment benefit to the provinces.

9.5.4 ANALYSIS OF PROJECT COSTS AND BENEFITS

Northern Gateway said that a number of intervenors suggested a social Cost Benefit Analysis (CBA) of the project should be undertaken, and the company responded to that request in its reply evidence.

The company said that CBA is a well-established approach commonly used to systematically attempt to quantify all direct, incremental benefits and costs to determine whether there is a net benefit to a project or policy, and whether it enhances wealth or wellbeing. A social CBA, the company said, is used when it is important to take a 'long' view (where repercussions extend well into the future) and a 'wide' view (where social costs and benefits rather than just private costs and benefits) must be considered.

The company said that the objective of its social CBA was to determine whether the project is in the national interest as measured by the net benefits to the collective within Canada's national borders. It said that the focus was on an evaluation of the economic merits of the proposed project for Canada.

The company said that its approach used forecast dollar flows or expected values and probability as a means of measuring costs and benefits. These were calculated on an annual basis and discounted by 4 selected rates (0, 5, 8, and 10 per cent) to generate an overall net benefit result based on the following components:

- direct cash flows from the project;
- adjustment for reducing unemployment;
- costs from excess capacity on main oil pipelines to the United States;
- Enbridge Northern Gateway Project "needed" or not, before a certain year;
- Canadian oil price uplift;
- environmental effects (including greenhouse gases); and
- costs resulting from oil and condensate spills (onshore, offshore, and at the marine terminal).

Northern Gateway said that the assumptions used in its CBA include:

- it is widely accepted that an appropriate social discount rate in Canada is in the range of 5 to 8 per cent;
- incremental effects are assessed against a benchmark forecast of factors (Canadian inflation rate, the foreign exchange rate, Canadian oil production, oil exports, and Canadian and international oil prices);
- that oil exported through the project would otherwise be exported to the United States. The benefits to the oil producers (and governments) are solely a result of the oil price uplift;
- that 5 per cent of the labour input in project construction and operations would otherwise be unemployed;
- oil price uplift is assumed to be $2 to $3 per barrel on an oil price of about $100 per barrel;
- two varieties of environmental externalities are included: (i) cost expectations associated with loss of ecosystem goods and services (EGS) from direct project activities; and, (ii) cost expectations related to the cleanup and remediation of possible oil spill risks from incidents associated with offshore, the marine terminal, and the onshore pipeline operations;
- any direct loss of ecosystem goods and services are included as a project cost expectation.

The company said that its CBA presented a base case and five sensitivity cases:

1. without an oil price uplift;
2. oil price uplift reduced by 50 per cent and only continues for 5 years;
3. oil price uplift reduced by 50 per cent and only continues for 5 years, all other cost component costs are doubled and other benefit components are halved;
4. oil price uplift reduced by 50 per cent and only continues for 5 years, all other cost component costs are doubled and other benefit components are halved, and the project is not needed until 2024; and
5. oil spill costs are set high enough to offset all other benefits in the base case.

Northern Gateway concluded that the economics of the project from a national Canadian perspective are very favourable in the base case: the estimated net benefits are expected to be both large and highly likely. It said that the base case shows an overall net benefit of $23.5 billion in constant 2012 dollars, with the oil price uplift being the major contributor to net benefits. Moreover, the company said that the project remains robust when tested against sensitivity cases of higher social discount rates, lower oil price uplift and greater possible ecological or oil spill damages than in the base case. It said that the second and third sensitivity cases indicate overall net benefits are positive, at $3.65 billion and $2.58 billion respectively. Northern Gateway said that cost expectations from oil spills would have to be increased by 289 times over the base case for the net social benefit to become equal to zero.

Without the oil price uplift, Northern Gateway said that the overall net benefit is negative $209 million at a discount rate of 8 per cent. The company said that this extreme sensitivity case demonstrates the long time period it would take for a social rate of return to be achieved. It also said a rate of return of 5 per cent is achieved after 13 years of operations. The company said that the amount and the duration of the oil price uplift are critical factors underpinning the robustness of the estimated social net benefits.

9.5.5 EVIDENCE OF COASTAL FIRST NATIONS AND THE HAISLA NATION

Coastal First Nations submitted a benefit cost assessment (BCA) of the project as part of its written evidence. Coastal First Nations said that the objective of a BCA is to identify all the positive and negative effects of a project and to aggregate these effects to determine whether a project creates a net gain or loss in society's overall wellbeing.

Coastal First Nations said that the BCA examined only the costs and benefits to the Canadian oil industry. Eleven different scenarios were tested and under all scenarios the project was forecast to result in a net cost to Canada. The BCA included an employment benefits scenario which assumed 6.7 per cent of the workers construction workforce would otherwise be unemployed.

Coastal First Nations concluded that the net costs ranged from $100 million to nearly $2.4 billion. Under the base case assumptions, Coastal First Nations estimated the project generates a net

cost to Canada of over $1.9 billion. It said that the base cases are considered conservative estimates because the surplus capacity assumptions are conservative and suggest there is a propensity for actual capital costs to exceed forecast costs for large projects. It also said that the BCA indicates the net cost is reduced by the presence of an Asia price premium. Coastal First Nations said that the Asia price premium, if it exists, needs to be reduced by the proportion of the price benefit accruing to non-Canadians.

Coastal First Nations said that these estimates do not include any social or environmental costs. If environmental costs such as the cost of oil spills, greenhouse gas emissions, social conflict, and other environmental effects are included, Coastal First Nations concluded that the net cost to Canada rises significantly.

Coastal First Nations said that while the BCA did not incorporate environmental costs, a discussion of certain environmental costs was provided to indicate the general order of magnitude of their effects on the project's contribution to the public interest. These included:

- the risk of oil spills;
- an indication of the magnitude of what people are willing to pay to prevent a major oil spill. Based on methods to estimate such values following the Exxon Valdez oil spill, the estimate ranges from $11.6 to $17.2 billion, which represent only passive non-use values;
- potential damage costs to direct users and cleanup costs. Coastal First Nations estimated the costs of a major oil spill equivalent to the Exxon Valdez in the PNCIMA at between $5.2 and $22.7 billion;
- greenhouse gas emissions; and
- socio-economic costs of conflict, such as legal actions, other activities to oppose the project and psychological stress associated with conflict.

Coastal First Nations also questioned the oil price uplift predicted by Northern Gateway. In response to direct questioning by Northern Gateway, Coastal First Nations said that, with no change in overall global supply or demand predicted in the evidence provided by Northern Gateway, there would not be a change in oil price because the market would move to minimize price differences. Coastal First Nations questioned the confidence the company can have in a forecasted price increase of $1.50 or $2.00 per barrel when there is no change in supply or demand over 20 to 30 years.

Coastal First Nations acknowledged that the values of ecological services are very difficult to estimate. It said that the estimated values it provided were intended to give a general order of magnitude to answer the question: Are ecological service values important? Coastal First Nations said that it did not suggest that these values should be used for decision-making for any particular project such as the Enbridge Northern Gateway Project. Coastal First Nations said that more detailed disaggregated analysis is needed to fully understand particular costs of ecological services.

The Haisla Nation provided evidence estimating the monetary value to ecosystem services affected by the proposed project. Five main types of effects associated with the proposed project were evaluated:

1. construction effects, which estimated the value of land that would be disrupted as a result of the project and related activities. This included cost estimates for a range of services (climate regulation, flood control, pollination, water supply and filtration, habitat for salmon and tourism) used to calculate the costs associated with the loss of a quantified area of each ecosystem type;
2. operational effects, which was limited to CO_2 emissions from tankers visiting the marine terminal;
3. oil sands extraction and upgrading, which estimated CO_2 emissions based on extraction of oil sands to meet pipeline capacity over the lifetime of the project and the upgrading of crude oil and end use of petroleum products;
4. use of end products shipped through the pipeline, which estimated CO_2 emissions associated with end use of products based on statistics from Asian markets, and the social costs of carbon; and
5. oil spills along the pipeline route and in the Kitimat Terminal, based on costs associated with seven hypothetical oil spill scenarios developed by Northern Gateway.

The Haisla Nation said that the combined estimates for total costs from damage to ecosystem services over the lifetime of the project (30 years) range from $3.1billion to $212 billion based on choice of discount rate and cost estimates of ecosystem services. The Haisla Nation said that including even a low-range estimate of ecological and social effects would significantly increase project costs. The Haisla Nation said that the average estimate of total ecological costs of the activities considered in the analysis ($26 billion) would more than triple Northern Gateway's cost estimate. It said that the high range of the estimates would increase project costs by a factor of nearly 50.

The Haisla Nation said that Northern Gateway has made several commitments to ensure that the revenue of the project is shared with Aboriginal people. These commitments include a 10 per cent share in the project (estimated at $280 million), ensuring 15 per cent of the workforce would be comprised of Aboriginal people (totalling $400 million in employment benefits, procurement, and joint venture), $200 million in future business opportunities as a result of training and education, and offering Aboriginal people 1 per cent of pre-tax income from the project (estimated at $100 million). The Haisla Nation said that these commitments total around $980 million, but also said that the estimates of social and ecological costs presented by the Haisla Nation are 3 to over 200 times as great as the commitments pledged by Northern Gateway.

In response to evidence of the Haisla Nation, Northern Gateway filed an evaluation of "natural capital and ecological goods and services at risk" associated with the project as part of the company's reply evidence.

The company acknowledged that, while the Haisla Nation's assessment of ecological costs was based on reasonably accurate data and peer-reviewed scientific literature, it contained a number of shortcomings. The company said that its own assessment of ecological goods and services at risk are for the Project Development Area only, and that the Haisla Nation's estimates of ecological and social costs are inflated because:

- effects were estimated based on the Project Effects Assessment Area and, therefore, calculated an effect 10 times larger than the Project Development Area proposed by Northern Gateway;
- carbon sequestration loss estimates should be based on actual carbon sequestration capacity (current and future potential) of the timber and other vegetation of the area affected during construction and following restoration or remediation of the Project Development Area. The Haisla Nation's estimates are based on the Project Effects Assessment Area and are roughly 13 times larger than Northern Gateway's estimates based on Net Biome Productivity (NBP) in the Project Development Area; and
- estimates of environmental goods and services (EGS) losses of $2,082 million are 117 times greater than Northern Gateway's estimates, due to both higher EGS loss estimates per hectare (particularly for water regulatory service and effects on forest land), and the use of the much larger Project Effects Assessment Area.

9.5.6 CONCERNS RAISED BY INTERVENORS AND THE PUBLIC

Through written evidence, information requests and direct questions, a number of intervenors questioned the potential economic effects of the project. The United Fishermen and Allied Workers Union–CAW (UFAUW–CAW) said that the fishing industry is the largest private sector employer on the North Coast.

The Union presented results of a survey administered to a sample of 163 members, based on prior research on oil spill disasters, including work on the social effects of the 1989 *Exxon Valdez* oil spill and the 2010 BP *Deepwater Horizon* in the Gulf of Mexico. UFAWU-CAW said that respondents were generally skeptical about the economic opportunities and benefits purported to be associated with the project. In particular, the survey indicated:

- most UFAWU-CAW respondents believe that the project would affect their access to seafood and traditional foods;
- 73 per cent of survey respondents do not believe that the commercial fishing industry and the routine operations of the project can successfully coexist;
- 71 per cent indicated that they 'strongly disagreed' or 'disagreed" with the statement, "*The Enbridge Project will have many positive benefits for my community*"
- only about 12 per cent of respondents reported that they are looking forward to new jobs and other economic benefits of the project; and
- 95 per cent believe that a spill on the North Coast would affect their employment in the commercial fishing industry.

The Union also presented the results of qualitative focus group sessions where participants discussed their views on the potential effects of the project. It said that no attempt was made in the report to quantify potential effects of the project. The report noted:

- little discussion around the potential benefits of the project;
- how the loss of the commercial fishery would affect coastal communities in the event of an oil spill; and
- how the effects would extend far beyond the loss of employment and income.

The Alberta Federation of Labour (AFL) said that the project is not in the public interest for a number of reasons, including:

- it would result in the loss of tens of thousands of potential jobs in upgrading, refining and petro-chemical production;
- by reducing the price differential between bitumen and conventional oil, it would remove Canadian refiners' competitive advantage of access to relatively cheap feedstock;
- it would overheat Alberta's economy and drive up development costs, thereby reducing royalty revenue that could be used for savings or to finance public services;
- it would distort the labour market in western Canada in ways that are harmful to the long-term best interests of Canadian workers;
- it would serve to permanently reduce Canada's GDP, increase unemployment, cause personal incomes to fall and decrease government revenues.

AFL and others said that the project would be competing with a number of other developments planned in the Alberta oilsands, and that competition for labour and supplies, notably steel, would result in higher project input costs.

AFL raised particular concerns about the effects of exporting bitumen compared to potential effects that might result from onshore refining. AFL said that the estimated 26 direct permanent jobs the project would create in Alberta "is a paltry, insignificant and unacceptable number compared to the thousands of jobs that would be created in Canada if nearly $13 billion worth of bitumen were upgraded here." AFL said that any narrowing of the price differential between bitumen and crude oil would undermine the economic viability of increased value-added petrochemical production.

AFL questioned the potential use of temporary foreign workers on the project. It said that the temporary foreign worker program in Alberta is being used in a way that deliberately distorts the provincial labour market. AFL said that the program exerts downward pressure on wages at a time when economic conditions suggest that wages should rise, and that high-paying jobs in areas like construction and manufacturing are being taken by temporary foreign workers when they could be filled by Canadians if development were to proceed at a more reasonable pace. AFL set out number of other concerns regarding the use of temporary foreign workers, including:

- potential exploitation of temporary foreign workers;
- wage inequality;
- working conditions; and
- rights enforcement.

With regard to Northern Gateway's economic analysis of the project, AFL criticized the company's use of input-output modelling to estimate the project's potential effects. By using an input-output model, AFL said Northern Gateway used a misrepresentative methodology in its economic case for the project, and has exaggerated the project's economic outcomes. AFL said that the estimated oil price lift and its reinvestment cannot be regarded as a reliable indication of what might happen. AFL also said that the only component of the project that might effectively be explored using an input-output framework is project construction.

AFL said that, when both price gains and price losses are considered in a Canadian context, net new investment and person-years of employment do not materialize and, in fact, permanent losses result. Rather than a wealth-generating opportunity, AFL said that the project would result in an inflationary oil price shock, leading to "higher interest rates, a permanent and long-term decline in GDP, a loss of existing jobs, decline in labour income and standard of living for many Canadians, as well as a deterioration of government revenues." AFL concluded the only way to see the full effect of higher oil prices on the Canadian economy as represented by GDP, employment, labour income, and government revenue is to model the project's potential effects within a dynamic general equilibrium framework.

The Communications, Energy and Paperworkers Union of Canada (CEP) questioned the project's contribution to increasing the relative volumes of bitumen exports. CEP said that this would mean that "the considerable economic and employment

benefits of adding value to Canadian resources will not accrue to Canada or Canadians." CEP said that the foregone economic and employment benefits that may be the consequence of exporting bitumen by the project would include the 'loss' of 26,000 jobs that would otherwise be created in the Canadian economy if the bitumen was upgraded in Canada.

The City of Prince Rupert said that maintaining a clean marine environment is critical to sustaining the tourism and marine resource extraction industries in and around Prince Rupert, and that this has allowed Prince Rupert to generate billions of dollars in economic activity. The City noted its concern that an oil spill would put much of this economic activity in jeopardy.

The Gitga'at First Nation provided an assessment of the potential effects of the project on the economic interests of the Gitga'at from marine tanker traffic associated with the project. The Gitga'at First Nation said that the assessment used 'total economic value' as an analytical framework, to identify and evaluate key effects of the project on economic interests of the Gitga'at and evaluate the likely effectiveness of key mitigation measures.

The Gitga'at First Nation concluded that the project is inconsistent with Gitga'at economic interests, and that the project has a high probability, even without a spill, of significantly undermining the Gitga'at's ability to develop and execute economic development consistent with their values and culture. In particular, it said that:

- There is a high probability that tanker traffic associated with the project would have a significant effect on commercial fishers; catch reductions of only 5 per cent are likely to put fishers out of business.
- There is a high probability that routine vessel traffic would result in large losses in nature-based tourism activity, translating into losses in revenues and associated employment.
- The project will impede the Gitga'at's ability to attract investment in conservation financing and ecosystem service projects and to gain funding for other conservation-related and sustainable economic initiatives.
- Given the heavy reliance on traditional harvests for food, social, and cultural practices, and the importance of traditional foods for health of the Gitga'at, even minor reductions in traditional food harvests could be significant.
- There is a high probability that a major spill would result in closure of commercial fisheries for multiple species, lasting between one-half and two seasons. The estimated losses in value of the commercial fishery are conservatively estimated at $6.9 million, with related adverse spin-off effects on the regional economy.
- There is a high probability that a major spill would decrease the demand for nature-based tourism in the region, significantly reducing the income and employment derived from this sector.
- A major spill would significantly reduce the value of ecosystem services that the Gitga'at Territory provides as well as the revenues and investments created by these services. If a major oil spill were to occur, the Gitga'at First Nation would also potentially be liable for compensating existing ecosystem service investors.
- In the event of a spill there is a high probability that traditional harvests would be reduced for a decade or more, with associated highly significant effects to the traditional economy. The replacement costs of reduced traditional harvests – which cover only a portion of the anticipated effects – are estimated to be between $0.4 and $13 million.
- A major accidental oil spill affecting the Gitga'at Territory is estimated to cause significant losses in non-use values of at least $10 million–$168 million dollars per year;
- The two primary mitigation measures proposed– a Fisheries Liaison Committee and monetary payments of compensation – are poorly described and little confidence can be placed in either of these two measures to effectively mitigate the identified economic effects of the project.

Northern Gateway questioned a number of the conclusions proposed by the Gitga'at First Nation. Specifically, Northern Gateway questioned the methodology used by the Gitga'at First Nation to calculate the likelihood of a spill during operations, the exact amount of economic activity in the tourism and commercial fishing industries that are of interest to the Gitga'at First Nation that could potentially be affected by the project, and the extent of other economic sectors of interest to the Gitga'at First Nation that could be affected by the project such as carbon offsets.

Letters of comment submitted in the process noted the potential economic benefits of the project, while others questioned its relative benefits and costs. Letters were received from individuals, municipalities, elected officials, trade organizations, and chambers of commerce expressing views on the potential economic effects of the project.

The Northern Alberta Mayors' and Reeves' Caucus said that it represents 58 Alberta municipalities with a combined 2011 population of 1.59 million people and a 2011 GDP of over $123 billion. It expressed "resounding endorsement" for the project. The Mayor of Edmonton, Chair of the Caucus, noted the Caucus unanimously provided the following messages:

- "that the project is imperative to provide access to global markets and competitive prices for our resources; and
- that the project will provide long lasting economic benefits to the communities and workforces of Canada, including continually exploring value-added projects and local refining opportunities."

The Canadian Chamber of Commerce, which said that it is Canada's largest business association, noted a number of the potential benefits of the project in its letter. The Chamber said that it is comprised of a network of over 420 chambers of commerce and boards of trade, representing 192,000 businesses of all sizes in all sectors of the economy and in all regions. The Chamber's President and CEO said that "with the potential to generate thousands of construction jobs and a $270 billion increase to Canada's Gross Domestic Product over 30 years the benefits from Northern Gateway can benefit all Canadians." The Chamber particularly noted the potential benefits for communities in British Columbia, saying that British Columbia "seeks to benefit from about 3,000 jobs during construction and about 560 long-term jobs. Projected British Columbia tax revenue from the project is $1.2 billion." The Chamber also said that the project "proposes significant benefits for Aboriginal Canadians along the right-of-way, with a 10 per cent equity ownership in the venture, as well as hundreds of millions of dollars in procurement and jobs."

The British Columbia Chamber of Commerce noted its "strong support" for the project. The Chamber said that the project represents a substantial increase in the movement of oil across British Columbia and through British Columbia's waters, and that projects must be assessed to determine a balance between potential environmental damage and the need for economic and social progress. The Chamber, which said that it represents over 32,000 businesses over every size, sector and regions of the province, said that, with the potential to generate thousands of construction jobs and a $270 billion increase to Canada's Gross Domestic Product over 30 years, the benefits from the project can benefit all Canadians. The Chamber said that in particular that northern British Columbia is "in desperate need of new investments and new opportunities for its residents to earn a living," and that the project "will help bring economic security and hope to the region."

The City of Edmonton said that it is the largest city along the proposed pipeline corridor, and that many of the economic benefits of this project would accrue to its citizens. The City said that the project "has the potential to generate continuing long-term economic growth that will benefit the economies of the Edmonton region, the Province, and Canada as a whole" and that "energy infrastructure, such as the Enbridge Northern Gateway Project, must be developed to ensure access to competitive global markets for Alberta's energy resources."

The Spruce Grove and District Chamber of Commerce, which said that it represents 600 member businesses and 12,000 employees, noted that "the Northern Gateway pipeline project is critical to our country and will greatly benefit our region." The District Chamber said that, in May 2012, it voted in favour of supporting the Northern Gateway project "due to the long-term benefits that will flow to our province and our country."

The Town of Bruderheim said that the majority of the Town's Council is supportive of the project. The Town also said that the project would contribute to job creation, training and capital investment, and urged the Panel to consider the long-term effects of exporting raw bitumen on Alberta and national economies.

Letters noting the potential economic benefits of the project, including positive effects relating to employment, tax revenue, associated business expansion or benefits, and trade diversification were also received from municipalities and organizations in the project area, including:

- The Greater Edmonton Regional Chamber of Commerce
- World Trade Centre Edmonton
- Flagstaff County, Alberta
- County of Grande Prairie No. 1
- Beaver County, Alberta
- Lac St. Anne County, Alberta
- Lamont County, Alberta
- Sturgeon County, Alberta
- Fort St. John and District Chamber of Commerce
- Fort Saskatchewan Chamber of Commerce
- Town of Redwater, Alberta
- Town of Morinville, Alberta
- Town of Mayerthorpe, Alberta
- Town of Gibbons, Alberta
- Town of Bon Accord, Alberta
- Town of Beaumont, Alberta

The Panel also reviewed letters from municipalities outside the project area expressing views on the potential economic benefits of the project.

Letters were also submitted from individuals, municipalities, elected officials and organizations questioning the predicted economic benefits of the project, or raising concerns about its potential economic costs.

Friends of Clayoquot Sound said that Tofino is one of the top tourist destinations in British Columbia, with almost a million visitors a year, and that "an oil spill washing ashore would obviously severely harm the region's tourist and seafood economy and cause layoffs and job losses."

The Tofino-Longbeach Chamber of Commerce said that its Board of Directors and membership of over 330 businesses "feel the threat of an oil spill such as the one that occurred in the Gulf of Mexico last year and on our own coast in 1989 poses too great a risk."

The City of Terrace submitted a letter noting its opposition to the project.

The British Columbia New Democrat Official Opposition said that a major oil spill could put more than 7,000 jobs in British Columbia's fishing, tourism and marine sectors at risk, and that, after careful consideration, it has concluded that "the environmental, economic, and social risks associated with [the project] simply outweigh the benefits."

A number of individuals noted general concerns about the potential economic effects of the project in their letters to the Panel, including:

- the low number of permanent jobs that would be created;
- the short-term nature of economic effects resulting from construction;
- the potential use of temporary foreign workers on the project; and
- potential benefits flowing to non-Canadian companies.

In response to the criticisms and concerns raised by AFL, Northern Gateway said that AFL's assumption that the project would dominate the macro economy and create a resource boom to the extent that it could significantly increase the rate of inflation or interest rates is erroneous. Northern Gateway said that:

- The effect of the project on oil prices in Canada is relatively small, representing an uplift of $2 to $3 per barrel and well within observable weekly crude oil price swings.
- The project cannot affect the world price of oil and, therefore, cannot affect the prices paid for crude oil by Eastern refiners. In the case of Western Canadian refineries, the effect of Northern Gateway would, at most, be a one-time increase of about 1.5 cents per litre in the price of gasoline.
- An increase of between 0 and 1.5 cents per litre in the price of gasoline is well within the range of regular short-term price movements.
- The extent that a one-time price increase in gasoline affects the Consumer Price Index is negligible and short-term and does not cause higher rates of inflation in every year thereafter.
- The key measure used by the Bank of Canada with respect to monetary policy is core inflation, which excludes energy prices.

In reply to the AFL's critique of Northern Gateway's use of input-output modelling, the company said that:

- input-output is the only widely accepted model for measuring project effects, particularly when the project is small relative to the total economy and it is necessary to capture interregional and inter-industry effects.

- While there are numerous computable general equilibrium models used by researchers, they are typically not validated and are generally small and, as such, lack the detail required to assess complex projects such as Northern Gateway. At the macro level, they are typically used to assess policy shifts that have relatively large implications for the macro-economy.
- Detailed and large general equilibrium models that have been used have not been demonstrated to more accurately capture overall effects for a project than a carefully applied and qualified input-output model.

9.5.7 EQUITY PARTICIPATION BY ABORIGINAL GROUPS

Northern Gateway said that it introduced an Aboriginal Economic Benefits Package to eligible Aboriginal groups. The company said that a package might include:

- an equity participation offer in the form of an Aboriginal Ownership Agreement (AOA);
- procurement, employment, and training initiatives through the use of a Memorandum of Understanding (MOU) or other similar arrangement;
- access to a community investment fund; and
- access to corporate-branded programs.

In respect to equity participation, Northern Gateway said that Aboriginal groups having similar characteristics in relation to the project were assessed for eligibility in a similar manner, while acknowledging that certain differences exist between Alberta and British Columbia Aboriginal groups.

Northern Gateway said that it assessed eligibility in the following ways:

1. For Alberta and British Columbia, groups with communities located within the project engagement area who had expressed an interest in economic opportunities arising from the project and to whom Northern Gateway had committed to offer economic opportunities related to the project were assessed as eligible.
2. For Alberta, certain other Aboriginal groups with communities located outside the project engagement area but whose traditional territory would be traversed by the pipeline corridor and who had expressed an interest in opportunities arising from the project and to whom Northern Gateway had committed to offer economic opportunities related to the project, were assessed as eligible.
3. For British Columbia, in addition to communities fulfilling the criteria noted under number 1 above, groups having a reserve land base within 80 kilometres to either side of the pipeline right-of-way or marine tanker route were assessed as eligible to receive offers of economic participation (including equity), whether or not the record of engagement showed an interest in economic opportunities arising from the project and, whether or not, prior to June 2011, Northern Gateway had committed to offer economic opportunities once same were developed.

To accept the equity offering, the company said that each Aboriginal group must enter into an Aboriginal Ownership Agreement and the Northern Gateway Pipelines Limited Partnership Agreement.

Northern Gateway said that it set a deadline of 31 May 2012 for Aboriginal groups along the proposed route of the pipelines to indicate their acceptance of the offer of up to 10 per cent of the equity in the project. As of that deadline, Northern Gateway said that it had a majority of the groups eligible to participate as equity owners execute an Aboriginal Ownership Agreement with Northern Gateway. The company said that almost 60 per cent of eligible Aboriginal communities along the proposed right-of-way (representing 60 per cent of the First Nations population and 80 per cent of the combined First Nations and Métis population) have agreed to be part owners of the proposed pipelines. The company said that half of the equity units taken up went to groups in British Columbia, and the other half to groups in Alberta, as follows:

- 15 out of 18 Alberta Aboriginal groups accepted; and
- 11 out of 22 British Columbia inland Aboriginal Groups accepted.

The company said that its Aboriginal Economic Benefits Package was not presented in this same manner to coastal Aboriginal groups, and that its equity offering has not been finalized for the coastal First Nations.

The company said that, in presenting the equity offer, "Northern Gateway made reasonable efforts to ensure that Aboriginal groups made an informed decision to accept or reject. This involved a range of activities varying from group to group, including community information sessions, meetings with community leadership and meetings with Aboriginal groups and their legal counsel." The company also said that the equity offer was not designed as a form of compensation. Rather, it was intended as a business agreement, but one which sought to align the interests of Northern Gateway over the long term with the interests of Aboriginal communities that accepted the equity offer.

Northern Gateway said that Aboriginal groups who accepted the equity offer were not restricted from participating in the regulatory hearing process to provide input or express concerns regarding the project with respect to (i) their use of land for traditional purposes, (ii) the socio-economic circumstances of their members, (iii) the environment, and (iv) their Aboriginal and treaty rights or title (or both), including their right to suggest measures to be taken to mitigate the potential effects of the project. Northern Gateway stated its desire to be respectful of its Aboriginal equity partners' Aboriginal and treaty rights and their concerns about the project. The company said that it would work together with its Aboriginal equity partners to ensure that issues and concerns are addressed or mitigated (or both), and the project economic benefits targeted for Aboriginal communities are realized.

The company said that, while the equity offering is significant, it represents less than one-third of the total potential Aboriginal benefits Northern Gateway is proposing, which also include:

- a procurement, employment, and training strategy;
- access to a Community Investment Fund;
- stewardship programs; and
- a Marine Services and Benefits Portfolio.

Northern Gateway said that "these commitments break new ground by providing an unprecedented level of long-term economic, environmental and social benefits to Aboriginal groups."

Michel First Nation raised concerns about not being offered an equity participation component of the Aboriginal Benefits Package. In response, Northern Gateway said that Michel First Nation did not meet the criteria set by the company, namely that Michel First Nation did not have a formally recognized and settled land base within the project corridor, had not expressed an interest in economic opportunities, and had not received an offer from the company.

Through information requests, the Enoch Cree Nation, Ermineskin Cree Nation, Louis Bull Tribe, Montana First Nation, Samson Cree Nation, and Whitefish Lake First Nation raised a number of questions about Northern Gateway's Aboriginal Benefits Package, among them:

- how Aboriginal groups were identified, including the rationale for offering different opportunities and benefits to groups in similar circumstances relative to the project and its likely effects;
- the extent to which project effects were considered in offering benefits; and
- how Aboriginal capacity issues would be addressed.

In response, Northern Gateway said that:

- the primary focus was with Aboriginal groups who met the eligibility criteria for the Aboriginal Economic Benefits Package. Northern Gateway would also look for opportunities to extend, (for example, training, employment, and contracting opportunities) to those groups who do not meet these criteria but who expressed an interest, and these would occur closer to the start of construction;
- the purpose of the Aboriginal Economic Benefits Package is to create economic opportunity for, and long-term alignment of interests with, those communities who are in proximity to the proposed project. Northern Gateway has not designed the benefits package as a compensatory mechanism; and
- its approach to training and early dialogue is intended to position Aboriginal groups so they can take advantage of potential project contracting opportunities on a regional basis

Views of the Panel

The Panel finds that there are significant potential benefits to local, regional, and national economies associated with the project. Construction and routine operation of the project would likely result in positive economic effects on employment, income, GDP, and revenues to all levels

of government. The Panel finds that the overall economic effects that could result from the construction and operation of the project, as estimated by Northern Gateway, could be substantial, including more than $300 billion in potential gain to Canadian GDP, approximately $70 billion in additional Canadian labor income, a gain of $90 billion in government revenues, and more than 900,000 person-years of employment.

The Panel accepts much of the evidence provided by Northern Gateway regarding its estimates of the potential economic effect of the project. The Panel notes, however, that these represent broad estimates, and that the actual economic effects of the project would only be determined once the project was constructed and placed into operation. The Panel also notes that not all parties agreed with Northern Gateway's estimates of the overall potential economic effects of the project.

The Panel acknowledges the evidence provided by intervenors, including the evidence provided by Coastal First Nations, the Haisla Nation, the Gitga'at First Nation and the Alberta Federation of Labour [AFL]. The Panel accepts the view of Coastal First Nations that the relative values of ecological goods and services are difficult to estimate and are therefore limited in their capacity to be used in decision-making. The Panel is of the view that the valuation of ecological goods and services remains a developing approach, and that not all parties acknowledged what would be agreed-upon, or objective, standards for evaluating such costs. The Panel finds that more work would be needed to fully understand these potential costs.

The Panel notes the criticisms raised by intervenors, including those by the AFL, about the methodology used by Northern Gateway to calculate the potential economic effects of the project. The Panel finds that the methods used by Northern Gateway in its Economic Impact Analysis were acceptable for the purposes of estimating the macro-economic effects of the project. The Panel does not agree with AFL's view that the project would result in negative long-term effects on the Canadian economy.

The Panel also acknowledges the evidence presented by the Gitga'at First Nation regarding the potential effects of the project, including the potential effects of a large spill, on Gitga'at economic interests. The Panel's views on the likelihood of a large spill are found in Chapter 7.

Regarding the potential effects Northern Gateway predicted would result from an oil price uplift, the Panel is of the view that the potential market effects of constructing new pipelines to connect producing regions and consuming regions cannot be easily predicted. It is therefore difficult to determine, with certainty, the effect the Enbridge Northern Gateway Project may have on broader market prices once it is placed in service, or how revenues may be invested. The Panel is satisfied that the project would assist producers to realize full market value for their production, and would provide revenues to governments and industry to make investments, which in the Panel's view benefits all Canadians.

The Panel recognizes that there may be adverse socio-economic effects associated with this project and that these are likely to primarily affect local communities along the pipeline route, and coastal communities. The Panel also acknowledges that the potential opportunities and benefits that can be realized from the project would not be distributed evenly. On balance, the Panel finds that the potential economic effects of the project on local, regional, and national economics would be positive, and would likely be significant.

Some communities and individuals raised concerns about the potential negative effects of the project, and in particular the effects that a malfunction or accident could have on the economies or livelihoods of individuals and communities. The Panel also heard from a number of municipalities, chambers of commerce, and elected officials about the potential economic benefits that the project would have on their communities, citizens, businesses, and governments. In order to effectively attain the potential benefits of the project, Northern Gateway committed to a number of measures that would support the participation of local, regional, and Aboriginal businesses and communities in the project. The Panel notes the measures committed to by Northern Gateway to encourage and support the participation of interested Aboriginal groups and businesses in the project, and to assist local and Aboriginal business and individuals to qualify for the opportunities that would be available.

The Panel concurs with Northern Gateway's view on the potential economic and social benefits of the project for Aboriginal groups, and is of the view that the company's commitments break new ground by providing an unprecedented level of long-term economic, environmental, and social benefits to Aboriginal groups. The Panel acknowledges Northern Gateway's commitment to provide equity participation to eligible Aboriginal groups, its commitment to meet or exceed

15 per cent Aboriginal employment for construction and operation of the project, and its proposed programs to support education and training for interested Aboriginal individuals and businesses.

The Panel sees the participation of local people and businesses in the project as a vital component of the project proceeding, and as a key measure of its ultimate success. The Panel is of the view that it is appropriate for the benefits of the project to flow to local individuals, communities and businesses. The Panel requires Northern Gateway to submit its plans for implementing training, employment, and educational opportunities for Aboriginal and local people, and its programs to track and measure the success of these.

The Panel is of the view that, with Northern Gateway's commitments, and with the Panel's conditions, the project is likely to have positive net economic benefits to local, regional, and national economies, and can provide positive benefits and opportunities to those local, regional, and Aboriginal individuals, communities, and businesses that choose to participate in the project.

9.6 Traditional land and resource use

As part of its review, the Panel considered information on how the project could potentially affect Aboriginal traditional land and marine use in the project area. The Panel evaluated information related to how Aboriginal groups currently use the lands, waters, and resources for traditional purposes, and how the Enbridge Northern Gateway Project could affect that use.

Throughout the process, Aboriginal groups provided information related to their use of lands, waters, and resources along the pipeline and shipping routes. The Panel heard about specific locations where Aboriginal groups have exercised or currently exercise their traditional activities. The Panel was also provided with oral and written evidence from Aboriginal groups about their general use of lands, waters, and resources in the project area, including harvesting land and marine resources (such as hunting, trapping, fishing, and gathering), as well as the importance of these practices to the culture of Aboriginal communities. Northern Gateway also provided information to the Panel about the use of lands, waters, and resources by Aboriginal groups. This included information provided to the company through its engagement activities with Aboriginal groups, analysis of the potential effects of the project conducted through the environmental and socio-economic assessment (ESA) for the project, as well as summaries of issues raised by Aboriginal groups in their Aboriginal Traditional Knowledge community reports.

9.6.1 NORTHERN GATEWAY'S ABORIGINAL TRADITIONAL KNOWLEDGE (ATK) PROGRAM

Northern Gateway said that its Aboriginal Traditional Knowledge (ATK) program was an important component of the overall Aboriginal engagement activities undertaken for the project. The company said that its objective for the program was to "gain an understanding of, and document, traditional activities, anticipated project effects on traditional lands and activities, and possible mitigation strategies."

Northern Gateway said that the focus of its ATK program was on Aboriginal groups with communities within 80 kilometres either side of the proposed right-of-way, as well as coastal Aboriginal groups with interests in the area of the Kitimat Terminal and the Confined Channel Assessment Area. The company said that Aboriginal groups had the option of either working collaboratively with Northern Gateway to complete a report, or working on an independent report for the project. Northern Gateway said that it provided funding for communities that chose to do an independent report. According to the company, the ATK community reports:

- provide the Aboriginal group's perspective of potential effects of the project on traditional lands and activities (including cultural, social, and economic effects);
- provide relevant ATK information about the potential effects of the project, including biophysical, cultural, and socio-economic information, that may not otherwise be available through technical scientific methods;

- provide mitigation recommendations for potential effects on traditional uses;
- provide information to aid in project planning and design and reduce potential conflict between an Aboriginal community's goals, use and wellbeing, and development plans for the project;
- support long-term relationship building between Northern Gateway and Aboriginal communities potentially affected by the project; and
- contribute to building ATK program capacity within Aboriginal communities.

Northern Gateway said that the collection and use of ATK for the project was guided by the following principles:

- ATK is the property of the Aboriginal community and ATK participants;
- the rights of distribution of ATK are maintained by the Aboriginal community and ATK participants;
- designated community representatives determine the most appropriate providers of ATK;
- use of ATK in the environmental and socio-economic assessment is established only through consent of the Aboriginal community;
- description of baseline conditions, assessment of potential effects of the project on traditional lands and activities, and recommendations for mitigation measures are made by ATK participants;
- in the case of collaborative ATK community reports, the draft community report is reviewed and approved by ATK participants and designated community representatives before being released to Northern Gateway; and
- all original materials generated from an ATK community report are returned to the Aboriginal group coordinator once regulatory processes are complete.

Northern Gateway described in detail the processes followed for its ATK program. For collaborative ATK community reports, the company said that discussions were focused on potential project effects on traditional use and resources. The company said that participants were encouraged to discuss topics of most concern to them and were asked to identify use areas with the potential to be affected by the project, including travel routes, harvesting locales, habitation areas, and spiritual sites. It also said that important areas for wildlife, fish, and plant species (e.g., locations of plants, fish spawning sites, calving grounds, mineral licks), and locations of archaeological and palaeontological sites important to the community were also identified. The company said that baseline conditions were also discussed, and that information regarding observed changes in environmental aspects such as air and water quality, water quantity, plant and wildlife health, climate conditions, community wellbeing, and socioeconomic conditions were recorded. The company said that ATK participants were asked to identify potential effects that the project might have on any of the elements discussed, and, where possible, to provide recommendations for mitigation measures to lessen these potential effects.

For independent ATK community reports, Northern Gateway said that each Aboriginal group determined the format and content of the report, and controlled the ATK information provided.

The company said that two basic types of ATK were generally collected: traditional use (TU) and traditional environmental knowledge (TEK) information. The company said that traditional use focused on activities and sites or areas of cultural significance within traditional lands and territories. The company said that, for the ATK community reports, the types of activities, sites, or areas identified included broad categories such as:

- travel (e.g., trail systems, waterways, and landmarks);
- harvesting (e.g., registered traplines, resource use and harvesting areas, special-use sites such as fish camps, berry-picking areas, and medicinal plant collection areas);
- habitation areas (e.g., occupation areas, meeting areas, gathering places, cabins, and campsites); and
- spiritual sites and sacred landscapes (e.g., burial sites, sacred sites, spiritual sites, and sacred geography).

Northern Gateway said that traditional environmental knowledge was also collected, and that it refers to the wisdom and understanding by Aboriginal groups or individuals of a particular natural environment that has accumulated over countless generations. The company noted that traditional environmental knowledge can provide additional context to baseline descriptions and the analysis of potential project effects.

The company said that, once an ATK community report was made available, summary tables that included all potential project effects as identified by the ATK participants were generated. It said that these were organized according to discipline and project phase, and outlined mitigation recommendations proposed by the community for each of these anticipated project effects.

Northern Gateway said that, as of February 2013 a total of 35 ATK studies had been completed (20 in Alberta and 15 in British Columbia), while a number of studies were also continuing at that time. It said that it spent a total of $5 million ($2.5 million in Alberta and $2.5 million in British Columbia) to fund ATK studies. Northern Gateway said that funding for ATK studies remained ongoing. The company said that 100 per cent of the length of the proposed right-of-way for the pipelines was covered by completed ATK studies.

The company said that there is substantial overlap in traditional lands and use areas along the right-of-way. The fact that one Aboriginal group had completed a report addressing a certain portion of the route does not mean that all Aboriginal groups who could potentially be affected by the project have completed reports for the same portion of the right-of-way. The company said that not all communities shared common uses, knowledge, or understanding of these areas. It said that, as additional ATK information for those areas is received, it would be considered in follow-up mitigation programs and during detailed route surveys.

9.6.2 NORTHERN GATEWAY'S ASSESSMENT OF POTENTIAL EFFECTS ON TRADITIONAL LAND AND MARINE USE

In its evidence, Northern Gateway filed detailed summaries of the information provided to the company through the ATK program, including the potential effects that the project might have on traditional use and resources, and recommendations for mitigation measures. The company said that the anticipated project effects identified in the available ATK community reports included:

- disturbance to specific traditional use sites and areas along the right-of-way, including harvesting areas for food, ceremonies, and traditional activities;
- potential effects of spills on the environment and on traditional use areas;
- access management (providing continued access to Aboriginal community members while preventing increased access to recreational users);
- potential effects on key ecological features, such as wetlands, lakes, and streams, and the associated effects on wildlife, fish, and fish habitat; and
- potential effects on vegetation (disturbance of medicinal plants, right-of-way clearing, maintenance and use of herbicides, and reclamation practices).

Northern Gateway provided detailed summaries of its understanding of the issues and concerns raised by Aboriginal groups in ATK studies, and the measures proposed to address them. In response to information requests from the Panel, Northern Gateway noted information for each Aboriginal group participating in the ATK program, including:

- specific issues or concerns raised;
- mitigation measures proposed by Aboriginal groups;
- standard or generally accepted mitigation measures that Northern Gateway can, or would, implement to address the issue or concern raised by Aboriginal groups; and
- Northern Gateway's response to mitigation measures proposed by Aboriginal groups.

The company said that the potential for spills, accidents or malfunctions was the single greatest environmental concern expressed in the available ATK community reports. It said that Aboriginal groups questioned the reliability of engineered fail-safes and preventative measures, and that groups involved in ATK community reports for the project predict that any spills, accidents, or malfunctions would have systemic effects on the food chain and watersheds, and ultimately, on the ability to exercise Aboriginal and treaty rights.

The company said that access management was a concern shared by Aboriginal groups for the project, as it has implications for the use and enjoyment of traditional territories and the availability of traditional resources. The company said that many ATK participants also noted potential project effects on key habitats or ecological features, such as mineral licks, medicinal plants sites, spawning areas, and grizzly habitat, as examples.

Northern Gateway said that, overall, potential effects on harvesting, access, ecological features and wildlife, or vegetation, in addition to the potential for environmental contamination, were raised repeatedly and consistently by Aboriginal participants and indicates deep concerns by Aboriginal groups about potential effects on traditional use.

The company said that, where Aboriginal groups completed ATK studies for the project prior to filing its application, information was incorporated in the environmental and socio-economic assessment for the project. As discussed in Chapter 4, the company said that it assessed potential project effects on resources commonly understood to be of importance for Aboriginal people, or that support the land base and habitat conditions essential to the sustainability of these resources. It said that it took into account species, species groups, or indicators that are, or represent, resources commonly understood to be of importance for Aboriginal people, as well as issues raised by Aboriginal people, information on traditional land use and ecological knowledge, and recommendations provided by Aboriginal groups on project design changes and mitigation.

Northern Gateway said that in its environmental and socio-economic assessment for the project it has detailed a full suite of mitigation measures and follow-up programs, including the Construction Environmental Protection and Management Plan. The company said that mitigation measures and monitoring recommendations contained in the Construction Environmental Protection and Management Plan would be used to limit the magnitude, geographic extent, and duration of potential environmental effects as a result of the project. The company said that mitigation measures for affected sites, areas, and locales may include avoidance, buffering, further studies, monitoring, or co-management programs, restoration, or conservation measures, or compensatory action.

Northern Gateway committed to reducing the effects of the project on the use of lands and waters for traditional purposes, and said that this is primarily accomplished through sound engineering and environmental design, as described throughout its application. The company said that results of the ATK studies would be considered in project planning and execution, with a particular emphasis on identification of site-specific resources or features that need to be considered in detailed routing and during construction. The company also said that input received from participating Aboriginal groups has been assessed and incorporated where appropriate into the preliminary Construction Environmental Protection and Management Plan, and that input from Aboriginal groups would continue to be collected and would be incorporated into the final Construction Environmental Protection and Management Plan and revised, whenever possible.

Northern Gateway said that effects associated with routine project activities during construction, operation, and decommissioning are not likely to cause significant adverse effects on terrestrial or marine environments and, therefore, the project would not have a significant adverse effect on those who depend on the land and water for sustenance, including Aboriginal groups.

9.6.3 TRADITIONAL LAND AND MARINE USE INFORMATION PROVIDED TO THE PANEL BY ABORIGINAL GROUPS

In addition to the evidence provided by Northern Gateway, the Panel received information about traditional land and marine use directly from Aboriginal groups via oral evidence, individual affidavits, and through various studies that were filed on the record.

The information provided by Aboriginal groups regarding their traditional land and marine use generally focused on how communities and individuals use the lands, waters, and their respective resources to exercise their potential or established Aboriginal and treaty rights. This included information about traditional harvesting activities (such as fishing, hunting, gathering, processing, and other activities), and cultural and spiritual practices and systems. The information provided also included specific annual and seasonal harvesting locations and species used by Aboriginal groups for the activities described, how the needs of that community continued to be met by these activities, as well as specific sites that are of cultural or spiritual importance to potentially affected Aboriginal groups.

For Aboriginal groups along the proposed right-of-way, the Panel heard about food harvesting activities (i.e. hunting, trapping, fishing, medicinal herbs, and plant and berry gathering) as well as the cultural importance of this type of traditional land use. Groups said that it is during these activities that Elders pass along their knowledge to younger community members, allowing for reconnection with ancestral teachings. Groups said that food

and medicines gathered on their traditional land are also shared amongst community members and traded with other Aboriginal groups. Groups shared information relating to important archaeological sites, burial sites, and sacred sites where important spiritual ceremonies take place. During oral evidence, Métis groups explained how the Métis people were some of the first settlers at the fur-trade outposts and their family names mark important historical landmarks all along the pipeline route.

In addition to providing information on the past and present traditional land use activities, groups said that access to these lands has diminished due to increased industrial activity. Groups said that they were concerned that clearing activities, construction of the pipelines, and new access created by the project would affect their ability to continue to use their lands for traditional purposes.

Whereas, in the past, some of these resources were right on their "doorstop," groups said that they now have to travel further for their traditional harvesting activities. Groups said that travelling greater distances makes it more difficult for Elders to participate and pass on traditional knowledge to younger generations. They also said that lands further away do not contain the traditional food they are used to, or that sometimes this food has been tainted due to industrial activity. Groups also said that declining access to land can affect the use of language, as understanding of place names is dependent on continued use of the language.

Coastal Aboriginal groups shared information on food harvesting activities (primarily relating to fishing, but also hunting, trapping, medicinal herbs, and plant and berry gathering), as well as the cultural importance of these activities. As these communities were largely concerned with the effects of shipping and potential marine spills, the information they provided focused mostly on traditional marine use. Aboriginal groups described the traditional methods of fishing, the important role the harvesting sites and camps play in passing traditional knowledge on to future generations, how food is prepared, stored, and described the sharing, trading, and feasting that comes after foods are harvested. They also described how their cultural systems, practices, and stewardship are inextricably connected to the traditional use of the lands and the waters.

Coastal groups shared information regarding sacred sites and burial grounds, and how it is difficult to map some of these traditional sites and important coastal areas due to both privacy concerns and difficulty of access. They said that these sites were named after important events that happened or resources that are harvested there, and that, with a loss of traditional knowledge and resources, the place names could be lost as well. Coastal communities also described the challenges they face in continuing traditional harvesting activities. These challenges primarily relate to increased distance from, and access to, harvesting sites due to:

- closures and loss of access to fishing areas as a result of previous and existing industrial activities;
- competition from commercial, recreational, and sport fishing; and
- pollution from increased industrial activity.

9.6.4 CONCERNS RAISED ABOUT NORTHERN GATEWAY'S APPROACH TO ASSESSING EFFECTS ON TRADITIONAL LAND USE

Aboriginal groups raised a number of general concerns about Northern Gateway's approach to assessing potential effects to traditional land use. These included:

- limitation in the scope of fieldwork and surveys;
- flaws in the study methodology ;
- amount of funding offered by Northern Gateway;
- level of detail regarding site-specific mitigation for traditional use sites;
- incorporation of information from traditional use studies into the project application or updates ; and
- Northern Gateway's determination that there would be no significant adverse environmental effects and, therefore, no significant effects to how Aboriginal groups use lands, waters or resources.

For example, the Driftpile First Nation said that, while its Aboriginal Traditional Knowledge study had been completed, its geographical scope was restricted to easily accessible areas due to budget constraints, and the study's informational value was, therefore, severely limited. Other groups said that the scope of the studies was limited due to the level of funding from Northern Gateway. Michel First Nation said that limited funding did not allow for field visits, so sites or areas that are potentially affected by the project had not been accurately documented.

In response to questions from Aboriginal groups regarding how Northern Gateway determined whether an ATK study is needed and what the level of funding would be, Northern Gateway said that it considered information provided by an Aboriginal group and the Aboriginal group's level of interest in the project to determine whether a study should be undertaken and, if so, the appropriate scope for the study. The company said that funding was based on the scope and size of the study that was mutually agreed upon between Northern Gateway and the Aboriginal group. The company said that factors considered in the scope of work for ATK studies varied from group to group, but included the group's internal capacity to complete the study, site-specific interests that were identified, level and degree of interest, and number of participants that would be involved in the study. Northern Gateway said that the manner in which the ATK studies were conducted required thorough discussion at the outset and that both parties sign an ATK information sharing agreement which addresses issues of ownership and confidentiality of the knowledge.

Enoch Cree Nation expressed concerns about the quality of its ATK report, saying that the consultant "may have only included interviews with six or seven members of the Nation, who were mostly elderly and, as a consequence, the ATK report reads as though the Nation may have had some limited traditional use in the project area, and that the Nation, more or less, does not use the project area anymore." Enoch Cree Nation said that this does not accurately reflect its use of the project area. It said that it raised these concerns with Northern Gateway and did not receive a response.

Kelly Lake Cree Nation raised concerns regarding consultation with Northern Gateway about the results of its ATK study. It said that there are still a number of outstanding concerns and issues arising from its ATK report regarding specific mitigation measures and accommodation. Whitefish (Goodfish Lake) First Nation said that Northern Gateway had not followed up with the Nation on any specific mitigation measures arising from the issues and concerns identified in the community's ATK report.

A number of groups said that there was a lack of integration of traditional land use into the project application. For example, Michel First Nation said that "without the integration of traditional land use information into the design and execution of the environmental assessment and into the determination of effects, a project-specific traditional land use study is limited in its application after the completion of assessment report has occurred, except to highlight information that should have been collected and used during the assessment process." Michel First Nation also said that, while an ATK study can be used to identify Aboriginal use and general concerns, it must also be integrated into an environmental assessment along with a robust consultation program in order to identify effects.

Gitxaala Nation expressed a similar view, saying that Northern Gateway seemed to perceive traditional use studies as a parallel, stand-alone environmental assessment. Gitxaala Nation said in its view "Aboriginal traditional knowledge information that is collected must be incorporated into, and reflected in, all other biophysical and socio-economic studies conducted specifically to this application to determine what the extent of the effects are, including to Aboriginal and treaty rights." Gitxaala Nation said that Northern Gateway did not specify how the traditional use information provided by the Gitxaala was used in designing the proposed mitigation measures. Gitxaala Nation also said that it had "serious concerns about Northern Gateway's failure to incorporate the information contained in the use study generally and with respect to assessing the potential effects of the project on Gitxaala's Aboriginal rights and interests, including potential socio-cultural impacts."

In response to questioning from the Gitxaala Nation regarding how the Nation's traditional use study was used, Northern Gateway said that it was received after the application had been filed. Northern Gateway also said that, after reviewing the information in the Gitxaala study and others, it "did not see a need to change our environmental assessment predictions or the methodology … however that information and more information hopefully that we can receive from this community and others will be incorporated into our detailed design going forward."

Some Aboriginal groups said that they were not satisfied with Northern Gateway's statement that traditional use information received after the application had been filed would be incorporated into future project planning and design. Coastal First Nations said that the lack of baseline information means that the potential effects and risks cannot be known and quantified, nor predictions made, to evaluate the effects of the project or a potential spill on traditional marine use. The Council of the Haida Nation questioned Northern Gateway's understanding of the knowledge that Elders shared

during the oral evidence portion of the hearing and how their concerns were incorporated into the application.

In response, Northern Gateway said that, as this information was gathered post-application, it would be included in future programs to be implemented should the project be approved. Northern Gateway said that the concerns voiced during oral evidence were consistent with the information that it already had and that it understood their concerns and looked at ways to address them and mitigate them. Northern Gateway also said that this type of information would be incorporated into coastal sensitivity mapping going forward and that it would provide integral information for future spill response planning. The company said that this type of information would be used as part of the marine environmental effects monitoring program which would gather baseline information regarding traditional food quality and food harvests in areas that would be selected based on consultation with the Council of the Haida Nation.

In response to questioning from Enoch Cree Nation, Ermineskin Cree Nation, and Samson Cree Nation, Northern Gateway said that, along the proposed right-of-way, information regarding traditional land use has been incorporated into project planning in a variety of ways. It said that the information was used for developing the route, including alterations to the route to accommodate information that has come in through the ATK process and through consultation with Aboriginal groups. The company also said that the ATK study process is ongoing and that, as Northern Gateway receives mitigation information from Aboriginal groups, it would be incorporated into the Environmental Protection and Management Plan. The company said that the measures in this plan may also be modified where practical based on any additional information received through oral evidence and the oral portion of the hearing.

In response to questioning from the Daiya-Mattess Keyoh, Northern Gateway said that the Environmental Protection and Management Plan as originally filed in the proceeding is very general and that Northern Gateway would collect site-specific information through various measures, including with the assistance of Aboriginal groups to add to the plan. The company also said that Northern Gateway made two commitments to Aboriginal groups regarding understanding site-specific traditional land use. It said that the first would be a route-walk prior to setting the final centreline, to better understand traditional harvesting areas, cultural sites, and other traditional values. It said that, during this centreline survey, a team, which would typically consist of an Aboriginal member from the First Nation whose traditional territory is affected by that portion of the pipeline, an engineer, an archaeologist, a wildlife biologist, a botanist, and a fisheries biologist, would set the centreline together to find an optimal balance between all the different factors that are concerned, taking into account pipeline safety.

Many Aboriginal groups said that they were concerned that, despite the gathering of traditional land use information, Northern Gateway's focus was too narrow, as it only addressed biophysical elements and did not address concerns related to rights and interests. Gitxaala Nation said "the proponent's assessment of Gitxaala rights and interests, using an alternate biophysical valued component as a 'proxy', rather than directly assessing the specific practice or rights or use of lands and resources for traditional purposes, is inappropriate and has likely resulted in incorrect conclusions." The Gitga'at First Nation said that Northern Gateway did not assess social effects to potentially-affected communities, nor did it take into consideration the fundamental values of the Gitga'at, including their identity and worldview.

Driftpile First Nation said that its ATK study was deficient as it only documented Driftpile's land use and members' issues and concerns, but did not assess effects of the project on Aboriginal and treaty rights. East Prairie Métis Settlement and Horse Lake First Nation said that they did not feel Northern Gateway understood the difference between Aboriginal and treaty rights as well as what this means for the use of ATK.

Northern Gateway said that, within its assessment, it concluded that, as no significant adverse environmental effects are predicted for terrestrial or marine biota or the ecosystems on which they depend, the project is also not expected to result in any significant adverse effects on the abundance, distribution, or diversity of resources harvested by Aboriginal people or the land which supports these resources. It said that it did not consider it appropriate to comment on whether these changes would affect aesthetic, cultural, and spiritual aspects of harvesting and land use of importance to Aboriginal people. More information on Northern Gateway's approach to the assessment of potential project effects on Aboriginal rights and interests can be found in Chapter 4.

9.6.5 ABORIGINAL FISHERIES AND HARVESTING

Northern Gateway said that the Food, Social, and Ceremonial (FSC) fishery is an important component of the traditional activities of Aboriginal groups who harvest fish for spiritual and cultural purposes, as well as a key food source. The company said that the FSC fishery targets species similar to those of commercial-recreational fisheries and is managed by Fisheries and Oceans Canada based on species abundance and in consultation with participating Aboriginal groups. It said that it gathered most of its information on the FSC fishery from data provided by Fisheries and Oceans Canada and through interviews with Aboriginal residents in coastal communities. It said that further information would be collected from Aboriginal Traditional Knowledge reports and harvesting studies to be completed in the future. It said that Aboriginal harvesting concerns along the route were gathered through the consultation process and as part of completed and ongoing Aboriginal Traditional Knowledge studies.

Northern Gateway said that, similar to potential effects on commercial fisheries, potential effects to Aboriginal fisheries could include:

- restriction of access to fishing grounds;
- loss or damage to fishing gear;
- change in distribution and abundance of harvested species; and
- aesthetics, visual, and noise disturbances.

Northern Gateway said that potential effects to Aboriginal harvesting would be focused on access management issues and increased human activity along the right-of-way.

Aboriginal groups said that they were largely concerned how any fisheries closures or access restrictions, due to construction, operations, or a spill along the right-of-way would affect their ability to harvest. Groups were also concerned about the effects these could have on their ability to feed their community members, as well as the cultural practices and traditional knowledge transfer that are integral elements of these activities.

The Gitga'at First Nation said that marine foods critically important to the Gitga'at cultural practice of feasting would be adversely affected by oil spills. The Gitga'at First Nation said that travelling to harvest sites was an important part of the dissemination of cultural knowledge. The Nation also said that Elders pass on songs, knowledge about survival, traditional medicines and teach language while at the harvest sites. It also said that harvesting and distribution of traditional foods occur along lines of kinship and in accordance with relationships of respect and perceived need, and that, once the food is collected, the feast is a time when Gitga'at chiefs and their clans affirm their relationship to their territories. The Gitga'at First Nation said that the majority of Gitga'at households engage actively in traditional harvesting activities, and over 40 per cent of meals are traditionally sourced.

The Heiltsuk Tribal Council said that it is increasingly difficult to access fish for Food, Social, and Ceremonial purposes, and that community members have to go further, and stay out for longer periods, to feed their families. The Tribal Council said that the food fishery is a major element of Heiltsuk cultural continuity, enabling members to maintain close ties to different parts of their territory, and sustain their families and the social structure of the community. The Tribal Council said that harvesting is an important part of the ongoing activities of the Heiltsuk people, providing food, medicine, fuels, building materials, ceremonial and spiritual necessities, and other materials. The Heiltsuk Tribal Council said that the Supreme Court of Canada recognized their Aboriginal right to trade herring spawn on kelp on a commercial basis.

Gitxaala Nation said that over 90 per cent of their diet comes from traditionally harvested food, that this food is shared amongst community members, and that this sharing brings great pride to members. Over several days of oral evidence, Gitxaala Nation described the species it harvested, where fishing camps were located, how place names were given based on the harvesting that occurred there, and how various traditional methods of harvesting resources such as roe on kelp and seaweed are been passed on from Elders to the community's youth. The Nation shared stories related to *naxnox*, which is the spirit of the plants and animals that the Gitxaala harvest, and how it represents the relationship that the Nation has with these resources. The Gitxaala Nation said that if it does its part, and is respectful of its surroundings and the beings within its traditional territories, the *naxnox* will do its part and provide for the community.

Aboriginal groups along the right-of-way expressed concerns about project effects, due to pipeline construction and operation, on their ability to harvest medicinal plants and other country food sources, and how this could also potentially limit their cultural activities. The Kitsumkalum Indian Band shared information relating to the resources harvested from the Skeena River. It said that several fundamental parts of Kitsumkalum Tsimshian First Nation traditional culture are linked to all aspects of traditional marine foods, including harvesting, processing preparation, distributing, personal consumption, sharing, trading, and feasting.

In oral evidence, Samson Cree Nation said that traditional knowledge is passed on by Elders during ceremonies that take place during hunting and gathering. The Métis Nation of Alberta said that moose hunting and berry picking is becoming more difficult due to industrial activity as hunters have to go further afield to find game. It said that moose has cultural importance to the Métis as it is a primary food source, dried meat is used in ceremonies, and the hide is used for moccasins and other clothing. Swan River First Nation also said moose harvesting is declining in its area and described the effect this is having on its community members.

Both coastal and inland Aboriginal groups said that fishing and harvesting play an important role in their traditional economy and trade with other Aboriginal groups. The Office of the Wet'suwet'en said that the salmon fishery has always been a central focus of the Wet'suwet'en sustenance and trading economies, and that arrangements for management of the fishery are deeply interconnected and woven into the fabric of Wet'suwet'en culture. In oral evidence, the Kitasoo/Xai'xais First Nation said that its harvest is linked with trade, and that "we do a lot of trading with our resources within our territory with other people in the mainland like Kitimat, Bella Coola, and people up the Nass Valley. They do not have the herring eggs or the seaweed and other resources, those people we trade with."

Groups also said that any disruption to their traditional harvesting and fishing would affect their ability to hold feasts and, therefore, affect their traditional governance. Gitxaala Nation said that changes to its harvest could result in cascading cultural changes, such as effects to the house group managing the area, or the transmission of knowledge regarding the areas important to the resources. It said that, without the capacity to harvest, Gitxaala Nation could not hold feasts, and without feasts it could not pass on names or traditional knowledge. The Office of the Wet'suwet'en said that its clan system is reliant on feasts. It said that feasting is the time when laws are determined, names are taken and responsibilities are passed on to future generations.

Access management was of concern to several groups. Aboriginal intervenors raised concerns about the potential opening up of lands that have been traditionally used for harvesting to non-Aboriginal land users, as well as potential restrictions to Aboriginal fishing and harvesting during construction and operation.

Northern Gateway committed to develop follow-up programs for monitoring the potential effects of the project on Aboriginal fishing. The company said that this includes funding studies for each of the coastal Aboriginal groups within the Confined Channel Assessment Area, in an effort to quantify the FSC fishery and to better understand the location of harvests, the type and amount of resources harvested, and the timing and quality of the harvest. Northern Gateway said that this information would also be used to evaluate and compensate any future losses that may be experienced by coastal First Nations.

Northern Gateway said that site-specific information on FSC fisheries would also be included in environmental sensitivity atlases as well as Geographic Response Plans. The company said that it expects that Aboriginal fishers would participate in the Fisheries Liaison Committee and be active participants in the catch monitoring programs which it has committed to start 3 years prior to operations. It said that protocols to address costs associated with loss or damage to FSC fisheries would be developed through the Fisheries Liaison Committee.

Coastal Aboriginal groups expressed concerns about the appropriateness of the Fisheries Liaison Committee and compensation as mitigation measures for potential effects to Aboriginal fisheries. The Gitga'at First Nation said that the committee as presented lacked concrete details and did not explain how it would resolve issues between fishers and the project. It questioned how Northern Gateway would calculate harm to traditional harvests, and that cultural dimensions of traditional harvesting such as knowledge transfer may be impossible to compensate.

Regarding the recovery of biophysical and human environments from oil spills, Northern Gateway said that, in previous spills, there were short-term negative effects related to the availability of resources to share within communities. It said that, over the long term, cultural transmission between Elders and youth continued, as did food sharing patterns, and ultimately the basic fabric of society remained unchanged. Northern Gateway said that important cultural concerns, such as issues related to traditional food, access to resources, and sharing would be included in spill response planning.

Northern Gateway committed to provide opportunities for participating Aboriginal groups along the right-of-way to harvest medicinal and food-source plants prior to clearing activities. The company said that, prior to construction, each Aboriginal group along the proposed right-of-way would have the opportunity to participate in a program designed to identify traditional use trappers, harvesters and yields. Northern Gateway also said that Aboriginal groups would be given the opportunity to review site-specific plans to address public access concerns before construction begins.

Northern Gateway said that it had determined within its assessment that there would not be significant adverse effects on fishing and harvesting of resources by Aboriginal groups. The company said that it did not attempt to make predictions about significance of effects on aesthetic, cultural or spiritual aspects of the potential uses of these resources.

Views of the Panel

The Panel learned and benefited from the evidence of Aboriginal groups and their members provided during the oral portion of the hearing and through their written submissions. The Panel recognizes that Aboriginal Traditional Knowledge is often unwritten and is shared through generations of experience and connection to the land. The Panel thanks each community for providing unique, personal, and often sacred knowledge.

The Panel carefully considered the evidence provided by Aboriginal groups and Northern Gateway about the nature and extent of the traditional land and marine use that is carried out by Aboriginal groups within the project area, and the potential effects of the project on these traditional activities. The Panel also considered all of the relevant information filed in the process regarding the potential effect of the project on the biophysical elements and the ecosystems that support these, including vegetation, wildlife, fish and fish habitat, marine species and marine habitat, and freshwater resources. The Panel considered the measures committed to by Northern Gateway to avoid or mitigate such effects. The Panel recognizes the importance that Aboriginal groups place on being able to continue their traditional activities and uses within the entire area of their traditional territories, including access to resources and cultural sites. The Panel has assessed the potential project effects and mitigation with that perspective in mind.

Many Aboriginal groups felt that their traditional land use information was not fully incorporated into the project application. They noted that the specific information they had provided in their ATK studies was not reflected in Northern Gateway's assessment or that the mitigation measures proposed by the company did not address their concerns.

Northern Gateway said that its approach to assessing potential project effects on traditional land and marine use took into account species or resources that are commonly understood to be of importance to Aboriginal people, as well as issues raised by Aboriginal people, information on traditional land use and ecological knowledge, and recommendations provided by Aboriginal groups on project design changes and mitigation. Northern Gateway has committed to reducing the effects of the project on the use of lands, waters, and resources for traditional purposes, and said that this would primarily be accomplished through sound engineering and environmental design, as well as in future routing decisions and emergency response planning. The company has also committed to including site-specific information on Food, Social, and Ceremonial fisheries in environmental sensitivity atlases and Geographic Response Plans and expects that FSC fishers would participate in the Fisheries Liaison Committee.

Aboriginal groups also told the Panel that they felt that Northern Gateway's approach to assessing ATK information was insufficient as it did not address the cultural importance of traditional land and marine use activities. The Panel acknowledges and recognizes the strongly-held views of Aboriginal groups about the cultural, biophysical, and spiritual connectedness between the lands, the waters, the peoples, and their societies. Aboriginal groups told the Panel that a negative effect on one

of these may result in a negative effect on any or all of the others. The Panel respects and appreciates the importance of this view.

The Panel finds the company's approach for the assessment of project effects on traditional land and resource use acceptable. The Panel accepts Northern Gateway's assessment that, during construction and routine operations, there would not be significant adverse effects on the lands, waters, or resources in the project area, and so, there would not be significant adverse effects on the ability of Aboriginal people to utilize lands, waters, or resources in the project area for traditional purposes.

The Panel does not agree with the view of some Aboriginal groups that the effects associated with this project during construction and routine operations would eliminate the opportunity for Aboriginal groups to maintain their cultural and spiritual practices and the pursuit of their traditional uses and activities associated with the lands, waters, and their resources.

The Panel finds Northern Gateway's approach to ATK studies as a community-driven process was appropriate. The Panel recognizes the work done by both the Aboriginal groups and the company over a number of years, with the aim that studies were thorough and validated by the community before being released to Northern Gateway. The Panel acknowledges that collecting traditional use information takes time and that not all of the information was available prior to the filing of the application. The Panel notes that, despite the updates filed by the company during the process regarding its consideration of traditional use information, the company failed to commit to clear and effective communication with some Aboriginal groups that provided information and shared their knowledge about their uses and interests in the project area. In the Panel's view, the company could have done more to clearly communicate to some Aboriginal groups how it considered, and would continue to consider, information provided.

For those ATK studies not yet completed, the Panel encourages both Aboriginal groups and Northern Gateway to continue discussions so that appropriate information can be incorporated into the project design and follow-up programs. The Panel also encourages Aboriginal fishers to participate in the FLC, so as to reduce potential project conflicts with FSC fishing activities and to inform catch monitoring programs.

To address concerns regarding site-specific traditional land use information and the potentially outstanding concerns as noted by Northern Gateway in its application updates, the Panel requires Northern Gateway to continue to consult with Aboriginal groups and engage them on detailed route-walks and centreline surveys. As previously noted, the Panel encourages ongoing communication and further dialogue regarding the incorporation of traditional land and marine use information in project design, mitigation measures, and follow-up programs. The Panel requires Northern Gateway to report on any additional information, effects, and proposed mitigation measures to address the concerns of Aboriginal groups.

On balance, the Panel finds that, during construction and routine operations, there would not be a significant adverse effect on the ability of Aboriginal groups to continue to use lands, waters, or resources for traditional purposes within the project area.

The Panel finds that, in the unlikely event of a large oil spill, there would be significant adverse effects on lands, waters, or resources used by Aboriginal groups, and that the adverse effects would not be permanent or widespread.

The Panel recognizes that any disruptions to the ability of Aboriginal groups to practice their traditional activities may result from the interruption or reduction of access to lands, waters, or resources used by Aboriginal groups, including country foods. The Panel recognizes that such an event would place burdens and challenges on affected Aboriginal groups. The Panel finds that such interruptions would be temporary. The Panel recognizes that, during recovery from a spill, users of lands, waters, or resources may experience disruptions and possible changes in access or use. The Panel discusses the likelihood of malfunctions or accidents, and the potential associated environmental effects, in Chapters 5 and 7.

9.7 Human health

In its application, Northern Gateway undertook a variety of studies which directly or indirectly assessed potential effects to human health. The human health risk assessment (HHRA) and the ecological risk assessment (ERA) looked at construction and routine operations of the pipelines and the Kitimat Terminal. The company also completed a risk assessment of spills at the terminal, and a human health and ecological risk assessment of pipeline spills along the right-of-way. The company said that its HHRA considered air emissions from the marine terminal as the primary source of human health risks during operations. It said that people may be directly affected by emissions in the ambient air, or indirectly through contact with chemicals deposited in the soil and surface water or through consumption of country foods, including those consumed by Aboriginal people.

Northern Gateway said that the HHRA considered residents in Kitamaat Village and in the Town of Kitimat to be the most sensitive receptors. The company said that it used predictive air quality modelling to predict the concentration of chemicals of potential concern (COPCs) in the sediments, fish, seaweed, and shellfish in the marine waters and wild game and vegetation in the region.

The company said that it used values from Health Canada in its estimations of exposure through country food consumption. It also said that it used the lowest toxicological reference values (TRVs) available for the toxicity assessment of carcinogenic and non-carcinogenic chemicals. The company said these included, among others, values used by Health Canada and the United States Environmental Protection Agency (US EPA).

Northern Gateway said that its assessments concluded that the effects of the project on human health from pipeline construction would not be significant, and there would be no long-term risks to human health from routine operation of the pipelines and the Kitimat Terminal, including effects from air emissions and consumption of country foods. The company also said that there are no predicted risks to human health from regular shipping operations.

Northern Gateway said that its modelling indicated that any exposures to carcinogens and non-carcinogens, resulting from a spill at the terminal, via consumption of foods such as mollusks, crabs, and shellfish, would be below acceptable thresholds as defined by Health Canada.

The company said that, for chronic health risks associated with a pipeline spill, its assessment concluded that risk reduction would occur as hydrocarbon concentrations are continually reduced either by natural processes or remedial activities.

The company said that in assessing the maximum potential exposure to COPCs, it assumed that 100 per cent of each receptor's daily intake of soil, water, traditional plant, berry, and animal tissue (i.e., moose, hare, muskrat, bear, duck, and fish) is from an affected area over their entire lifetime. The company said that this assumption is generally conservative because it may overestimate the exposure of an individual to the COPC. Northern Gateway said that risk management activities that target the protection of exposure pathways during remediation after a spill would be important in reducing risks. For example, the company said that removing as much hydrocarbon from the shoreline soils as possible would result in substantial risk reduction, and that restrictions placed on fishing after a spill could prevent the consumption of tainted fish and protect human health, if warranted based on the results of environmental monitoring undertaken following an actual event. The company said that, based on the assumptions used in its assessment, including its assumptions regarding exposures from country food consumption, risk estimates were below thresholds used by agencies such as Health Canada and the US EPA for chronic risks to human health.

Ms. Wier raised questions regarding how receptors were chosen for the HHRA, as well as the rigour of the assessment. The Haisla Nation also raised concerns regarding the indicators that Northern Gateway chose as inputs into its HHRA model. In response, Northern Gateway said that its assessment looked at the most sensitive toxicological endpoint. It said that the HHRA used the most current values available that were developed by Health Canada. Northern Gateway said that a risk assessment is done as conservatively as possible and, in this case, its assessment tried to overestimate the risks so that it has a margin of safety as a result. More information regarding the conclusions of the HHRA can be found in Chapter 7.

In the case of routine pipeline and terminal operations, intervenors were largely concerned with potential effects to air and water quality, and increased noise, and the effects these would have on human health. The Haisla Nation said that previous

industrial activity in Kitimat has resulted in pollution of the Kitimat River, tainting their traditional fishery. Groups along the route, such as the McLeod Lake Indian Band, said that it was concerned that chemical sprays used to maintain clearings may contaminate nearby water sources and that construction activities would result in increased dust in the project area. The Driftpile Cree Nation and Swan River First Nation said that they were concerned about the effects of declining groundwater quality from industrial development, while the District of Kitimat noted potential contamination to drinking water supply. The Fort St. James Sustainability Group said that it was concerned about increased noise as a result of the construction and operation of the Fort St. James pump station.

Northern Gateway said that construction noise would be short-term and local, and would be restricted to daytime hours where possible. It said that, during operation, there would be no ambient noise from the pipeline and any noise coming from pump stations would meet Alberta's ERCB Directive 38, which determines acceptable noise levels for industrial operations. As a result, Northern Gateway said that no occupied dwelling near the Fort St. James pump station would be affected by ambient noise.

Northern Gateway committed to use appropriate transportation and dust control measures, during construction, to limit air pollution.

Northern Gateway said that it plans to use mechanical methods to maintain a clear right-of-way along the proposed route, so effects to human health from chemicals associated with this maintenance are not expected. It said that any chemicals required to address noxious weed problems on the right-of-way would be subject to Northern Gateway's Weed Management Plan which would include environmental considerations such as proximity to water sources, water bodies, food growing, riparian areas, and wildlife and fish habitat.

Northern Gateway committed to follow proven industry practices at the terminal to manage surface water runoff and has committed to setting up an air quality emissions management plan.

Aboriginal groups along the proposed route, and in coastal areas, expressed concerns about the project's effect on their health as a result of general pollution and changes to their traditional diet. Groups said that these changes could be the result of construction and routine operations, as access to country foods could be limited. Groups said that this could force community members to rely on store-bought foods that are unfamiliar to them. Coastal groups, such as the Metlakatla First Nation, said that increased tanker traffic would lead to increased pollution, which could affect the health of the fish they rely on for much of their diet.

Groups also said that these concerns would be amplified in the case of a spill. The Gitga'at First Nation said that the traditional diet accounts for 50 per cent of the total intake of energy for community members. It said this is equivalent to between 245 to 753 grams of fish and shellfish per day. It also said that health risks from the loss of this food, via fisheries closures or avoidance of certain areas due to perception of risk, could result in nutrient deficiency potentially causing anemia or compromised immune functions, and a potential increased risk of chronic diseases such as diabetes.

During oral evidence Aboriginal groups expressed concerns about the high rate of diabetes in their communities. They said that rates of diabetes in their communities increased as people began eating more processed foods and that it affects both the young and old. They said that a focus on country foods, in order to reduce the rate of diabetes and the associated high health costs, was a priority for them. Individuals described how a diet of country foods, such as seafood, seaweed, fresh berries, herbs, and freshwater fish, has altered the course of the disease and improved their health. They were concerned that potential effects of the project would impact their ability to access traditional foods.

In addition to effects to physical health, intervenors said that the project could also affect people's mental health and individual identity. Kitasoo/Xaixais First Nation said that the pristine waters surrounding its community convey physical, spiritual, mental, and emotional wellbeing. Both the United Fishermen and Allied Workers Union and the Heiltsuk Tribal Council said that the project could result in the potential for increased individual and community stress, anxiety disorders, and depressive symptoms in communities along the shipping route.

Northern Gateway committed to both marine and terrestrial monitoring programs for a minimum of 3 years after the start of operations, to determine if any chemicals of potential concern have increased as a result of the project. Within these monitoring programs, Northern Gateway committed to collect information on the use of specific country foods (i.e., amount collected and consumed, time of harvest, time of use, etc.)

by Aboriginal groups. The company said that Aboriginal groups and appropriate federal and provincial agencies would be invited to participate in the development of both the marine and pipeline environmental effects monitoring programs.

Northern Gateway said that it recognized the potential affect to mental health of individuals, and social wellbeing of affected communities, in the event of a spill. The company said that one way to address psychological stress caused by oil spills is to incorporate measures such as counseling and recovery efforts into an operational Oil Spill Response Plan.

Northern Gateway said that, in the event of a marine spill, human health is assumed to be protected through the publication of advisories regarding the consumption of fish, crustaceans, and mollusks, followed by biological, taint, and chemical monitoring to confirm that baseline conditions are restored. The company said that areas would not be re-opened until conditions are safe. Northern Gateway said there would therefore be no adverse effects on human health. Northern Gateway also said that, as any fishing closures would be temporary, long-term changes in diet are not expected. Northern Gateway committed to working with the communities in advance by involving them in community-based response strategies to discuss acceptable food alternatives in the case of a closure. The company said that it would come to an agreement in advance of an event that would identify where replacement food would come from (i.e. country foods from other locations or foods purchased from a store). Northern Gateway said that food harvesting sites of importance to coastal Aboriginal groups would be included in the geographic response planning process, with the goal of managing the effects of the spill to ensure that harvesting would resume as soon as possible.

Views of the Panel

The Panel heard that communities, especially Aboriginal communities, are concerned about the potential effects the project could have on their health. The Panel accepts that many Aboriginal groups rely on, and have a preference for, eating traditional foods. The Panel heard that Aboriginal groups believe these traditional foods could be contaminated as a result of routine operations, and that access could be interrupted in the case of a large spill. The Panel also heard concerns about the change in air quality during construction and operation of the terminal.

The Panel acknowledges the stress that some communities, especially coastal Aboriginal groups, feel at the prospect of the project and the potential risks that come with shipping activities. The Panel received evidence that there is already vessel traffic and industrial activity along British Columbia's northern coast and that Aboriginal groups continue to use the land and waters in this area for traditional purposes.

The Panel received evidence from Aboriginal groups regarding the value and importance of country foods. The Panel accepts Northern Gateway's evidence that exposure to chemicals of potential concerns during routine operations, or in the event of a large spill, would not exceed Health Canada thresholds and guidelines. This would also apply to those consuming country foods, as any closures would be well-marked, would be short-term, and a return to traditional diets would be possible after cleanup. The Panel notes that Northern Gateway has committed to gather information related to country foods through ATK reports and harvest studies which would provide information on the species of importance for harvesting and human consumption, as well as baseline information on the quality of various plants, fish, birds, and mammals. The Panel notes Northern Gateway's commitment to enter into agreements prior to commencing project operations with potentially affected Aboriginal groups regarding replacement foods, including water. In the Panel's view, this is an example of a precautionary and proactive approach to address some of the interests and concerns of Aboriginal groups.

The Panel accepts Northern Gateway's plans to follow provincial guidelines for ambient noise for pump stations and to manage any chemicals required to address noxious weeds while clearing the right-of-way. The Panel also accepts Northern Gateway's commitments to manage surface water runoff at the terminal and to set up an air quality emissions management plan. The Panel requires the company to file information related to its air quality monitoring program at the terminal.

The Panel having considered all the evidence finds that, with Northern Gateway's commitments and the Panel's conditions, during construction and routine operation there would be no significant adverse effects on human health, including the health of Aboriginal people. In the case of a malfunction or accident, including a large spill, the Panel accepts the conclusions reached in

Northern Gateway's assessments and finds that, with Northern Gateway's commitments and the Panel's conditions, there would be no significant adverse effects on human health, including the health of Aboriginal people and those who consume country foods.

Summary views of the Panel

In this chapter, the Panel reviewed the effect of routine project activities on people and communities along the pipeline right-of-way and in coastal areas. It considered the evidence and perspectives presented by those who participated in the process. The Panel examined how people use the land and waters for both current and traditional uses; the heritage resources contained in the project area; the project's interaction with community infrastructure and services; potential changes to individual and community health and wellbeing; and potential benefits to education, employment, and economic opportunities.

The Panel finds that, with Northern Gateway's commitments and the Panel requirements, the project's potential effects on lands, waters, and resource use can be effectively addressed. The Panel also finds that the project would not have a significant adverse effect on the ability of Aboriginal people to use the lands, waters, and resources in the project area for traditional purposes, including accessing country foods. The Panel does not believe that the routine operations of the project would have a negative effect on the social fabric of communities in the project area, nor would it affect the health and wellbeing of people and communities along the route or in coastal areas. The Panel finds that the net overall economic effects of the project would be positive, significant, and would provide potential benefits and opportunities to those individuals and businesses that choose to participate in the project.

The Panel notes that its recommendations are dependent on the full and successful implementation of Northern Gateway's commitments, and compliance with conditions required by the Panel. An important aspect of both the company's commitments and the Panel's conditions is continued consultation with local and Aboriginal communities in the project area. In order for multi-stakeholder initiatives such as the Fisheries Liaison Committee and Community Advisory Boards, or follow-up plans such as harvesting studies, coastal sensitivity mapping, or education and training programs to be successful, the Panel encourages continued dialogue between Northern Gateway and the public, landowners, stakeholders, governments, and Aboriginal groups throughout the life of the project. The Panel would also require the monitoring and adaptive management of Northern Gateway's socio-economic programs. Accordingly, with respect to Aboriginal peoples, the Panel recommends that the project is not likely to cause significant adverse environmental effects in Canada on health and socio-economic conditions; physical and cultural heritage; the current use of lands and resources for traditional purposes; or any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance.

10 Need for the project and economic feasibility

The Panel has considered the justification for, and economic feasibility of, the proposed Enbridge Northern Gateway Project. This involved assessing whether the facilities are needed and would be used at a reasonable level over their expected economic life.

For pipeline proposals, applicants must generally provide evidence on:

- the supply of commodities that would be shipped on the pipeline;
- the markets that would receive the products transported by the pipeline;
- transportation matters, including the appropriateness of the capacity of the applied-for facilities and the capability of existing transportation infrastructure to meet the need identified by the applicant;
- the financial arrangements for the construction and ongoing operations of the proposed project; and
- whether there is a reasonable likelihood that tolls on the pipeline would be paid.

10.1 Need for the project and economic feasibility

Views of Northern Gateway

10.1.1 ECONOMIC SETTING

Northern Gateway said that Canada's petroleum industry has been, and remains, a major driver of economic growth and prosperity in this country. It said that this industry directly or indirectly accounts for about 8 per cent of national Gross Domestic Product (GDP). It said that the petroleum industry represents the largest single private sector investor in the country, is the largest net contributor to Canada's positive trade balance, and is a major component of Canada's total wealth. Northern Gateway said that the potential remains for the oil and gas sector to continue to be a key driver of the economy for many years into the future. It said that sustaining Canadian living standards requires developing and expanding basic or propulsive industries, of which the petroleum industry in Canada fits the classic definition.

Northern Gateway said that there are significant changes affecting the supply and demand dynamics of global oil markets. With respect to global supply, conventional oil reserves are unlikely to meet still-growing global demand. This is partly because most existing conventional reserves, and several of the best prospects to increase them, are concentrated in countries that do not allow international companies to take part in upstream petroleum activities. In its view, the prospective development of oil supply from these areas is likely to fall short of market needs. In addition, certain countries with substantial production and favourable resource endowments are characterized by potential political instability. Northern Gateway said that this creates a concern among consuming nations about the long-term security of supply from these areas.

Regarding global demand, Northern Gateway said that a historic shift is taking place between the fully-developed, post-industrial economies of North America and Western Europe and the developing countries in East Asia. Northern Gateway said that demand for oil in the developed world appears to have peaked, mainly as a result of relatively slow economic growth, de-industrialization, and measures related to climate change policy. Northern Gateway said that countries in the developing world, seeking to increase the standard of living for their growing populations, are now driving global growth in demand for oil and are concerned about the availability of secure supplies to meet this growth. Northern Gateway said that Canadian oil sands attract interest for several reasons:

- the resource is open to and attracts significant investment from national and international sources;
- reserves are known;
- production has been growing; and
- Canada has a record of political stability.

Northern Gateway said that, in the past, the United States has provided Canadian oil producers with a steadily growing and secure market. As a result, Canada has been in the unique position among the world's major crude oil exporters of delivering virtually all of its exports to one foreign jurisdiction. Northern Gateway said that demand is now declining in the United States and trade-related actions are occurring that may limit Canada's access to that market. Northern Gateway said that the most significant change affecting United States import requirements has been the resurgence of oil and gas production attributable to breakthroughs in technology in developing unconventional resources.

Northern Gateway said that India and China are leading oil demand growth in the developing world. It said that, when this demand growth is contrasted with the declining demand for oil in the United States, the need for Canada to access international markets is clear. Northern Gateway said that western Canadian crude oil pricing is under extreme stress because of a lack of pipeline capacity to serve new markets and, consequently, oversupply in existing markets. It said that this situation results in a massive transfer of wealth from Canadian crude oil producers and governments to the refining sector, the vast majority of which is located in the United States.

Taking into account these factors, Northern Gateway said that it is important for Canada to gain access to growing Pacific markets if it is to receive full value for western Canadian oil production.

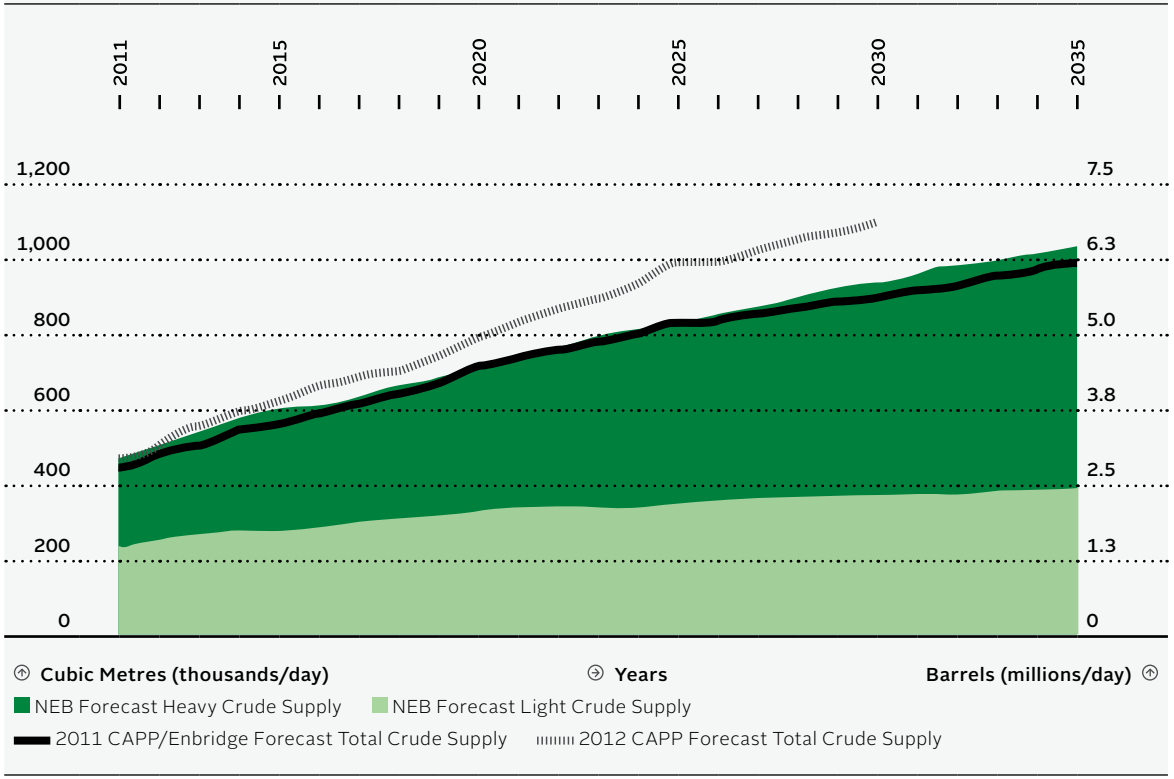
10.1.2 SUPPLY

10.1.2.1 Crude oil

In support of its application, Northern Gateway submitted evidence on crude oil supply in western Canada. In its 2010 application, Northern Gateway presented several forecasts demonstrating that crude oil supply is anticipated to grow significantly through to 2025. In response to the Panel's request, Northern Gateway provided an updated supply forecast. This was based on the Canadian Association of Petroleum Producers' *Crude Oil Forecast, Markets & Pipelines, June 2011* forecast. This forecast data ended in 2025. Northern Gateway extrapolated it to 2035 by using the rate of change for the period from 2020 to 2025.

Northern Gateway's western Canada forecast projects supply growth from 447,900 cubic metres (2.8 million barrels) per day in 2010 to 990,800 cubic metres (6.2 million barrels) per day by 2035. Its comparison to the 2011 National Energy Board Energy Futures forecast and the Canadian Association of Petroleum Producers' 2012 forecast is provided in Figure 10.1. Northern Gateway said that forecast conventional light and heavy crude oil supply volume is projected to decline for the period from 2026 to 2035. It said that advances in drilling and production technologies could result in reduced decline rates, flat production, or even increased production.

FIGURE 10.1 **WESTERN CANADA CRUDE OIL SUPPLY**



Based on Northern Gateway evidence summarizing forecasts from the National Energy Board, the Canadian Association of Petroleum Producers, and Enbridge Inc.

TABLE 10.1 **REMAINING ESTABLISHED RESERVES OF OIL AND BITUMEN** (Estimate at the end of 2007)

Reserves	Volume (thousand cubic metres)	Volume (thousand barrels)
Total conventional crude oil	614,400	3,871,000
Total bitumen	27,448,000	172,922,000
Total remaining reserves	28,062,400	176,793,000

Northern Gateway said that western Canadian oil supply growth is being driven by the development of Canada's oil sands reserves (Table 10.1). It said that forecast supply is subject to continuous assessment and revision based on projected conditions, which include oil prices, financial markets, and capital cost projections to develop oil sands projects. Northern Gateway said that, although supply growth may vary between forecasts, there is a consistent trend that growth will continue in the Canadian oil sands. Northern Gateway noted the Alberta Energy and Resources Conservation Board estimate that only 3.3 per cent of oil sands reserves had been produced between 1967 and 2009.

Northern Gateway said that it intends to secure long-term, unconditional shipping commitments for the oil export pipeline, which would minimize the risk related to oil supply availability.

10.1.2.2 Condensate

Northern Gateway submitted evidence concerning global condensate markets, prepared by the consultants Poten & Partners. The study explored the growth in condensate supply sources that could be available to markets in western Canada. It concluded that there was more than sufficient global supply available to the project when taking into consideration a combination of field condensates, ultra-light oil, plant condensates, return condensates, and light virgin naphtha supplies.

Northern Gateway said that forecast gross condensate supply from the Asia Pacific and Middle East is an indication of the total quantity available to the export market. Based on the current market structure, it said that some volumes would likely be consumed for petrochemical, refinery, and splitter (a refinery that processes only condensate) use and, therefore, may not be available for export to Canada (Table 10.2). The Poten & Partners study estimated that net supplies of 6,500 cubic metres (41,000 barrels) per day in 2015 and 52,700 cubic metres (332,000 barrels) per day in 2020 could be available to Canada. The study indicated that, by 2035, condensate availability could reach 81,300 cubic metres (512,000 barrels) per day.

Northern Gateway said that the assessment of available condensate supply is conservative in two respects. First, as condensate trades in an open market and is available to the highest bidder, subtracting volumes for petrochemical, refinery, and splitter use may understate available supply. Second, by only looking at the Asia Pacific and the Middle East, the available supply was restricted. Northern Gateway said that South American supply sources are relatively close and would also likely be available.

Northern Gateway identified several factors that could affect the availability of global supply:

- global natural gas production;
- petrochemical demand;
- refinery and condensate splitter demand;
- disruptions in producing countries; and
- heavy oil producers' demand for diluent.

Northern Gateway said that, like crude oil, condensate prices are an interaction between supply and demand. The choice by western Canadian producers to purchase an imported condensate would depend on the cost and availability of alternative blending agents and condensate supply sources. Northern Gateway said that the existence of signed precedent agreements (PAs) is currently the best indication of the underlying demand for condensate, and that shippers are confident that they could access sufficient condensate supply to satisfy their contractual obligations.

TABLE 10.2 **INTERNATIONAL CONDENSATE SUPPLIES** **(All quantities in thousand barrels per day)**

	2010	2011	2012	2013	2014	2015	2020	2025	2030	2035
Exports										
Asia/Pacific Condensate Exports	180	172	181	191	195	199	300	378	449	489
Middle East Condensate Exports	1,418	1,476	1,532	1,413	1,499	1,484	1,874	1,848	1,961	2,065
Total Available for Export	1,598	1,648	1,713	1,604	1,694	1,683	2,174	2,226	2,410	2,554
By Use										
Refining/Petrochemical	756	806	871	762	800	800	1,000	1,050	1,150	1,200
Merchant and Petrochemical Splitting	842	842	842	842	842	842	842	842	842	842
Total by Use	1,598	1,648	1,713	1,604	1,642	1,642	1,842	1,892	1,992	2,042
Diluent Potential	0	0	0	0	52	41	332	334	418	512

10.1.3 TRANSPORTATION

10.1.3.1 Oil export capacity

The oil pipeline is designed for an average throughput capacity of 83,500 cubic metres (525,000 barrels) per day, while the condensate import pipeline is designed for an average throughput capacity of 30,700 cubic metres (193,000 barrels) per day.

Northern Gateway said that the proposed marine terminal would include two tanker berths capable of loading crude oil and unloading condensate. The tanker berths would be sized to accommodate a vessel of up to 320,000 deadweight tons, enabling the terminal to accept Very Large Crude Carriers (VLCCs). Northern Gateway said that the berths would also be able to accommodate smaller vessels, such as the Suezmax (130,000 deadweight tons) and Aframax (80,000 deadweight tons) classes, which may be more suitable for certain markets in the Pacific.

10.1.3.2 Transportation contracts

Northern Gateway said that, in order for the project to be financeable and to proceed to construction, long-term firm shipping commitments would need to be in place. Northern Gateway said that, before entering into unconditional transportation service agreements (TSAs), prospective shippers would need to be satisfied that:

- the project has been approved by the regulator, and subject to acceptable terms and conditions;
- the costs to construct the project are reasonable and can be satisfactorily managed; and
- the project's in-service date would meet shippers' commercial requirements.

Northern Gateway said in its application that, with prospective shippers, it was developing precedent agreements and the form of firm transportation service agreements that would be entered into. Northern Gateway expected that these would be negotiated and finalized in advance of the regulatory decision. In August 2011, Northern Gateway advised that both the oil export and the condensate import pipelines had been fully subscribed for long-term transportation service through shipper-executed precedent agreements. Northern Gateway filed copies of the pro-forma precedent agreement and transportation service agreement for both pipelines.

Northern Gateway confirmed that the precedent agreements are non-binding in that they do not require any shipper to execute a transportation service agreement that would commit them to ship or pay for oil or condensate transportation unless, among other things, the shipper has received, at its sole discretion, the necessary approval of its senior management or board of directors.

Northern Gateway said that final contracted volumes for each of the pipelines would be determined when transportation service agreements are executed. It did not indicate what minimum level of contracted capacity would be required in order to make the project commercially viable. Northern Gateway said that it expects that, when transportation service agreements are executed, there would be 10 shippers on the project with firm volume commitments comprising the full contractible capacity of both the oil (79,400 cubic metres [500,000 barrels] per day) and condensate pipelines (27,800 cubic metres [175,000 barrels] per day) for a term of at least 15 years.

Northern Gateway said that, if there were insufficient commercial support for either the oil or the condensate pipeline, one (most likely the oil pipeline) could potentially proceed without the other. Northern Gateway said that it would conduct a Class III capital cost estimate for the scenario where both the oil and condensate pipelines are built together, and another estimate with only the oil pipeline being built. It said that it would likely not conduct a separate Class III capital cost estimate for the condensate pipeline proceeding alone.

Northern Gateway said that the basic process to finalize firm transportation service agreements includes three steps:

1. The terms and conditions of regulatory approval would be reviewed to confirm their commercial acceptability.
2. More definitive costs to construct the project would be estimated based on prevailing labour and materials costs, and on imposed regulatory conditions. This process is expected to involve expenditures in the range of $150 to $180 million, depending on the degree of cost certainty required.
3. Construction financing would be arranged.

Northern Gateway said that, when the first two steps have been completed, the prospective shipper would be in a position to finalize the amount of capacity and execute the transportation service agreement attached to its precedent agreement. Northern Gateway said that, following successful allocation of capacity (including, if necessary, an open season to offer remaining capacity to third parties), it would proceed with project financing and construction. The transportation service agreements would be filed with the National Energy Board before beginning construction.

Northern Gateway said that transportation service agreements would need to be in place in the 2014 timeframe to meet the target in-service date of 2018.

TABLE 10.3 **CAPACITIES OF EXISTING SYSTEMS EXITING WESTERN CANADA**

Name	Destination	Current Capacity (thousand cubic metres/day)	Current Capacity (barrels/day)
To PADD V/West Coast Offshore			
Kinder Morgan (Trans Mountain)	British Columbia US West Coast Offshore	47.7	300
To Other Markets			
Enbridge Pipelines	Eastern Canada US Midwest	398.3	2,505
Kinder Morgan (Express)	US Rocky Mountains US Midwest	44.9	282
Milk River Pipeline	US Rocky Mountains	18.8	118
Rangeland PIpeline	US Rocky Mountains	13.5	85
TCPL (Keystone)	US Midwest	69.2	435

SOURCE: Energy Resources Conservation Board 2009 and company websites.

10.1.3.3 Western Canada Sedimentary Basin transportation system

Northern Gateway said that nearly all western Canadian oil production moves via pipeline to refining centres in the United States and Canada. The two primary distribution centres in Alberta are located near Edmonton and Hardisty. Oil flows into these centres on a large network of feeder pipelines. Northern Gateway said that the feeder system has grown in recent years by adding the Access, Horizon, and Waupisoo pipelines, and by expanding the Cold Lake System and the Corridor Pipeline.

From Edmonton and Hardisty, crude oil is transported by pipeline to domestic and export markets. At Edmonton, crude oil is transported east on the Enbridge Mainline system, west on Kinder Morgan's Trans Mountain Pipeline, and south through Pacific Energy Partners' Rangeland Pipeline system. At Hardisty, crude oil can travel to the United States Petroleum Administration for Defense Districts (PADD) II and IV on the Enbridge Mainline system, Kinder Morgan's Express Pipeline, TransCanada's Keystone Pipeline, or through the combination of Inter Pipeline Fund's Bow River and Plains Marketing's Milk River pipelines.

The Enbridge Mainline system, Keystone, and Express Pipeline provide export capacity to North American mid-continent markets, while the Trans Mountain Pipeline system is the only pipeline that can currently access markets on the west coast. Northern Gateway said that the existing Trans Mountain Pipeline system operates at or near full capacity. Table 10.3 shows the capacities of these existing systems.

Northern Gateway said that TransCanada had expanded the Keystone Pipeline to a capacity of 93,800 cubic metres (590,000 barrels) per day from Hardisty, Alberta to Wood River, Illinois and Cushing, Oklahoma and has received National Energy Board approval to expand the Keystone system by a further 111,100 cubic metres (700,000 barrels) per day to access the United States Gulf Coast market (Keystone XL).

In 2010, the 29,600 cubic metres (186,000 barrels) per day Enbridge Southern Lights condensate line began operation, importing condensate from Illinois to Edmonton.

10.1.3.4 Canadian crude oil export pipeline utilization

To address the requirement for additional export pipeline capacity from western Canada, Northern Gateway submitted an assessment by Muse Stancil and Co. (Muse). Muse said that the utilization of all export pipelines is influenced by the total volume of western Canadian crude oil supply and the composition of western Canadian crude oil supply. The utilization of a specific pipeline is influenced by its tolls, volume commitments, and the crude supply-demand balance at the terminus of the export pipeline.

Muse said that the crude supply-demand balance at the end point of any pipeline can be very important in determining utilization. Irrespective of total western Canadian crude oil supply, an export pipeline must connect the western Canadian crude oil supply with a market. Absent demand at the terminus, Muse said that the export pipeline has no utility.

The analysis examined outbound rail and export pipeline utilization for the period from 2018 to 2035 absent the Enbridge Northern Gateway Project (Base Case), and with the Enbridge Northern Gateway Project (the Northern Gateway Case).

Key conclusions of the Base Case included:

- Rail shipments from western Canada to the United States Gulf Coast and Asia via British Columbia were forecast to commence by 2019, and to rise to 264,700 cubic metres (1,665,000 barrels) per day by 2035. If rail were not available, the alternative would be to shut-in production in western Canada, or to build a high capacity export pipeline.
- The Trans Mountain Pipeline is full throughout the forecast period.
- The Enbridge Mainline is close to its expanded capacity at Cromer, Manitoba and Superior, Wisconsin.
- Hardisty receipts on the Keystone XL pipeline tend to be constrained by the available downstream capacity at Baker, Montana and Cushing, Oklahoma.
- The Keystone pipeline is projected to have capacity available throughout the forecast period. This is primarily due to the finite crude demand at the WRB Wood River, Illinois refinery and the limited market alternatives at Patoka, Illinois.
- Excess pipeline capacity to the United States Rockies region is projected throughout the forecast period. This is due to the fairly small size of the Rockies refining capacity, combined with rising volumes of Rockies crude production and limited outbound (from the Rockies) pipeline capacity.

Key conclusions of the Northern Gateway case included:

- The start-up of Northern Gateway is projected to eliminate rail shipments from Canada until about 2023, after which rail deliveries begin to the British Columbia ports, followed by increasing deliveries to the United States Gulf Coast in subsequent years.
- The Trans Mountain Pipeline remains at capacity, except perhaps in 2018.
- The utilization of the Keystone XL and Keystone pipelines is comparatively unaffected by the commissioning of the Enbridge Northern Gateway Project.
- The combined utilization of the pipelines to the Rockies decreases due to a higher volume of Bakken crude being transported on the Platte pipeline, which acts to displace Canadian crude transshipments through the Rockies to the Midwest via the Platte pipeline.
- The Enbridge Mainline experiences the largest change in utilization. In 2019, excess capacity at Cromer is approximately 21 per cent or 89,000 cubic metres (560,000 barrels) per day. The amount of excess capacity on the Mainline rapidly decreases and drops to 3 per cent by 2023.

Muse did not include the potential expansion of Trans Mountain in its assessment of western Canadian export pipeline utilization.

Northern Gateway said that there is not currently excess capacity to the markets that the project is designed to serve. It said that efficient infrastructure is often of large scale, requiring a period of transition wherein other infrastructure may be underutilized. Northern Gateway said that, under the terms of the Enbridge Mainline Competitive Tolling Settlement (CTS), Enbridge, not its shippers, would absorb the revenue impact of lower volume on the Mainline.

Northern Gateway said that the value of the project is not that it creates incremental pipeline capacity for western Canadian crude oil supply, rather that it would enable western Canadian crude oil to reach new markets, maximizing pricing benefits to western Canadian oil producers.

With respect to utilizing condensate import facilities, Northern Gateway said that the Southern Lights pipeline can be expanded to 47,600 cubic metres (300,000 barrels) per day, which it said would not be sufficient to meet condensate import demand forecast by the National Energy Board by the year 2020.

10.1.4 MARKETS

10.1.4.1 Crude oil

In support of its application, Northern Gateway submitted a market potential and benefits analysis prepared by Muse. In recognition of the significant changes in the market environment that had occurred since the report dated January 2010, it prepared an updated report dated July 2012. The following discussion refers to the updated report.

Muse said that the project would act to expand the market area for western Canadian crude to the entire Asia-Pacific region, thereby approximately doubling the absolute size of the potential market for western Canadian crude oil. It said that the key markets would be Northeast Asia and possibly the United States west coast. Sales outside of these regions would be highly probable, though they would likely be somewhat intermittent.

10.1.4.1.1 Northeast Asia

Northern Gateway said that the Northeast Asia market is regarded as the most prospective for Canadian crude producers due to its size, the installed capability of the regional refineries, and its physical proximity to the west coast of Canada. Northern Gateway said that China and Japan are the second and third largest oil markets in the world, following the United States.

Muse said that, in 2008, crude imports into China, Japan, South Korea, and Taiwan totaled 1,756,000 cubic metres (11 million barrels) per day. At the regional level, crude imports are sourced predominantly from the Middle East, with an increasing proportion in recent years obtained from West Africa.

Muse said that the distance from Kitimat, British Columbia to Northeast Asia is about 80 per cent of that from the region's supply sources in the Middle East, and less than half the distance from West Africa. It said that the relative proximity of Kitimat to the Northeast Asia market is an important competitive advantage for western Canadian crude producers. Table 10.4 provides the voyage distances to three key Northeast Asia markets from the Middle East, West Africa, and Kitimat.

Muse estimated that Northeast Asia total potential demand for western Canadian crude oil is approximately 350,000 cubic metres (2.2 million barrels) per day. Table 10.5 provides an overview of the estimated potential demand in Northeast Asia for western Canadian crude oil.

TABLE 10.4 **WATERBORNE VOYAGE DISTANCES**
(nautical miles, round trip)

Destination	Load Port		
	Kitimat	*Arabian Gulf*	*Nigeria*
China (Shanghai)	9,729	11,994	20,649
Japan (Yokohama)	8,082	13,277	21,931
South Korea (Ulsan)	8,725	12,546	21,201

TABLE 10.5 **TOTAL NORTHEAST ASIA POTENTIAL DEMAND**

Country	Cubic Metres per Day	Thousands of Barrels per Day
Japan	100,200	630
Northern China	129,800	820
Sourthern China	38,400	240
South Korea	56,200	350
Taiwan	28,100	180
Total	352,700	2,220

JAPAN

Muse said that Japan is currently the second largest importer of crude oil in Northeast Asia, following only China. Japan is also advantageously located to receive crude shipments from Kitimat, as it is the closest major Asian market to the west coast of Canada. Total crude imports in 2008 totaled 664,000 cubic metres (4.2 million barrels) per day with almost 90 per cent sourced from the Middle East. Muse said that Japanese refiners are concerned about this degree of reliance upon the Middle East, and have been seeking to diversify their crude sources in recent years.

Muse said that the average sulphur content and gravity of Japanese crude oil imports is reflective of a medium sour grade. It said that, although the proportion of the Japanese refining sector capable of processing heavy crudes is not particularly high, the refining capacity that is in the high and medium category is material, totaling some 380,000 cubic metres (2.4 million barrels) per day. Muse said that the Japanese industry is a strong potential customer for Canadian synthetic crude oils, particularly the premium synthetic crude grades that have better distillate properties.

Muse estimated the overall potential market for western Canadian crude in Japan to be about 100,000 cubic metres (630,000 barrels) per day.

CHINA

Muse said that Chinese refiners have been adding more capacity than refiners anywhere else in the world, and this is expected to remain the case for the medium term. Moreover, China has been increasing its capacity to process heavier and higher sulphur content crude oil.

Muse said that China has perhaps the most diversified array of crude sources in all of the Asia-Pacific. It said that imports have been growing at an annualized rate of 14 per cent since 2003, totaling 570,000 cubic metres (3.6 million barrels) per day in 2008.

Muse said that Chinese imports are likely a blend of predominantly medium sour crude oil and various sweet crude oil grades. Muse limited its market potential analysis to coastal refineries since it is unlikely that the inland refineries would import significant volumes of waterborne crudes. It further disaggregated total coastal refining capacity between that in northern China and southern China, since Canadian supply to the southern China refineries is somewhat hampered by the greater distance from Kitimat, and the lessened distance from competing sources of crude oil supply. Muse said that over 60 per cent of the northern China refining industry is assessed to have a high or medium capability to process heavy, high sulphur crude oil. The total size of the northern China coastal refinery market is approximately 408,000 cubic metres (2.6 million barrels) per day.

Overall, the potential market size for western Canadian crude oil in Northern and Southern China was estimated to be about 129,800 cubic metres (820,000 barrels) per day and 38,400 cubic metres (240,000 barrels) per day, respectively.

SOUTH KOREA

Muse said that refining capacity in South Korea has been relatively static over the last several years. South Korean refiners have been steadily investing in their existing refineries to improve their ability to process heavier and higher sulphur content crude oil. Muse said that the South Korean refining industry is characterized by a few extremely large refineries.

Muse said that South Korea imported 376,000 cubic metres (2.4 million barrels) per day of crude oil in 2008 with roughly 60 per cent sourced from the Middle East. Although many of the South Korean refineries are very large, they are not specifically designed to process heavy sour crude oil. Muse said that South Korean refining capacity totals 418,000 cubic metres (2.6 million barrels) per day and, accordingly, there is a strong potential for Canadian crude sales to South Korea.

The overall potential market size for western Canadian crude oil was estimated to be approximately 56,200 cubic metres (350,000 barrels) per day.

TAIWAN

Muse said that the Taiwanese refining sector shares many of the characteristics of the South Korean refining sector, in that its few refineries are quite large. Refining capacity has been static for a number of years and totals 197,000 cubic metres (1.2 million barrels) per day.

According to Muse, total Taiwanese crude imports were 146,000 cubic metres (920,000 barrels) per day in 2008, with 83 per cent of imports sourced from the Middle East. Muse estimated that Taiwanese refineries process a mix of predominantly light sweet and medium sour crude oils and are not specifically designed to process heavy sour crude oils.

The overall potential market size for western Canadian crude oil was estimated to be approximately 28,100 cubic metres (180,000 barrels) per day.

10.1.4.1.2 United States west coast

Muse said that the United States west coast has three refining areas accessible by tanker. These centres are the Puget Sound area of Washington, the San Francisco area, and Los Angeles. Puget Sound refiners process Canadian crude oil delivered by the Trans Mountain Pipeline and by tanker from Kinder Morgan's Westridge dock at Burnaby, British Columbia. Some spot shipments to California from the Westridge dock have also been made over the last several years.

PUGET SOUND

Muse said that the refining capacity in Puget Sound is approximately 99,000 cubic metres (623,000 barrels) per day. Imports represent about 40 per cent of total refining capacity, with remaining refinery needs satisfied by domestic Alaskan North Slope production delivered via tanker. Muse said that Alaskan North Slope production has been in decline for several years and production forecasts indicate that this trend is likely to continue. It said that, unless refineries in this region make substantial conversion capacity investments, the most likely replacement for Alaskan North Slope will be a light crude oil such as Canadian light synthetic.

CALIFORNIA

Muse said that California is the third largest consumer of transportation fuels in the world. It has 21 refineries that process over 318,000 cubic metres (2 million barrels) per day of crude oil. The two main refining areas in California are the San Francisco area and Los Angeles. Both have access to waterborne supply, as well as pipeline connections to state production. In 2008, California state production accounted for 38 per cent of its total refinery supply. Muse said that California's domestic crude oil is predominantly heavy in quality, and in many aspects is similar in character to Canadian heavy crude oil. As in Puget Sound, refineries in California also process Alaskan North Slope crude. Muse said that, over the coming decade, both these traditional supply sources are forecast to decline, resulting in an increased reliance on foreign imports.

Muse said that the United States west coast market provides a significant growth opportunity for western Canadian producers. In California alone, it estimated the market potential at up to 71,500 cubic metres (450,000 barrels) per day, although this could be reduced by proposed low carbon fuel requirements in the state.

10.1.4.2 Imported condensate

Northern Gateway said that supplies of western Canadian field condensates have remained relatively flat and are expected to decline throughout the forecast period due to lower volumes available from produced natural gas. Growth in bitumen production will require significant increases in diluent supply for blending. Northern Gateway said that, in the past, condensate supply for blending has been supplemented with light oil, synthetic crude oil, and imported volumes of natural gasoline. It said that, although light oil and synthetic crude oil may continue to be used for blending, additional sources of condensate will be required to sustain the forecast growth in bitumen production.

Northern Gateway said that in the National Energy Board 2009 Energy Futures Reference Case Scenario, Western Canada Sedimentary Basin condensate supply is forecast to decline from 23,900 cubic metres (150,000 barrels) per day in 2008 to 14,600 cubic metres (92,000 barrels) per day by 2020. Northern Gateway said that the National Energy Board projects that condensate imports, mainly as a result of bitumen blending, could grow from 12,400 cubic metres (78,000 barrels) per day in 2008 to 55,000 cubic metres (346,000 barrels) per day by 2020. Northern Gateway said that, based on the National Energy Board's demand projections, and taking into account other means of delivering condensate to the Athabasca region, there is an apparent market shortfall approximating the delivery capacity of the project's condensate pipeline.

10.1.5 PROJECT FINANCING

Northern Gateway's financial plan is in a preliminary state and would not be finalized until other key steps in the project are completed following the release of the Panel's report. These steps include completing a Class III capital cost estimate to give a higher level of certainty on indicative tolls and finalizing commercial support by executing unconditional transportation service agreements.

Northern Gateway expects the project to be financeable because of the following project attributes: supply and market support, a cost of service toll, credit worthy shippers, and long-term transportation service agreements that must be in place before construction. Some of these project attributes are still being developed. Project financing is further discussed in Section 11.2.

To finance the project, Northern Gateway is taking a project financing approach with 30 per cent equity and 70 per cent non-recourse debt that would be secured by the project's property and cash flow. If non-recourse debt cannot be arranged, Enbridge and the other equity investors would provide both the debt and equity for the project. The capital structure would be modified to include 40 per cent equity and 60 per cent debt in this financing scenario.

Views of parties

Funding Participants – Cenovus Energy Inc. (Cenovus), INPEX Canada Ltd. (INPEX), Nexen Inc. (Nexen), Suncor Energy Marketing Inc. (SEMI), and TOTAL E&P Canada Inc. (TOTAL)

Cenovus, INPEX, Nexen, SEMI, and TOTAL (the Funding Participants) said that they have directly, or through affiliates, executed funding support agreements and precedent agreements with Northern Gateway for transportation on the applied-for oil and condensate pipelines and related infrastructure. The Funding Participants said that there is a clear need for the project to be developed in a timely manner.

Cenovus said that its operations include extensive in-situ oil sands and conventional oil developments in Alberta and Saskatchewan. It currently produces about 20,600 cubic metres (130,000 barrels) per day and has a 10-year plan to increase its oil production in western Canada to about 79,400 cubic metres (500,000 barrels) per day.

Cenovus said that it is interested in becoming a shipper on Northern Gateway to enable firm access to transportation capacity that will support its market diversification efforts and to provide an additional source of diluents. Cenovus said that it has been importing diluent into the Kitimat area and transporting it by rail to Edmonton since 2006, and that Northern Gateway would likely replace these volumes.

Nexen said that it is a large oil and gas producer, with Nexen Marketing as its marketing arm. It said that Nexen Marketing markets in excess of 47,600 cubic metres (300,000 barrels) per day of oil produced in western Canada on behalf of Nexen and more than 300 producers and customers.

Nexen said that it is interested in becoming a shipper on the Enbridge Northern Gateway Project to access new markets for its production and diluent requirements. Nexen said that tidewater access from the west coast of Canada will allow producers to build long-term, commercial relationships with more partners thereby gaining access to new markets. Nexen said that broader access to global markets and pricing would allow it to have greater choice in addressing economic risk.

SEMI said that it is the marketing entity of Suncor Energy Inc., currently marketing more than 55,500 cubic metres (350,000 barrels) per day of oil sands production from Alberta. It said that Suncor Energy Inc. has plans to produce in excess of 111,000 cubic metres (700,000 barrels) per day from Alberta by 2020.

SEMI said that tidewater access to the west coast would allow it to sell some of its growing crude oil production to new markets in the Pacific Basin, enabling market diversification. SEMI was of the view that current forecast production volumes will require the capacity associated with the proposed expansion of the Trans Mountain pipeline system, Keystone XL, and the Enbridge Line 9 reversal, as well as the Enbridge Northern Gateway Project. SEMI said that, assuming that all of the referenced pipeline projects are completed, the projected use of the Enbridge Northern Gateway Project would not be diminished.

TOTAL said that it currently produces about 4,000 cubic metres (25,000 barrels) per day of crude oil in Alberta, with plans to increase production to about 31,700 cubic metres (200,000 barrels) per day over the next decade.

TOTAL said that the project would provide Alberta oil producers with access to the world market and the condensate pipeline will be required to supply diluent volumes to support growing bitumen production. TOTAL was of the view that current forecast production volumes will require the capacity associated with the proposed expansion of the Trans Mountain pipeline system, Keystone XL and the Line 9 reversal as well as the Enbridge Northern Gateway Project. TOTAL said that, assuming the completion of all the referenced pipeline projects, the projected use of the Enbridge Northern Gateway Project would not be diminished.

The Funding Participants said that substantial Western Canada Sedimentary Basin crude oil reserves and the supply forecasts published by third parties such as the Canadian Association of Petroleum Producers and the National Energy Board, combined with their supply expansion plans, demonstrate that there will be adequate supply available for the oil pipeline. They said that the project would diversify available sources of diluent needed to ensure that bitumen can be transported by pipeline. The Funding Participants said that the increasing demand for diluent in western Canada is supported by the National Energy Board market assessment issued in November 2011 which shows forecast condensate import requirements into Canada of 106,400 cubic metres (670,000 barrels per day) by year 2035. The Funding Participants said that there are many sources of diluent available in the international market and they are confident that adequate supplies will be available to ship on the condensate pipeline.

The Funding Participants said that the commitments made through the Funding Support Agreements (approximately $140 million) and the precedent agreements demonstrate strong support for the project. Cenovus, Nexen, SEMI and TOTAL said that if the project proceeds as contemplated and is economic, it would be their intent to enter into firm transportation service agreements.

MEG Energy Corp. (MEG)

MEG said that it is currently producing approximately 4,100 cubic metres (26,000 barrels) per day and has plans to increase production to 41,000 cubic metres (260,000 barrels) per day by 2020.

MEG said that it is a Funding Participant, has executed precedent agreements, and is interested in becoming a shipper on the Enbridge Northern Gateway Project because it would provide access to new and growing markets for the sale of crude oil and purchase of condensate. It said that the Enbridge Northern Gateway Project would create an alternative outlet for Canadian crude oil, thereby reducing exposure to capacity constraints on existing pipeline systems.

MEG said that significant volumes of crude oil supply would be available for shipment on the oil pipeline. In its view, this position is supported by the Funding Participants' expansion plans, the National Energy Board and Canadian Association of Petroleum Producers forecasts, and by western Canadian oil reserves, which are among the largest in the world. MEG said that Northern Gateway's evidence regarding condensate supply demonstrates that condensate available to the project from international sources would exceed the capacity of the import pipeline. MEG said that it sources diluent from the United States Gulf Coast. It said that waterborne condensate imports via the Enbridge Northern Gateway Project are very likely to be attractive from a cost perspective compared with the United States Gulf Coast, due to the shorter transportation distance.

MEG supported the conclusions of the Muse market analysis. It said that the market potential in Northeast Asia alone of 349,200 cubic metres (2.2 million barrels) per day represents over 4 times the capacity of the oil export pipeline. It said that the United States west coast also holds strong potential for shippers. MEG said that there is no credible evidence that calls into question the position that the project would open new markets for Canadian crude oil. In its view, the commitments made by the Funding Participants support the existence of the market opportunity. MEG said that the Kinder Morgan Trans Mountain pipeline system is currently the only pipeline system exiting western Canada that is able to access these markets, and it is operating at or beyond full capacity.

MEG said that each Funding Participant would be making a commitment of about $1 billion in executing a 15-year transportation service agreement for each 7,900 cubic metres (50,000 barrels) per day of capacity. MEG said that it was looking for the opportunity to sign a transportation service

agreement. It said that, given the significance of the investment, it and the other Funding Participants first need to fully understand the economics of the project, including project timing and the terms and conditions of regulatory approval. It said that this reflects a prudent approach to managing the risks of a large scale, market-opening, and greenfield project.

Canadian Association of Petroleum Producers

The Canadian Association of Petroleum Producers said that it represents large and small companies which collectively account for more than 90 per cent of Canada's natural gas and crude oil production. It said that the need for the Enbridge Northern Gateway Project is clear, as there has been tremendous crude oil supply growth in the Western Canada Sedimentary Basin and significant further growth is forecast. It said that as a result of this supply growth, western Canadian producers require access to new and growing markets, and there is clear commercial support for the project.

The Canadian Association of Petroleum Producers said that the United States has long been the primary export market for Canadian production, and it has and continues to be an extremely good market. It said it expects growing United States crude oil production to increase competition for western Canadian crude oil in various United States markets. It said that the Enbridge Northern Gateway Project would provide increased access to new and growing Pacific Rim markets, creating a significant new option and outlet for Canadian producers. The Canadian Association of Petroleum Producers said that no party has seriously questioned the availability of supply or the existence of markets for the project.

The Canadian Association of Petroleum Producers said that growth in pipeline capacity is not keeping up with the supply growth in the Western Canada Sedimentary Basin. It said that apportionment on multiple export pipelines has been a problem for several years and that, without new pipeline facilities, supply could become trapped. It said that trapped supply is a very significant concern to the Canadian petroleum producing industry and to governments that would experience lost revenue from lower taxes and royalties. The Canadian Association of Petroleum Producers said that insufficient pipeline capacity has also contributed to significant crude oil price discounting. It said that these outcomes are not in the public interest, and that it is not an option to wait for some other pipeline to proceed or for some other means to connect supply and markets.

The Canadian Association of Petroleum Producers said that it is the clear policy of the Canadian government that, subject to meeting all applicable regulatory and legal requirements, the operation of market forces should determine when energy developments and infrastructure should proceed and how supply and markets are connected. It its view, the Enbridge Northern Gateway Project is an example of the market working to put necessary infrastructure in place to accommodate Canadian crude oil supply growth.

Edmonton Chamber of Commerce

The Edmonton Chamber of Commerce, in final argument, said that it is Canada's largest chamber of commerce by membership, representing nearly 3,000 businesses with tens of thousands of employees in a variety of different industries and sectors. It said that it supports the approval of the Enbridge Northern Gateway Project. In its view, the project would contribute to a strong and viable energy and resource sector for the benefit of the whole country. It said that diversified market options for oil and gas are critical to sustaining Canada's prosperity and living standards.

Strathcona County

Strathcona County said that it is home to the majority of refining in western Canada, and is Canada's largest hydrocarbon processing centre. Strathcona County said that it supports the Enbridge Northern Gateway Project. It said that the petroleum industry forms the base of Canadian economic growth, development, and prosperity, and is essential to sustaining the national standard of living. In its view, the project is needed to diversify and stabilize Canadian crude oil exports, to access growing Northeast Asia markets, and to provide the necessary infrastructure for future growth.

World Trade Centre Edmonton

The World Trade Centre Edmonton said that its members include 21 chambers of commerce located in northern Alberta, northern British Columbia, northern Saskatchewan, Yukon, the Northwest Territories, and Nunavut. It said that the

combined membership of these chambers is more than 10,000 businesses that employ more than 100,000 Canadians in a wide variety of industries.

The World Trade Centre Edmonton said that it supports approval of the Enbridge Northern Gateway Project. It said that the project would create market options for Canadian oil and gas products and generate revenues enabling diversification in the economy. The World Trade Centre Edmonton said that, if the project is not approved, the viability of Canada's oil and gas sector would be threatened.

The World Trade Centre Edmonton said that the project would have the important effect of reducing vulnerability to United States energy policy and current terms of trade. It said that Canada's economy is less stable, resilient, and productive as a result of the overdependence on the large United States market. It said that United States crude oil demand is decreasing while, in Asia and other places in the world, expected future demand is on the rise. It said that the Enbridge Northern Gateway Project is the clear and most efficient solution to effectively and responsibly manage these critical issues.

The World Trade Centre of Edmonton said that Canada's economy relies on commodities, and that the oil and gas industry is a primary engine of economic contribution to the commodity sector. It said that environmental considerations can be expected to lead to a less carbon-based economy and that future oil demand may decrease. It said that the Enbridge Northern Gateway Project would maximize the value of current oil production. It said that the investment capital generated through the project and the expertise developed through leading-edge risk management could diversify the Canadian economy over the longer term.

Alberta Federation of Labour

The Alberta Federation of Labour said that it is the largest labour organization in Alberta, representing more than 145,000 unionized workers in all sectors of the Alberta economy. As part of its evidence, the Alberta Federation of Labour filed a report titled *An Economic Assessment of Northern Gateway,* authored by Robyn Allan. The report critiqued many aspects of the economic case presented by Northern Gateway and concluded that the project is not needed and is not in the public interest. With respect to economic feasibility, the report took the position that the supply forecast presented by Northern Gateway could be optimistic because a portion of the forecast related to projects and supply that had not yet been sanctioned by regulators or industry. It also identified the potential risk that lower realized supply could lead to excess pipeline capacity and an associated increase in costs for all operators.

The Alberta Federation of Labour said that there was insufficient evidence to conclude that the condensate pipeline is needed and in the public interest. It said that the analysis regarding condensate availability prepared for Northern Gateway by consultants Poten & Partners was not provided as evidence and that, because Northern Gateway did not provide a witness to speak to it, it had not been tested. The Alberta Federation of Labour said that the supply identified by Poten & Partners, and relied upon by Northern Gateway, was available for Canada and other global markets and, therefore, Canada must compete for this supply.

Coastal First Nations

The Coastal First Nations commissioned a report by Dr. Thomas Gunton and Sean Broadbent of Simon Fraser University to assess the need for the project. The report titled *A Public Interest assessment of the Northern Gateway Project* concluded that the evidence provided by Northern Gateway is deficient and the application is incomplete. It said that the application does not demonstrate that the pipeline meets the need and public interest criteria required for National Energy Board approval.

With respect to need, supply, transportation matters, and markets, the Coastal First Nations said that Northern Gateway did not provide evidence of firm shipping contracts and, therefore, fails to meet one of the National Energy Board's key tests for demonstrating project need. It said that Northern Gateway did not adequately assess the supply and demand for incremental pipeline capacity and, therefore, did not demonstrate that the oil pipeline is required.

The Coalition – ForestEthics Advocacy, Living Oceans Society, and Raincoast Conservation Foundation

The Coalition submitted two reports in respect of the need for the pipeline: *Pipeline to Nowhere?* and *The Northern Gateway Pipeline: An Affront to the Public Interest and Long Term Energy Security of Canadians*.

The reports reached the following conclusions:

- The application did not provide adequate evidence of market demand as there are no long-term commitments from shippers or refinery-specific demand analysis, as has conventionally been provided in past export pipeline applications before the National Energy Board. Unlike legally-binding transportation service agreements, the Enbridge Northern Gateway Project precedent agreements do not provide as robust an economic case for market demand.
- The provided supply forecast would require a tripling of oil sands production by 2035. This is unreasonable and likely not achievable given the capital, infrastructure, and other inputs that would be required.
- If no additional export pipelines are constructed in western Canada, there would not be a risk of supply shut-in until at least 2020. If Keystone XL and the Enbridge Northern Gateway Project are constructed, there would not be a risk of Western Canada Sedimentary Basin shut-in until 2026.

The Coalition said that Northern Gateway has not secured binding commercial support for the project and, therefore, the need for the project has not been demonstrated by the Canadian oil industry.

Haisla Nation

The Haisla Nation said that Northern Gateway has not established that the project is needed.

The Haisla Nation said that Northern Gateway has not met the majority of the *National Energy Board Act*'s threshold requirements with respect to its application for the condensate import pipeline. Specifically, it said that Northern Gateway did not establish a likely long-term supply of condensate, understated existing or potential infrastructure to import condensates into Canada, and failed to analyze the demand for imported condensates. The Haisla Nation said that Northern Gateway failed to provide evidence on the financial viability of the condensate import pipeline and did not demonstrate that it would be economically viable, independent of the oil export pipeline.

The Haisla Nation said that, without a guarantee that long-term shipping agreements will be executed, it is not possible to determine whether either of the proposed pipelines is economically viable. It said that the Northern Gateway precedent agreements should not be construed as evidence of market demand because shippers have not analyzed potential sources of condensate or production requirements. It said that shippers would only make a decision to execute transportation service agreements after regulatory approval is obtained and after undertaking an extensive analysis on sourcing options and production needs.

Swan River First Nation

The Swan River First Nation said that the supply and demand evidence presented by Northern Gateway fails to prove that there is a need for the project, and carries the risk of creating surplus pipeline capacity. It said: "the needs of the oil sands industry do not represent the needs of Canadians, nor are they an appropriate proxy for public convenience and necessity. The needs of the oil sands industry are irrelevant to the question of what Crown actions are required to uphold Treaty No. 8 in relation to the project. In fact, the "need" for this Project has been explicitly established from the perspective of Northern Gateway."

Government of Alberta

Alberta said that the timing of tidewater access through projects like the Enbridge Northern Gateway Project is critical to Canada's energy producers competing in global markets and to Albertans and Canadians receiving full economic value for the development of their non-renewable resources. Alberta said that it agreed with Northern Gateway's view that, though not quantifiable, the project would offer significant and important benefits for the Canadian petroleum industry through market expansion and diversification.

Alberta said that there is clear and compelling evidence of a significant economic benefit associated with approving and constructing the project. It clarified that it has not taken a position in direct support of the application. In its view, the joint review process is well suited to determine whether the project is in the public interest.

Views of the Panel

Northern Gateway is seeking certificates of public convenience and necessity for the oil export pipeline and for the condensate import pipeline, which, together with the associated terminal facilities, constitute the project. The Panel must examine the justification for each pipeline. The Panel notes that the commercial underpinning for the project, as contemplated, would involve shippers (the Funding Participants) executing firm transportation agreements on both pipelines. For this reason, the views of the Panel on transportation contracts, commercial support, and project need are considered for both pipelines together.

SUPPLY, MARKETS, AND TRANSPORTATION MATTERS FOR THE OIL EXPORT PIPELINE

The Panel finds that there would be adequate supply available to the Northern Gateway oil export pipeline. Northern Gateway said that forecast western Canadian crude oil supply is expected to increase from 447,900 cubic metres (2.8 million barrels) per day in 2010, to 990,800 cubic metres (6.2 million barrels) per day by 2035. The Panel notes that this forecast is supported by nearly 28 billion cubic metres (177 billion barrels) of crude oil and bitumen reserves. The Panel notes that this forecast is similar to forecasts prepared by Canadian Association of Petroleum Producers and the National Energy Board. The Funding Participants said that they have plans to significantly expand production. The Panel notes that Northern Gateway intends to secure long-term, firm transportation agreements that would minimize supply risk to the pipeline. The Panel had no convincing evidence before it to demonstrate that there would not be adequate oil supply available to the pipeline. Though the Alberta Federation of Labour and the Coalition questioned whether the projected rate of supply growth was achievable, no party disputed that the oil sands are capable of delivering significant supply growth over the long term.

The Panel finds that there would be adequate markets available for the Northern Gateway oil export pipeline. Northern Gateway identified Northeast Asia to be the target market for the pipeline, assessing the market potential for western Canadian crude oil in this area to be about 350,000 cubic metres (2.2 million barrels) per day, representing about 4 times the capacity of the oil export pipeline. Northern Gateway said that the United States west coast is also a highly prospective market. The Funding Participants have indicated that they are seeking high-growth market alternatives for their production. The Panel notes that no party took the position that there would not be adequate markets available to absorb the volumes expected to be delivered off the oil export pipeline. In the Panel's view, it is in the public interest that growing western Canadian crude oil supply be able to access growing Pacific Basin markets.

Several parties, including the Alberta Federation of Labour, the Coalition and the Coastal First Nations said that the Enbridge Northern Gateway Project could result in excess western Canadian oil export pipeline capacity. The Panel is of the view that determining the need for additional pipeline capacity is a complex undertaking involving the forecasting of multiple uncertain variables, including supply, markets, and the evolution of transportation systems. It is crude oil shippers that most directly bear the costs of pipeline infrastructure in the form of tolls on new or expanded pipeline systems, and potentially higher tolls on cost of service based pipeline systems if throughput volumes are reduced. It is also shippers that most directly benefit from the pricing impacts afforded by the market access enabled by new or expanded pipeline infrastructure. Government revenues and royalties are, in a similar way, also impacted by these costs and benefits. In this connection, the Panel notes that no shipper or commercial third party, or government took the position that the pipeline would create excess pipeline capacity or any associated economic burdens. The evidence of Northern Gateway, the Funding Participants, the Canadian Association of Petroleum Producers, and the Government of Alberta was that pipeline capacity is not keeping pace with growing supply and additional pipeline capacity is required. The Panel agrees with Northern Gateway's assessment that there is currently no excess capacity between western Canada and the west coast of Canada enabling access to growing Pacific Basin markets. Currently, western Canadian producers can only access these markets via the Kinder Morgan Trans Mountain pipeline, which is operating at capacity, and is often in apportionment.

SUPPLY, MARKETS, AND TRANSPORTATION MATTERS FOR THE CONDENSATE IMPORT PIPELINE

The main justification for the condensate import pipeline is the growing requirement for diluent for heavy oil blending in order to facilitate pipeline transportation to market. The Panel agrees with Northern Gateway's broad assessment that there is strong evidence to support expected significant growth in heavy oil production from western

Canada and, as a result, that there will likely be significant growth in the requirement for diluent imports.

The Panel notes the position of the Alberta Federation of Labour and the Haisla Nation that there was insufficient evidence to establish the need for the condensate import pipeline. Specifically, they said that the international condensate supply forecast relied upon by Northern Gateway should be given no weight because the source analysis of the forecast prepared by a consultant was not filed as evidence and, therefore, could not be tested. The Panel notes that no party filed evidence which demonstrated that there would not be adequate supply available to the condensate pipeline. The Funding Participants said that they are confident that there would be sufficient supplies available on the international market to ship on the pipeline. The Haisla Nation said that Northern Gateway's western Canadian condensate demand analysis, and the consideration of alternative transportation options to meet this demand, were inadequate. The Panel notes that no shipper or commercial third party took the position that the condensate import pipeline would create excess pipeline capacity or any associated economic burdens.

Northern Gateway said that, in its dealings with potential shippers, it became apparent that there could be sufficient market demand for a condensate import pipeline to be placed into operation concurrently with the oil pipeline. The evidence of the Funding Participants is that they have plans to significantly increase heavy oil production and they are seeking to diversify available sources of diluent. The Panel notes Northern Gateway's position that the condensate import pipeline would only proceed if there is adequate shipper support in the form of long-term firm transportation service agreements. The Panel is of the view that these agreements would minimize the supply risk to the pipeline and confirm market demand in western Canada for the imported condensate. In this context, the Panel finds that there was sufficient evidence regarding condensate supply availability and the market potential for imported condensate in western Canada.

Northern Gateway said that if adequate shipper support is not obtained for the condensate import pipeline, the oil pipeline could proceed independently. The Panel notes that Northern Gateway did not contemplate conducting a Class III capital cost estimate for a scenario whereby the condensate pipeline would proceed on a stand-alone basis independent of the oil pipeline. Accordingly, the Panel finds that there is no expectation that the condensate pipeline would be built on a stand-alone basis, without the oil pipeline.

TRANSPORTATION CONTRACTS, COMMERCIAL SUPPORT, AND PROJECT NEED

The Panel is of the view that the market will determine the pipeline projects which are required to ensure the proper functioning of the petroleum market and those which can provide competitive transportation service.

The Panel is of the view that the financial commitments made by Northern Gateway and the Funding Participants to advance the project through the regulatory process are supportive of the market opportunity to be provided by the project. The Panel notes Northern Gateway's evidence that both the oil export pipeline and condensate import pipeline have been fully subscribed for long-term service under shipper-executed precedent agreements. In the Panel's view, these agreements are an indicator of market interest in the project. The Panel accepts that the process undertaken to develop the Enbridge Northern Gateway Project reflects the operation of the market.

Northern Gateway said that the project would only proceed to construction with long-term, firm transportation agreements in place, and that final contracted volumes would only be known when these agreements are executed, following regulatory approval. In this connection, Northern Gateway said that it expects that both pipelines would be fully contracted by credit-worthy shippers for a term of not less than 15 years. The Funding Participants that were active in the hearing indicated that, if the project proceeds as expected, it would be their intention to enter into firm transportation service agreements.

When shippers make long-term take-or-pay commitments, they are demonstrating that the commitment represents the best use of their capital resources relative to other transportation options. The Panel notes the position of several intervenors including the Haisla Nation, the Coalition and Coastal First Nations, that, in the absence of firm transportation agreements with shippers, Northern Gateway has not demonstrated that the facilities are needed. The Panel recognizes that shipper commitments are central to the Enbridge Northern Gateway Project application and, accordingly, has set out a condition that would require Northern Gateway to file with the National Energy Board, prior to construction, the long-term, firm

transportation agreements demonstrating that sufficient commercial support has been secured for both the oil and condensate pipelines.

To obtain regulatory approval, there must be a strong likelihood that the facilities would be used at a reasonable level. There will always be a degree of uncertainty in projecting the long-term utilization of transportation facilities, because utilization is influenced by many uncertain variables including supply, market development and the evolution of transportation infrastructure overall. It is in this context that the National Energy Board has in the past placed significant weight on the existence of long-term firm transportation agreements with shippers in determining whether facilities are needed and likely to be sufficiently well utilized over their economic life.

The Enbridge Northern Gateway Project would have broad economic, social and environmental implications for local, regional and national communities. In balancing the benefits and burdens of the project, the Panel finds that, in this case, it is prudent and necessary to set an initial minimum volume level requirement for each pipeline. Using the careful and precautionary manner of reviewing this project, the Panel finds that, in order to proceed, Northern Gateway must secure long-term, firm transportation service agreements for not less than 60 per cent of the capacity of each pipeline prior to construction.

In making this determination, the Panel considered that transportation providers and shippers should have broad flexibility to arrive at efficient market outcomes, without undue influence by the regulator. In this regard, the Panel notes that imposing an initial minimum contracted capacity requirement on the project could potentially have implications for the commercial arrangements for the project, which are yet to be finalized. The Panel also considered that pipeline infrastructure benefits from economies of scale and that the potential for some degree of underutilization during the early period of operation is inherent in large scale greenfield projects. Balancing these factors is the Panel's overarching need to be satisfied that the facilities are likely to be well utilized and, in this connection, that the benefits expected to flow from the project are likely to be realized. The Panel is of the view that the consideration of commercial support in the justification for at-risk infrastructure is a matter of judgement which will depend on the particular circumstances of each case. In making its determination on the appropriate level of initial contracted capacity required for the Enbridge Northern Gateway Project, the Panel is not defining the appropriate level of commercial underpinning for future cases.

Western Canadian crude oil supply and the demand for imported condensate are forecast to grow significantly over the life of the project. Tidewater access to the Pacific Basin would provide access to diverse crude oil markets and sources of condensate supply. Given these fundamental factors, with the required initial volumes in place, the Panel is satisfied that each pipeline would be well utilized and the benefits of the project would likely be significant and robust. The Panel is of the view that conditioning this initial minimum volume requirement would not place an unreasonable burden on the project, given Northern Gateway's expectation that it would be fully contracted.

The Panel accepts Northern Gateway's preliminary financing plan. The Panel recognizes that Northern Gateway's financing plan would remain in a preliminary state until after the Panel makes its recommendations to the Governor in Council. In the subsequent Part IV application, which Northern Gateway would be directed to file after finalizing commercial support for the project, the National Energy Board would examine, at that time, the tolls that would incorporate the annual costs of the finalized financing plan.

ECONOMIC FEASIBILITY

Given the Panel's views on crude oil supply, markets, and contracts, if the necessary transportation service agreements are executed, the Panel is satisfied that the oil export pipeline would likely be used at a reasonable rate over its economic life and that the tolls would be paid.

Given the Panel's views on condensate supply, markets, and contracts, if the necessary transportation service agreements are executed, the Panel is satisfied that the condensate import pipeline would likely be used at a reasonable rate over its economic life and that the tolls would be paid.

With the necessary transportation service agreements in place, the Panel believes that Northern Gateway would be able to finance the project.

10.2 Potential impact on western Canada crude oil prices

The netback price of a barrel of crude oil is calculated by taking the revenue that producers receive for that oil and subtracting all the costs associated with getting that crude oil to the market.

Views of Northern Gateway

The Enbridge Northern Gateway Project application included a netback benefits analysis prepared by Muse. In its assessment, Muse used its proprietary model to quantify the expected pricing benefit of the project to the Canadian oil industry. The assessment focused on the Northeast Asia market, though Muse noted that crude oil would likely also be sold to more distant markets. Muse prepared an updated report, dated July 2012, in recognition of the significant changes in the market environment which had occurred since the application was filed. The following discussion refers to the updated report.

In preparing its assessment, Muse established a set of analytical assumptions relating to supply, transportation, and markets. For each year from 2018 to 2035, the model was run using this set of assumptions, once without the Enbridge Northern Gateway Project in operation (Base Case), and again with the project in operation. Muse determined the project's pricing benefit to the Canadian oil industry by comparing computed output prices for various grades of Canadian crude oil for each case in each year.

Muse found that the Enbridge Northern Gateway Project start-up would increase the price of crude at Edmonton versus the Base Case as the Canadian crude market expands to include Northeast Asia, as well as possibly the United States west coast.

Muse explained that, in the early years of the forecast period, the Enbridge Northern Gateway Project start-up is expected to result in substantial crude oil shipments on the northbound pipelines between the United States Gulf Coast and the Midwest. This would shift the price-setting location for Canadian light crudes from the United States Gulf Coast northward to the Midwest, which would increase the price at Edmonton for Canadian light synthetic and conventional light crude oil. Muse said that, by enabling Canadian heavy crude producers to access the Asia-Pacific market with meaningful volumes, the Enbridge Northern Gateway Project would allow Canadian crude producers to avoid price discounting and reduce the need to ship heavy crude via comparatively expensive rail transport.

Muse said that higher crude oil prices increase Canadian crude producers' revenues, and increase the feedstock cost for Canadian refiners by the same amount (to the extent the refiners are processing western Canadian crude oil). Consequently, it adjusted the gross Canadian oil industry benefit for the effect of the higher crude prices on Canadian refiners. It also adjusted for expected Enbridge Northern Gateway Project tolls (Table 10.6).

Muse said that the expansion of Trans Mountain could not be used in a base case for the purposes of assessing benefits associated with the project because it was not possible to develop either an in-service date or terms and conditions upon which service on Trans Mountain might be offered.

Muse estimated the present value of the net benefits to the Canadian oil industry at approximately $29 billion through 2035. On an undiscounted basis, the value of the Canadian oil industry benefits was estimated to be about $45 billion through 2035.

TABLE 10.6 **SUMMARY OF NORTHERN GATEWAY BENEFIT CALCULATION (Real millions of 2009$ per year, unless noted)**

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Gross Canadian Producer Benefit	2,281.6	4,997.2	4,932.9	3,734.3	2,533.9	2,437.5	3,835.0	3,905.0	3,851.1	4,284.4	3,701.9	3,709.6	3,796.1	3,321.4	3,527.4	4,161.9	3,742.4	4,327.6
Less Canadian Refinery Impact	(424.7)	(948.9)	(884.7)	(691.1)	(442.5)	(382.7)	(596.7)	(566.4)	(532.2)	(522.7)	(445.7)	(423.2)	(417.9)	(359.1)	(314.3)	(296.1)	(241.0)	(280.7)
Less Northern Gateway Committed Toll	(685.4)	(687.5)	(689.7)	(689.4)	(756.2)	(758.0)	(759.8)	(759.5)	(763.4)	(765.3)	(767.9)	(768.4)	(772.6)	(774.7)	(776.8)	(563.9)	(561.1)	(547.4)
Net Canadian Benefit	1,171.5	3,360.8	3,358.5	2,353.7	1,335.1	1,296.8	2,478.6	2,579.2	2,555.6	2,996.4	2,488.3	2,518.0	2,605.6	2,187.7	2,436.4	3,302.0	2,940.3	3,499.5

Views of parties

Government of Alberta

Alberta submitted a report prepared by Wood Mackenzie Inc. (Wood Mackenzie), which estimated the impact on crude oil prices received by western Canadian producers from increasing west coast crude oil export capacity. Alberta submitted the report, dated December 2011, as its evidence in the proceeding. In recognition of changes in the North American crude oil market, Wood Mackenzie prepared an update to its report, dated July 2012. The following discussion refers to the updated report.

The Wood Mackenzie report said that new technologies and the oil price environment were encouraging companies to invest capital in western Canada. Its analysis projected that Western Canada Sedimentary Basin supply would reach 920,000 cubic metres (5.8 million barrels) per day by 2025, with oil sands volumes accounting for about 762,000 cubic metres (4.8 million barrels) per day.

The Wood Mackenzie analysis concluded in the following substantive findings:

- Canadian crude oil producers will require additional pipeline capacity to transport incremental supply volumes to key demand centres by 2017.
- Asia is an attractive market on a netback basis.
- Tidewater access is an important link to the fast growing Asian markets.
- Insufficient access to premium heavy crude refining markets could cause Canadian producers to lose approximately 8 dollars per barrel for every Canadian heavy crude barrel produced, potentially resulting in foregone revenue in the area of $8-12 billion per year for the period from 2017 to 2025.

Alberta said that the conclusions of the Wood MacKenzie analysis broadly align with the Muse analysis prepared on behalf of Northern Gateway.

Funding Participants – Cenovus Energy Inc. (Cenovus), INPEX Canada Ltd. (INPEX), Nexen Inc. (Nexen), Suncor Energy Marketing Inc. (SEMI), and TOTAL E&P Canada Inc. (TOTAL)

The Funding Participants said that the ability to reach broader international markets would create a more efficient market and, in turn, allow Canadian producers to realize higher netback prices by mitigating the discounted pricing that exists today.

MEG Energy Corp. (MEG)

MEG said that the level of apportionment experienced on Canadian crude oil pipelines, and the price discounting on oil shipped to the United States, makes additional pipeline capacity and market diversification imperative for the Canadian industry.

Canadian Association of Petroleum Producers

The Canadian Association of Petroleum Producers agreed with MEG's submission that insufficient pipeline capacity has contributed to significant crude oil price discounting and that additional pipeline capacity and market diversification are required. It said that the Enbridge Northern Gateway Project is a way for producers to get full market value for their production.

Alberta Federation of Labour

The Alberta Federation of Labour said that the netback benefits forecast by Muse were not reliable; therefore, the benefits to the Canadian oil industry and to Canadians, which were based on the netback benefits, were not reliable.

Specifically, the Alberta Federation of Labour said that the Muse and Wood Mackenzie reports showed that, once the oil export pipeline is full, it would no longer be a price-setting mechanism in the oil market. In its view, once full, the oil export pipeline would cease to provide benefits to the Canadian economy. It said that this pipeline would provide the economic benefits predicted by Northern Gateway and its experts in the first year or two of its operation, while it fills to capacity and as it begins operations.

Coastal First Nations

The Coastal First Nations said that Northern Gateway did not demonstrate the reliability of its netback benefit analysis and resulting revenue benefit.

The Coalition – ForestEthics Advocacy, Living Oceans Society, and Raincoast Conservation Foundation

The Coalition said that the estimated financial impacts of the project as presented in the Muse report and the subsequent use of those estimates in the Wright Mansell public interest benefit evaluation were subject to errors and were not reliable. Specifically, the Coalition said that Northern Gateway inappropriately relied on the economic benefits of increased oil and gas production induced by the project, since the environmental costs associated with oil sands production were outside the scope of the proceeding.

Haisla Nation

The Haisla Nation said that, with regard to the oil export pipeline, methodological deficiencies or inconsistencies in the Muse and Wright Mansell's analyses indicate that the purported net benefits to producers and predicted public benefits were overstated and were not reliable.

United Fisherman and Allied Workers' Union – Canadian Auto Workers

The United Fisherman and Allied Workers' Union – Canadian Auto Workers said that it was not proven that the project would increase benefits to oil producers. It said that, if this was the purpose of the project, then the need for the project had not been established.

Ms. Josette Wier

Ms. Wier said that the economic analysis presented by Muse was not reliable. She said that Northern Gateway had not adequately considered the full impact of the project on the Canadian economy and Canadian energy security.

Views of the Panel

Nearly all western Canadian crude oil exports are currently delivered to markets in the United States. The Panel notes that the United States is experiencing flat-to-declining demand for oil and significant growth in domestic crude oil production. Against this backdrop, western Canadian crude oil supply is growing and significant further growth is expected. The Panel notes the perspective of Northern Gateway and the commercial intervenors that the current state of reliance on the United States market has contributed to significant price discounting for western Canadian crude oil. These parties said that market diversification is required to manage this risk in the future. The Panel accepts this assessment.

The Panel agrees with Northern Gateway's evidence that the petroleum industry is a significant driver of the Canadian economy and an important contributor to the Canadian standard of living. The Panel is of the view that it is in the public interest to maximize the prices received for western Canadian crude oil, a non-renewable resource. To accomplish this objective, adequate pipeline capacity must be in place to transport growing supply to the markets that require that supply. The Enbridge Northern Gateway Project would connect growing western Canadian supplies with growing markets in the Pacific Basin. The Panel does not agree with the position advanced by the Alberta Federation of Labour that, once the Enbridge Northern Gateway Project is operating at full capacity, it would cease to provide economic benefits because it would no longer be the price-setting mechanism for western Canadian crude oil. If the Enbridge Northern Gateway Project is operating at full capacity, it would be because shippers have determined that supplying the markets served by the pipeline provides an economic benefit. This economic benefit would continue to exist even if the pipeline was no longer acting as the price setting mechanism for western Canadian crude oil.

The Panel notes that the crude oil netback analyses prepared by Muse and Wood Mackenzie generated a great deal of questioning by intervenors and, in final argument, several parties took the position that the results of these studies were unreliable. The Panel is of the view that new pipelines connecting producing regions with consuming regions change market dynamics in ways that cannot easily be predicted. As a result, it is difficult to determine the exact impact that a major project such as the Enbridge Northern Gateway Project may have on netback prices once it is placed into service. The Panel finds that, if constructed, the project would significantly expand and diversify the market options for western Canadian crude oil supply which would contribute to the realization of full market value pricing over the long term.

The Panel notes the argument advanced by the Coalition to the effect that, since evidence of the environmental effects of upstream oil and gas development induced by the project were not considered, the upstream benefits of oil and gas development induced by the project must be excluded from the Panel's consideration. In the Panel's view, there was not a sufficiently direct connection between the project and any particular existing or proposed oil sands development or other oil production activities to warrant consideration of the effects of these activities. During its deliberations, the Panel did not assign weight to any specific estimates of potential induced upstream benefits. As set out in the foregoing discussion, the Panel is of the view that the project, if constructed, would likely deliver economic benefits by expanding and diversifying the markets available for western Canadian crude oil exports.

10.3 Potential impact on the Alberta upgrading and Canadian refining industries

Views of the parties

Alberta Federation of Labour

The Alberta Federation of Labour took the position that the Enbridge Northern Gateway Project is counter to the public interest and should not be approved because it would enable the export of raw unprocessed bitumen, resulting in the loss of tens of thousands of potential jobs in Canada's refining, upgrading, and petro-chemical sectors. The Alberta Federation of Labour said that the Enbridge Northern Gateway Project would result in a reduced price differential between bitumen and conventional oil, thereby removing a major competitive advantage enjoyed by Canadian refiners. It also said that the project would make it difficult, and perhaps impossible, for Canadian elected leaders to achieve the policy goal of upgrading more bitumen in Canada and creating more value-added jobs for Canadians. It said that significantly greater economic benefits would be enjoyed for longer periods of time if bitumen were upgraded and refined in Canada rather than sold in raw form to Asia.

The Alberta Federation of Labour said that Northern Gateway's economics benefits case failed to take into account that increasing the price of bitumen to Canadian refineries would likely lead to increases in the price of fuel to Canadian business and individual consumers.

Communications Energy and Paperworkers Union of Canada

The Communication Energy and Paperworkers Union of Canada said that it is Canada's largest union of energy industry workers, with some 35,000 members employed in oil and gas extraction, transportation, refining, and conversion in the petrochemical and plastics sectors. It said that it agrees with the submissions of the Alberta Federation of Labour.

The Communications Energy and Paperworkers Union of Canada said that it is concerned about industry plans to substantially increase the relative volumes of bitumen exports, resulting in considerable foregone economic and employment benefits of adding value to Canadian resources in Canada. It filed a letter, authored by economics consulting firm Infometrica Inc., which estimated the potential loss of 26,000 jobs that would otherwise be created in the Canadian economy if the bitumen contemplated to be shipped on the Enbridge Northern Gateway Project was upgraded in Canada. The estimate was based upon a report originally prepared by Infometrica Inc. for the National Energy Board's MH-1-2006 proceeding, which considered the transfer of certain TransCanada PipeLines Ltd. facilities from natural gas service to oil service in connection with the TransCanada Keystone Pipeline Project.

The Communications Energy and Paperworkers Union of Canada said that it supports the responsible development of the oil sands and understands the importance of foreign markets and the export pipelines needed to serve them. It said that the Enbridge Northern Gateway Project must be assessed in the broader context of Canadian needs, including eastern Canada's energy security and refining needs. In its view, with uncertain and declining access to western Canadian crude oil, eastern Canada has already suffered a loss of refining capacity, a loss of jobs, and gasoline supply problems.

United Fisherman and Allied Workers' Union – Canadian Auto Workers

The United Fisherman and Allied Workers' Union – Canadian Auto Workers said that, if the project were to increase the value of raw bitumen, it would negatively impact domestic consumers and impede the future development of secondary oil processing, which is not in the interest of Canadians.

Northern Gateway

Northern Gateway said that the oil export pipeline could accept many grades of oil, including synthetic crude oil upgraded from oil sands raw material. It said that decisions to invest in further upgrading in Canada, whether in Alberta or in eastern Canada, will be determined by a variety of market factors. It said that the creation of a new outlet for western Canadian crude oil accessing large, high-value markets neither fosters nor inhibits upgrading in Canada.

Northern Gateway said that the fundamentals of the Canadian refining industry are strong and will remain so, and the project would not jeopardize the Canadian refining industry. Northern Gateway said that there is unlikely to be any domestic need for increased production of refined products in Canada, and higher labour and transportation costs

are significant challenges that would face Canada's ability to profitably construct and operate export-oriented refineries. Northern Gateway said that the project could potentially support the upgrading sector through higher prices for synthetic crude oil. It said that one of the reasons for locating the pipeline origin in the Edmonton area was to facilitate deliveries of light crude oils, including synthetic crude oil.

Northern Gateway said that the three refineries east of Montreal are geographically dispersed. It said that the provision of western Canadian crude oil by pipeline would be costly and those costs would have to be reflected in higher prices for locally-used oil products or lower prices for producers of the oil. Northern Gateway said that, if western Canadian producers or eastern buyers identify a market opportunity, then investors in transportation infrastructure can be expected to respond with projects. It said that the Canadian public interest is best served by allowing market forces to work.

Northern Gateway said that increased prices of western Canadian crude oil brought about by the project would be distributed to Canadian refiners and Canadian consumers. It said that the price increase would very likely be borne solely by Canadian refiners. It said that, even if refiners were able to pass-through the additional crude oil feedstock costs in their retail gasoline prices, doing so would yield only a one-time 1.5 cent per litre increase, which would be "virtually immeasurable" in the consumer price index.

Canadian Association of Petroleum Producers

The Canadian Association of Petroleum Producers said that they did not agree with the positions of the Alberta Federation of Labour and the Communications Energy and Paperworkers Union of Canada. It said that it is not the case that the export of crude or bitumen will leave domestic refineries or upgraders wanting for supply. It said that there is no evidence to suggest that a denial of the Enbridge Northern Gateway Project application would lead to more refineries and upgraders being built in Canada. In its view, the decision to build refineries and upgraders should be made by the market, and it is not the subject of the project application.

Funding Participants – Cenovus Energy Inc. (Cenovus), INPEX Canada Ltd. (INPEX), Nexen Inc. (Nexen), Suncor Energy Marketing Inc. (SEMI) and TOTAL E&P Canada Inc. (TOTAL)

The Funding Participants said that they did not agree with the position of the Alberta Federation of Labour that the project is not in the public interest because of the detrimental impact that it would have on investment and jobs in the refining and upgrading sector. The Funding Participants said that there is no evidence of a direct relationship between the Enbridge Northern Gateway Project and whether upgraders and refineries are built in Alberta, or that the project would result in domestic upgraders and refiners being without adequate supply. They said that, given the evidence, the Panel should not interfere with the market-based decisions made by the Funding Participants and existing government policy.

MEG Energy Corp. (MEG)

MEG said that it did not agree with the position of the Alberta Federation of Labour that the project is not in the public interest because of the detrimental impact that it would have on investment and jobs in the refining and upgrading sector. It said that the position should be rejected.

Government of Alberta

Alberta said that it did not agree with the positions advanced by the Alberta Federation of Labour and the Communication Energy and Paperworkers Union that projects like the Enbridge Northern Gateway Project discourage additional value-added processing in Alberta, and are detrimental to the Canadian economy. It said that pipeline expansions are consistent with the development of future value-added opportunities, and are an essential component of properly functioning petroleum markets.

Alberta said that it agrees with the National Energy Board's historical position that well-functioning markets tend to produce outcomes that are in the public interest, and that proper functioning markets require adequate transportation capacity to connect supply to markets. Alberta said that pipelines can be reconfigured to transport a range of products, including petroleum products, should additional domestic refining and upgrading materialize in the future. Alberta said that no refiner or market participant has raised concerns that the project may have a negative impact on their ability to access feedstock. Alberta said that there is no evidence that would warrant an intervention by the Panel in the market. It said that the positions of the Alberta Federation of Labour and Communication Energy and Paperworkers Union should be dismissed.

Views of the Panel

The Alberta Federation of Labour and the Communication Energy and Paperworkers Union of Canada expressed concern that exporting raw bitumen by pipeline has a detrimental impact on domestic investment in upgraders and refineries in Alberta and Canada. The Panel considered these perspectives and finds that they are valid public interest considerations. Based on the evidence before it, the Panel has not been convinced that developing export pipeline infrastructure deters investment in upgraders and refineries in Canada. The Panel finds that it is significant that no commercial party in the refining or upgrading sector expressed opposition to the application on the basis that it would undermine their operations in Canada. The Panel is of the view that properly functioning petroleum markets require adequate transportation capacity to be in place and, further, that the type of commodity to be transported on a pipeline is a decision properly made by the market. The Panel is of the view that well-functioning markets tend to produce outcomes that are in the public interest.

The Panel had no compelling evidence before it to support the proposition that the project would result in existing refineries experiencing feedstock shortages. The Panel notes that western Canadian supply is forecast to increase significantly through 2035. Many people and parties commented on the need to provide eastern Canadian markets with future access to western Canadian crude oil. The Panel is of the view that producers will continue to seek new markets, including those in Canada.

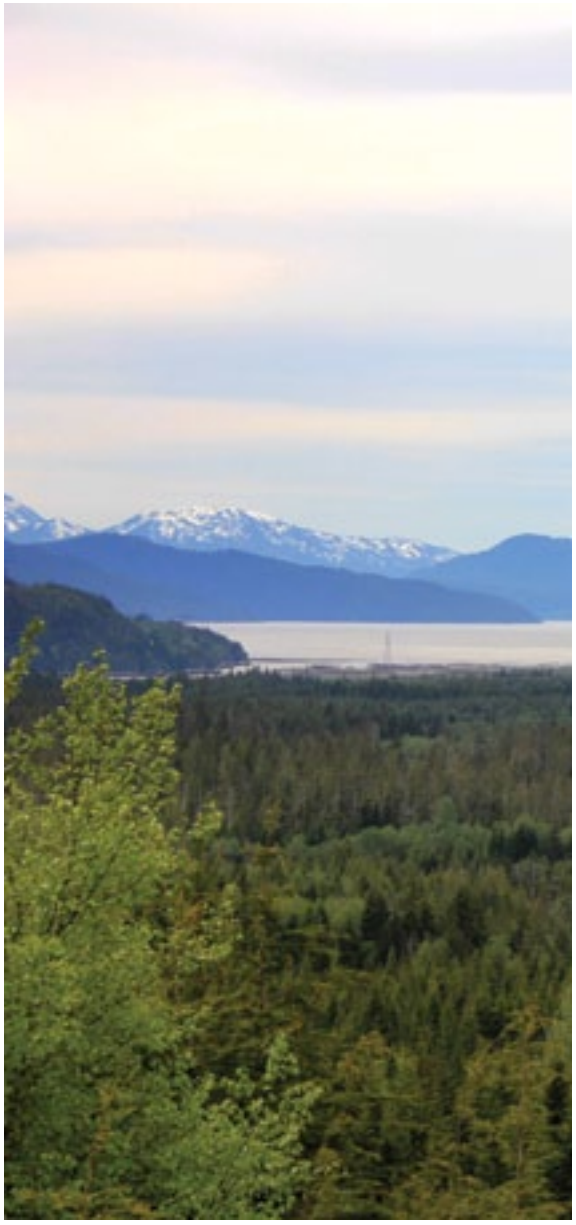
The Panel accepts the evidence of Northern Gateway that the project is unlikely to result in an increase in the price of retail gasoline in Canada. The Panel is of the view that if there were a one-time increase in retail gasoline prices on the order of 1.5 cents per litre, this would not represent a significant economic burden relative to the economic benefits of the project.

The Panel notes the Alberta Federation of Labour position that project approval would undermine the policy goals of Alberta and Canada in regards to the desire to realize more value-added crude oil processing. While the Panel is informed by current economic and energy policy, it does not set policy. The Panel notes that the Government of Alberta did not agree with the positions advanced by the Alberta Federation of Labour and the Communication Energy and Paperworkers Union of Canada. It said that pipeline expansions are consistent with the development of future value-added opportunities and are an essential component of properly functioning petroleum markets. Alberta said that pipelines can be reconfigured to transport a range of products, including refined petroleum products, should additional domestic refining and upgrading materialize in the future.

The Panel finds that no evidence was presented that lead it to conclude that the development of new infrastructure to significantly increase access to growing crude oil markets will hinder the functioning of the Canadian refining and upgrading sector. The Panel agrees with the view of the Government of Alberta that, should additional domestic refining and upgrading capacity materialize, pipelines can be reconfigured to transport a range of hydrocarbons, including refined petroleum products.

Summary views of the Panel

Many people and parties commented on the economic benefits and burdens that could be brought about by the Enbridge Northern Gateway Project. It is the Panel's view that opening Pacific Basin markets is important to the Canadian economy and society. Though difficult to measure, the Panel finds that the economic benefits of the project would likely outweigh any economic burdens.



11 Financial, tariff, and tolling matters

In this chapter, the Panel considers Northern Gateway's evidence on its business structure, project financing plan, toll and tariff matters, pipeline capacity allocation, and open access conditions. Northern Gateway applied for approval of the toll principles applicable to service on each of the proposed pipelines, including the tank and the marine terminals at Kitimat. Northern Gateway's tariff, including tolls, would set the charges and conditions for transporting hydrocarbons on the pipelines and the conditions for shippers to get access to the pipelines. The tolls must be set at adequate levels to allow Northern Gateway to generate enough revenue to carry out its pipeline operator responsibilities in a safe and responsible manner. The Panel's decisions in this chapter determine the key commercial conditions for the pipelines, should they advance to the operating phase.

11.1 Business structure

Northern Gateway said that, should the project be approved, the entities in the corporate structure of Northern Gateway Pipelines Limited Partnership (Northern Gateway, or the Transporter) would continue to evolve, as its partners and potential partners decide on their options to assume new roles such as shippers and/or equity investors. Figure 11.1 identifies these entities and their interrelationships over the different phases of the project.

FIGURE 11.1 **STEPS IN DEVELOPING REGULATORY APPROVAL AND COMMERCIAL ARRANGEMENTS FOR THE ENBRIDGE NORTHERN GATEWAY PROJECT**

PHASES	Pre-Development	Development	Finalize Shipper Support and Financing	Construction	Pipeline Operations
MAJOR ACTIVITIES	• Prepare and support regulatory application • Develop financial support through Funding Participants • Regulatory hearings	• Construction Execution Management Plan • Technical studies such as: Class III Capital Cost Estimate and Finance Plan	• Shippers execute firm Transportation Service Agreements • Project financing finalized • File part IV application for approval of tolls and tariffs with National Energy Board		• Transportation Service Agreements and tariff implemented • Transporter delivers hydrocarbons for shippers
KEY PARTICIPANTS	• Northern Gateway Pipelines Limited Partnership that includes: Enbridge Inc. (first limited partner), Northern Gateway Pipelines Inc. (general partner & transporter) • Funding Participants • Confirmed Funding Participants (have executed precedent agreements)	• General Partner • Supporting term shippers (confirmed when Transportation Service Agreements executed)	• General Partner • Term shippers • Direct Owner (potential) • Equity Investors and limited partners such as Enbridge Inc., Founding Shippers and Aboriginal Equity Partners		• General Partner • Term shippers • Direct Owner (potential) • Spot shippers • Investors (limited partners such as Founding Shippers and Aboriginal Equity Partners)
KEY DOCUMENTS	• Limited Partnership Agreement • Funding Support Agreement • Precedent Agreement and pro forma Transportation Agreement • Regulatory application to Panel	• Letters of support from term shippers • Construction Execution Management Plan • Class III cost estimate • Finance Plan	• Executed firm Transportation Service Agreements • Financing arrangements with lenders and equity investors • Part IV application to National Energy Board for approval of tolls and tariffs • Limited Partnership Agreement and related documents		• Leave to Open order • Certificate conditions • Tariff • Limited Partnership Agreement • Firm Transportation Service Agreements • Direct Ownership Agreement

NORTHERN GATEWAY'S SUBMISSIONS

Enbridge Inc. formed Northern Gateway Pipelines Limited Partnership under the Alberta *Partnership Act* to develop, design, build, own, and operate the project. The current limited partnership agreement between Enbridge Inc., as limited partner, and Northern Gateway Pipelines Inc., as general partner, was formed in 2004 and revised in 2008. The general partner would manage all project construction and operating activities. Northern Gateway expects that the agreement would be revised again before the pipelines start commercial operation because future equity investors and debt lenders to the project may request further changes. Northern Gateway chose the limited partnership structure because of the need to accommodate a broad range of interests, including potential shippers and Aboriginal groups, in a shared ownership arrangement.

Enbridge Inc., as a limited partner, is the only equity investor to date and its ownership interest would not be finalized until after regulatory approval is granted. As currently structured, the general partner would have a 0.19 per cent interest. There are two other potential types of equity investor in the project: Aboriginal Equity Partners, and Funding Participants. As described in Chapter 9, 26 out of 40 eligible Aboriginal groups have elected to subscribe to the Aboriginal ownership option and become Aboriginal Equity Partners. Northern Gateway set aside 10 per cent of the project's total equity for this option. Northern Gateway expects the full 10 per cent to be taken up by the Aboriginal groups before the project goes into service. The interest taken up by Aboriginal Equity Partners would be financed by the project and would be activated when the pipelines are ready to start commercial operations.

The Funding Participants are potential pipeline shippers and investors. Since potential shippers were unwilling to commit unconditionally to transportation service agreements during the 2005 open seasons, Enbridge devised Funding Support Agreements. These agreements enabled Enbridge and the Funding Participants to share project development costs and risks. By the third quarter of 2012, 10 Funding Participants had contributed about $140 million to the pre-development work. These contributions give each Funding Participant, among other things, the option to acquire transportation capacity on each pipeline (FP Option Volume) at discounted tolls and to become an equity investor-owner in the project. One Funding Participant (MEG Energy Corp.) has an option to purchase its equity in the form of direct ownership of a portion of the pipeline assets. The Direct Owner would have use of a pipeline's capacity up to the proportion of its direct ownership interest.

After the Funding Participants joined the project, they entered into negotiations with Enbridge to develop a structure for commercial arrangements. These negotiations resulted in a precedent agreement and a pro forma transportation service agreement, which included toll principles. These documents were filed with the Panel in June and August 2011. If a Funding Participant enters into a firm transportation service agreement, it would become a Founding Shipper and also a term shipper. Under the pro forma transportation service agreement, a Founding Shipper's total toll for its Option Volume is estimated to be about 15 per cent less than for non-Funding Participant term shipper volumes transported under long-term, firm transportation service agreements. The term shippers, direct owners, and the Transporter would share in any revenue from non-term shippers that would exceed the toll revenue collected from term shippers under long-term transportation service agreements.

What is a limited partnership?

A limited partnership is a business structure made up of a general partner who is responsible for the operation and management of the partnership, and limited partners who may invest cash and other property in the partnership and have limited liability. The limited partners grant the general partner the authority to carry out its management responsibilities. Limited partners cannot provide services and are not involved in the day-to-day management and control of the business. Usually, they cannot lose more than their contribution to the capital of the limited partnership. Limited partners share the profits or other compensation from income on their contributions to the limited partnership. The general partner distributes cash to the limited partners in accordance with the partnership agreement and legislation such as the Alberta *Partnership Act* subsection 59(2).

Northern Gateway said that a Funding Participant's option to acquire equity in the project is independent from the decision to become a shipper. Both the Aboriginal Equity Partners and the Funding Participants that exercise their equity option are expected to be limited partners in the Northern Gateway Pipelines Limited Partnership. Northern Gateway stated that, pursuant to applicable legislation, a limited partner's liability would be restricted to the funds contributed to the limited partnership.

Views of intervenors

The Alberta Federation of Labour (AFL) commented on the limited partnership business structure that Enbridge has set up for the project. In its view, limited partnerships are a special form of partnership that are used when business entities wish to limit liability for potential debts of the enterprise while accessing the preferential tax treatment that comes from this form of business structure. The Federation said that the business structure Northern Gateway proposed would provide limited access to cash resources in the event of damages, losses, or liability because of the limits on liability of the partnership. This would have consequences for liability limits for any compensation scheme for a catastrophic event such as an oil spill. In the Federation's view, once Northern Gateway would exhaust its insurance protection, its access to cash resources could be significantly restricted compared to a large corporation.

Haisla Nation said that, in Northern Gateway's corporate structure, only the initial investments of Enbridge Inc. and the Funding Participants would be at risk. Should the costs associated with an oil spill exceed these initial investments, Haisla Nation was concerned that it and the Canadian public may be responsible for some of the costs caused by the spill.

MEG Energy Corp. said that if it exercised its direct ownership option it would have to file an application pursuant to section 74 of the *National Energy Board Act*. It is MEG's view that this is the only approval needed if it exercises this option. MEG requested the Panel to confirm this position in its decision.

Views of the Panel

Although Northern Gateway provided its proposed approach to corporate structuring, this structure may change if the equity investors in the project change. The Panel finds the structure Northern Gateway proposed to be acceptable when combined with the conditions set out by the Panel to ensure financial accountability. When determining the financial assurances that Northern Gateway must arrange for the project, the Panel has considered the unique characteristics of the limited partnership.

The Panel understands that Northern Gateway expects the limited partnership agreement to be revised before the project starts commercial operation because future equity investors and debt lenders may request further changes to the agreement. Because these commercial arrangements may change, the Panel has decided that Northern Gateway must file the up-to-date limited partnership agreement and all related agreements at the time that it files its Part IV tolls application.

Northern Gateway said that the project would be in the Canadian national interest. Representatives of the Funding Participants testified that there is a critical need for the project to proceed so that access to new markets could be realized. The Panel finds that the Enbridge Northern Gateway Project has the potential to become a major, high capacity oil pipeline system dedicated to exporting crude oil from Canada to new, foreign markets. Because of its large capacity and potential importance in Canada's energy infrastructure for accessing new markets for oil, the Panel is of the view that additional regulatory oversight is appropriate to ensure that shippers are granted reasonable access to the oil pipeline and that the tolls do not impede access. In addition, the Panel finds that close monitoring of the project's market and financial performance would provide useful information about these emerging markets and related hydrocarbon transportation system needs. For these reasons, the Panel has decided that, if the project is approved, Northern Gateway would be designated as a Group 1 company and must comply with the National Energy Board's filing requirements for Group 1 companies as outlined in the *Toll Information Regulations* and *Guide BB – Financial Surveillance Reports* in the National Energy Board's Filing Manual.

The Panel has considered MEG Energy's request for a decision on the regulatory approvals required by MEG for its potential application requesting approval of direct ownership under section 74 of the *National Energy Board Act*. The Panel notes that MEG has not yet filed an application with the Board, and finds that it would be inappropriate to comment on a potential future application to the Board.

11.2 Financing plan

Northern Gateway's financial responsibility, financial structure, and financing methods are identified in subsection 52(2) of the *National Energy Board Act* as potentially relevant factors for consideration in the Panel's recommendation as to whether the project ought to be approved. These factors were raised during the proceeding, and the Panel's views on them are set out in this report.

NORTHERN GATEWAY'S SUBMISSIONS

Throughout the Panel's process, Northern Gateway said that its financing plan is preliminary and would remain so until the project is developed further. The development of a specific financing plan would follow regulatory approval, more definitive construction cost preparation, and shippers signing firm transportation service agreements.

Northern Gateway is of the view that the project would be financeable for the following reasons:

- growing supply and markets;
- long-term firm shipping agreements would be in place before construction;
- shippers would be creditworthy;
- cost-of-service tolls for each pipeline would recover operating costs, debt service costs, taxes, depreciation, and would provide for a reasonable return on common equity;
- no risks caused by fluctuating volumes carried by the pipeline because all fixed charges would be covered by the monthly demand charges that are part of the tolls paid by the shippers; and
- Enbridge's project management and pipeline expertise.

Northern Gateway plans to use a capital structure with 70 per cent debt and 30 per cent equity to finance the project. Enbridge would arrange debt financing from the project financing market for Northern Gateway. This debt would be non-recourse. Typically, project debt lenders require that a project have features such as long-term transportation service agreements signed by credit-worthy shippers to make a project feasible.

If non-recourse debt cannot be arranged, Enbridge and the other equity investors (which would include all limited partners except the qualified Aboriginal groups) would provide both the debt and equity for the project. The capital structure would be modified to include 60 per cent debt and 40 per cent equity. The strength of each investor's balance sheet would facilitate access to this debt.

If non-recourse debt is attainable, Northern Gateway calculated that the weighted average cost of capital after tax (WACCAT) would be 7.17 per cent and, if it is not attainable, the WACCAT would be 7.86 per cent. Northern Gateway assumes that the cost of debt would be 6.80 per cent in both financing scenarios. The higher WACCAT in the second scenario is attributable to the higher common equity ratio partially offset by a lower debt component in the capital structure.

Enbridge intends to be the first equity investor in the project. Its level of investment would depend on the amount invested by Founding Shippers, who would have the option to invest equity in the project. If eligible Aboriginal Investor groups exercise their equity option, they would not inject funds into the project. Rather, their equity purchase would be financed by the project. If the Founding Shippers do not exercise their full equity options, Enbridge would increase its equity stake in the project to achieve the target debt to equity ratio at operations start-up.

The equity thickness and rate of return on equity were established through negotiations between Enbridge (on behalf of Northern Gateway) and Funding Participants (potential shippers) who had executed precedent agreements. These negotiations created two alternatives. In one alternative, Enbridge would take on no risk for capital cost variances and the return on common equity would be 11 per cent. In the other, Enbridge would take on the risk for some capital cost variances and the return on equity would be 12 per cent if the

What is non-recourse debt?

Non-recourse debt is typically secured by property and other assets pledged as collateral, and also in this case would be supported by the project's cash flow rather than being secured by the general assets or creditworthiness of the limited partners who would be equity investors. If the borrower were to default, the lender could seize the collateral. The lender's recovery would be limited to the pledged assets.

actual capital costs equaled the estimated costs. The return would vary as the spread between the actual and the Class III estimate of capital costs widened. This would create a sliding scale risk-reward mechanism for the return on equity. For example, if the actual costs were 135 per cent of the estimated costs, the return on equity is forecast to be 9.9 per cent. Conversely, if the actual costs were 75 per cent of estimated costs, the return on equity is forecast to be 15.4 per cent. Northern Gateway assured the Panel that it would not allow this risk-reward mechanism to detract from its commitment to the project's safety and reliability.

Views of intervenors

The Alberta Federation of Labour expressed the view that the Northern Gateway model, which would include shippers that are also equity holders, had the potential to reduce competitive market forces when these parties negotiated the toll principles. The Federation questioned whether these parties' investor interests may have taken precedence over their shipper interests.

Views of the Panel

The Panel accepts Northern Gateway's preliminary financing plan and its options for completing the financing arrangements, should the project receive Governor in Council approval and commercial support.

The Panel recognizes that Northern Gateway's financing plan would remain in a preliminary state until well after the Panel makes its recommendations to the Governor in Council. The Panel has set out a condition that would require Northern Gateway to file a subsequent Part IV application after commercial support for the project is finalized. Once it is filed, the National Energy Board would examine the tolls that would incorporate the annual costs of the financing plan.

The Panel notes that the investors' return on equity may be tied to variances in the project's capital cost. This could create the risk of reducing capital costs for future shareholder gain. The Panel accepts Northern Gateway's commitment to safety and reliability and its assurance that it would not reduce any capital spending that would diminish these strategic operating objectives.

11.3 Toll and tariff matters

Northern Gateway has applied for approval of the toll principles applicable to service on each of the proposed pipelines, including tank storage and terminal services at Kitimat. In this application it has not applied for Panel approval of the tolls that would be in effect at the start of project operations. Final tolls are not available yet because Northern Gateway has not completed several project steps that would provide the data required to calculate the tolls. These steps would culminate in shippers signing firm transportation service agreements and Northern Gateway finalizing its financing plan. After these steps are complete, Northern Gateway would have the necessary information to file a Part IV tolls application with the National Energy Board.

The tolls and tariffs, including conditions for shipper access to Northern Gateway's pipeline services, must conform to the requirements contained in Part IV of the *National Energy Board Act*. Section 62 of the *National Energy Board Act* requires that the tolls be just and reasonable. Section 67 states that a company shall not make any unjust discrimination in tolls, service, or facilities against any person or locality. These requirements are intended to result in all shippers that use the same route, for traffic with similar circumstances and conditions, paying the same tolls. Finally, subsection 60(1) of the *National Energy Board Act* requires Northern Gateway to have tolls specified in a tariff filed with the Board or approved by a National Energy Board order before it can charge the tolls to its shippers.

Northern Gateway's phasing of the project's pre-development work results in a two-step regulatory process, with the review of Northern Gateway's

initial tolls occurring under subsection 60(1) of the *National Energy Board Act* subsequent to the Panel's issuance of this report.

NORTHERN GATEWAY'S SUBMISSIONS

In its 27 May 2010 application, Northern Gateway requested an order under Part IV of the *National Energy Board Act* approving the proposed toll principles applicable to service on each of the proposed pipelines, including tankage and terminalling at Kitimat. Northern Gateway's application included estimated tolls based on the toll principles. Northern Gateway did not request approval of the tolls that it would implement. Finalization of the tolls would depend on the completion of the following events:

- Governor in Council approval of the project;
- confirmation by Northern Gateway and the potential shippers of the commercial acceptability of the terms and conditions of regulatory approval;
- completion of Class III capital cost estimate;
- shippers signing firm transportation service agreements;
- the finalization of a feasible financing plan; and
- receipt of National Energy Board approval of the tolls that would be implemented for each pipeline.

Northern Gateway has consulted extensively with industry about its export pipeline concept since 2004 and held an open season for each pipeline in 2005. In 2007, it contacted all organizations involved in the 2005 open seasons, and other industry members in North America and Asia with an interest in the project, to solicit them to become Funding Participants. Northern Gateway spent 1.5 years signing up the Funding Participants and another 2.5 years negotiating the precedent agreement, pro forma transportation service agreement, and toll principles. Northern Gateway's efforts to attract Funding Participants continued into early 2012.

In June and August 2011, Northern Gateway filed an update to its application that included the pro forma precedent agreement, the pro forma transportation service agreement and the toll principles for each pipeline.

Northern Gateway said that it would establish the tolls for each pipeline on a stand-alone cost of service basis.

The negotiated toll principles identify the annual cost components that would be eligible for inclusion in the revenue requirements for each pipeline, and the definitions of oil and condensate throughput volumes that would be used to calculate the tolls. Northern Gateway split the revenue requirement into two parts: a capital revenue requirement, and operating expenses. The capital revenue requirement would include annual costs associated with the capital invested in pipeline facilities and a working capital allowance (together, the investment or rate base). Return on equity, cost of debt, income tax allowance, and depreciation expense are the major items in the capital revenue requirement. The operating expense components are identified below.

Tolls payable to Northern Gateway for transportation services would be calculated according to the toll principles that are part of the pro forma transportation service agreement. Key features of these principles and related matters are summarized below.

What is cost of service?

The cost of service for regulated utilities is the total annual costs (cost of service or annual revenue requirement) that shippers must pay through tolls to cover all costs for the transportation services on each pipeline. The tolls for each pipeline must recover the operating costs, the debt servicing costs, income and other taxes, depreciation, and a reasonable return on investors' equity.

Forward (future) test year:
The tolls for the coming year would be based on the pipeline's cost of service estimates for the next year (forward test year). All differences between estimated and actual tolls would be recorded and recovered or refunded with carrying charges in the tolls 1 year beyond the test year.

Capital structure:
Assuming that Northern Gateway can raise non-recourse debt, the project would have a capital structure of 70 per cent debt and 30 per cent equity. If this kind of debt is not available, the capital structure would be 60 per cent debt and 40 per cent equity.

Return on equity:
The target return on equity would be 12 per cent if the cost-risk sharing mechanism described below is implemented and 11 per cent if the cost-risk sharing is rejected by the Founding Shippers. Northern Gateway proposes to fix the return for 30 years.

Rate base:
The rate base components are made up of the capital expenditures for the facilities of each pipeline, plus an allowance for working capital to fund day-to-day operations, less accumulated depreciation. Northern Gateway's rate base would include expenditures for the development and design of each pipeline. The rate base would be adjusted for the First Nation Note Receivable, the mechanism by which the project would fund the Aboriginal equity.

Cost-risk sharing adjustment to rate base for variances between estimated and actual capital costs:
Table 11.1 summarizes the adjustments in the cost-risk sharing mechanism to recognize capital costs that exceed or fall below the Class III capital cost estimate. An increase in rate base above actual costs by this adjustment mechanism will enhance earnings and a decrease in rate base will reduce earnings.

Northern Gateway said that its management team's overriding priority is to construct and operate the project safely. It said that it would administer the cost risk sharing methodology within the bounds of a safe work environment and prudent engineering design and operational practices. Northern Gateway confirmed that its processes and policies would remain the same whether the cost risk sharing methodology is in place or not. Northern Gateway said that both the pipeline and Funding Participants are aligned on the need for a safe project and there would not be a reason to shortcut on capital spending.

Depreciation expense:
The facilities installed for the initial start-up would be fully depreciated at the end of 30 years. During the initial 15 years, the annual depreciation rate would be changed annually so that the capital revenue requirement escalates by approximately 2 per cent per year, and achieves an accumulated depreciation of the initial investment in the pipeline facilities of 50 per cent at the end of year 15. For the final 15 years, the depreciation would be charged on a straight-line basis.

Operating expenses would include:
Reasonable costs for labour, supplies, utilities, overhead, rentals, insurance, and capital-related expenditures for maintenance items that are less than $2 million, individually. Costs relating to actions required for environmental issues would be an eligible operating expense if they are not associated with initial construction and completion or abandonment of the pipeline facilities.

Variable power costs:
Expenditures for electricity that are directly associated with pipeline throughput would be included on the shipper's bill as an item separate from the charge for operating expenses. These costs would be billed at a rate equal to the electricity costs Northern Gateway incurred.

Differentiated toll structure:
The tolls that Northern Gateway proposes to charge its shippers are separated into three tiers in which the tolls increase from one tier to the next. The toll differentials are based on the differing commitments of the shippers. The first tier would be made up of Funding Participants who would become Founding Shippers (and also Term Shippers) by signing long-term transportation service

TABLE 11.1 **COST-RISK SHARING ADJUSTMENT TO RATE BASE**

Actual Capital Cost Variance from Class Iii Estimate	Possible Risk-Reward Adjustments to Transporter's Rate Base
15 per cent or less below estimate	(i) Increase the rate base by an amount equal to 25 per cent of the difference between the estimated and actual costs
Less than 85 per cent of estimate	(ii) Increase the rate base by the sum of: 50 per cent of the difference between 85 per cent of the estimated costs and the actual costs plus the adjustment in (i)
Up to 25 per cent more than estimate	(iii) Reduce the rate base by 25 per cent of the difference between the actual costs and the estimated costs
More than 125 per cent of estimate	(iv) Reduce the rate base by the sum of: 50 per cent of the difference between 125 per cent of the estimated costs and the actual costs plus the adjustment in (iii)

agreements. The second tier would be made up of non-Funding Participant Term Shippers. Both categories of Term Shippers would commit to service agreements with a term of 15 years or more. The third tier would be made up of spot or non-term shippers that make no volume and revenue commitments. The revenue from the tolls of the two categories of term shippers (Committed Toll Revenue) would match the total revenue requirement for each pipeline and the revenue from the non-term shippers would be designated excess and distributed to the Term Shippers and Northern Gateway Pipelines Limited Partnership. Table 11.2 summarizes Northern Gateway's differentiated toll structure.

Reserve capacity:
Northern Gateway proposes to provide reserve capacity for non-term shippers on the oil pipeline that equals 5 per cent of term shippers' committed volumes. For the condensate pipeline, this would be 10 per cent. The term shippers' tolls would recover the capital and operating costs associated with the provision of the reserve capacity to non-term shippers.

Excess revenue sharing:
Northern Gateway may collect revenue in excess of Committed Toll Revenue from non-term volumes shipped on reserve capacity or spot capacity, if the latter is available. This excess revenue net of variable electricity costs attributable to the non-term volumes would be distributed among term shippers (75 per cent) and Northern Gateway Pipelines Limited Partnership (25 per cent). If a Direct Owner holds capacity on a pipeline, the 75/25 split would be adjusted to recognize the Direct Owner's rights.

Northern Gateway's illustrative tolls showed that the differentiated toll structure in Table 11.2 created nearly a 1.8 to 1.0 ratio between an uncommitted spot shipper's total toll and the Funding Participant's total toll. This structure, which is part of the toll principles, resulted from negotiations between Northern Gateway and Funding Participants who had executed precedent agreements. Northern Gateway considered the potential shippers that negotiated the tolls to be representative of shippers in all three toll categories. Northern Gateway said that no parties have come forward to oppose the toll principles and three non-Funding Participants (third parties) executed precedent agreements after the original Funding Participants signed. Northern Gateway viewed this as support for the differentiated toll structure.

Northern Gateway said that, throughout its extensive consultations with industry members since 2004, all potential shippers have been provided with an equal opportunity to participate in the same service offerings and to obtain the benefits associated with these service offerings. The process, in Northern Gateway's view, was open and transparent and consistent with subsection 71(1) of the *National Energy Board Act*. Through Northern Gateway's continued solicitation from early 2007 to 2012, third parties had the opportunity and information to become Funding Participants. Seats at the negotiating table were not restricted to the original Funding Participants.

Northern Gateway said that potential shippers have not signed the transportation service agreements yet because they need more information. Specifically, they need to know: when regulatory approval will materialize; the Class III capital cost estimate and the resulting tolls; and the estimated in-service date of the project.

During the hearing, Northern Gateway said that it was opposed to holding a new open season and making the negotiated transportation service agreements open to comment from potential shippers who have not been involved in the Northern Gateway process to date. Northern Gateway was also opposed to increasing the reserve capacity on the oil pipeline to 20 per cent from the proposed 5 per cent. Further, it did not want to increase the reserve capacity on the condensate pipeline above the 10 per cent proposed.

Views of intervenors

The Alberta Federation of Labour expressed concern that shippers who are also equity holders may have a conflict of interest when negotiating tolls and may not strive to get the most competitive tolls possible. The Federation questioned whether such a result may have an undesirable effect on toll negotiations for other pipelines in the country.

The Shippers Group said that the negotiations subsequent to the open season were unique and different from the open season process because new foreign markets requiring tidewater access were involved. These shippers expressed no concern with the spot capacity toll being 77 per cent greater than for the Funding Participant Term Shippers' committed capacity. The Force Majeure provision in Section 15 of the transportation service agreement, that may obligate shippers to pay tolls for up to 12 months in the event of a service interruption, was acceptable to these companies.

TABLE 11.2 **DIFFERENTIATED TOLL STRUCTURE**

Category	Service	Capital Portion of Toll (CT)	Operating Portion of Toll (OT)
Funding Participant (FP) Term Shipper (Founding Shipper)	Term (committed)	CT_1	OT_1
Non-FP Term Shipper	Term (committed)	$CT_2 = CT_1 * 1.25$	$OT_2 = OT_1 * 1.0$
Uncommitted Spot Shipper	Non-Term (spot)	$CT_3 = CT_2 * 1.50$	$OT_3 = OT_2 * 1.50$

These shippers would oppose:

- increasing the spot capacity up to 20 per cent from the 5 per cent proposed by Northern Gateway for the oil pipeline and above 10 per cent for the condensate pipeline;
- making the transportation service agreements available for comment by potential shippers who have not been involved in the Northern Gateway process to date; and
- holding another open season.

Increasing reserve capacity above the 5 per cent level incorporated in the tolling principles would, in the views of the Shippers Group representatives, negatively affect the economics for the committed shippers. They would have to support the costs for this unavailable capacity through tolls and would have access to less firm pipeline capacity. The Shippers Group was concerned that additional reserve capacity would affect the committed shippers' marine shipping logistics. They observed that no prospective shippers appeared in the hearing to demand more reserve capacity.

The Shippers Group said that it was too late to consider another open season or to make the transportation service agreement available for comment by potential shippers that had not been involved in the Northern Gateway process to date.

The Shippers Group representatives said that they would expect the Panel to require them to file executed transportation service agreements before construction starts. They would not commit to these transportation service agreements until they have a definitive Class III cost estimate with the resulting tolls, and know the projected in-service date of the pipelines.

Views of the Panel

Northern Gateway applied for approval of the toll structure and principles for the project under Part IV of the *National Energy Board Act*. The Panel's views apply to the both the oil and condensate pipelines.

The Panel observes that the toll structure and principles were developed through extensive negotiations between Northern Gateway and the Funding Participants over a lengthy period of time well after the open seasons for both pipelines were closed. In a typical open season all parties have the same opportunity and information at the same time to negotiate for pipeline capacity and the terms and conditions for access to that capacity. A successful open season would culminate with shippers executing firm or conditional transportation service agreements.

In contrast, the Funding Participants committed funds for project pre-development work and then negotiated terms and conditions of access, including tolling principles, with Northern Gateway. The Panel notes that Northern Gateway took reasonable steps to implement a process that was inclusive, open and fair and that no potential shipper objected to the negotiating process or its outcome. At the end of the process, all Funding Participants had access to the same information and agreed to a precedent agreement that included a pro forma transportation service agreement for each pipeline. The precedent agreement gives the Funding Participants the option of becoming Founding Shippers if they sign the transportation service agreement. At this time, the Funding Participants have not contracted for pipeline capacity.

The Panel accepts Northern Gateway's proposals for the following tolling principles:

- Term Shippers being responsible for the annual cost of service for each pipeline;
- Forward Test Year;
- Capital Structure;
- Depreciation Expense methodology; and
- all other principles not discussed below.

The Panel's views on the remaining tolling principles follow.

Return on equity:
The Panel accepts Northern Gateway's proposed target return of 11 per cent per annum with no adjustments for cost-risk sharing and 12 per cent if the cost-risk sharing mechanism is accepted by the Supporting Term Shippers. The Panel does not approve of the return being fixed for 30 years regardless of future circumstances that may develop. This return should not be fixed beyond the initial terms of the transportation service agreements. In addition, a system expansion could potentially require a review of the return before the initial terms of the Agreements expire. Further, all shippers have the right to file a complaint with the Board about tolls and tariff matters.

Cost-risk sharing adjustment to rate base for variances between estimated and actual capital costs:
The Panel accepts this adjustment mechanism and its potential effect on return on equity. If this mechanism is applied, the Panel accepts Northern Gateway's commitment to give priority to the safety and reliability of the project during the design, construction, and operation of the project and to not shortcut spending funds that would enhance the project's safety and reliability.

Differentiated toll structure:
The Panel recognizes that this structure is the result of negotiations with Funding Participants who may enter into long-term transportation service agreements with Northern Gateway. Although these negotiating parties may have represented all three shipper categories, there is no evidence that potential shippers who might use the pipeline solely as non-term or spot shippers participated in the determination of the tolls that resulted in the Non-Term Shipper/Funding Participant Term Shipper toll ratio of approximately 1.80 to 1.0. It is unclear at this time whether the Non-Term Shipper toll premium of nearly 80 per cent might become a significant impediment to spot shippers using the system. Accordingly, the Panel directs Northern Gateway to use a monthly auction process to allocate this Uncommitted Non-Term Shipper capacity to spot shippers. Northern Gateway should conduct the auction within a toll range with the upper limit being the total Uncommitted Spot Shipper toll determined by the toll principles used in Table 11.2. The lower limit of the range would be determined in the Part IV proceeding.

Reserve capacity:
Please see the Views of the Panel on reserve capacity in Section 11.4.

The Panel directs Northern Gateway to include in its regular surveillance reports a summary of how this reserve capacity is used, including level of usage by shippers that are solely in the Non-Term Shipper category, pricing with respect to the ceiling and floor, and bid volumes vs. capacity allocated in the auction. The Panel does not accept the view expressed by the Alberta Federation of Labour that the potential shippers who are also potential equity holders may have had a conflict of interest when negotiating the toll principles. The evidence indicated that 10 Funding Participants with diverse interests negotiated with Northern Gateway. The inclusion of the cost-risk sharing mechanism in the toll principles demonstrates the Funding Participants' attempt to put an upper bound on the return on equity and to obtain value for any increase in return above 11 per cent. Also, no potential shippers raised concerns that the negotiating process was unfair or that Enbridge took a dominant position.

Although the negotiating process did not have all the features of an open season, the Panel accepts the results of this process subject to its views and conditions. Using this process, Northern Gateway and potential shippers developed the commercial terms, including toll principles, and Northern Gateway continues to collaborate with these parties to finalize commercial support for the project.

The Panel has attached conditions, including additional monitoring by the Board, to its approval of the toll structure and principles because:

- this project may have the potential to become strategic infrastructure with a national interest;
- this project may result in the first, or one of the first, pipelines to provide high capacity access to Asian markets for Canadian crude oil;
- this project could be a significant and important means by which western Canadian producers are able to access condensate imports;
- no firm transportation service agreements have been executed to date;

- potential shippers said that they will not sign the transportation service agreements until they get more information, which will not be available until after the recommendations in this report are considered by the Governor in Council and a decision is made;
- the precedent agreement does not commit a potential shipper to execute a firm transportation services agreement subject to specific and well defined conditions precedent. Rather, the potential shipper can terminate the Agreement at its sole discretion;
- the negotiating process occurred over an extended period of several years during which time the project scope changed; and
- based on the evidence, the negotiating process did not appear to be as structured and as open as a typical open season process. For example, Northern Gateway's negotiations with individual parties extended over 2 years and all parties did not have access to the same information at the same time throughout the process.

The Panel approves the toll principles subject to its comments and conditions. The Panel is not approving specific tolls that Northern Gateway would charge its shippers. The Panel finds that there is a need to maintain regulatory oversight over Part IV matters in this application because the required data are not available to determine the final tolls and because the potential shippers do not have enough information yet and are not ready to make shipping commitments. Accordingly, the Panel directs Northern Gateway to file an application under paragraph 60(1)(b) of the *National Energy Board Act* with the Board seeking approval for the tolls it will charge its shippers after it has finalized commercial support for the project.

11.4 Capacity allocation and open access

Subsection 71(1) of the *National Energy Board Act* establishes that oil pipelines under National Energy Board jurisdiction are common carriage pipelines. It states:

Subject to such exemptions, conditions or regulations as the Board may prescribe, a company operating a pipeline for the transmission of oil shall, according to its powers, without delay and with due care and diligence, receive, transport and deliver all oil offered for transmission by means of its pipeline.

Oil pipelines are increasingly relying on long-term contracts to support new facility construction. Under this structure, capacity must be allocated in an appropriate manner among firm shippers and uncommitted shippers to ensure that the pipeline continues to comply with its common carrier obligations.

11.4.1 VIEWS OF NORTHERN GATEWAY

11.4.1.1 Open seasons

Northern Gateway said that the project's oil pipeline was announced in early 2004 and an open season seeking expressions of shipper interest was conducted from October through December 2005. Northern Gateway said that the notice of the open season was advertised during October 2005 in several local, regional, national, and international news publications. It said that the open-season package was distributed to 36 companies in North America and the Asia-Pacific region, and to all additional parties that contacted it in response to the public advertisements.

Northern Gateway said that, during 2004, it had become apparent that there could be sufficient support for the construction of a condensate import pipeline concurrently with the oil pipeline. Therefore, it conducted an open season from July through September 2005, seeking expressions of shipper interest in the condensate pipeline. Northern Gateway said that notice of the open season was advertised during June 2005 in several local, regional, national and international news publications and the open season package was distributed to 25 companies and to all additional parties that contacted it in response to the public advertisements.

Northern Gateway said that the oil pipeline open season resulted in 15 parties submitting non-binding requests totaling 183,600 cubic metres (1,155,000 barrels) per day of service, and the condensate pipeline open season resulted in 12 parties submitting non-binding requests totaling 42,000 cubic metres (264,000 barrels) per day of service.

Northern Gateway acknowledged that several of the key project parameters contained in the open season offerings including pipeline capacity, capital cost and toll estimates and in-service date, had changed in relation to the applied-for facilities. Northern Gateway maintained that the application reflects fundamentally the same concept of providing for high volume oil export capacity and condensate imports. Northern Gateway said that it did not consider holding a second open season based on the changed parameters, electing instead to develop funding support agreements with the

open season participants and other third parties. Northern Gateway confirmed that none of the terms of the Funding Support Agreement and the preferential rights were included or described in the 2005 open season package materials provided to potential shippers.

11.4.2 FUNDING SUPPORT AGREEMENTS

Northern Gateway said that the open season processes held in 2005 yielded considerable expressions of interest for the oil pipeline and the condensate pipeline. Regulatory uncertainty was a significant concern for prospective shippers, and was a barrier to securing shipping commitments. The anticipated cost of resolving the regulatory uncertainty associated with a greenfield project to the west coast was a significant obstacle for Enbridge, as the sole project sponsor. Northern Gateway said that it ultimately concluded that obtaining regulatory approval for the project was necessary before prospective shippers would be willing to enter into long-term shipping commitments and that additional financial support for project development was required.

Northern Gateway said that, between early 2007 and 2008, it approached prospective shippers that had been identified through the open season processes and others to determine whether they would provide financial support to partially fund predevelopment activities. Northern Gateway said that, as a result, it successfully placed 10 $10 million units with a combination of Canadian oil producers and Asian market area interests (the Funding Participants).

Northern Gateway said that, for each $10 million unit of initial financial support to the project, a Funding Participant (under certain terms and conditions):

- received an option to secure up to 7,949 cubic metres (50,000 barrels) per day of capacity on the oil pipeline at the oil pipeline Founding Shipper toll;
- received an option to secure up to 2,782 cubic metres (17,500 barrels) per day of capacity on the condensate pipeline at the condensate pipeline Founding Shipper toll;
- received an option to acquire up to 4.9 per cent equity or ownership in the project (later reduced to 4.41 per cent as a result of Aboriginal Equity ownership); and
- would receive its pro rata share, in the form of a credit for future transportation, of 75 per cent of any revenue collected by Northern Gateway in excess of the toll revenue collected from term shippers.

Northern Gateway said that a Funding Participant's option to acquire equity is independent from its decision to become a shipper. MEG Energy was identified as the only Funding Participant with a further option to purchase its equity in the form of direct ownership of portions of the asset. Northern Gateway said that this direct ownership option could be as high as 13.23 per cent with firm capacity on the pipelines equal to its ownership. According to the terms of the pro forma transportation service agreements, the direct owner capacity would not be operated as a common carrier. The Direct Owner would put up its share of the reserve capacity for uncommitted shippers. As of late 2012, neither the equity agreement nor the direct ownership agreement had been finalized.

Northern Gateway said that the structure of the commercial arrangements with the Funding Participants prevented it from issuing additional units to potentially interested third parties after the initial placement of the 10 units. It said that the option to become a Funding Participant was open until early 2012, by way of Funding Participants that were seeking to sell a portion of their interest. Northern Gateway said that two third parties came forward and became Funding Participants. Northern Gateway said that, in addition, two-third parties expressed interest in becoming Funding Participants but could not be accommodated because, as of mid-2012, the Funding Participants were no longer seeking to sell their units.

Northern Gateway said that, as of late 2012, there were 10 Funding Participants with various levels of units held. At that point in time, the Funding Participants continued to fund predevelopment activities beyond their initial commitment and had contributed about $140 million in aggregate.

11.4.3 PRECEDENT AGREEMENT AND PRO FORMA TRANSPORTATION SERVICE AGREEMENT

In August 2011, Northern Gateway said that both the crude oil and condensate pipelines had been fully subscribed for long-term transportation service through shipper-executed precedent agreements. Northern Gateway filed copies of the pro forma precedent agreement and transportation service agreement for both the crude oil export pipeline and the condensate import pipeline. Northern Gateway said that it holds executed precedent agreements for 15,900 cubic metres (100,000 barrels) per day in

excess of the proposed contractible capacity of the oil pipeline and 1,590 cubic metres (10,000 barrels) per day in excess of the proposed contractible capacity of the condensate pipeline.

Northern Gateway confirmed that the precedent agreements are non-binding in that they do not obligate any shipper to execute a transportation service agreement unless the shipper has received, at its sole discretion, the necessary internal approval of its senior management or board of directors, as the case may be. Northern Gateway said that, before potential shippers can execute the transportation services agreement, they will need to understand when regulatory approval will materialize, the Class III capital estimate and the resulting toll, and the potential in-service date. Northern Gateway said that it is possible, but not the intent, that the transportation service agreement be renegotiated at a later date.

Table 11.3 provides a summary of the capacity contracted under the precedent agreements for both the oil and condensate pipelines.

Northern Gateway said that the negotiating process for these agreements took place between 2009 and mid-2011, and, although discussions focused on the Funding Participants, seats at the negotiating table were not restricted to the original Funding Participants. It said that, through the application filed in May 2010 and continued solicitation for more Funding Participants through 2012, third parties had the knowledge and opportunity to participate.

Northern Gateway said that the option to enter into a precedent agreement remains open, and that it was encouraging parties to do so. Under the terms of both the oil and condensate pipeline precedent agreements, firm service on the pipelines could only be obtained to the extent that current Funding Participants did not provide letters of support to Northern Gateway to fund the technical studies (e.g. the Class III capital cost estimate). If a Funding Participant failed to deliver a letter of support, that capacity option would be first offered to the remaining Funding Participants. If all Funding Participants provided letters of support, and subsequently executed transportation service agreements for their full option volume, third party holders of precedent agreements would not have the opportunity to obtain firm service via the execution of a transportation services agreement.

Under the terms of the both the pro forma oil and condensate pipeline transportation service agreements, any party can request that capacity be made available by providing a backstopping agreement to fund the necessary technical studies and feasibility assessment. If a request were to be made, Northern Gateway would first seek to provide the capacity by way of Funding Participants holding firm capacity who may wish to release all or a portion of their term volume commitment, followed by other firm shippers. In the event that there were capacity requests from Funding Participant firm shippers, term shippers and non-term shippers exceeding turn back volumes, requests from Funding Participant firm shippers would be satisfied first, followed by other term shippers, and, finally, non-term shippers, each on a pro rata basis. If there were unallocated volumes remaining, Northern Gateway would then consider a capacity expansion, subject to the requesting parties providing satisfactory backstopping agreements. Northern Gateway said that, as of late 2012, the form of the backstopping agreement had not yet been developed.

11.4.4 RESERVE CAPACITY

Northern Gateway said that the two pipelines have been designed to provide the capacity necessary to efficiently transport term shippers' committed volumes. In addition, Northern Gateway said that the oil pipeline would provide 3,975 cubic metres (25,000 barrels) per day of reserve capacity, which is equal to 5 per cent of the term shippers' committed volume of 79,500 cubic metres (500,000 barrels) per day, and the condensate pipeline would provide 2,780 cubic metres (17,500 barrels) per day of reserve capacity, which is equal to 10 per cent of the term shippers' committed volume of 27,820 cubic metres (175,000 barrels) per day.

In determining the amount of reserve capacity for each pipeline, Northern Gateway said that it considered the incremental cost of providing reserve capacity and the associated financial risk to Northern Gateway and its term shippers, as well as the practical limitations of the marine terminal operations related to available tankage. Regarding the latter, it said that a monthly nomination for the reserve capacity on the oil pipeline would be sufficient to accommodate one cargo movement per month. Non-term shippers would also have the option to purchase additional oil supplies at Kitimat from other Northern Gateway shippers, if they wished to increase the size of their cargo. Northern Gateway said that, in addition, in any given month, the amount of pipeline capacity available

TABLE 11.3 **ENBRIDGE NORTHERN GATEWAY PROJECT CONTRACTED CAPACITY**

	Oil Pipeline (cubic metres/day [barrels/day])	**Condensate Pipeline** (cubic metres/day [barrels/day])
Capacity	83,500 [525,000]	30,600 [193,000]
Funding Participant PA volume	67,900 [427,000]	23,700 [149,000]
Direct Owner PA volume potential	10,500 [66,000]	3,660 [23,000]
Third party PA volume	15,900 [100,000]	1,590 [10,000]
Total PA Volume	94,300 [593,000]	28,900 [182,000]

NOTE: PA – precedent agreement

to non-term volumes could exceed the reserve capacity if a term shipper did not nominate its full committed volume or if ambient factors were to result in more available capacity on the pipeline.

Northern Gateway said that, based on the anticipated pricing benefits in the Asian market and the fact that term shippers would be making binding take or pay commitments, spot capacity made available from unutilized term volumes would likely be relatively low and utilization of reserve capacity on the oil export pipeline would likely be high.

Potential Condition 10(e) would have required Northern Gateway to increase the level of reserve capacity for uncommitted shippers on the oil pipeline to 10 per cent of the average annual capacity as part of its future tolls application. Northern Gateway commented that the Canadian Association of Petroleum Producers and a number of sophisticated shippers active in the proceeding did not express concern with establishing reserve capacity of 5 per cent.

11.4.5 CARRIER STATUS

Northern Gateway said that, through its total service offering, it has conducted itself in a fair, open, and transparent manner consistent with the requirements of subsection 71(1) of the *National Energy Board Act*.

Northern Gateway said that it conducted open seasons that enabled all interested parties to make informed decisions regarding whether they would participate in the service offerings. Northern Gateway said that it also engaged in extensive consultations with all interested parties since 2004 in a continued offering of service. It said that, throughout this time, all potential shippers were provided with an equal opportunity to participate in the service offering and to obtain the benefits associated with the offering. In addition, capacity would be made available for uncommitted shippers on the two pipelines.

Views of the intervenors

Cenovus Energy Inc., INPEX Canada Ltd., Nexen Inc., Suncor Energy Marketing Inc., Total E&P Canada Ltd.

The Funding Participants said that, during the proceeding, no party expressed a concern with regard to the proposal to reserve 5 per cent of nominal capacity for non-term shippers on the oil export pipeline. It said that there is no basis upon which Northern Gateway should be required to reserve a minimum of 10 per cent of the oil pipeline's nominal capacity for non-term shippers. It said that a change to the amount of reserve capacity for non-term shippers may have an inadvertent impact on the toll principles, as shippers holding the contracted volumes are required to pay the oil and condensate pipelines' annual revenue requirement, with revenue from non-term shippers being shared by Northern Gateway and contract shippers.

MEG Energy Corp. (MEG)

MEG said that the proposed increase in reserve capacity from 5 per cent to a minimum of 10 per cent could have significant negative economic implications for Funding Participants' future involvement in the project. MEG said that, through the Funding Support Agreements, the Funding Participants made significant financial commitments based on an understanding of what they would be entitled to in return. It said that an increase in the reserve capacity necessarily decreases the volume available for each Funding Participant's option to reserve firm capacity on the pipelines pursuant to transportation service agreements. MEG said that no party intervened in the proceeding in respect of the level of reserve capacity.

Alberta Federation of Labour

The Alberta Federation of Labour suggested that the opposition by the Funding Participants to the Panel's potential condition proposing an increase in reserve capacity for non-term shippers from 5 per cent to 10 per cent makes the project sound like a private pipeline.

Views of the Panel

The Panel notes Northern Gateway's position that it has, through its total service offering, conducted itself in a fair, open, and transparent manner that is consistent with the requirements of subsection 71(1) of the *National Energy Board Act.* The Panel also notes that no shipper intervened in the proceeding and took the position that Northern Gateway would not be meeting its obligations as a common carrier.

In past decisions, the National Energy Board has found that an oil pipeline offering firm service acts in a manner consistent with its common carrier obligations when an open season is properly conducted and where sufficient capacity is left available for monthly nominations by non-term shippers. The Board has sometimes also considered whether the facilities are readily expandable.

The open seasons conducted by Northern Gateway in 2005 did not result in binding or conditional commitments for transportation service. Most of the project parameters included in the open seasons, such as pipeline capacities, capital cost estimates, estimated tolls, and in-service date changed in relation to those contained in the application, and further changes appear to be possible. Moreover, the concept of the Funding Support Agreements and the rights and obligations relating thereto were not part of the open season processes. The Panel is of the view, therefore, that there is no clear link between the open seasons and the development of the Funding Support Agreements, and the subsequent negotiations between the Funding Participants and Northern Gateway resulting in the precedent agreements and pro forma transportation service agreements.

The Panel notes that both the oil and condensate pipelines have been fully subscribed by the Funding Participants for long-term service under the precedent agreements. These agreements do not require the Funding Participants to execute firm transportation service agreements to ship oil or condensate, or pay the tolls for the capacity option that they hold. Accordingly, it is possible that Funding Participants, in whole or in part, would not enter into firm transportation service agreements with Northern Gateway. The Panel is of the view that this could affect the amount of capacity available for other shippers to access the facilities, either on a committed or uncommitted basis. It could also potentially affect the terms of access.

If all the Funding Participants execute transportation services agreements for their full option volumes, no other shipper would be able to gain firm access to capacity on either pipeline by way of executing a precedent agreement or transportation service agreement. The option volume rights were part of a package granted to the Funding Participants which were secured in exchange for sharing the costs of project predevelopment, which, as of late 2012, were about $14 million per unit. This differs from the typical exchange wherein the granting of firm access on common carrier oil pipelines has been justified because it was valuable to shippers whose financial support was required to underpin the substantial capital costs of commercially at-risk infrastructure. The Funding Participants have not, to date, committed to underpin the significant capital costs of the Enbridge Northern Gateway Project. The Funding Participants collectively hold the option to secure the entire contractible capacity on both the oil and condensate pipelines, and, therefore, the Funding Participants control access to the system. The Panel notes Northern Gateway's evidence that it holds executed precedent agreements for 15,900 cubic metres (100,000 barrels) per day in excess of the proposed contractible capacity of the oil pipeline and 1,590 cubic metres (10,000 barrels) per day in excess of the proposed contractible capacity of the condensate pipeline. Northern Gateway said that the option to enter into a precedent agreement remains open and it is encouraging parties to do so.

Under the terms of the pro forma transportation service agreements for both the oil and condensate pipelines, any party can request that capacity be made available by providing a backstopping agreement to fund the necessary technical studies and feasibility assessment. If there were competing requests for firm capacity which exceeded available existing capacity on either the oil or condensate pipelines, Funding Participants would be given priority in acquiring the available capacity. In such a case, Northern Gateway would consider a

system expansion to accommodate the unallocated volumes, subject to satisfactory financial backstopping agreements being in place. The Panel notes that the backstopping agreement, which presumably would need to be in place to trigger such an application, has not yet been developed. The Panel is of the view that the form of the backstopping agreement could potentially have implications for pipeline access.

The Panel notes Northern Gateway's proposal that the oil pipeline would provide 3,975 cubic metres (25,000 barrels) per day of reserve capacity, which is equal to 5 per cent of the term shippers' committed volume of 79,490 cubic metres (500,000 barrels) per day, and that the condensate pipeline would provide 2,780 cubic metres (17,500 barrels) per day of reserve capacity, which is equal to 10 per cent of the term shippers' committed volume of 27,820 cubic metres (175,000 barrels) per day. The Panel is of the view that, if constructed, the oil export pipeline, in providing access to Pacific Basin markets, would be a significant and strategic addition to the western Canadian pipeline system overall. In the Panel's view, it would provide producers with valuable flexibility in their transportation options and allow for the development of a significantly broader range of customers. From a public interest perspective, these factors would, in the Panel's view, suggest that the uncommitted reserve capacity proposed by Northern Gateway be increased.

The Funding Support Agreements provide the right to the Funding Participants to acquire equity in the project commensurate with the option volume they hold, which is in turn determined by the number of units held. MEG holds a further option to purchase its equity in the form of direct ownership of portions of the asset. The direct ownership option could be as high as 13.23 per cent, with firm capacity on the pipelines equal to its ownership. The direct owner capacity, as contemplated by Northern Gateway, would not be operated as a common carrier. The equity agreement and the direct ownership agreement have not yet been negotiated. In the Panel's view, the form of these agreements, and the extent to which the Funding Participants elect to exercise their options, could potentially have implications for pipeline access.

The *National Energy Board Act* does not define or use the term common carrier, nor does it establish whether, and if so under what circumstances, priority access may be granted on an oil pipeline. Taken together with section 67, subsection 71(1) requires an oil pipeline to offer service under the same terms and conditions to any party wishing to ship on an oil pipeline. This obligation to provide open access to an oil pipeline is fundamental to the granting of a certificate to construct and operate an oil pipeline. Given the unique process undertaken by Northern Gateway to develop commercial support for the project, and the uncertainties identified in the foregoing discussion, the Panel finds that it would, at this time, be premature to determine whether Northern Gateway would operate in a manner consistent with its common carrier obligations. The Panel finds that it would be appropriate to consider Northern Gateway's common carrier status when it has finalized the commercial support for the project. In this connection, the Panel is of the view that this should occur when Northern Gateway seeks National Energy Board approval under Part IV of the *National Energy Board Act* for the tolls that it intends to charge on the pipelines. In this regard, in Conditions 22 and 23, the Panel has identified the information that Northern Gateway must include in its toll application.

The Panel has decided to remove the former part e) of Potential Condition 10, which would have required Northern Gateway to set aside a minimum of 10 per cent of the average annual capacity of each pipeline as reserve capacity for uncommitted shippers. As discussed, for oil pipelines operating as common carriers, capacity must be properly allocated between committed and uncommitted shippers, and this would be most appropriately considered when the commercial arrangements for the project have been finalized. Based on the evidentiary record of this proceeding, the Panel continues to be of the view that meaningful access for uncommitted shippers to a system of the scale and strategic importance of Northern Gateway would entail reserve capacity for both the condensate import and the oil export pipelines of not less than 10 per cent.

11.5 Tariff matters

Section 58.5 of the *National Energy Board Act* describes a tariff as a schedule of tolls, terms and conditions, classifications, practices or rules and regulations applicable to the provision of a service by a company and includes rules respecting the calculation of tolls.

Northern Gateway's pro forma precedent agreement, pro forma transportation services agreement, and the pipeline toll principles cover tariff-related matters. Some of the tariff-related topics are: calculation and payment of tolls, pipeline and shipper obligations and liabilities, financial assurances from shippers, term of transportation services agreement and termination of the agreement, capacity apportionment, pipeline expansion capacity allocation, shipper audit rights, and Force Majeure conditions.

These terms and conditions would affect the basis on which both potential shippers that have signed precedent agreements and potential shippers without contractual arrangements would get access to pipeline services. For a common carrier pipeline these terms will determine if Northern Gateway's transportation capacity would be available on an open access basis.

Views of Northern Gateway

In its application Northern Gateway said:
The tariffs applicable to the operation of the pipelines will be described in Rules and Regulations published separately for the oil pipeline and the condensate pipeline. These Rules and Regulations will apply to Term Shippers and Non-Term Shippers. Provisions that are not operational in nature, such as financial assurances and invoicing, will be addressed in:

- the transportation service agreement for Term Shippers; and
- published Terms of Service for Non-Term Shippers.

Views of the Panel

Northern Gateway's approach to tariff documentation would result in the tariff's terms and condition being distributed throughout multiple documents. One of Northern Gateway's obligations as a common carrier is to provide service with reasonable terms and conditions and to make these terms and conditions available to all categories of shippers and potential shippers in a clear and orderly way. The Panel must ensure that there is open access to these pipelines as required by the *National Energy Board Act*. To achieve this, the Panel directs Northern Gateway to prepare a single document that includes all tariff-related matters.

Fairness requires that prospective shippers know the terms of access to a pipeline in advance of contracting for capacity. This knowledge will allow market participants to make informed supply, market, and transportation decisions, which will contribute to the efficient functioning of the petroleum market.

The Panel notes that the precedent agreement and the pro forma transportation service agreement convey several benefits to the Founding Shippers. These benefits include significantly lower tolls than the other categories of shippers and priority rights to pipeline capacity. It is the Panel's view that the topics for the List of Issues to be considered during the Part IV proceeding should include Northern Gateway's assessment of how the Founding Shippers' priority rights to the initial allocable capacity and future capacity releases and expansions result in no unjust discrimination in service or facilities as required by section 67 of the *National Energy Board Act.* The Panel is also of the view that the List of Issues should require Northern Gateway to demonstrate that the terms of access to transportation capacity for potential shippers satisfy subsection 71(1) of the *National Energy Board Act.*

11.6 Financial assurances

Pipeline operations, emergency preparedness and response, and the consequences of oil or condensate spills were dominant issues in this proceeding. Northern Gateway proposed several enhancements to reduce the risk of a hydrocarbon spill from its pipelines and the Kitimat Terminal. Even with these measures, some parties continued to have a concern that some risk of a large oil spill with catastrophic consequences would remain. This prompted parties to inquire about Northern Gateway's financial capability to manage the costs and liabilities associated with this risk that may cause damage to persons and the environment. Intervenors were looking for assurances from Northern Gateway that would demonstrate it has adequate financial resources to manage the consequences of a spill from the pipelines and the Kitimat Terminal. As a result, Northern Gateway was asked to prepare a financial assurances plan. Funds from this plan would be used to cover costs in the event of a spill from these facilities. It would not apply to spills from tankers offshore because these are covered under Canada's *Marine Liability Act*.

During the hearing most of the financial assurances submissions focused on the impacts and estimated cost of a large hydrocarbon spill, and Northern Gateway's financial capability to manage the resulting damages and costs.

What are financial assurances?

Financial assurances demonstrate that the pipeline operator has sufficient financial means or financial instruments in place to cover the costs of cleanup, damages, remediation, and liabilities that may arise from potential malfunctions, accidents, and failures during the operation of the pipeline. This comprises all large oil spills originating from the oil and condensate pipelines and tank and terminal facilities connected to the pipelines, including spills that have the potential of being catastrophic events.

NORTHERN GATEWAY'S SUBMISSIONS

Northern Gateway said in its application that the operator of a pipeline is responsible under statutory and common law for operating the pipeline in a safe and responsible way. Various federal and provincial statutes, including the *National Energy Board Act*, identify Northern Gateway's liability for prevention, cleanup, and remediation of an incident such as an oil spill. Northern Gateway said in the "unlikely event" of a spill it would implement measures to identify and remediate damage caused and address property loss and personal injury compensation claims fairly and efficiently. Northern Gateway acknowledged that it cannot give complete assurance that a large spill would not occur and that it would not be larger than average. Further, it expects that there could be a scenario where the spill costs may exceed the insurance coverage for a spill. Northern Gateway recognized that risk cannot be eliminated entirely. Regardless of whether or not insurance covers losses and liabilities of Northern Gateway and/or third parties, Northern Gateway said that it would cover the costs of the damages caused by a spill from the project's facilities.

Estimated cost of an oil spill

Northern Gateway said that the environmental and social consequences of a spill and related cleanup costs would depend on a combination of factors such as:

- type of hydrocarbon spilled;
- spill location characteristics including weather, and land and water flow regimes affecting the oil;
- volume of oil spilled;
- spill mitigation and restoration initiatives; and
- proximity to sensitive areas.

These factors result in each spill being unique and the costs being highly variable. Northern Gateway said that it would not be possible to predict the cost of any single spill accurately because of the interaction of these biophysical factors. In its reply evidence, Northern Gateway presented supplementary information that provided a basis for estimating the upper bound of average expected spill costs.

To simplify the complexities resulting from the interaction of these factors, Northern Gateway adopted the convention of estimating the costs of spills for a range of spill volumes and a range of unit costs ($ per barrel or $ per hectare). Northern Gateway separated the costs into:

i. cleanup; and
ii. environmental goods and services (EGS) costs.

Cleanup costs would be the direct, out-of-pocket costs for spill response and remediation. Environmental goods and services costs have less certainty than cleanup costs and may consist of damages arising from the losses of environmental goods and services such as waste treatment, erosion control, water regulation, pollination, biological control, subsistence food production services, and recreation.

The following equation summarizes Northern Gateway's approach to estimating spill costs:

Total cost of a spill = spill volume x (cleanup cost per barrel + environmental goods and services cost per barrel)

To derive an expected annual cost from the estimated spill costs in the above equation, Northern Gateway multiplied these costs by the estimated probability of occurrence of a spill in 1 year. Combining total spill cost with the probability of occurrence resulted in an expected cost or an overall estimate of risk.

The cost expectations approach relies on estimated average values of spill volumes, damages caused by the spill, cleanup costs, and recovery periods. The expected cost represents the average value of a range of possible outcomes. Northern Gateway said that its use of average, rather than median, values in its calculations tended to increase the expected spill costs. Northern Gateway said that it has erred on the side of over-estimating environmental costs and that the average expected spill costs are upper-bound estimates. It said that both the spill volumes and the financial costs of spills in its supplementary information are treated as average expected values and fall on the high end of the values found in the survey of literature and industry experience.

Northern Gateway identified two categories of spills, based on spill quantity:

- full-bore ruptures that would release a large volume of petroleum product; and
- leaks involving small volumes.

Northern Gateway said that large spills may have low probability of occurring and would have impacts with high total costs. It said that small spills may be more frequent and would have impacts with lower total costs. In the context of developing relevant financial assurance plans, this hearing focused on large volume spills.

Table 11.4 summarizes the range of estimated spill volumes from each pipeline for a full-bore rupture and a leak. One source for these volumes was Northern Gateway's semi-quantitative risk assessment. This assessment identified the risks of a full-bore oil pipeline rupture and the potential spill quantities along the entire length of the pipeline route.

Northern Gateway said that its estimated spill volumes, costs, and probabilities of spill occurrence were based on consideration of relevant literature, Enbridge's experience with eight oil spill incidents between 2001 and 2011, four oil spill cases in Alberta and British Columbia between 2000 and 2011, and its pipeline semi-quantitative risk assessment. It said that the literature survey was broadly scoped and helped inform its analysis and selection of values for spill volumes, costs, and probability of occurrences. Northern Gateway said that Enbridge's experience with 8 oil spill incidents between 2001 and 2011 indicated that costs averaged about $62,900 per cubic metre ($10,000 per barrel) for all spills and about $15,700 per cubic metre ($2,500 per barrel) for 6 spills excluding the Marshall, Michigan spill and 1 other incident. Regarding the Marshall spill, the U.S. National Transportation Safety Board estimated that over 3,180 cubic metres (20,000 barrels) of oil spilled from Enbridge's Line 6B into a Michigan wetland in July 2010. As of the summer of 2012 the cleanup costs exceeded $767 million.

The key data for the four spills in Alberta and British Columbia between 2000 and 2011 are summarized in Table 11.5.

Northern Gateway's evidence showed that, although the cost information for some of these spill incidents is incomplete, the cleanup cost for the Plains Rainbow spill was about $15,725 per cubic metre ($2,500 per barrel). Its data showed that the cleanup and damage costs for the Lake Wabamun spill are estimated to be slightly over $189,000 per cubic metre ($30,000 per barrel). This high unit cost is attributed to the high values of the lake front property affected by the spill

TABLE 11.4 **ESTIMATED SPILL VOLUMES** (From Northern Gateway's evidence)

Source of Data	Spill Cause	Oil Pipeline	Condensate Pipeline
Northern Gateway analysis – expected average size	Full-bore rupture	2,238 cubic metres (14,100 barrels)	823 cubic metres (5,183 barrels)
Northern Gateway SQRA studies	Full-bore rupture	986 to 5,227 cubic metres (6,200 to 32,900 barrels) with median value of 2,104 cubic metres (13,200 barrels)	N/A
D.T. Etkin, US EPA-modelling of oil spill response and damage costs	Full-bore rupture	1,890 to 3,785 cubic metres (11,900 to 23,800 barrels)	382 to 1,890 cubic metres (2,400 to 11,900 barrels)
Northern Gateway analysis – expected average size	Leak	95 cubic metres (600 barrels)	95 cubic metres (600 barrels)
D.T. Etkin, US EPA-modelling of oil spill response and damage costs	Leak	38 to 380 cubic metres (238 to 2,380 barrels)	38 to 380 cubic metres (238 to 2,380 barrels)

and the lake's important recreational role for the residents. Northern Gateway considered the high costs of the Marshall, Michigan spill, which were at least $252,000 per cubic metre ($40,000 per barrel), to be an outlier or a rare event because the spill occurred in a densely populated area, because the pipeline's response time was abnormally long, and because there was the prospect of potentially lengthy legal proceedings.

Northern Gateway's semi-quantitative risk assessment provided an estimate of the likelihood and consequences of various spill scenarios along the oil pipeline right-of-way. This risk assessment was based on several premises, including:

- a full-bore oil pipeline rupture with a maximum release volume at a throughput of 92,690 cubic metres (583,000 barrels) per day;
- the release of diluted bitumen (dilbit);
- a 10-minute spill detection time followed by 3-minute valve closing time.

Northern Gateway said that the semi-quantitative risk assessment focused on pipeline ruptures because they would have the most extreme consequences. It said that the hazards and threats that could cause a full-bore rupture include:

- internal and external corrosion;
- manufacturing and construction defects;
- incorrect operations and equipment failure;
- third party damage; and
- geotechnical and hydrological threats.

Northern Gateway said that the semi-quantitative risk assessment provided estimates of spill volumes and likelihood of a major spill in high consequence areas within the 1-kilometre-wide Project Effects Assessment Area and other high consequence areas outside this 1-kilometre-wide area. High consequence areas outside the project area include: parks, urban areas, Indian Reserves, wildlife habitat, watercourses, and water intakes. The Fraser, Kitimat, and Skeena drainage areas are examples of high consequence areas. The failure frequency of the pipelines was estimated from reliability methods and expert judgement. The consequence of a spill includes consideration of the magnitude of the spill volume, the extent of the spread of a spill, and the sensitivity of the spill area to an oil spill event.

The model used in the semi-quantitative risk assessment divided the pipeline into 1-kilometre-long segments, which in turn were separated into 20 segments that were each 50 metres long. This resulted in 23,000 elements, and the modelling and analysis of 23,000 hypothetical spills. Within each one-kilometre segment the largest rupture volume of the 20 elements was taken as the expected rupture volume. With the selection of the largest of the 20 values in each 1-kilometre-long segment, Northern Gateway determined that the average size of spill on the oil line would be greater than the average of the 23,000 hypothetical spills evaluated along the 1,178-kilometre-long pipeline route. Figure 11.2 summarizes the oil spill volumes generated in the semi-quantitative risk assessment

TABLE 11.5 **OIL SPILLS IN ALBERTA AND BRITISH COLUMBIA BETWEEN 2000 AND 2011**

Year	Spill Description	Volume of Spill	Spill Environment	Spill Costs
2000	Pine River crude oil spill in near Chetwynd, British Columbia	985.72 cubic metres, or 6,200 barrels	Land and fresh water	• $26 million for cleanup & restoration • $5 to 6 million for third party economic loss
2005	Lake Wabamun bunker oil spill from freight train near Whitewood Sands, Alberta	695.57 cubic metres, or 931 barrels	Land and fresh water	• $87 million in cleanup, mitigation, and remediation • $45.3 million for third party claims
2007	Trans Mountain spill of heavy synthetic crude oil into Burrard Inlet	238.48 cubic metres, or 1,500 barrels	Marine	• $15 million in environmental mitigation, remediation, and restoration • Third party damages not known
2011	Plains Rainbow crude oil spill northeast of Peace River, Alberta	4,451.64 cubic metres, or 28,000 barrels	Remote, densely forested muskeg	• $70 million in cleanup and remediation

simulations. The estimated oil release volumes ranged from 986 to 5,227 cubic metres with a median volume of 2,104 cubic metres.

The semi-quantitative risk assessment did not generate an estimate of economic losses caused by a spill. Northern Gateway relied on its analysis of literature, and spill events experienced by Enbridge and other liquid hydrocarbon carriers in Alberta and British Columbia. After assessing all of this information, Northern Gateway proposed spill parameters, estimated oil spill costs, and the probabilities of a spill occurring. These are summarized in Table 11.6.

Northern Gateway said that the return period is the average interval between events, over an extended period of time. Annual probability is the inverse of the return period.

Northern Gateway regarded the costs in the summary Table 11.6 as conservative (i.e., high). In Northern Gateway's view the most costly pipeline spill incident would be a full-bore oil pipeline rupture, with an estimated cost of $200 million, and an extremely low probability of occurrence.

NORTHERN GATEWAY'S FINANCIAL RESOURCES

Northern Gateway identified the following potential financial resources that could play a role in in meeting its obligations in event of a spill:

- assets of about $8 billion;
- annual cash flow of $400 million;
- Force Majeure provisions in Article 15 of the pro forma transportation services agreement, which would obligate shippers to pay the full toll for up to 12 months under shutdown or reduced flow conditions on the pipeline;
- under the toll principles (Paragraph 7(g)) that are part of the pro forma transportation service agreement, shippers would commit to accepting an increase in tolls, to collect additional revenue to pay for cleanup costs along the right-of-way, if additional funds were needed;
- business interruption insurance; and
- stand-alone third party liability insurance.

Northern Gateway said that its asset base would generate $400 million of annual cash flow during normal operations and may facilitate borrowing arrangements. Its pro forma financial statements show that the annual cash flow of approximately $400 million is before dividend payments. These statements also show that the dividend payments are 100 per cent of the net income. Northern Gateway acknowledged that the dividend payments may be greater than the net income providing there is compliance with limited partnership and accounting obligations. The company said that if there were an incident involving a spill, the payouts to the equity investors would be reduced so that obligations arising from the spill would be met first.

Although Northern Gateway said that it would arrange for stand-alone, third party liability insurance of $250 million to cover damages in the event of an oil spill, it said that insurance details should be addressed later after detailed engineering is completed.

Northern Gateway said that losses and claims in excess of liability insurance payouts could be funded by:

- cash flow from operations;
- the issuance of debt, commercial paper, and/or credit facility draws;
- expected future access to capital markets; and
- the sale of assets.

Northern Gateway said that it would put a financial facility in place to pay bills while insurance claims are being processed. It said that it would have access to sufficient resources to cover cleanup and compensation costs. In the event that Northern Gateway cannot meet its financial obligations it would not have access to Enbridge's financial resources in excess of Enbridge's equity investment in the project. Enbridge is not prepared to consider an ownership structure that would result in Enbridge assuming more financial risk than its ownership share in the project.

Northern Gateway committed to investing $500 million in additional facilities and mitigation measures such as thicker wall pipe, more block valves, more in-line inspections, and complementary leak detection systems to enhance the reliability of the system and reduce the risk of a spill. In Northern Gateway's view these measures are a form of insurance that would reduce the need for liability insurance.

FIGURE 11.2 **MAP SHOWING THE PIPELINE ROUTE WITH HYDROLOGIC ZONES AND CORRESPONDING GRAPH OF OIL SPILL VOLUMES FROM SEMI-QUANTITATIVE RISK ASSESSMENT SIMULATIONS FOR THE OIL PIPELINE**

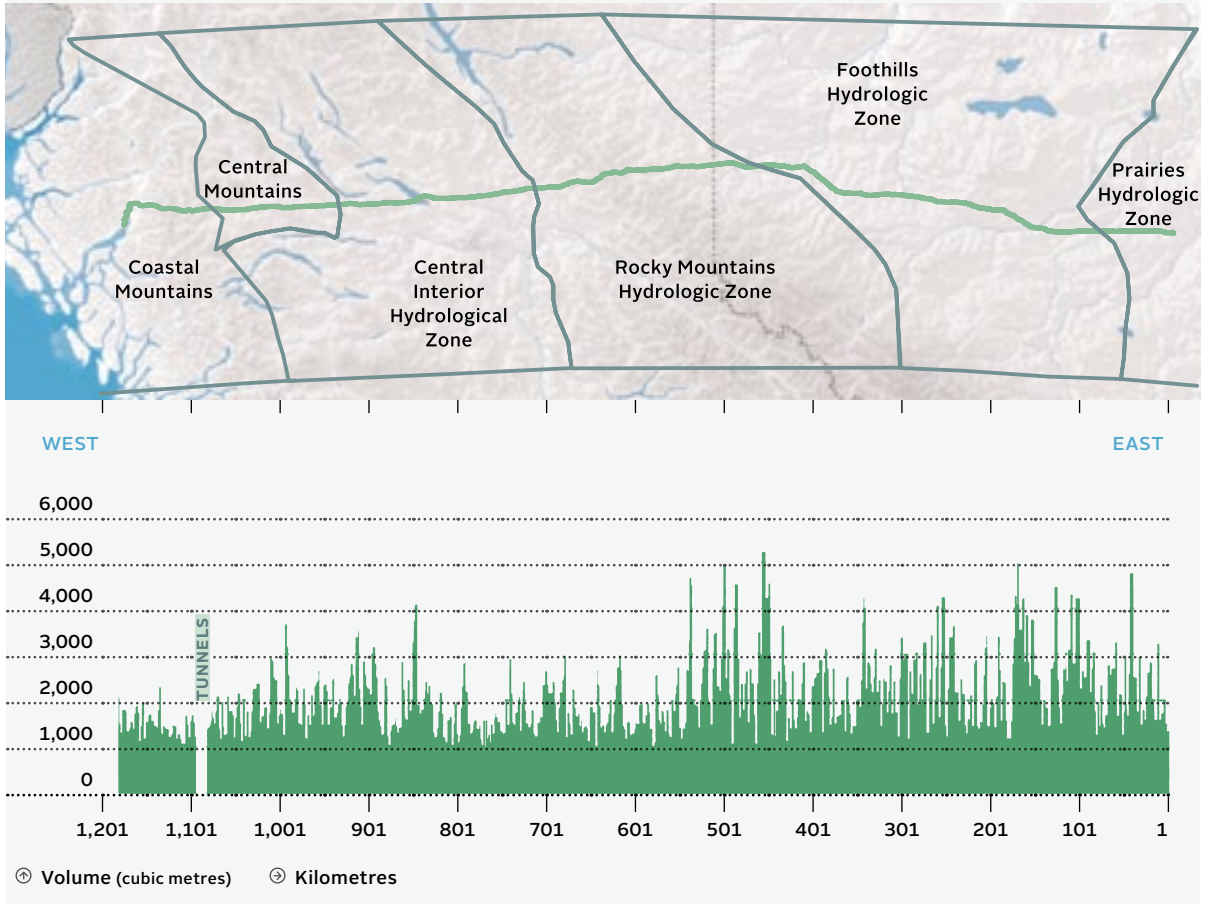


TABLE 11.6 **NORTHERN GATEWAY'S SUMMARY OF REPRESENTATIVE PARAMETERS FOR OIL SPILL COST CALCULATIONS**

Spill Parameter	Marine Terminal Spill	Oil Pipeline, Full-Bore Rupture	Oil Pipeline, Other Spills
Mean Size	1,575 barrels	14,100 barrels	600 barrels
Return Period	61 years	240 years	4 years
Annual Probability	0.0164	0.00417	0.25
Cleanup Costs	$11,000 per barrel	$4,000 per barrel	$9,000 per barrel
Damage Costs	$9,000 per barrel	$10,000 per barrel	$800 per barrel

NOTE: The estimate for the marine terminal spill includes both oil and condensate handling.

Northern Gateway said that it would be well capitalized, and would have very significant resources, so there would be no need to take any additional steps such as obtaining a guarantee from Enbridge. Because of these financial resources and the ownership structure, Enbridge reiterated its commitment to bear financial responsibility proportionate to its ownership share.

Northern Gateway accepted the need to develop a financial assurances plan providing it was based on facts and reasonable costs on the record in the proceeding and not costs of an outlier nature. Northern Gateway requested that the Panel treat it consistently with the rest of industry regarding the financial obligations in the plan. In the event that any regulatory changes are implemented to standardize financial assurance requirements for pipelines, Northern Gateway proposed that Potential Condition 147 should be superceded and the requirement to file a financial assurances plan should be modified or withdrawn.

Views of intervenors

The Alberta Federation of Labour recommended that Northern Gateway be required to carry a minimum of $1 billion mandatory insurance coverage annually on a stand-alone basis for the project as long as it operates. This floor of $1 billion was influenced by claims experience of other pipeline operators such as PG&E that experienced a gas pipeline explosion in San Bruno, California. The Federation said the Panel's potential financial assurances condition should be maintained as drafted.

Coastal First Nations, the Gitga'at First Nation, the Gitxaala Nation, and Haisla Nation filed evidence that described their concerns about the impact of oil spills on their territory, livelihood, and culture. Much of this evidence addressed the effects of oil spills in the marine environment. Haisla's evidence also included estimates of damages that terrestrial oil spills would cause.

Haisla Nation estimated the cost of damage to ecosystem services because of a terrestrial oil spill from Northern Gateway's pipeline would be in the range of $12,000 to $610 million for a 30-year period. The Haisla's cost estimates were based on values for environmental goods and services and probabilities of spills that were independent of Northern Gateway's parameters for estimating oil spill costs. In contrast to Northern Gateway's estimated spill frequency and costs, the Haisla predicted that spills would occur more often and placed a higher value on damages to environmental goods and services.

Haisla Nation argued that Northern Gateway overestimated its ability to detect and respond to a spill. In the Haisla's view this resulted in the cost of a spill and the requisite financial assurances being understated. Haisla cited several factors, including: remote location, limited access, challenging terrain, seasonal conditions, and river flow conditions that would cause the cost of cleaning up a spill in the Kitimat River valley to be significantly greater than the costs associated with Enbridge's Marshall, Michigan spill. For these reasons, Haisla proposed that Northern Gateway should be required to obtain a minimum of $1 billion of liability coverage through insurance and financial assurances. Haisla said that Northern Gateway should file annually the report from an independent third party assessing the financial assurances plan.

Gitxaala Nation filed evidence assessing Northern Gateway's expected value approach for evaluating the risks of this project. The expected value methodology combines the probability of the event with the severity or estimated cost of the event to yield a single monetary number. Gitxaala Nation said this methodology is not suitable for assessing the risks of this project because it tends to discount the consequences of catastrophic events. In Gitxaala Nation's

view, the Enbridge Northern Gateway Project is at risk for low probability events that would be unexpected and would have highly adverse effects. These events would be catastrophic and should not be discounted out of the risk analysis as the expected value approach does.

Basing its analysis on Northern Gateway data, Douglas Channel Watch provided estimates of spill probabilities for six regions along the pipeline route, and for the six regions combined. The estimated probability of at least 1 medium spill of less than 1,000 cubic metres, or 1 large spill of more than 1,000 cubic metres, in a 50-year period, is 82.8 per cent for the 6 regions of the pipeline combined. When the results for medium and large spills from the Kitimat Terminal, the pipeline, and maritime transport are combined, the probability of at least 1 medium or large spill, over a 50-year period, is about 87 per cent.

MEG Energy said that it would be premature to determine the specific minimum amount of financial coverage at this time.

Nathan Cullen said that the proposed $950 million in financial assurances was unacceptably low.

Terry Vulcano said that Enbridge should have an insurance policy of $5 billion to cover its spill liability.

The United Fishermen and Allied Workers' Union said that, if the project proceeds, it should carry an insurance policy that would cover at least the costs of the most recent spills in the United States so that two payouts within a short time could be made, if required.

The Office of the Wet'suwet'en expressed concern that the damages that Northern Gateway would contemplate recognizing, following a pipeline spill, would not include, nor address, cultural losses. Because Northern Gateway said that there is no acceptable way of quantifying cultural effects in economic terms, the Wet'suwet'en interpret this as a tacit acknowledgement that these damages would be of an irreparable nature.

The Province of British Columbia opposed Northern Gateway's proposed amendments to Potential Condition 147.

The Coalition said that the Panel was correct in the amounts and form of financial security described in the financial assurances condition. It argued that the amount specified in Potential Condition 147 should be maintained regardless of any change to a pipeline regulatory regime.

In letters of comment many parties expressed concerns about the risk and unacceptable consequences of an oil spill. A few parties commented on insurance to cover the costs of spill. Regardless of whether the parties commenting on the insurance supported, opposed, or were undecided about the project, they were in agreement that Northern Gateway must have adequate third party liability insurance coverage to compensate for third party damages and liabilities.

Northern Gateway's reply

Northern Gateway said that Haisla's findings were based on a number of fundamental methodological flaws and a lack of probability analysis to support the high frequency of occurrence of oil spill events. Northern Gateway argued that Haisla's estimates of ecosystem service values were inflated because they were based on values from unrelated studies. In Northern Gateway's view, Haisla relied on high passive use values that were not justified.

Northern Gateway did not accept the Alberta Federation of Labour's rationale for the level of third party liability insurance that the Federation proposed. It felt that a lower amount was the appropriate threshold.

Views of the Panel

During the proceeding, several parties stated their expectation that Northern Gateway must operate this project to a high standard so that there is little risk of damaging the environment or the property of others. If there is a malfunction, accident, or failure that causes an oil spill during the operation of the pipelines and the Kitimat Terminal, the Panel finds that Northern Gateway must have the financial capability to pay for the damages and losses while also responding effectively with cleanup and remediation action.

Several times during the hearing Northern Gateway said that it would cover any loss or damage that is directly attributable to its operations. The Panel notes that Northern Gateway also said that, regardless of whether its insurance would cover losses and liabilities of third parties, Northern Gateway would compensate for the damages which it has caused. The Panel finds that this is confirmation that Northern Gateway has accepted the "polluter pays" principle.

The Panel is of the view that major industrial projects, such as the Enbridge Northern Gateway Project, must operate to minimize the risk of damages to the environment and the public. Should the project cause damage, the operator should be responsible for the costs of such damages. This requires the Panel to examine the potential costs of a large oil spill and Northern Gateway's financial capability to pay for the damages and losses caused by a spill. The responsibility for these losses and damages must be borne by Northern Gateway and not by third parties or the public.

Many factors influence the costs, including location, type of product spilled, the quantity of the spill, and the kind of cleanup and remediation required in each unique circumstance. Costs anywhere along the pipeline right-of-way and at the marine terminal must be covered. While the Panel heard evidence of costs associated with offshore spills in the marine environment, these matters are covered under Canada's *Marine Liability Act*. The Panel has not discussed compensation for marine spills in this chapter. Chapter 7 provides additional information on financial responsibility and compensation for marine shipping spills.

Northern Gateway provided estimated probabilities and return periods of oil spills occurring along the pipelines and at the marine terminal, over the life of the project. Haida Nation considered the probabilities presented by Northern Gateway to be much lower than would actually be the case.

During the hearing Northern Gateway and intervenors provided estimates of spill probabilities for the project and its components. The estimates covered a broad range of probabilities and generated controversy. There was no consensus on the return periods or probabilities of oil spills in similar circumstances. In the Panel's view, the return period of an event is an estimate of the frequency of that event stated in years. The return period or recurrence interval is the average time between events over an extended period of time. However, it is not a prediction of when the event will occur. When determining the financial assurances that Northern Gateway should provide, the Panel did not use probability data. The evidence indicates that there is some probability that a large oil spill may occur at some time over the life of the project. In these circumstances the Panel must take a careful and precautionary approach because of the high consequences of a large spill. The Panel has decided that Northern Gateway must arrange and maintain sufficient financial assurances to cover potential risks and liabilities related to large oil spills during the operating life of the project.

Northern Gateway committed to investing $500 million in additional facilities and mitigation measures such as thicker wall pipe, more block valves, more in-line inspections, and complementary leak detection systems. This initiative should enhance the safety and reliability of the system and help reduce and mitigate the effects of a spill, but it would not eliminate the risk or costs of spills. This initiative is not a direct substitute for third party liability insurance and does not eliminate the need for liability insurance or any other form of financial assurance to cover the cost of a spill.

The results of the semi-quantitative risk assessment assisted Northern Gateway in identifying the risks of full-bore ruptures along the pipeline route and prioritizing mitigation measures through route revisions and the addition and enhancement of facilities. The Panel found that the semi-quantitative risk assessment provided additional insight into risks that might cause pipeline spills, and also provided insight into mitigation measures to reduce the risk and consequences of a spill. This analysis also helped the Panel develop a better understanding of the range of spill consequences on people, property, and the environment along the pipeline route. The Panel supports Northern

Gateway's continued use of this tool in the detailed design of the pipelines to identify and develop risk-mitigation measures. The Panel also believes it could be used beneficially by other pipeline proponents and operators of existing pipelines.

The Panel has decided that Northern Gateway must provide a total of $950 million in financial assurances to cover the costs of a large oil spill, including one that has the potential to be catastrophic. This amount is based on a large spill with costs for clean-up, remediation, and damages totaling $700 million. In addition to the financial instruments providing the primary coverage of $700 million, Northern Gateway must put backstopping arrangements of at least $250 million in place to cover any shortfalls in the primary coverage.

The Panel used the values of 2 variables to estimate the $700 million spill cost: i) the estimated quantity of a potentially large oil spill, and ii) the estimated total unit cost of an oil spill. The costs for cleanup, remediation, and damages would be captured in this total unit cost. The damages could include a range of items, including some allowance for damage to the ecosystem.

Based on the hearing record, the Panel finds that the estimated costs for damages to ecosystem goods and services are neither well developed nor currently broadly accepted. The evidence of Northern Gateway and the intervenors showed widely divergent cost estimates, sometimes orders of magnitude apart. In addition, the actual costs for historical spills did not identify all components making up total costs.

Regarding the Office of the Wet'suwet'en's concern about potential cultural losses, the Panel agrees that some aspects of cultural activity cannot be described in economic terms. To the extent that activities contribute to a culture, and monetary values can be attributed to these activities, the Panel should take these into account.

Considering these factors in combination with the unique circumstances of each spill, and the need to take a careful and precautionary approach, the Panel decided that the methodology does not currently exist to segregate the cost of components making up the total cost of a spill. It decided to use the total unit cost based on the available evidence, which was not complete enough to support disaggregation of the data. In addition, the weighting of the components may vary on a case-by-case basis.

Northern Gateway suggested that a large spill from the oil pipeline would have a volume of 2,242 cubic metres (14,100 barrels), and a large spill from the condensate pipeline would be 827 cubic metres (5,200 barrels). These estimates of a large spill volume were based on the expected average spill size from Northern Gateway's analysis. From the semi-quantitative risk assessment, the Panel notes the largest oil spill volume is approximately 5,000 cubic metres (31,500 barrels). Another source referenced by Northern Gateway proposed a volume, in the upper range of large spill volumes from the oil pipeline, of 3,800 cubic metres (23,800 barrels). The Panel has decided on a spill volume of 5,000 cubic metres (31,500 barrels). The Panel finds that the costs associated with an oil spill volume of 5,000 cubic metres would also cover the costs of a spill from the condensate pipeline.

The Panel accepts that the cleanup costs for the Marshall, Michigan spill were orders of magnitude higher because of the extended response time. In this application, the Panel accepts Northern Gateway's commitment to complete the shutdown in no more than 13 minutes after detection. For this reason the Panel did not use the Marshall spill costs in its calculations. The spill volume and the resulting costs are directly dependent on the Northern Gateway's control room staff and the pipeline control system fully closing the adjacent block valves no longer than 13 minutes from the detection of an alarm event, as well as the amount of oil which would drain out of the pipeline after valve closure due to elevation differences.

The Panel decided on a total unit cost of $138,376 per cubic metre ($22,000 per barrel). This is midway between the unit cost of $88,058 per cubic metre ($14,000) per barrel proposed by Northern Gateway and the unit cost of $188,694 per cubic metre ($30,000 per barrel) for the Lake Wabamun spill. It is about one-half of the Marshall spill's unit cost. Giving weight to the Lake Wabamun costs recognizes actual costs experienced in a Canadian spill and the greater costs of spills in high consequence areas. In these areas, individuals, populations, property, and the environment would have a high sensitivity to hydrocarbon spills. The deleterious effects of the spill would increase with the spill volume, the extent of the spill, and the difficulty in accessing the spill area for cleanup and remediation.

Using these spill volume and unit cost values in the calculation below, the Panel estimated the total cost of a large spill could be $700 million.

Total cost of a spill = 31,500 barrels x $22,000 per barrel
= $693 million, or $700 million when rounded up.

The Panel based the financial assurances requirements for Northern Gateway on a spill with a total estimated cost of $700 million and directs Northern Gateway to develop a financial assurances plan with a total coverage of $950 million that would include the following components:

i. Ready cash of $100 million to cover the initial costs of a spill;

ii. Core coverage of $600 million that is made up of stand-alone, third party liability insurance and other appropriate financial assurance instruments, and

iii. Financial backstopping via parental, other third party guarantees, or no fault insurance of at least $250 million to cover costs that exceed the payout of components i. and ii.

The financial backstopping would be available to fill the gap if the spill volumes or unit costs were under-estimated or if the payout from the core coverage would be less than 100 per cent. It would also compensate for the limited partnership's defined liability limits.

The instruments in the financial assurances plan and the proceeds from these instruments must be dedicated to covering the cost of a large oil spill or other malfunctions, accidents, and failures during the project's operations. At all times, Northern Gateway must isolate, to the fullest extent possible, the payout proceeds of the instruments in its financial assurances plan from its operations and financial circumstances, including potential insolvency.

APPENDIX 1
The Panel's conditions

In these conditions, the following terms are defined as:

Northern Gateway or the company
Northern Gateway Pipelines Inc., on behalf of Northern Gateway Pipelines Limited Partnership.

NEB
National Energy Board.

Oil pipeline
The oil export pipeline located approximately between Bruderheim, Alberta and Kitimat, British Columbia, including all associated facilities to be installed along the pipeline, with the exception of the Kitimat Terminal, as defined below.

Condensate pipeline
The condensate import pipeline located approximately between Kitimat, British Columbia, and Bruderheim, Alberta, including all associated facilities to be installed along the pipeline, with the exception of the Kitimat Terminal, as defined below.

Kitimat Terminal
Located near Kitimat, British Columbia, the Kitimat Terminal is the tank terminal, the marine terminal (including marine-based structures), and the defined undeveloped area outside of the fence line.

Infrastructure
All structures or sites necessary for constructing the oil pipeline, the condensate pipeline, and the Kitimat Terminal. Examples of infrastructure include construction camps, stockpile sites, laydown areas, temporary work space, borrow pits, roads, bridges, snow pads, and temporary power supply lines necessary for operating infrastructure and equipment during the construction phase.

Project
The Enbridge Northern Gateway Project in all its components, including the oil pipeline, the condensate pipeline, the Kitimat Terminal, and all infrastructure.

Construction
Any in-field activity that may have an effect on the environment and that is necessary for installing, or preparing to install, any component of the Project. Construction activities include, clearing, mowing, grading, trenching, drilling, boring, and blasting. Construction activities do not include activities associated with routine surveying operations or data collection activities, such as geotechnical investigations (e.g., geophysical surveys, bore holes, and test pits). In-water construction for the Kitimat Terminal refers to construction activities occurring in the marine environment that are necessary for installing, or preparing to install, any component of the Kitimat Terminal. These include dredging, blasting, and pile drilling and grouting.

Commencing operations
In the case of the oil pipeline or condensate pipeline, when it is opened for hydrocarbon transmission.

In the case of the Kitimat Terminal, when oil first crosses the tank terminal boundaries and enters terminal piping, or when condensate first enters marine terminal piping directly from a tanker.

For approval
Where a condition requires a filing for NEB approval, Northern Gateway must not commence the indicated activity until the NEB issues its written approval of that filing.

Consultation
Unless otherwise specified in a condition, Northern Gateway's consultation must be carried out in a manner whereby it:

a. provides, to the individual, group, or organization to be consulted:
   i. notice of the matter in sufficient form and detail to allow that individual, group, or organization to prepare its views or information on the matter;
   ii. a reasonable period for that individual, group, or organization to prepare those views or information; and
   iii. an opportunity to present those views or information to Northern Gateway; and
b. considers, fully and impartially, the views or information presented; and
c. is able to demonstrate to the NEB its appropriate consideration of the views or information presented.

Third party (in relation to a review)
An independent consultant, expert, or contractor that, except for receiving payment for acting as a third party, is unaffiliated with Northern Gateway, Enbridge, the principal consultants of either, or any other corporate entity with a financial interest in the Project. A third party is, because of their knowledge, training, and experience, qualified and competent to perform an assessment or review, and was not involved in developing the manual, report, plan, program, or policy being assessed or reviewed.

Monitoring
Observing the environmental and socio-economic effects of the Project for the purposes of assessing and measuring the effectiveness of mitigation measures undertaken, identifying unanticipated environmental and socio-economic issues, and, based on the results of these activities, determining any remedial actions required.

From an engineering perspective, monitoring involves regularly observing pipelines and facilities (e.g., through surveys, patrols, inspections, testing, instrumentation) to ensure their operation is within defined parameters, with the goal of identifying any issues or potential concerns (e.g., pipeline integrity, geohazards, erosion, security) that may compromise the protection of the pipelines and facilities, property, persons, and the environment.

Including
Use of this term, or any variant of it, is not intended to limit the elements to just those listed. Rather, it implies minimum requirements with the potential for augmentation, as appropriate.

Government authorities are mentioned in certain conditions. If a particular authority's name changes in the future, Northern Gateway's requirements relating to that authority would rest with its successor. Similarly, if a particular authority's function is assumed by another authority, Northern Gateway's requirements relating to that function would rest with the new authority.

Two certificates would be issued for the Project, if it is approved as applied for: one for the oil pipeline and one for the condensate pipeline. For regulatory purposes, the condensate pipeline certificate would not contain references to the oil pipeline, and vice versa.

All of Northern Gateway's condition-related filings, and the NEB's correspondence related to them, would be publically available in the Project's online document registry, found on the NEB's website.

RANGE #	CONDITION	PROJECT COMPONENT* (with condition #)				
		Infrastructure**	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project***
PHASE: MISCELLANEOUS / OVERARCHING IN NATURE						
1	**Compliance with conditions** Northern Gateway must comply with all of the certificate conditions, unless the NEB otherwise directs.					1
2	**Certificate expiration (sunset clause)** Unless the NEB otherwise directs prior to **31 December 2016**, the certificate will expire on **31 December 2016**, unless construction of the pipeline or the Kitimat Terminal has commenced by that date.					2
3	**Project completion** Northern Gateway must file with the NEB, **within 30 days after commencing operations**, confirmation, signed by the President of the company, that the Project was completed and constructed in compliance with all applicable certificate conditions. If compliance with any of the conditions cannot be confirmed, the President of the company must file with the NEB the reason(s) for this and the proposed course of action for compliance.					3
4	**Group 1 designation** a) Northern Gateway is designated a Group 1 company and must file with the NEB **annual** Surveillance Reports as outlined in the NEB's *Toll Information Regulations* and Guide BB – *Financial Surveillance Reports* of the NEB's Filing Manual, or any successor NEB guideline documents. Financial information must be provided for the pipeline and audited financial statements (income, balance sheet, and cash flow) must be provided for Northern Gateway Pipelines Limited Partnership. b) Northern Gateway must file with the NEB, **on a quarterly basis**, pipeline throughput information by shipper category, broken down by month, as outlined in the NEB's *Toll Information Regulations* and Guide BB of the NEB's Filing Manual.					4
5	**General engineering** Northern Gateway must cause the Project facilities to be designed, located, constructed, installed, and operated in accordance with, at a minimum, the specifications, standards, policies, mitigation measures, procedures, and other information included or referred to in its Project application or as otherwise committed to during the OH-4-2011 proceeding.					5
6	**General environment** Northern Gateway must implement or cause to be implemented, at a minimum, all of the policies, practices, programs, mitigation measures, recommendations, and procedures for the protection of the environment included or referred to in its Project application or as otherwise committed to during the OH-4-2011 proceeding.					6

* a) Condition wording is generalized so that conditions can apply to multiple Project components, as required. Condition wording appears only once and, if applicable to a particular component, a condition number is assigned in that column and the condition filing(s) must address that component. The timing element (e.g, prior to commencing construction) of each condition should be interpreted in the context of each separate and applicable component, unless otherwise specified in the condition itself.

b) Northern Gateway would have the option to submit separate filings for each condition number within a row or, if appropriate and as long as all timing elements are satisfied, a single filing that could apply to all of the condition numbers in that row. Similarly, conditions duplicated on the issued certificates could be addressed by a single filing, if appropriate under the circumstances and if Northern Gateway indicates this intent.

c) Certain conditions require filings during different Project phases. In these cases, the conditions appear under the phase headings according to when the initial filing would be due.

** Prior to commencing construction of the first infrastructure site, the pre-construction filing for each of the conditions in this column must be satisfied. Each filing must address the collection of infrastructure sites. If infrastructure is the first Project component to be constructed, the applicable pre-construction conditions for the Project must also be satisfied and must address the collection of infrastructure sites. See Condition 9 for more requirements regarding infrastructure-related condition filings.

*** Generally, conditions in this column are overarching in nature and not linked to a particular project component (by context or timing), unless otherwise specified in the condition itself. Conditions in this column that relate to a particular project component may appear here, and not in the individual components' columns, in those cases where their associated filings are tied to an overall project timing element. Where a condition in this column refers to filing information "prior to commencing construction," it is referring to the first construction activity to be undertaken for the project as a whole, regardless of the component. Where a condition in this column refers to filing information "after commencing operations," it is referring to the point when the last project component becomes operational.

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
7	**Commitments tracking table** Northern Gateway must implement the commitments contained within its commitments tracking table and must: a) file with the NEB, at the following times, an updated commitments tracking table: i) **within 90 days after the certificate date**; and ii) **at least 30 days prior to commencing construction**; b) update the status of the commitments and file those updates with the NEB **on a monthly basis until commencing operations, and quarterly during operations until all conditions are satisfied (except those that involve filings for the Project's operational life)**; c) post on its company website the same information required by a) and b), **using the same indicated timeframes**; and d) maintain at each of its construction offices: i) the relevant environmental portion of the commitments tracking table listing all of Northern Gateway's regulatory commitments, including those from the Project application and subsequent filings, and conditions from received permits, authorizations, and approvals; ii) copies of any permits, authorizations, and approvals for the Project issued by federal, provincial, or other permitting authorities that include environmental conditions or site-specific mitigation or monitoring measures; and iii) any subsequent variances to any permits, authorizations, and approvals in d) ii).					7
8	**Phased filings** a) Northern Gateway must file with the NEB, **at least 7 months prior to commencing construction,** a complete list of construction spreads, regions, or work areas that, for the duration of Project construction, will serve as the basis by which Northern Gateway may submit condition filings in a phased approach. Each spread, region, or work area must be clearly delineated (e.g., by kilometre posts). b) As part of its filing for a), to aid the NEB in anticipating future submissions, Northern Gateway must indicate the specific conditions where it expects to apply this phased approach. Northern Gateway must file updates to this estimate **as they are available**. c) When submitting a filing for any condition using this phased approach, Northern Gateway must clearly indicate which spread(s), region(s), or work area(s) that filing applies to. d) **Construction of a particular spread, region, or work area must not proceed until all pre-construction conditions using this phased approach have been satisfied for that spread, region or work area. Prior to commencing construction of the initial spread, region, or work area, all applicable conditions with more general pre-construction timing elements must also be satisfied**.					8
9	**List of infrastructure sites** Northern Gateway must file with the NEB, **at least 90 days prior to commencing construction**, and any updates **as they are available**, a complete list of all infrastructure sites (based on the definition provided in advance of this table) to be constructed for the Project. This list must include information on each site's location, structures to be installed, the anticipated date for commencing construction, and activities involved in its construction. The initial list and updates must also include the condition numbers (those under the "prior to commencing construction" phase heading) that are applicable to each site and an indication of whether each of those conditions has been or remains to be satisfied.	9				
10-13	**Project organizational structure** Northern Gateway must file with the NEB, **at least 60 days prior to commencing construction**, a diagram of the Project's organizational structure (i.e., project management, design, and field staff) that clearly identifies roles, accountabilities, responsibilities, and reporting relationships for the applicable Project component.	10	11	12	13	
14-15	**Composite coating** Northern Gateway must use a three-layer composite coating or High Performance Composite Coating (a proprietary Bredero-Shaw product) for the pipeline between kilometre post 600 and the Kitimat Terminal. Northern Gateway may specify a different coating if it will provide superior protection than that provided by the three-layer composite coating or High Performance Composite Coating. Northern Gateway must inform the NEB, **at least 60 days prior to commencing pipe installation**, of any coating substitution and the rationale for its use.		14	15		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
16-17	**Category III pipe** Northern Gateway must install pipe that, at a minimum, meets the requirements of Canadian Standards Association (CSA) Z245.1 Category III pipe. Northern Gateway must file with the NEB, **at least 6 months prior to pipe manufacturing**, a statement signed by an officer of the company that confirms its ability to comply with this requirement.		**16**	**17**		
18	**Marine Voluntary Commitments** Northern Gateway must not load or unload oil or condensate tankers at the Kitimat Terminal until it has implemented or caused to be implemented all of its voluntary commitments related to marine tanker traffic and enhanced oil spill response associated with the Project (Marine Voluntary Commitments). As referenced in the Project application and other evidence, including the TERMPOL Review Committee's TERMPOL Review Process report filed on 23 February 2012, these include: a) simulator training for tug crews, and working with the Pacific Pilotage Authority to complete joint training with pilots and tug crews; b) live field trials in the Confined Channel Assessment Area for tankers and tug escort operations simulating both laden and ballasted conditions; c) requiring laden tankers in the Confined Channel Assessment Area to have two escort tugs (one tethered); d) requiring ballasted tankers to be accompanied by a close escort tug; e) purpose-built escort tugs available for ocean rescue; f) escort tugs equipped with oil pollution emergency response equipment; g) developing Terminal Regulations and a Port Information Handbook; h) identifying safe transit speeds for tankers in the Terminal Regulations and Port Information Book; i) requiring tankers to modify their speed to reduce the risk of marine mammal strikes; j) completing a tanker drift study and developing appropriate mitigation based on the results of the study; k) installing radar to monitor marine traffic (this may also provide additional information to the Canadian Coast Guard's Marine Communications and Traffic Services, subject to Canadian Coast Guard agreement); l) establishing vessel operational safety limits that address visibility, wind, and sea conditions; m)establishing terminal operational safety limits that address visibility, wind, and sea conditions; n) developing a Tanker Acceptance Program that incorporates Northern Gateway's commitments regarding vessel design, construction, and inspection ratings, and that has been audited by a third party (as defined), with the audit results made publically available; o) not accepting tankers with full width cargo tanks at the Kitimat Terminal; p) using skilled and properly-trained terminal personnel; q) requiring boom deployment around tankers during oil loading operations; r) using tug crews trained in emergency response; and s) enhanced oil spill response capabilities, including: i) establishing a Response Organization with a 10,000 tonne response capability that has been certified by the federal Minister of Transport, with an additional response capability of 22,000 tonnes, all of which has been audited by a third party (as defined) to verify that it meets Northern Gateway's commitment to have at least 1 major on-water recovery task force capable of being at the site of a spill in the Confined Channel Assessment Area within 6 to 12 hours, and at the site of a spill in the Open Water Area within 6 to 12 hours plus travel time; ii) strategic location(s) for oil spill response equipment and vessels to meet the response time capabilities; iii) oil spill response capability at the Port of Kitimat that is equal to or greater than that of a designated port; iv) identifying and prioritizing sensitive areas for oil spill response in Geographic Response Plans developed in consultation with the Province of British Columbia and communities that could be affected in the event of a spill; and v) developing Community Response Plans for participating coastal communities in the Confined Channel Assessment Area, Hecate Strait, and communities outside these areas, as appropriate. To demonstrate the above, Northern Gateway must file with the NEB**, at least 90 days prior to loading or unloading the first tanker at the Kitimat Terminal**, confirmation, signed by an officer of the company, that its Marine Voluntary Commitments have been implemented. Northern Gateway must also include and report on its Marine Voluntary Commitments in its commitments tracking table (required by Condition 7).					**18**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
19	**TERMPOL Review Committee recommendations** Northern Gateway must not load or unload oil or condensate tankers at the Kitimat Terminal until it has implemented or caused to be implemented all of the TERMPOL Review Committee recommendations included in the TERMPOL Review Process report filed on 23 February 2012. To demonstrate this, Northern Gateway must file with the NEB, **at least 90 days prior to loading or unloading the first tanker at the Kitimat Terminal**, confirmation, signed by an officer of the company, that the TERMPOL Review Committee recommendations have been implemented.					19
20	**Transportation Service Agreements (TSAs) – oil pipeline** a) Northern Gateway must file with the NEB, **within 60 days after executing all TSAs, but not less than 6 months prior to commencing Project construction,** the long-term, firm TSAs executed with shippers to demonstrate that it has secured sufficient commercial support for the Project. In no case can sufficient commercial support for the oil pipeline be constituted by TSAs comprising less than 60 per cent of its nominal capacity (525,000 barrels per day). b) If Northern Gateway has not filed the TSAs described in a) with the NEB **by 1 July 2014**, it must file with the NEB, **on this date and every 6 months thereafter,** a report summarizing its progress in securing commercial support for the Project and the status of the TSAs.		20			
21	**TSAs – condensate pipeline** a) Northern Gateway must file with the NEB, **within 60 days after executing all TSAs, but not less than 6 months prior to commencing Project construction,** the long-term, firm TSAs executed with shippers to demonstrate that it has secured sufficient commercial support for the Project. In no case can sufficient commercial support for the condensate pipeline be constituted by TSAs comprising less than 60 per cent of its nominal capacity (193,000 barrels per day). b) If Northern Gateway has not filed the TSAs described in a) with the NEB **by 1 July 2014**, it must file with the NEB, **on this date and every 6 months thereafter,** a report summarizing its progress in securing commercial support for the Project and the status of the TSAs.			21		
22	**Part IV application** Northern Gateway must apply to the NEB, **within 6 months after executing firm TSAs with shippers that demonstrate sufficient commercial support for the Project** (as defined in Conditions 20 and 21), for an order or orders under Part IV, paragraph 60(1)(b), of the *National Energy Board Act* approving the tolls that Northern Gateway proposes to charge shippers on the pipeline. Northern Gateway must include the following documents and information with its Part IV application: a) a summary of all executed TSAs in table format which details, for each firm shipper category, the number of shippers and total contracted volume for each term contract option. Each term contract option must specify the contract duration and expiry date; b) the most recent capital cost estimate for the Project and its pipeline and terminal components based on the Class III Capital Cost Estimate, as well as the rate base for the pipeline resulting from these costs; c) a summary of the results of the decision to adopt or reject the cost risk sharing methodology defined in article 6 of the pro forma precedent agreement. This summary must include a description of any consequential amendments to its applicable pipeline toll principles; d) confirmation that the Project has secured financing and a summary of the key terms in the Project financing plan that also shows the capital structure components, their weightings, and their costs, as well as the overall cost of capital for the Project; e) a description of how Northern Gateway has set aside reserve capacity for non-term shippers on the pipeline, with an explanation of how Northern Gateway has addressed the Panel's view that not less than 10 per cent of the pipeline's nominal capacity should be set aside as reserve capacity for non-term shippers; f) a proposal to manage the reserve capacity on the pipeline through an open and fair process, such as a monthly public auction in which eligible bids would fall within floor and ceiling toll limits. The ceiling would be the total Uncommitted Spot Shipper toll as determined by the toll principles, and the floor would be determined in the Part IV proceeding; g) a status report confirming and describing how all potential shippers seeking capacity on the pipeline under the terms of the executed TSAs have been accommodated;					22

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
22	h) an assessment of how the pipeline will operate in a manner consistent with the requirements of subsection 71(1) of the *National Energy Board Act*; and i) a consolidation of all terms and conditions from the pro forma precedent agreement, the pro forma TSA, the toll principles, and other relevant sources into a tariff document for the pipeline that distinguishes between conditions for shippers when the pipeline commences operations and conditions for potential shippers that may request capacity after pipeline operations commence.					22
23	**Additional reports to file with the NEB** **At the time of its Part IV application,** Northern Gateway must file with the NEB, for its information, the following documents: a) Direct Owner's Agreement (if any); b) Northern Gateway Pipeline Limited Partnership Agreement (Limited Partnership Agreement); c) Shareholder Agreement; d) Distribution Policy; and e) any other agreements referenced in the TSA, or otherwise related to the Limited Partnership Agreement.					23
24	**Landowner consultation records** Northern Gateway must maintain records of its landowner consultations that includes: a) a description of landowner consultations, including the consultation methods, dates, and a summary of any issues or concerns raised by landowners; and b) a summary of actions that Northern Gateway has undertaken to address or respond to each of the issues or concerns raised by landowners, or a rationale for why no actions were taken, and any outstanding concerns. Northern Gateway must file with the NEB, **beginning at least 60 days prior to commencing construction, and every 6 months thereafter until completing construction,** its landowner consultation records. Northern Gateway must continue to file its landowner consultation records with the NEB **every 6 months for 5 years after commencing Project operations**.					24
25	**Landowner complaint records** Northern Gateway must create and maintain records, **for the life of the Project (from pre-construction to the end of operations)**, that chronologically track landowner complaints related to the Project. These records must include: a) a description of each complaint; b) how each complaint was received (e.g., telephone, letter, email); c) the date each complaint was received; d) subsequent dates of all contact or correspondence with each complainant; e) records of any site visits, monitoring, or inspections; f) contact information for all parties involved in each complaint; g) the date of each complaint's resolution; and h) if a complaint remains unresolved, a description of any further actions to be taken or a rationale for why no further action is required. Northern Gateway must maintain these records for audit purposes and make them available to the NEB **upon request.** Northern Gateway must make available to a landowner, **upon request**, the records related to the complaint(s) that landowner made to Northern Gateway.					25
26	**Temporary Foreign Worker Labour Market Opinion** a) Northern Gateway must notify the NEB **within 14 days after any application is made to Service Canada for a Labour Market Opinion** by it, on its behalf, or by its contractors, for the purposes of using Temporary Foreign Workers for Project construction. b) Northern Gateway must file with the NEB a copy of any Service Canada-issued Labour Market Opinion **within 14 days of it or its contractors receiving it**.					26

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
PHASE: PRIOR TO COMMENCING CONSTRUCTION						
27-29	**Pipeline Environmental Effects Monitoring Program** Northern Gateway must file with the NEB for approval, **within 1 year after the certificate date,** a Pipeline Environmental Effects Monitoring Program for the Project's operational life, in accordance with the Pipeline Environmental Effects Monitoring Program Framework filed during the OH-4-2011 proceeding. The program must address all sections noted in the framework and include: a) locations (i.e., along the pipeline route, or at infrastructure sites) where the program will be implemented; b) the program's duration; and c) a description of how Northern Gateway has taken available and applicable Aboriginal Traditional Knowledge (ATK) and Traditional Land Use (TLU) studies into consideration in developing the program.	27	28	29		
30-32	**Pipeline Environmental Effects Monitoring Program: survey framework** Northern Gateway must file with the NEB, **within 1 year after the certificate date**, a survey framework associated with the Pipeline Environmental Effects Monitoring Program (required by Conditions 27-29), that includes: a) a list of species or species groups, habitat parameters, and environmental parameters to be surveyed, including for species at risk; b) the survey methods that will be used for the species (including species at risk) and species groups, habitat parameters, and environmental parameters to be surveyed; c) a summary of the outcomes of Northern Gateway's collaboration with relevant government authorities, participating Aboriginal groups, research organizations, and public stakeholder groups on the survey framework; and d) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the survey framework.	30	31	32		
33-35	**Pipeline Environmental Effects Monitoring Program: survey results and monitoring plans** a) Northern Gateway must file with the NEB, **within 45 days after completing each of the Pipeline Environmental Effects Monitoring Program surveys**, the survey results and verification that they were provided to the appropriate federal and provincial authorities. b) Northern Gateway must file with the NEB, **on or before 31 January of each year for the duration of the Pipeline Environmental Effects Monitoring Program**, the following: i) monitoring plans stemming from survey results and how those plans will be incorporated into the program or, if no further monitoring is planned for certain species, species groups, habitat parameters, or environmental parameters, a rationale; ii) a summary of the outcomes of Northern Gateway's collaboration with relevant government authorities, participating Aboriginal groups, research organizations, and public stakeholder groups on the monitoring plans; and iii) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the monitoring plans.	33	34	35		
36	**Marine Environmental Effects Monitoring Program** Northern Gateway must file with the NEB for approval, **within 1 year after the certificate date**, a Marine Environmental Effects Monitoring Program for the Project's operational life, in accordance with the Marine Environmental Effects Monitoring Program Framework filed during the OH-4-2011 proceeding. The program must address all sections noted in the framework.					36
37	**Marine Environmental Effects Monitoring Program: survey framework** Northern Gateway must file with the NEB for approval, **within 1 year after the certificate date**, a survey framework associated with the Marine Environmental Effects Monitoring Program (required by Condition 36), including: a) a list of species or species groups, habitat parameters, and environmental parameters to be surveyed, including for species at risk; b) the survey methods that will be used for the species (including species at risk) and species groups, habitat parameters, and environmental parameters to be surveyed;					37

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
37	c) a summary of the outcomes of Northern Gateway's collaboration with relevant government authorities, participating Aboriginal groups, research organizations, and public stakeholder groups on the survey framework; and d) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the survey framework.					**37**
38	**Marine Environmental Effects Monitoring Program: survey results and monitoring plans** a) Northern Gateway must file with the NEB, **within 90 days after completing each of the Marine Environmental Effects Monitoring Program surveys,** the survey results and evidence that they were provided to the appropriate federal and provincial authorities. b) Northern Gateway must file with the NEB, **on or before 31 January of each year for the duration of the Marine Environmental Effects Monitoring Program**, the following: i) monitoring plans stemming from survey results and how those will be incorporated into the program or, if no further monitoring is planned for certain species or species groups, habitat parameters, or environmental parameters, a rationale; ii) a summary of the outcomes of Northern Gateway's collaboration with relevant government authorities, participating Aboriginal groups, research organizations, and public stakeholder groups on the monitoring plans; and iii) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the monitoring plans.					**38**
39-41	**Quality Management Plan** Northern Gateway must file with the NEB for approval, **at least 6 months prior to manufacturing any pipe and major components for the pipeline (including facilities along the pipelin**e) **or the Kitimat Terminal**, a Project-specific Quality Management Plan that includes: a) material/vendor qualification requirements; b) quality control and assurance of pipe and components that ensure all materials meet Enbridge specifications (i.e., processes, procedures, specifications, inspection, random testing, inspection, and test reports); c) mandatory documentation of process conditions during manufacture and verification of the conformance of manufacturer material test reports with Enbridge requirements; d) mandatory inspection requirements, inspector competency training, and qualifications; e) non-conformance reporting and correction procedures; f) change management process; and g) commissioning requirements.		**39**	**40**	**41**	
42-43	**Report – loading and dynamic effects** Northern Gateway must file with the NEB, **at least 3 months prior to pipe manufacture**, a report summarizing the loading and dynamic effects considered during final design and that confirms that the pipeline has adequate strength to resist these loadings. This report must also identify and address potential pipe deformation that may impede passage of pipeline inspection tools. If Annex C of CSA Z662-11 is used in designing certain pipeline sections, Northern Gateway must file with the NEB, **at least 3 months prior to pipe manufacture**, a report describing how allowable strains for the pipeline were established giving due consideration to clause C.8.9.1 and the notes accompanying Tables C.1, C.2, and C.3. This report must include the potential effects of strain-aging and strain rate. If experimentally-established allowable strains are available, these must be referenced in the report.		**42**	**43**		
44-45	**Fracture toughness** a) When strain-based design will be used in accordance with CSA Z662-11 Annex C, Northern Gateway must determine the minimum acceptable Charpy V-Notch toughness (CVN) and crack tip opening displacement (CTOD) values for weld metal and heat-affected zone of mill circumferential, helical (if practicable), and longitudinal welds. At a minimum, testing must account for the lowest installation temperature and the most severe deformation during construction or operation. The CVN and CTOD tests must be conducted for all combinations of pipe steel producers and pipe mill manufacturers and be representative of applicable Project pipe with the maximum carbon equivalent (CE) heat.		**44**	**45**		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
44-45	b) When weld zone defect acceptance criteria will be established in accordance with CSA Z662-11 Annex K, Northern Gateway must determine the minimum acceptable CVN and CTOD values for field circumferential welds for the lowest installation temperature and the most severe deformation during construction or operation. The CVN and CTOD tests must be conducted at the welding procedure development phase, for all combinations of pipe steel producers and pipe mill manufacturers and must be representative of applicable Project pipe with the maximum CE heat. c) Northern Gateway must file with the NEB, **at least 60 days prior to conducting the tests for** a) **and** b) **above,** the test procedures it will use. d) Northern Gateway must file with the NEB, **at least 60 days prior to field welding**, the minimum acceptable CVN and CTOD values and the test results from a) and b) above.		**44**	**45**		
46-48	**Joining Program** Northern Gateway must develop a Joining Program and file it with the NEB **at least 30 days prior to conducting welding procedure qualification tests** for: a) field circumferential production, tie-in, and repair pipeline welds; and b) welding of Project facilities. The Joining Program must include: i) welder qualification requirements; ii) requirements for welding inspector qualifications and duties; iii) welding procedure specifications; iv) non-destructive examination (NDE) specifications; v) procedure qualification records for welding procedure specifications and NDE specifications; vi) a quality assurance program for field welds and welding procedures; and vii) any additional information that supports the Joining Program.		**46**	**47**	**48**	
49	**Fisheries Liaison Committee (FLC) meeting summaries** Northern Gateway must file with the NEB, **at least 1 year prior to commencing in-water construction for the Kitimat Terminal**, a report summarizing the FLC meetings. The report must include: a) a list of FLC members or attendees at each meeting; b) meeting agendas; and c) each meeting's minutes. Northern Gateway must file with the NEB, **at least 6 months prior to commencing in-water construction for the Kitimat Terminal**, any updates to a) through c).					**49**
50	**Marine Mammal Protection Plan development** Northern Gateway must file with the NEB for approval, **at least 9 months prior to commencing in-water construction for the Kitimat Terminal,** a description of how it intends to develop its Marine Mammal Protection Plans for construction and operations (required by Conditions 51 and 191). The Marine Mammal Protection Plans must address all sections noted in the Framework for the Marine Mammal Protection Plan filed during the OH-4-2011 proceeding. This description must include: a) how Northern Gateway will implement, monitor, and ensure compliance with the voluntary marine mammal protection measures it committed to in relation to marine terminal construction and marine shipping associated with the Project; b) a discussion of proposed monitoring and research initiatives and how the results of these initiatives will be incorporated into the Marine Mammal Protection Plans; c) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, Transport Canada, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding Marine Mammal Protection Plan development. This summary must include any issues or concerns raised regarding plan development and how Northern Gateway has addressed or responded to them; d) a description of the reporting structure for any marine mammals struck, injured, or killed during construction and operations; and e) a description of how and to whom Northern Gateway intends to communicate and report the results of its marine mammal mitigation and monitoring activities.				**50**	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
51	**Construction Marine Mammal Protection Plan** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing in-water construction for the Kitimat Terminal,** a Construction Marine Mammal Protection Plan. The plan must be prepared in accordance with the Framework for the Marine Mammal Protection Plan filed during the OH-4-2011 proceeding, and must include all marine mammal mitigation measures and monitoring that will be implemented during the Kitimat Terminal construction period. The Construction Marine Mammal Protection Plan must include a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, Transport Canada, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them.				**51**	
52	**FLC operational guidelines** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing in-water construction for the Kitimat Terminal**, the FLC's operational guidelines. The guidelines must, at a minimum: a) identify how FLC membership will be determined; b) identify the FLC structure; c) identify an officer of the company who will be accountable for implementing the guidelines; d) include information on how the FLC will be funded both initially and on an ongoing basis, including information on any funding available to FLC members; and e) describe the scope, mandate, and operational protocols to be addressed or implemented by the FLC, including: i) the FLC's goals; ii) the issues and activities that will be within the FLC's mandate; iii) the protocols and procedures for documenting, reporting, and determining fair compensation for lost or damaged fishing gear as a result of the Project; iv) the protocols and mechanisms for implementing FLC recommendations or decisions; v) a dispute resolution process; and vi) the protocols for reporting and communicating with FLC members, member constituents, and other potentially-affected or interested parties.				**52**	
53-56	**TLU investigation plan for detailed routing and final design** Northern Gateway must file with the NEB for approval and serve a copy on all potentially-affected Aboriginal groups, **at least 1 year prior to commencing construction**, a plan for identifying potentially-affected TLU sites or resources that arise from detailed routing and design. This includes finalizing the pipeline centreline and watercourse crossing locations, and the Kitimat Terminal's final design. The plan must describe: a) the methods that will be used to identify potentially-affected TLU sites and resources; b) how Northern Gateway has considered and addressed information from any ATK studies that it did not previously report during the OH-4-2011 proceeding; c) the general and specific TLU site types and resources that Northern Gateway expects to encounter; d) a summary of Northern Gateway's consultation with potentially-affected Aboriginal groups regarding the plan. This summary must include: i) a description of Northern Gateway's offers to potentially-affected Aboriginal groups to participate in investigations, and the potentially-affected Aboriginal groups' responses; ii) any additional mitigation that Northern Gateway did not previously report during the OH-4-2011 proceeding, or that has subsequently been requested by potentially-affected Aboriginal groups, that it will implement to address potential Project effects on TLU sites and resources; iii) any issues or concerns raised regarding the plan, and how Northern Gateway has addressed or responded to them; and iv) a list of, and explanation for, outstanding issues or concerns, and the steps that Northern Gateway will take to address or respond to them; and	**53**	**54**	**55**	**56**	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
53-56	e) how the results of investigations arising from detailed routing and design will be provided to potentially-affected Aboriginal groups, including proposed timing, communication methods, opportunities to comment on the findings and proposed mitigation, and how this information has been incorporated into detailed routing and final design, as appropriate. Northern Gateway must file with the NEB, **at least 6 months prior to commencing construction**, any updates to a) through e).	**53**	**54**	**55**	**56**	
57-59	**Pre-construction caribou habitat assessment** For areas of the Project that are within a federally-recognized caribou range, Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing construction of spreads, regions, work areas, or infrastructure potentially affecting each caribou range**, a detailed caribou habitat assessment for each caribou range. The framework of the habitat assessment should use the components of critical habitat outlined in the appropriate *Woodland Caribou Recovery Strategy*, where such a recovery strategy is available. The habitat assessment must include: a) map(s) indicating the location of the habitat; b) a description of the amount of habitat and the existing habitat alteration, in hectares; c) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in the assessment; and d) a description of the type of habitat characterized by the biophysical attributes of critical habitat, as defined in the appropriate *Woodland Caribou Recovery Strategy*, where available.	**57**	**58**	**59**		
60-62	**Caribou Habitat Restoration Plan (CHRP)** Northern Gateway must file with the NEB for approval, in accordance with the timelines below, preliminary and final versions of a CHRP for each caribou range. a) Preliminary CHRP - to be filed **at least 6 months prior to commencing construction of spreads, regions, work areas, or infrastructure potentially affecting each caribou range**. This version of the CHRP must include, but not be limited to: i) the CHRP's objectives for each caribou range; ii) a list of criteria used to identify potential caribou habitat restoration sites; iii) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in identifying potential caribou habitat restoration sites; iv) a conceptual decision-making tree(s) or process that will be used to identify restoration actions to be used at different types of sites. The decision process should be based on a literature review of caribou habitat restoration methods and their relative effectiveness, and address typical site factors that may constrain implementation; v) the quantifiable targets and performance measures that will be used to evaluate: the extent of predicted residual effects, CHRP effectiveness, the extent to which the objectives have been met, and the need for further measures to offset effects on habitat; vi) a schedule indicating when mitigation measures will start and the estimated completion date; and vii) a summary of Northern Gateway's consultation with Environment Canada, appropriate provincial authorities, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the preliminary CHRP. This summary must include any issues or concerns raised regarding the preliminary CHRP and how Northern Gateway has addressed or responded to them. b) Final CHRP - to be filed **on or before 1 November after the first complete growing season after commencing Project operations**. This updated version of the CHRP must include, but not be limited to: i) the preliminary CHRP, with any updates identified in a revision log that includes the rationale for any changes; ii) a detailed decision-making tree(s) or process that will be used to identify and prioritize restoration actions among selected habitat restoration sites; iii) a complete tabular list of caribou habitat restoration sites, including locations, spatial areas, habitat quality descriptions, site-specific restoration activities, and challenges; iv) maps or Environmental Alignment Sheets showing the site locations;	**60**	**61**	**62**		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
60-62	v) a summary of Northern Gateway's consultation with Environment Canada, appropriate provincial authorities, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the final CHRP. This summary must include any issues or concerns raised regarding the final CHRP and how Northern Gateway has addressed or responded to them; and vi) a quantitative and qualitative assessment of the total area of direct and indirect disturbance to caribou habitat that will be restored, the duration of spatial disturbance, and the extent of the resulting residual effects to be offset.	**60**	**61**	**62**		
63-66	**Construction Environmental Protection and Management Plan (EPMP)** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing construction**, an updated Construction EPMP, including Environmental Alignment Sheets. This Construction EPMP must be a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in Northern Gateway's Project application, its subsequent filings, evidence collected during the hearing process, or as otherwise committed to during questioning or in its related submissions during the OH-4-2011 proceeding. The Construction EPMP and Environmental Alignment Sheets must **subsequently be updated** to include any additional measures arising from all outstanding pre-construction field studies and surveys. The Construction EPMP must reflect Northern Gateway's consideration of seasonal influences and include: a) environmental procedures, including site-specific plans, criteria for implementing these procedures, mitigation measures, and monitoring applicable to all Project phases and activities; b) contingency plans and environmental management plans as outlined in the preliminary Construction EPMP filed as Exhibit B3-19 (Volume 7A of the Project application); c) a reclamation plan that includes a description of the condition to which Northern Gateway intends to reclaim and maintain disturbed areas once construction has been completed, and a description of measurable goals for reclamation; and d) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, Environment Canada, the British Columbia Ministry of Environment, Alberta Environment, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Construction EPMP. This summary must include any issues or concerns raised regarding the Construction EPMP and how Northern Gateway has addressed or responded to them.	**63**	**64**	**65**	**66**	
67-70	**Wetlands Functional Assessment Plan** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing construction**, a Wetland Functional Assessment Plan. The plan must address all sections noted in the Wetland Function Assessment Framework filed during the OH-4-2011 proceeding and all of Northern Gateway's commitments regarding wetlands during the course of the proceeding. The plan must include: a) wildlife species at risk presence and distribution in relation to each specific potentially-affected wetland and associated riparian areas; b) a description of the potentially-affected wetlands' biological characteristics, and the ecological services and functions they provide; c) the criteria, and the rationale for the criteria, for the crossing methods and mitigation measures to be implemented for potentially-affected wetlands; d) a description of how the avoidance, minimization, and compensation mitigation hierarchy, and the goal of no net loss of wetland functions, were considered in developing the Wetland Functional Assessment Plan and the Wetland Compensation Plan; e) details of the monitoring plan for the first 3 years of operations; f) details of the Wetland Compensation Plan; g) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the Wetland Functional Assessment Plan; and h) a summary of Northern Gateway's consultation with Environment Canada, other appropriate provincial and federal authorities, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Wetland Functional Assessment Plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them.	**67**	**68**	**69**	**70**	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
71-73	**Linear Feature Management and Removal Plan** Northern Gateway must file with the NEB, **at least 6 months prior to commencing construction**, a Linear Feature Management and Removal Plan, in accordance with the Linear Feature Management and Removal Plan Framework filed during the OH-4-2011 proceeding. The plan must address all sections noted in the framework and include: a) the plan's goals and objectives; b) the criteria for measuring the plan's success in achieving its goals and objectives; c) the areas where linear feature management and removal measures will be implemented; d) linear feature management and removal measures that are proposed in the areas identified; e) a summary of Northern Gateway's consultation with appropriate federal and provincial authorities, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Linear Feature Management and Removal Plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them; and f) a description of Northern Gateway's proposed follow-up program to assess the plan's effectiveness, including provisions to apply adaptive management principles when required and scheduling of follow-up reports to report on how the plan's goals and objectives are being achieved.	**71**	**72**	**73**		
74-75	**Access Management Plan** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing construction**, an Access Management Plan describing access control measures proposed for construction, operations, and decommissioning. The plan must include: a) access management goals and objectives to control both human and predator access; b) the criteria for measuring the plan's success in achieving its goals and objectives; c) a summary of related baseline information that will be collected and, if no additional information will be collected, a rationale; d) a list of sites where access control measures will be implemented, the control measure(s) proposed at those sites, and the rationale for selecting those sites and measures; e) a summary of Northern Gateway's consultation with appropriate federal and provincial authorities, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Access Management Plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them; f) the methods for monitoring the effectiveness of access control measures implemented; g) a description of available adaptive management measures and of the criteria Northern Gateway will use to determine if and when adaptive management measures are warranted; h) a description of the locations where access control measures are put in place specifically for construction, as well as those that will remain in place into operations and will be monitored for the Project's operational life; and i) a commitment to report, as part of Northern Gateway's post-construction environmental monitoring reports (required by Condition 196), on the results of the control measures implemented, monitoring undertaken, and the success of control measures in meeting the Access Management Plan's goals and objectives.		**74**	**75**		
76	**Aboriginal, local, and regional skills and business capacity inventory** Northern Gateway must file with the NEB, **at least 6 months prior to commencing construction**, an Aboriginal, local, and regional skills and business capacity inventory for the Project. The inventory must include: a) a description of the information and data sources, including Northern Gateway's Regional Skills and Business Inventory Database, and any other sources; b) a summary of Aboriginal, local, and regional skills and business capacity; c) an analysis of the ability of Aboriginal, local, and regional capacity for meeting Northern Gateway's commitments for Aboriginal, local, and regional employment and business opportunities for the Project; d) a description of identified or potential skills and business capacity gaps, and any proposed measures to address them or to support or increase skills or capacity; and e) plans for communicating with Aboriginal, local, and regional communities and businesses regarding skills and business capacity, any identified gaps, and any proposed measures to support or increase skills or capacity. Northern Gateway must file with the NEB, **at least 90 days prior to commencing construction**, any updates to a) through e).					**76**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
77	**Training and Education Monitoring Plan** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing construction**, a plan for monitoring the implementation and outcomes of Aboriginal, local, and regional training and education measures and opportunities for the Project. The plan must include: a) a description of, and rationale for selecting, the elements or indicators that will be monitored to track the implementation of training and education measures and opportunities, and progress toward meeting intended outcomes of these measures and opportunities; b) the monitoring methods and schedule, including information and data sources for the elements or indicators being monitored; and c) plans for consulting and reporting on the implementation and outcomes of training and education measures and opportunities with relevant Aboriginal, local, and regional communities; industry groups or representatives; government sponsors; and education delivery agencies and institutions. Northern Gateway must file with the NEB, **at least 90 days prior to commencing construction**, any updates to a) through c).					**77**
78	**Socio-Economic Effects Monitoring Plan** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing construction**, a plan for monitoring potential adverse socio-economic effects of the Project during construction. The plan must include: a) the factors or indicators to be monitored; b) the methods and rationale for selecting the factors or indicators; c) a description of the baseline, pre-construction socio-economic conditions; d) the monitoring methods and schedule, including third party data source identification; e) data recording, assessment, and reporting details; f) a discussion of how measures will be implemented to address any identified adverse effects, including: i) the criteria or thresholds that will require measures to be implemented; ii) how monitoring methods and measures implementation to address adverse effects, as necessary, are incorporated into Construction Execution Plans; and iii) a description of the roles and responsibilities of construction prime contractors, sub-contractors, and community liaison staff in monitoring socio-economic effects and implementing measures to address adverse effects; g) a summary of Northern Gateway's consultation with potentially-affected communities, Aboriginal groups, local and regional authorities, and service providers regarding the Socio-Economic Effects Monitoring Plan. This summary must include: i) a description of any developed agreements or protocols; ii) any issues or concerns raised regarding the plan, and how Northern Gateway has addressed or responded to them; and iii) a list of, and explanation for, outstanding issues or concerns, and the steps that Northern Gateway will take to address or respond to them; and h) plans for regular consultation and reporting on effects during construction with potentially-affected communities, Aboriginal groups, local and regional authorities, and service providers.					**78**
79	**Training and education monitoring reports** Northern Gateway must file with the NEB, **at least 6 months prior to commencing construction**, **and every 6 months thereafter until completing construction**, monitoring reports for the implementation and outcomes of Aboriginal, local, and regional training and education measures and opportunities for the Project. The reports must include: a) a description of each training and education measure and opportunity implemented during the reporting period, including duration, participant groups, delivery agency or institution, and intended outcomes; b) a description of the elements or indicators that were monitored; c) a summary and analysis of the progress made toward meeting intended outcomes of each training and education measure and opportunity, including an explanation for why any intended outcomes were not met; d) a description of identified or potential training or education gaps, and any proposed measures to address them or to support or increase training and education measures and opportunities; and					**79**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
79	e) a summary of Northern Gateway's consultation with relevant Aboriginal, local, and regional communities; relevant industry groups or representatives; government sponsors; and education delivery agencies and institutions regarding the implementation and outcomes of training and education measures and opportunities for the reporting period. This summary must include any issues or concerns raised regarding these measures and opportunities and how Northern Gateway has addressed or responded to them. Northern Gateway must file with the NEB, **within 6 months after completing construction**, a final report.					**79**
80-81	**Valve spacing** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing construction**, its final valve location assessment for the pipeline that provides calculated maximum release volumes based on a 10-minute dynamic (pressurized) release and a 3-minute full valve closure. This assessment must use the same valve location selection criteria as was used in the preliminary valve location engineering assessment (Exhibit B109-4). Northern Gateway must provide, as part of this assessment: a) calculated maximum volume release and elevation plots; b) valve location tables with valve location, description, and rationale; c) for each 10-kilometre-long section, a rationale for why the maximum release volume within that section is as low as reasonably practicable; and d) full-bore release and spill extent mapping in a format and scale similar to that provided in Exhibit B020. These maps must identify and plot all geohazards identified by Northern Gateway at the time of the submission.		**80**	**81**		
82	**Air Quality Emissions Management and Soil Monitoring Plan** Northern Gateway must file with the NEB for approval, **at least 4 months prior to commencing construction**, an Air Quality Emissions Management and Soil Monitoring Plan for the Kitimat Terminal. The potential for foliar injury should be reflected in the modelling and monitoring design. This plan must include: a) a description of the baseline, pre-construction conditions, informed by relevant modelling results and recent, existing monitor data; b) locations of both air and soil monitoring sites on a map or diagram, including the rationale for the locations selected and the timing for installation; c) methods and schedule of ambient monitoring for contaminants of potential concern in air (e.g., NO2, SO2, and H2S) and in soils (e.g., pH; major plant nutrients K, P, N, and S; and trace metals), and emissions source tracking; d) data recording, assessment, and reporting details; e) a description of the public communication and complaint response process; f) additional measures that will be implemented as a result of monitoring data or ongoing concern; g) the criteria or thresholds that will require implementing additional measures; h) a description of the plan updating process; i) a summary of Northern Gateway's consultation with Environmental Canada and the British Columbia Ministry of Environment regarding the Air Quality Emissions Management and Soil Monitoring Plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them; and j) a summary of discussions with the District of Kitimat and local or regional industrial emitters regarding collaborating on the plan's design and implementation.				**82**	
83	**Construction schedule** Northern Gateway must file with the NEB, **at least 90 days prior to commencing construction**, a construction schedule identifying the major construction activities expected and, **on a monthly basis from the start of any clearing until commencing operations**, updated detailed construction schedules.					**83**
84	**Security Programs** Northern Gateway must confirm with the NEB in writing, in accordance with the timelines below, that it has developed Security Programs for the construction and operations phases of the Project, pursuant to the *National Energy Board Onshore Pipeline Regulations* (as amended from time to time) and CSA Z246.1: a) **At least 90 days prior to commencing construction** for the construction phase Security Program. b) **At least 90 days prior to commencing operations** for the operations phase Security Program.					**84**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
85	**Emergency Response Plan for construction** Northern Gateway must file with the NEB, **at least 90 days prior to commencing construction**, an Emergency Response Plan that addresses 24-hour medical evacuation, fire response, hazardous chemical and fuel spill response, and security. The plan must include: a) the plan's scope, detailing the Project facilities and infrastructure, geographic areas, and time periods covered by the plan; b) training and orientation requirements for company and contractor staff; c) an inventory of petroleum products, chemicals, and other hazardous substances that will be transported, stored, or used prior to and during construction, as well as the locations where the Material Safety Data Sheets for each of these products will be kept; d) storage facilities and locations of the above-inventoried products and substances; e) resources (e.g., equipment, contractors, and staff) to be on-site and/or available to respond to emergencies; f) mutual aid partners and the locations of their resources (e.g, equipment and staff) available to respond to emergencies; g) procedures for responding to spills, releases, fires, medical emergencies, and security issues, including the incident reporting and notification system; h) fire and spill response equipment store locations and vehicle spill kit requirements; i) a phone list of company, contractor, government authority, and community representatives that identifies their respective roles and information needs; j) cleanup and disposal procedures for generated wastes; k) muster points for emergency evacuations from camps and facilities; l) emergency medical treatment locations and capabilities; m)the requirement for 24-hour emergency medical evacuation capability; n) maps showing the location of the right-of-way and infrastructure (as defined) to facilitate first responder dispatching; and o) a description of how potential geological, meteorological, and geographical hazards have been incorporated into the plan.					85
86-88	**Technology and site-specific mitigation related to emergency preparedness and response** Northern Gateway must file with the NEB, **at least 90 days prior to commencing construction**, an assessment of the emergency preparedness and response technology and site-specific mitigation discussed in the Project application and during the OH-4-2011 proceeding, as well as the locations where this technology and mitigation will be used or a rationale for not using them.		86	87	88	
89-92	**Pre-construction TLU investigation report** Northern Gateway must file with the NEB for approval and serve a copy on all potentially-affected Aboriginal groups, **at least 90 days prior to commencing construction**, a report describing the pre-construction TLU investigations undertaken to identify potentially-affected TLU sites or resources that arose from detailed routing and design (required by Conditions 53-56). The report must include: a) a summary of investigations undertaken, including the scope, spatial extent, methods used, timing, and any activities undertaken with potentially-affected Aboriginal groups; b) a description of the potentially-affected TLU sites or resources identified in the investigations; c) a summary of any mitigation measures that Northern Gateway did not previously report during the OH-4-2011 proceeding that it will implement to reduce or eliminate potential Project effects on TLU sites or resources identified; d) a description of how Northern Gateway has incorporated mitigation measures into its Construction EPMP (required by Conditions 63-66); e) a description of, and explanation for, any outstanding issues or concerns raised by potentially-affected Aboriginal groups, and the steps that Northern Gateway will take to address or respond to them; and f) a summary of any outstanding investigations or follow-up activities to be completed prior to commencing construction, including an estimated completion date, and a description of how Northern Gateway has already identified, or will identify, any potentially-affected TLU sites or resources if the outstanding investigations will not be completed prior to construction.	89	90	91	92	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
93	**Aboriginal, Local, and Regional Employment Monitoring Plan** Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing construction**, a plan for monitoring Aboriginal, local, and regional employment for the Project. The plan must include: a) a description of, and rationale for selecting, the elements or indicators that will be monitored to track Aboriginal, local, and regional employment, including those specific to tracking progress toward meeting Northern Gateway's commitment of 15 per cent Aboriginal employment; b) the monitoring methods and schedule, including information and data sources for the elements or indicators being monitored; and c) plans for consulting and reporting on Aboriginal, local, and regional employment with relevant Aboriginal, local, and regional communities, and industry groups or representatives.					93
94	**Aboriginal Contracting and Procurement Monitoring Plan** Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing construction**, a plan for monitoring Aboriginal contracting and procurement for the Project. The plan must include: a) a description of, and rationale for selecting, the elements or indicators that will be monitored to track Aboriginal contracting and procurement for the Project; b) the monitoring methods and schedule, including information and data sources for the elements or indicators being monitored; and c) plans for consulting and reporting on contracting and procurement with relevant Aboriginal communities, businesses, and individuals.					94
95-98	**Protection and management plan for post-AD 1846 culturally-modified trees (CMTs)** Northern Gateway must file with the NEB and serve a copy on all potentially-affected Aboriginal groups, **at least 90 days prior to commencing construction,** a plan to protect and manage post-AD 1846 CMTs within the British Columbia porti on of the Project. The plan must include: a) the methods for surveying or inventorying potentially-affected CMT sites at locations to be disturbed by construction; b) results of pre-construction surveys or inventories of CMT sites; c) an assessment of the potential effects on identified CMTs; d) a description of mitigation measures to reduce or eliminate potential effects on identified CMTs; e) a summary of Northern Gateway's consultation with potentially-affected Aboriginal groups regarding the protection and management plan. This summary must include: i) a description of any agreements or protocols regarding CMTs developed with potentially-affected Aboriginal groups; ii) any issues or concerns raised regarding the plan, and how Northern Gateway has addressed or responded to them; and iii) a list of, and explanation for, outstanding issues or concerns, and the steps that Northern Gateway will take to address or respond to them; and f) a description of how Northern Gateway has incorporated mitigation measures into its Construction EPMP (required by Conditions 63-66).	95	96	97	98	
99-101	**Acid rock drainage monitoring and follow-up program** a) Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing construction**, its follow-up program to determine the post-construction water quality of groundwater drainage from the Hoult and Clore tunnel portals, all acid rock storage sites, and the receiving water bodies, as committed to in Volume 6A of the Project application (Exhibit B003). Northern Gateway must include a proposed schedule for reporting results to the NEB. b) Northern Gateway must file with the NEB, **based on the NEB-approved schedule referred to in** a)**,** the results of the follow-up program, including monitoring results, an evaluation of the environmental assessment predictions and mitigation effectiveness, and a discussion of any necessary adaptive management measures.		99	100	101	
102-105	**Surveys and mitigation for rare plants and ecological communities** Northern Gateway must undertake, **within the year prior to commencing construction**, spring, summer, and fall field surveys for rare plants and ecological communities. Survey design and sampling methods must consider the availability of unique habitats to support rare species or ecological communities. Northern Gateway must file with the NEB, **at least 90 days prior to commencing construction**:	102	103	104	105	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
102-105	a) the spring, summer, and fall field survey results; b) confirmation that the Vegetation Protection and Management Plan, to be included in the Construction EPMP (required by Conditions 63-66), has been, or will be, updated to include: i) mitigation measures to be implemented for species and communities potentially affected during construction; ii) a monitoring survey protocol for post-construction reclamation; iii) the methods for determining the extent of non-avoidable effects on rare (including those listed under all Schedules of the *Species at Risk Act*) plants and ecological communities; and iv) a plan for providing offset measures for all non-avoidable effects on rare plants and ecological communities, including criteria that will be used to assess offset measure effectiveness; c) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the surveys and mitigation; and d) a summary of Northern Gateway's consultation with Environment Canada, other appropriate federal and provincial authorities, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the surveys and mitigation for rare plants and ecological communities. This summary must include any issues or concerns raised regarding the surveys and mitigation, and how Northern Gateway has addressed or responded to them.	**102**	**103**	**104**	**105**	
106-109	**Construction safety manuals** Northern Gateway must file, **at least 90 days prior to commencing construction**, construction safety manuals for the applicable Project components. Filings for the pipeline must include separate construction safety manuals for pipeline construction, station construction, and tunnel construction (including pipeline facility fabrication and installation within the tunnels). These manuals must address routine construction activities, as well as blasting, avalanche safety, and special access road procedures that may be required in areas subject to activities other than Project construction (e.g., logging).	**106**	**107**	**108**	**109**	
110-111	**Complementary leak detection systems** Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing construction**, a report that includes: a) a description of the methods and conclusions of Northern Gateway's investigations for the complementary leak detection technologies described during the OH-4-2011 proceeding; b) a description of the complementary leak detection systems Northern Gateway has decided to implement and the reasons why; and c) a timetable for installing and implementing the chosen complementary leak detection systems.		**110**	**111**		
112-115	**Heritage resources** Northern Gateway must file with the NEB, **at least 60 days prior to commencing construction**: a) copies of correspondence from the Alberta Department of Culture and the British Columbia Ministry of Forests, Lands and Natural Resource Operations confirming that Northern Gateway has obtained all of the required archaeological and heritage resource permits and clearances; b) a description of how Northern Gateway will meet any conditions and respond to any comments and recommendations contained in the permits and clearances referred to in a); and c) a description of how Northern Gateway has incorporated any additional mitigation measures into its Construction EPMP (required by Conditions 63-66) as a result of any conditions or recommendations referred to in a).	**112**	**113**	**114**	**115**	
116	**Marine Voluntary Commitments and the TERMPOL Review Committee recommendations – implementation, monitoring, and compliance** Northern Gateway must file with the NEB, **at least 30 days prior to commencing construction**, a plan describing how it intends to implement, monitor, and ensure compliance with its Marine Voluntary Commitments and the TERMPOL Review Committee recommendations. The plan must include a summary of Northern Gateway's consultation with Transport Canada, the Pacific Pilotage Authority, Environment Canada, Fisheries and Oceans Canada, the Canadian Coast Guard, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them.					**116**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
117-119	**Emergency preparedness and response planning – document preparation** Northern Gateway must file with the NEB, **at least 30 days prior to commencing construction**, a plan for preparing the following documents: a) General Oil Spill Response Plan, including a net environmental benefit analysis framework; b) Pipeline Oil Spill Response Plan; c) Kitimat Terminal Oil Spill Response Plan; d) Marine Oil Spill Response Plan; and e) all related and accompanying plans, such as Tactical Watercourse Plans, Pre-SCAT (Shoreline Clean-Up Assessment Technique) and River Substrate Surveys, Response Tactics for Floating Oil, Response Tactics for Submerged and Sunken Oil, Control Points, Access Plans, Geographic Response Plans, an Oil Pollution Prevention Plan, and an Oil Pollution Emergency Plan. The plan must include the following information in relation to the above documents: i) steps to be undertaken in completing them; ii) approximate timing for their completion; iii) interested parties that will be consulted; and iv) a description of all federal and provincial regulations that need to be adhered to.		**117**	**118**	**119**	
120-121	**Freshwater Fish and Fish Habitat Compensation Plan** Northern Gateway must file with the NEB, **at least 30 days prior to commencing construction**, a final Freshwater Fish and Fish Habitat Compensation Plan for the pipeline right-of-way that details offset measures. With this plan, Northern Gateway must include: a) a letter from Fisheries and Oceans Canada indicating its approval of the plan; and b) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Freshwater Fish and Fish Habitat Compensation Plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them.		**120**	**121**		
122	**Marine Habitat Compensation Plan** Northern Gateway must file with the NEB, **at least 30 days prior to commencing construction**, a final Marine Habitat Compensation Plan. With this plan, Northern Gateway must include: a) a letter from Fisheries and Oceans Canada indicating its approval of the plan; and b) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Marine Habitat Compensation Plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them.				**122**	
123	**Post-construction environmental monitoring methods (terrestrial and freshwater)** Northern Gateway must file with the NEB, **at least 30 days prior to commencing construction**: a) the methods, including frequency and duration, for conducting post-construction environmental monitoring for all terrestrial and freshwater areas disturbed during construction; b) the criteria to be used for evaluating reclamation success; and c) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, Environment Canada, the British Columbia Ministry of Environment, and Alberta Environment regarding the post-construction environmental monitoring methods and criteria. This summary must include any issues or concerns raised regarding the methods and criteria and how Northern Gateway has addressed or responded to them.					**123**
124	**Secondary containment at the Kitimat Terminal** Northern Gateway must construct the secondary containment at the Kitimat Terminal's tank terminal such that its capacity can accommodate six times the volume of the largest tank in the tank terminal. It must also provide accommodation for peak precipitation, and have allowances for potential future tanks and for water generated from potential firefighting activities. Northern Gateway must file with the NEB, **at least 30 days prior to commencing construction**, confirmation that its design incorporates this requirement.				**124**	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
125-126	**Watercourse crossing designs** For all the watercourse crossings that are to be constructed within a common season or time period, Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing their construction**: a) an updated aquatic catalogue for all the watercourse crossings based on centreline surveys; b) an updated Watercourse Crossing Inventory for all the watercourse crossings, in both Adobe® PDF and Microsoft® Excel® spreadsheet formats, describing the watercourse name and numerical identifier, coordinates, stream class, width of wetted channel, primary and contingency construction methods, minimum pipeline cover (except for aerial crossings), navigability, fish habitat status, and level of assessment; c) detailed final design drawings and plans for both the proposed primary and contingency construction methods for all high-, medium-high, and medium-risk watercourse crossings to mitigate environmental or safety concerns including, calculated vertical and lateral scour potential, and proposed mitigation measures; d) design flood values for all high-, medium-high and medium-risk watercourse crossings, including for those where a trenchless crossing method is proposed as the primary construction method; e) detailed final drawings of typical designs for open-cut and isolated crossings of various watercourse types; f) an updated listing of navigable waterways to be crossed by the pipeline or affected by Project infrastructure, Project effects on navigation and navigation safety (outside of marine shipping), any issues or concerns raised by waterway users and Aboriginal groups regarding navigation use, how Northern Gateway has addressed or responded to those issues or concerns, and proposed mitigation measures to address Project effects on navigation and navigation safety for each navigable waterway; g) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the designs; and h) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, Environment Canada, the British Columbia Ministry of Environment, and Alberta Environment regarding the watercourse crossing designs. This summary must include any issues or concerns raised regarding these designs and how Northern Gateway has addressed or responded to them. **Northern Gateway must not commence construction of a watercourse crossing until all pre-construction conditions have been satisfied for the construction spread, region, or work area in which the crossing is located.**		**125**	**126**		
127-128	**Provisional least risk periods** For all the watercourse crossings that are to be constructed within a common season or time period, Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing their construction**: a) a list of the provisional least risk periods for each watercourse crossing with no established least risk period that reflects the habitat use by fish during the proposed construction period; b) the rationale for each provisional least risk period; c) any additional mitigation measures that will be applied in each case; and d) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada and the British Columbia Ministry of Environment that describes their views on the provisional least risk periods and any additional mitigation measures to be applied. **Northern Gateway must not commence construction of a watercourse crossing until all pre-construction conditions have been satisfied for the construction spread, region, or work area in which the watercourse crossing is located**.		**127**	**128**		
129-130	**Tunnel infrastructure** Northern Gateway must file with the NEB, **at least 6 months prior to commencing tunnel construction activities**: a) a report on the characterization of the rock mass quality and groundwater conditions expected to be encountered during construction and how they will be addressed during construction; b) details of mitigation measures for control and treatment of groundwater during construction and for the life of the tunnels; c) details of mitigation measures for the treatment of sulphide-bearing rock, if encountered; d) tunnel confined space entry procedures during and following construction; e) final cross-sectional design drawings; and		**129**	**130**		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
129-130	f) details of the construction plans for the tunnels, including: i) construction methods to be used; ii) permanent road access; iii) tunnel portals and doors; iv) geohazard mitigation measures at tunnel entrances; v) tunnel lining system; vi) ground support system; vii) ventilation and lighting; viii) location, size, and design of waste rock disposal areas; ix) plans for disposing of any waste rock that cannot be stored in the waste rock disposal areas; and x) location, size, and design of staging areas.		**129**	**130**		
PHASE: PRIOR TO COMMENCING OPERATIONS / DURING CONSTRUCTION						
131	**Construction progress reports** Northern Gateway must file with the NEB **monthly construction progress reports during construction**. The reports must include information on the progress of activities carried out during the reporting period. These reports must include safety, environmental, and security non-compliances that occurred during each reporting period and the measures undertaken to resolve them. These reports must also include a description of any changes made to geohazard mitigation measures, the location of any pressure tests carried out during the reporting period, and a description of any unsuccessful pressure tests and their cause.					**131**
132-134	**Quality assurance and control plans and procedures** Northern Gateway must file **monthly summary reports during construction** outlining non-conformances with its design, materials, and construction specifications, as well as the disposition of these non-conformances.		**132**	**133**	**134**	
135	**Aboriginal, local, and regional employment monitoring reports** Northern Gateway must file with the NEB, **within 3 months after commencing construction**, **and every 6 months thereafter until completing construction**, monitoring reports for Aboriginal, local, and regional employment for the Project. The reports must include: a) a summary of the elements or indicators monitored; b) a summary and analysis of Aboriginal, local, and regional employment during the reporting period, including: i) progress made toward meeting Northern Gateway's commitment of 15 per cent Aboriginal employment; ii) if the 15 per cent Aboriginal employment commitment is not met, an explanation why; and iii) any proposed measures to address identified or potential gaps or barriers in meeting the 15 per cent Aboriginal employment commitment; and c) a summary of Northern Gateway's consultation with relevant Aboriginal, local, and regional communities, and industry groups or representatives regarding employment for the reporting period. This summary must include any issues or concerns raised regarding employment and how Northern Gateway has addressed or responded to them. Northern Gateway must file with the NEB, **within 6 months after completing construction**, a final report on employment during the construction phase. Northern Gateway must also file with the NEB, **on or before 31 January of every third year after commencing operations**, employment monitoring reports, addressing a), b), and c) above, for the Project's operational phase.					**135**
136	**Aboriginal contracting and procurement monitoring reports** Northern Gateway must file with the NEB, **within 3 months after commencing construction**, **and every 6 months thereafter until completing construction**, monitoring reports for Aboriginal contracting and procurement for the Project. The reports must include: a) a summary of the elements or indicators monitored; b) a summary and analysis of Aboriginal contracting and procurement opportunities awarded or active during the reporting period, including: i) progress made toward meeting Northern Gateway's commitment for $300 million for Aboriginal contracting and procurement; and					**136**

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136	ii) any proposed measures to address identified or potential gaps or barriers in meeting the $300 million commitment for Aboriginal contracting and procurement; and c) a summary of Northern Gateway's consultation with relevant Aboriginal groups, businesses, and individuals regarding Aboriginal contracting and procurement for the reporting period. This summary must include any issues or concerns raised regarding Aboriginal contracting and procurement and how Northern Gateway has addressed or responded to them. Northern Gateway must file with the NEB, **within 6 months after completing construction**, a final report.					**136**
137	**FLC – annual report** Northern Gateway must file with the NEB, **on or before 31 January of each year after commencing in-water construction for the Kitimat Terminal, and for the Project's operational life**, an annual report describing the FLC's activities, recommendations, and outcomes. The reports must include: a) a list of the FLC members for each year; b) a summary of key FLC activities, including all recommendations; c) a description of how each recommendation was implemented or, if any recommendations were not implemented, a rationale for why not; d) a summary of any issues or concerns brought forward for dispute resolution, including the parties involved, and how these were resolved; e) a description of, and explanation for, any unresolved issues or concerns, and any steps required to resolve them to the greatest extent possible; f) a summary of compensation protocols; and g) the measured outcomes of each goal established under the FLC operational guidelines (required by Condition 52).				**137**	
138	**Construction Marine Mammal Protection Plan reporting** Northern Gateway must file with the NEB, **on or before 31 January of each year after commencing in-water construction for the Kitimat Terminal, for the duration of in-water construction,** a report describing the results of the monitoring activities, referred to in the Construction Marine Mammal Protection Plan (required by Condition 51), that were completed during the calendar year prior to filing.				**138**	
139-140	**Trenchless watercourse crossing completions and contingency plans** Northern Gateway must file with the NEB either: a) **upon successful completion of each trenchless watercourse crossing**, confirmation of its completion; or b) in the event that the primary construction method for a proposed trenchless watercourse crossing is not practicable, the following information, **at least 10 days prior to constructing the crossing**: i) notification of which contingency method, as approved under Conditions 125-126, will be used and the rationale for the change; and ii) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, the British Columbia Ministry of Environment, and Alberta Environment regarding the contingency crossing method implementation.		**139**	**140**		
141-142	**Construction outside of least risk periods** For each watercourse crossing where construction is to occur outside the established or accepted provisional least risk period, Northern Gateway must: a) where a trenchless crossing is proposed, notify the NEB **at least 15 days prior to constructing the crossing**; or b) where a trenched crossing is proposed, file with the NEB for approval, **at least 60 days prior to constructing the crossing**: i) the rationale for constructing outside of the least risk period; ii) a watercourse crossing plan, including proposed timing and any additional mitigation measures that will be applied; and iii) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, the British Columbia Ministry of Environment, and Alberta Environment regarding the proposed crossing schedule and plan. This summary must include any issues or concerns raised regarding the schedule and plan and how Northern Gateway has addressed or responded to them.		**141**	**142**		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
143-144	**Pipeline construction within tunnels** Northern Gateway must file with the NEB, **at least 6 months prior to commencing pipeline installation in the tunnels**, a detailed description of how the pipeline segments within the tunnels will be constructed, including welding, NDE, protective coatings, and pressure testing.		**143**	**144**		
145-147	**Geohazard Assessment, Mitigation, and Monitoring Report** Northern Gateway must file with the NEB for approval, **at least 6 months prior to commencing pipe installation**, a final Geohazard Assessment, Mitigation, and Monitoring Report that describes, at a minimum: a) in a table and/or using maps, the specific and combined geohazards identified that could have a reasonable probability of impacting the Project; b) specific design measures, including grading, special materials, installation procedures, protective structures, increased burial depth, erosion mitigation measures, and monitoring, that will be implemented to mitigate individual and combined geohazards; c) staff qualifications for those making decisions regarding the assessment and mitigation design; and d) ongoing monitoring requirements. For the pipeline, Northern Gateway must assess the terrain from height of land on both sides of the pipeline route in the Coast and Rocky Mountains. For the Kitimat Terminal, Northern Gateway must consider marine geotechnical studies (e.g., submarine or sub-aerial to submarine landslides) that could potentially impact near-shore facilities. The report must include a copy of the report(s) by the independent geohazard working group (or committee) comprised of geohazard specialists* from various organizations, including, governments, local experts, and Northern Gateway's consultants. * In this case, geohazard specialists must have a post-secondary education, experience, and a licence to practice geosciences. Geohazard specialists can include geotechnical engineers, geophysicists, geochemists, geomorphologists, and hydrogeologists.		**145**	**146**	**147**	
148-150	**Updated engineering alignment sheets and drawings** Northern Gateway must file with the NEB, **at least 90 days prior to commencing pipe installation**, updated engineering alignment sheets and drawings and, **as they become available and prior to their implementation**, any modifications to those sheets and drawings.		**148**	**149**	**150**	
151-153	**Specifications for field-applied coatings** Northern Gateway must file with the NEB, **at least 60 days prior to commencing pipe installation**, its product and application specifications for field-applied coatings.		**151**	**152**	**153**	
154-155	**Pipeline overpressure risk reduction** Northern Gateway must ensure that the maximum operating head profile of the pipeline is greater than or equal to the maximum discharge head of the upstream pump station. Northern Gateway must file with the NEB, **at least 60 days prior to commencing pipe installation**, confirmation that it has implemented this requirement. **In the event that this is not possible**, Northern Gateway must file design and operational measures that will reduce or eliminate the risk of overpressure at those locations.		**154**	**155**		
156-158	**Field changes manual for geohazard mitigation** Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing pipe-laying activities**, a field changes manual for geohazard mitigation. This manual must include: a) decision criteria for implementing mitigation for any geohazards identified during construction; b) specific criteria for implementing changes to the designs, grading, special materials, protective structures, increased burial depth, installation procedures, erosion mitigation measures, and monitoring as specified in the Geohazard Assessment, Mitigation, and Monitoring Report (required by Conditions 145-147); and c) details regarding the required qualifications of its field staff that will implement the manual.		**156**	**157**	**158**	
159-161	**NDE of final tie-in welds** Northern Gateway must delay NDE of final tie-in welds and any repairs to them **for 48 hours following weld completion**. Northern Gateway must include this requirement in the NDE specification of its Joining Program (required by Conditions 46-48).		**159**	**160**	**161**	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
162-163	**Radiographer and ultrasonic technicians** Northern Gateway must use only Canadian General Standards Board-certified radiographers and ultrasonic technicians to operate any NDE inspection equipment, and for the final interpretation of radiographic film and the results of the ultrasonic inspection system. Northern Gateway must file with the NEB, **at least 30 days prior to commencing NDE operations**, confirmation of compliance.		**162**	**163**		
164-166	**Pressure testing** a) Northern Gateway must pressure test the Project facilities with a liquid medium. b) Northern Gateway must file with the NEB for approval, **at least 90 days prior to commencing pressure testing**, a Pressure Testing Program that demonstrates compliance with applicable codes, standards, and regulatory requirements.		**164**	**165**	**166**	
167	**Enhanced marine spill trajectory and fate modelling** Northern Gateway must file with the NEB for approval, **at least 3 years prior to commencing operations**, a plan to prepare enhanced marine spill trajectory and fate modelling for the Kitimat Terminal and marine tanker traffic. The plan must include: a) a summary of Northern Gateway's consultation with Environment Canada regarding the scope of work to be undertaken. This summary must include any issues or concerns raised regarding the scope of work and how Northern Gateway has addressed or responded to them; b) the membership of a Scientific Advisory Committee and its Terms of Reference; c) a schedule for completing the work and confirmation that it will be completed prior to commencing operations; d) the scenarios to be modelled that, at minimum, must include the same six scenarios in terms of locations and potential spill volumes included in Northern Gateway's modelling work referenced in Exhibit B3-22 (Volume 7C of the Project application, Section 9 - Examples for Response Planning), and Exhibit B3-42 (Volume 8C of the Project application, Section 10 - Mass Balance Examples for Response Planning); and e) a discussion of how Northern Gateway will include the following in its enhanced modelling: i) stochastic calculations and visual representations; ii) how the model will be adapted to different physical and chemical characteristics of the oil that is intended to be shipped from the Kitimat Terminal, with particular reference to density, viscosity, emulsion formation, adhesion properties, and evaporation rates; iii) oil remobilization from the shorelines due to tidal or other influences, such as varying adhesion properties of the oil intended to be shipped from the Kitimat Terminal, and oil retention times; iv) submerged or entrained oil resurfacing; v) potential for oil to sink based on weathering and adhesion to sediment; vi) how weathering and trajectory models will be integrated to provide an accurate representation of the potential fate of oil within the environment; vii) how the models will be adaptable to any time of the year and to varying meteorological and hydrological conditions; and viii) how the models will be used to inform decision-making during spill response exercises and actual spill events.					**167**
168	**Consultation with interested parties on emergency preparedness and response** Northern Gateway must file with the NEB, **at least 3 years prior to commencing operations**, a plan for consulting on emergency preparedness and response for the pipeline and the Kitimat Terminal. This plan must include: a) the consultation plan's scope; b) the consultation plan's objectives; c) a preliminary list of regulatory authorities to be consulted; d) a preliminary list of communities and Aboriginal groups to be consulted; e) a preliminary list of consultation locations and timing; and f) the methods to track commitments made during consultation and to incorporate them into final Emergency Preparedness and Response Plans.					**168**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
169	**Research program on the behavior and cleanup of heavy oils** Northern Gateway must file with the NEB for approval, **at least 3 years prior to commencing operations**, a plan to lead, or jointly lead with other government and industry participants, a research program regarding the behavior and cleanup (including recovery) of heavy oils spilled in freshwater and marine aquatic environments. The plan must include: a) the funding required to ensure the developed research program is undertaken and concluded within a specified funding period, with details about: i) the level and duration of funding contributed by Northern Gateway; and ii) the levels and duration of funding from other sources; b) a plan for consulting with the NEB, Environment Canada, Transport Canada, the Canadian Coast Guard, the Province of British Columbia, and any other stakeholders that Northern Gateway will consult with, including Aboriginal groups; c) the membership of a Scientific Advisory Committee and its Terms of Reference; d) topics to be addressed through the research, including varying physical and chemical properties of the oil intended to be shipped from the Kitimat Terminal, product weathering, dispersion and oil/sediment interactions, product submergence, product behavior and cleanup following in-situ burning, and cleanup and remediation options for sediments and shoreline; e) the scope, objectives, methods, and timeframe for the research topics as they pertain to both laboratory and field work; f) how Northern Gateway will incorporate the results of the research into its enhanced marine spill fate and trajectory models; g) how Northern Gateway will incorporate the results of the research into its emergency preparedness and response plans; and h) how Northern Gateway will make the results of the research available to spill responders and relevant government authorities in the event of a spill.					**169**
170	**Annual research program progress reports** Northern Gateway must file with the NEB, **on or before 31 January of each year for the duration of the research program on the behavior and cleanup of heavy oils** (required by Condition 169), a progress report that demonstrates the extent to which the objectives of the research program have been achieved and that includes: a) an update on timing and the status of the work undertaken that year; b) results from research conducted during the calendar year prior to filing; c) work to be undertaken in the upcoming year; and d) any other matters that Northern Gateway wants to bring to the NEB's attention related to the research project.					**170**
171	**Pre-operations emergency response exercises** a) **Prior to commencing operations,** Northern Gateway must complete full-scale exercises to test the following six scenarios, one of which must be unannounced: i) a full-bore rupture under ice and snow conditions in the Coastal Mountains; ii) a full-bore rupture into the Athabasca River under peak flow conditions; iii) a full-bore rupture into the Kitimat River during high spring flow conditions; iv) a full-bore rupture into the Clore River during high spring flow conditions; v) a 250-cubic-metre condensate release into Kitimat Arm as a result of a release from the Kitimat Terminal; and vi) a 250-cubic-metre diluted bitumen release into Kitimat Arm as a result of a release from the Kitimat Terminal. b) Northern Gateway must conduct each exercise with the objectives of testing: i) emergency response procedures; ii) company personnel training; iii) communications systems; iv) response equipment; v) safety procedures; and vi) the effectiveness of its liaison and continuing education programs.					**171**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
171	c) Northern Gateway must notify the NEB, **at least 45 days prior to the date of each exercise (other than the unannounced exercise),** of: i) the exercise's date and location(s); ii) the objectives, if different from those noted above; iii) the participants in the exercise; and iv) the scenario for the exercise. d) Northern Gateway must file with the NEB, **within 60 days after completing each exercise,** a report on the exercise that includes: i) the results of the completed exercise; ii) areas for improvement; and iii) steps to be taken to correct deficiencies.					**171**
172	**Emergency Preparedness and Response Exercise and Training Program** Northern Gateway must file with the NEB, **at least 18 months prior to commencing operations**, an Emergency Preparedness and Response Exercise and Training Program for the pipeline and the Kitimat Terminal. The program's objective is to demonstrate the continual improvement of responder competencies (including control centre personnel) at all levels of the company to prepare for, respond to, recover from, and mitigate the potential effects of emergencies of any type. The program must include: a) a defined scope, other objectives in addition to those noted above, and program targets that address responder turn-over and ensure responders' ongoing training and practice; b) a list of mandatory courses for responders; c) how Northern Gateway will train its personnel to respond to all hydrocarbon spill scenarios in various seasons, including releases of hydrocarbons in mountain regions during winter conditions, into ice covered watercourses, and into watercourses under varying flow conditions; d) with the exception of unannounced exercises, a description of, and schedule for, all emergency response exercises (full-scale, tabletop, drills, functional) that Northern Gateway will conduct prior to operations to test a variety of scenarios; e) a plan, including rationales, for determining the schedule and frequency of all planned and unannounced emergency response exercises (full-scale, tabletop, drills, functional) to test a variety of scenarios during the Project's operational life. At a minimum, this must include how a full range of exercises will be used to test the following 6 scenarios within the first 5 years of operations: i) a full-bore rupture under ice and snow conditions in the Coastal Mountains; ii) a full-bore rupture into the Athabasca River under peak flow conditions; iii) a full-bore rupture into the Kitimat River during high spring flow conditions; iv) a full-bore rupture into the Clore River during high spring flow conditions; v) a 250-cubic-metre condensate release into Kitimat Arm as a result of a release from the Kitimat Terminal; and vi) a 250-cubic-metre diluted bitumen release into Kitimat Arm as a result of a release from the Kitimat Terminal; f) a learnings implementation plan for exercises that considers how Northern Gateway will update and amend its Emergency Preparedness and Response Plans and related documents following exercises. The learnings implementation plan must consider three main purposes: i) to validate plans; ii) to develop responder competencies (including control centre personnel) and provide them with the opportunity to carry out and understand their roles in emergency response; and iii) to test Project-specific and well-established emergency preparedness and response procedures; g) a plan for addressing the training requirements contained within the *National Energy Board Onshore Pipeline Regulations* (as amended from time to time) and associated documents, such as the NEB's 24 April 2002 letter *Security and Emergency Preparedness and Response Programs* and the NEB's Notice of Proposed Regulatory Change 2011-01 - *Management Systems* (as amended or superseded from time to time); and h) confirmation that a third party (as defined) has reviewed and assessed the Emergency Preparedness and Response Exercise and Training Program and that Northern Gateway has considered and incorporated the comments generated by that review and assessment into the program.					**172**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
173	**Filing Marine Oil Spill Preparedness and Response Plans with federal and provincial authorities** Northern Gateway must file with the NEB, **at least 1 year prior to commencing operations,** confirmation that it has prepared its marine-related oil spill preparedness and response plans in accordance with its Framework for Marine Oil Spill Preparedness and that it has filed these plans for review and comment with Transport Canada, the Canadian Coast Guard, Environment Canada, and the Province of British Columbia. This confirmation must include a description of how Northern Gateway will address or respond to any issues or concerns raised by these authorities.					**173**
174-175	**Emergency Preparedness and Response Plan for the pipeline** Northern Gateway must file with the NEB, **at least 1 year prior to commencing operations**, an Emergency Preparedness and Response Plan for the pipeline to verify compliance with its commitments regarding emergency preparedness and response, including its Framework for Pipeline Oil Spill Preparedness and the *National Energy Board Onshore Pipeline Regulations* (as amended from time to time). The plan must demonstrate Northern Gateway's ability to prepare for, respond to, recover from, and mitigate the potential effects of emergencies of any type and in any geographic region or season and must include: a) the relevant emergency preparedness and response documents as follows: i) General Oil Spill Response Plan; ii) Pipeline Oil Spill Response Plan; and iii) all related and accompanying plans, such as Tactical Watercourse Plans, Pre-SCAT (Shoreline Clean-Up Assessment Technique) and River Substrate Surveys, Response Tactics for Floating Oil, Response Tactics for Submerged and Sunken Oil, Control Points, Access Plans, and Geographic Response Plans.; b) an emergency response and preparedness table for the pipeline indicating which plans will be referred to in an emergency response for each 10-kilometre-long pipeline segment. For each pipeline segment, the table must also identify, at a minimum: i) high consequence areas; ii) potentially-affected persons or groups; iii) available access to the right-of-way and high consequence areas; iv) nearest control point(s); v) nearest available equipment cache(s); vi) response times for equipment and personnel to the right-of-way and high consequence areas; vii) geological, meteorological, and geographical hazards (e.g., snow avalanche, mud slides, rock slides, and steep slopes); and viii) site-specific technology and specialized mitigation (e.g., trajectory models for emergency response, off-channel diversion ponds, and hydrocarbon sensors) applicable to emergency response; c) how the plan conforms to requirements contained within the *National Energy Board Onshore Pipeline Regulations* (as amended from time to time) and associated documents, including the NEB's 24 April 2002 letter *Security and Emergency Preparedness and Response Programs* and the NEB's Notice of Proposed Regulatory Change 2011-01 - *Management Systems* (as amended or superseded from time to time); and d) confirmation that a third party (as defined) has reviewed and assessed the Emergency Preparedness and Response Plan and that Northern Gateway has considered and incorporated the comments generated by the review and assessment into the plan.		**174**	**175**		
176	**Emergency Preparedness and Response Plan for the Kitimat Terminal** Northern Gateway must file with the NEB, **at least 1 year prior to commencing operations**, an Emergency Preparedness and Response Plan for the Kitimat Terminal to verify compliance with its commitments regarding emergency preparedness and response, including its Framework for Pipeline Oil Spill Preparedness and the *National Energy Board Onshore Pipeline Regulations* (as amended from time to time). The plan must demonstrate geographic familiarity with the area and the response needed to prepare for, respond to, recover from, and mitigate the potential effects of emergencies of any type and must include: a) the relevant emergency preparedness and response documents as follows: i) General Oil Spill Response Plan; ii) Kitimat Terminal Oil Spill Response Plan; and				**176**	

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
176	iii) all related and accompanying plans, such as Tactical Watercourse Plans, Pre-SCAT (Shoreline Clean-Up Assessment Technique) Surveys, Response Tactics for Floating Oil, Response Tactics for Submerged and Sunken Oil, Control Points, Access Plans, Geographic Response Plans; b) a list of high consequence areas; c) a list of potentially-affected persons or groups; d) nearest available equipment cache(s); e) response times for equipment and personnel to the water and high consequence areas; f) how trajectory models will be used in response planning and who will be responsible for running them; g) how the plan conforms to requirements contained within the *National Energy Board Onshore Pipeline Regulations* (as amended from time to time) and associated documents, such as the NEB's 24 April 2002 letter *Security and Emergency Preparedness and Response Programs* and the NEB's Notice of Proposed Regulatory Change 2011-01 - *Management Systems* (as amended or superseded from time to time); and h) confirmation that a third party (as defined) has reviewed and assessed the Emergency Preparedness and Response Plan and that Northern Gateway has considered and incorporated comments generated by the review and assessment into the plan.				**176**	
177-178	**Tunnel access control plan and safety systems** Northern Gateway must file with the NEB, **at least 6 months prior to commencing operations**, a tunnel access control plan and a description of the safety systems to be installed in the tunnels for real-time monitoring of pipeline vibrations, temperature, air quality, fire, and gas.		**177**	**178**		
179	**Availability of enhanced marine spill trajectory and fate models for spill responders** Northern Gateway must file with the NEB, **at least 90 days prior to commencing operations**, a description of how it will make its enhanced marine spill trajectory and fate models for the Kitimat Terminal and marine tanker traffic available to, in addition to the Response Organization, the following authorities in the event of a spill: a) the NEB; b) Environment Canada; c) Transport Canada; d) the Canadian Coast Guard; and e) the Province of British Columbia.					**179**
180	**Third party damage prevention – condensate pipeline** Northern Gateway must file with the NEB, **at least 90 days prior to commencing operations**, a report that assesses additional protective measures to reduce the likelihood of third party damage to the condensate pipeline in the vicinity of the Whitecourt casino, Burns Lake, and Kitimat.			**180**		
181-182	**SCADA and leak detection system design** Northern Gateway must file with the NEB, **at least 90 days prior to commencing operations**, a report describing the pipeline's SCADA and leak detection systems' final design. The report must include information suitable for establishing a baseline for the quality program for its SCADA and leak detection systems. The report must also include: a) a description of the SCADA and leak detection systems; b) the locations and types of pressure, temperature and flow monitoring, control devices, and remote terminal units; c) the locations of remotely-operated valves; d) the target detectability (i.e., amounts leaked, time to detect, leakage rate); e) the target sensitivity (i.e., minimum leak size); f) the target reliability (i.e., false alarm rate, failure to alarm rate); g) the expected system robustness (i.e., system availability considering system operating conditions); h) the target accuracy (i.e., size and location of a detected leak); and i) a description of the quality program using both direct and inferred methods that Northern Gateway will implement during pipeline operations to ensure optimal performance.		**181**	**182**		
183-184	**Overpressure protection** Northern Gateway must install both pressure control valves and variable frequency drives at all of its pump stations and file with the NEB**, at least 30 days prior to commencing operations**, confirmation of compliance.		**183**	**184**		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
185-186	**Column separation** Northern Gateway must: a) identify locations having potential for slack line flow when the pipeline is operated at 100 per cent of its maximum operating pressure (MOP), 80 per cent of its MOP and 50 per cent of its MOP; b) install pressure transmitters at the high points identified; c) provide alarms for the pipeline operators to provide warnings when these conditions occur; d) develop operating procedures that require operating the pipeline in a manner that prevents column separation; and e) file with the NEB, **prior to applying for leave to open**, confirmation that the requirements of a) to d) have been met.		**185**	**186**		
187	**Financial Assurances Plan – operations phase** a) Northern Gateway must file with the NEB for approval, **at least 9 months prior to applying for leave to open**, a Financial Assurances Plan that includes details of the financial resources and secured sources of funds that will be capable of covering the costs of liabilities for, without limitation, cleanup, remediation, and other damages caused by the Project during the operations phase. These costs may arise from, among other things, potential accidents, malfunctions, and failures during the Project operations phase, including all spills originating from the pipeline and the Kitimat Terminal, up to and including spills of a quantity that have the potential of being a catastrophic event. The Financial Assurances Plan must be signed by an officer of the company, verifying that it is accurate, complete, and, at a minimum, meets the criteria and coverage levels described below: i) Criteria for financial assurance instruments and plan: • Any financial or insurance instruments included in the financial assurance plan for the purpose of covering the costs of liabilities for, without limitation, cleanup, remediation, and other damages must be dedicated for this purpose, isolated from Northern Gateway's day-to-day operating and capital accounts and unfettered by pre-existing claims, including those of creditors, and draws from limited partners. • Any letter of credit that forms part of the Financial Assurances Plan must be unconditional and irrevocable, segregated from Northern Gateway's day-to-day business activities, and be dedicated to providing funds to cover the costs of liabilities for, without limitation, cleanup, remediation, and other damages. • Third party liability insurance must be stand-alone, current, and broad, respecting the scope of environmental damages covered by the policy (i.e., only exceptional/non-standard perils, taking into account the Project's nature and scope, would be excluded from coverage). Such insurance must be structured on a multi-year basis, recognizing potential loss of income by persons sustaining damage caused by Northern Gateway, over a reasonable number of years after the event. • A portion of cash reserves or a portion of future cash flows of the Project may be included as instruments in the Financial Assurances Plan, provided they are secured by a commitment letter from a senior officer of the company confirming that the funds will be dedicated to the Financial Assurances Plan without restrictions for the period specified by the officer. • Immediately after a catastrophic event, sales of Project assets used for transporting hydrocarbons will not be eligible as financial assurance instruments in the Financial Assurances Plan unless Northern Gateway intends to abandon the facilities rather than continuing to use them in operating the Project. • Parental and other third party guarantors must be registered within a Canadian jurisdiction and should have financial strength that is demonstrated in balance sheet values and ratios and credit ratings. For example, total assets less total liabilities of the guarantor should be several multiples of the liability assumed in the Northern Gateway guarantee. ii) Financial assurance components and coverage levels: • Northern Gateway's Financial Assurances Plan must provide a total coverage of $950 million* for the costs of liabilities for, without limitation, cleanup, remediation, and other damages caused by the Project during the operations phase. The plan should include the following components and minimum coverage levels: • *Ready cash:* **Within 10 business days after a large spill from any Project component**, Northern Gateway must have unfettered access to at least $100 million to cover costs, including compensation to third parties for losses * The Panel's basis for this coverage level is described in Chapter 11 of its report.					**187**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
187	and damages in the near term, while insurance claims are being processed. Once used, this source of cash must be replenished immediately to cover the costs of a potential future spill. • *Core coverage:* Put in effect and maintain current **at all times** a core financial coverage of at least $600 million that includes third party, stand-alone liability insurance and other financial assurance instruments that comply with the criteria. • *Financial backstopping for costs that exceed the payout of all other components in the plan:* Financial backstopping arrangements, such as parental and other third party guarantees and no fault insurance, must be in place at all times for a minimum amount of $250 million. The purpose of this component would be to make up any shortfall in the core coverage. Below are some illustrative financial and insurance instruments that could be potential candidates for the Financial Assurances Plan: • irrevocable, unfettered letter of credit; • secured line of credit; • some cash reserves held by the general partner and not distributed to the limited partners (and verifiable on Northern Gateway Pipelines Limited Partnership's balance sheet); • some internal cash flow, including up to 1 year under force majeure conditions per Article 15 of the TSA, committed by Northern Gateway to financial assurances; • incremental revenues from a toll surcharge to cover operating expenses arising from environmental issues per Section 7(g) of the applicable pipeline toll principles; • third party liability insurance with exclusions for only exceptional/non-standard perils; • no fault third party liability insurance; • parental and other third party guarantees provided by parties demonstrating financial strength through balance sheets and credit ratings; and • other instruments developed by Northern Gateway and the insurance and financial markets. b) Northern Gateway must file with the NEB: i) **at least 6 months prior to applying for leave to open,** a report from a third party (as defined) assessing the Financial Assurances Plan and its key components against the criteria and actual experiences of industry damage claims. The report must summarize the key features of each financial and insurance instrument proposed for inclusion in the Financial Assurances Plan; ii) **at least 3 months prior to applying for leave to open**, a supplement to the report described in b) i) that provides verification of any third party liability insurance coverage, a copy of the insurance certificate, and a summary of the insurance policy's key features. This summary must include: limits on insurance coverage, deductible amounts, the risks and perils and properties covered by the insurance policy, the exclusions from coverage, Northern Gateway's obligations, effective dates, and names of insurers and reinsurers; and iii) **with its leave to open application,** a report describing the steps it took to eliminate any deficiencies in its Financial Assurances Plan that were identified in the third party report in b) i) and the NEB's subsequent review.					**187**
188-190	**Offset Measures Plan for residual effects on caribou habitat** Northern Gateway must file with the NEB for approval, in accordance with the timelines below, an Offset Measures Plan for each affected caribou range to offset all residual Project-related effects resulting from directly- and indirectly-disturbed caribou habitat, after taking into account the implementation of the Construction EPMP and CHRP measures. a) A preliminary version, to be filed **at least 90 days prior to applying for leave to open**, with the plan's criteria and measurable objectives and that includes: i) an initial quantification of the area of caribou habitat directly- and indirectly-disturbed; ii) a list of the potential offset measures available; iii) each potential offset measure's appropriate offset ratio; iv) each potential offset measure's expected effectiveness; v) each potential offset measure's relative value toward achieving the offset;	**188**	**189**	**190**		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
188-190	vi) a conceptual decision-making tree(s) or process that will be used to select which specific potential offset measures and accompanying offset ratios will be used under what circumstances; and vii) how the actions undertaken in the Linear Feature Management and Removal Plan (required by Conditions 71-73) will relate to the Offsets Measures Plan. b) A final version, to be filed **on or before 31 January after the second complete growing season after commencing Project operations**, including: i) the preliminary Offset Measures Plan, with any updates identified in a revision log that includes the rationale for any changes; ii) a detailed decision-making tree(s) or process that will be used to select which specific potential offset measures and accompanying offset ratios will be used under what circumstances; iii) a tabular list of the potential offset measures and appropriate offset ratios to be implemented or already underway, including a description of site-specific details and maps showing the locations; iv) a schedule indicating when potential offset measures will be started and their estimated completion date; v) either an assessment of the potential offset measures' effectiveness and their value in offsetting residual effects, or a plan for completing an assessment of the potential offset measures' effectiveness and value; and vi) an update on the restoration success to support offset measure decisions. Both the preliminary and final versions of the plan must also include a summary of Northern Gateway's consultation with Environment Canada, appropriate provincial authorities, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Offset Measures Plan. This summary must include a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the plan, any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them.	**188**	**189**	**190**		
191	**Operations Marine Mammal Protection Plan** Northern Gateway must file with the NEB for approval, **at least 6 months prior to loading or unloading oil or condensate tankers at the Kitimat Terminal**, an Operations Marine Mammal Protection Plan. The plan must be prepared in accordance with the Framework for the Marine Mammal Protection Plan filed during the OH-4-2011 proceeding, and must include: a) all marine mammal mitigation measures and monitoring that will be implemented for the Project's operational life; b) a description of how Northern Gateway has taken available and applicable ATK and TLU studies into consideration in developing the plan; c) a summary of Northern Gateway's consultation with Fisheries and Oceans Canada, Transport Canada, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Operations Marine Mammal Protection Plan. This summary must include any issues or concerns raised regarding the plan and how Northern Gateway has addressed or responded to them; d) a description of how Northern Gateway will determine mitigation measure effectiveness; and e) a discussion of how Northern Gateway will incorporate research and monitoring results into the Operations Marine Mammal Protection Plan throughout the Project's operational life to adaptively manage potential effects on marine mammals.				**191**	
PHASE: AFTER COMMENCING OPERATIONS						
192	**Emergency response exercises during operations** a) Northern Gateway must conduct each operations phase emergency response exercise described in its Emergency Preparedness and Response Exercise and Training Program (required by Condition 172) with the objectives of testing: i) emergency response procedures; ii) company personnel training; iii) communications systems; iv) response equipment; v) safety procedures; and vi) the effectiveness of its liaison and continuing education programs.					**192**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
192	b) Northern Gateway must notify the NEB, **at least 45 days prior to the date of each tabletop and full-scale emergency response exercise (other than unannounced exercises),** of: i) the exercise's date and location(s); ii) the objectives, if different from those noted in a); iii) the participants in the exercise; and iv) the scenario for the exercise. c) Northern Gateway must file with the NEB, **within 60 days after completing each tabletop and full-scale emergency response exercise and, for all other emergency response exercises, on or before 31 January of each year after commencing operations**, a report on the exercise(s) that includes: i) the results of the completed exercise(s); ii) areas for improvement; and iii) steps to be taken to correct deficiencies.					**192**
193	**Final research program report** **Within 6 months after completing its research on the behavior and cleanup of heavy oils** (required by Condition 169), Northern Gateway must file with the NEB, Environment Canada, Transport Canada, the Canadian Coast Guard, the Province of British Columbia, and other stakeholders that participated in the research, such as Aboriginal groups, a final report that includes: a) the results of all research undertaken; b) a discussion of how the findings will be used in spill response planning; c) how Northern Gateway will incorporate the results of the research into its marine spill fate and trajectory models and the timeframe for doing so; and d) how Northern Gateway will make the results of the research available to spill responders and relevant government authorities in the event of a spill.					**193**
194	**Caribou Habitat Restoration and Offset Measures Monitoring Program** Northern Gateway must file with the NEB for approval, **on or before 31 January after the first complete growing season after commencing operations**, a program for monitoring and verifying the effectiveness of the caribou habitat restoration and offset measures implemented as part of the CHRP (required by Conditions 60-62) and Offset Measures Plan (required by Conditions 188-190). This program must include: a) the scientific methods or protocols for short- and long-term monitoring of the restoration and offset measures, including their effectiveness; b) monitoring frequency, timing, and locations and the rationale for each; c) protocols for how restoration and offset measures will be adapted, based on the monitoring results from the program's implementation; and d) a schedule for filing reports of monitoring results and the adaptive management responses to the NEB, Environment Canada, and appropriate provincial authorities. Any changes to this schedule must be included at the beginning of each filed monitoring report.					**194**
195	**Caribou monitoring reports** Northern Gateway must file with the NEB, **based on the approved schedule for the Caribou Habitat Restoration and Offset Measures Monitoring Program** (required by Condition 194), a report(s) describing the program's results regarding the effectiveness of habitat restoration and offset measures for each caribou range, and how those measures will be adapted, as required, based on monitoring results.					**195**
196	**Post-construction environmental monitoring reports (terrestrial and freshwater)** Northern Gateway must file with the NEB, **on or before 31 January after the first, third, fifth, and tenth complete growing seasons after completing reclamation and final cleanup of the terrestrial and freshwater areas disturbed during construction**, a post-construction environmental monitoring report specific to each completed construction spread, region, or work area (as delineated in Northern Gateway's filing for Condition 8). The reports must reflect any monitoring or follow-up program developed and must:					**196**

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
196	a) assess the effectiveness of the mitigation measures applied during construction against the criteria for success; b) identify any deviations from plans and alternate mitigation applied; c) identify locations on a map and in a table where environmental issues arose during construction and where corrective actions were taken; d) identify the current status of the issues identified (resolved or unresolved); e) provide proposed measures and the schedule that Northern Gateway will implement to address any unresolved issues or concerns; and f) a summary of any comments received from Fisheries and Oceans Canada, Environment Canada, the British Columbia Ministry of Environment, Alberta Environment, and potentially-affected Aboriginal groups and stakeholders regarding issues identified in each report.					**196**
197	**Pipeline Environmental Effects Monitoring Program: monitoring results** Northern Gateway must file with the NEB, **on or before 31 January of each year for the duration of the Pipeline Environmental Effects Monitoring Program** (required by Conditions 27-29), a monitoring progress report that includes: a) a description of the involvement of relevant government authorities, participating Aboriginal groups, research organizations, and public stakeholder groups in monitoring activities; b) the current status of monitoring work identified as part of the program; c) results from monitoring conducted during the calendar year prior to filing; d) monitoring work to be undertaken in the upcoming year; and e) a discussion of any monitoring results that, due to natural environmental variations, are outside the range of results expected.					**197**
198	**Marine Environmental Effects Monitoring Program: monitoring results** Northern Gateway must file with the NEB, **on or before 31 January of each year for the duration of the Marine Environmental Effects Monitoring Program** (required by Condition 36), a monitoring progress report that includes: a) a description of the involvement of relevant government authorities, participating Aboriginal groups, research organizations, and public stakeholder groups in monitoring activities; b) the current status of monitoring work identified as part of the program; c) results from monitoring conducted during the calendar year prior to filing; d) monitoring work to be undertaken in the upcoming year; and e) a discussion of any monitoring results that, due to natural environmental variations, are outside the range of results expected.					**198**
199	**Operations Marine Mammal Protection Plan reporting** Northern Gateway must file with the NEB, **on or before 31 January of each of the first 5 years after commencing Project operations, and every fifth year thereafter,** a report describing how it incorporated the research and monitoring results, referred to in the Operations Marine Mammal Protection Plan (required by Condition 191), into the plan during the calendar year(s) prior to filing.					**199**
200	**Ongoing implementation of Marine Voluntary Commitments and the TERMPOL Review Committee recommendations** Northern Gateway must file with the NEB, **on or before 31 January and 1 July of each year after commencing Project operations**, a report, signed by an officer of the company, documenting the continued implementation of its Marine Voluntary Commitments and the TERMPOL Review Committee recommendations, any non-compliances with these commitments and recommendations, and actions taken to correct these non-compliances.					**200**
201-202	**Quality program for the complementary leak detection systems** Northern Gateway must file with the NEB, **on or before 31 January after the first, third, fifth, and tenth full years after commencing Project operations**, a report describing the observed detectability, sensitivity, reliability robustness, and accuracy of Northern Gateway's complementary leak detection systems.		**201**	**202**		
203-204	**Quality program for the SCADA and leak detection systems** Northern Gateway must file with the NEB, **on or before 31 January after the first, third, and fifth full years after commencing Project operations, and every fifth year thereafter**, a report describing the results of Northern Gateway's quality program for its SCADA and leak detection systems and how identified issues were addressed.		**203**	**204**		

		Infrastructure	Oil pipeline	Condensate pipeline	Kitimat Terminal	the Project
205	**Financial Assurances Plan – reports and updates** In relation to the approved Financial Assurances Plan (required by Condition 187): a) **Should there be a change in any instrument in the Financial Assurances Plan that results in Northern Gateway no longer meeting the criteria and coverage levels outlined in Condition 187**, Northern Gateway must **immediately** notify the NEB and describe the steps being taken to ensure there is sufficient coverage in the Financial Assurances Plan. Northern Gateway must complete its remedial steps **within 3 months of notifying the NEB that the criteria and coverage levels are not being met**. b) Northern Gateway must file with the NEB for approval, **on or before 1 July of every fifth year after commencing Project operations**, a report from a third party (as defined) assessing the Financial Assurances Plan and its key components against the criteria and actual experiences of industry damage claims. The report must summarize the key features of each financial and insurance instrument included in the Financial Assurances Plan. c) **Should a spill event occur more than 2 years before the second or later reports in b) are due**, Northern Gateway must file with the NEB, **within 1 year after the spill event**, a report that assesses the adequacy of its Financial Assurances Plan and summarizes proposed changes, if any, to improve coverage.					205
206-207	**Pipeline inspections** Northern Gateway must conduct the following pipeline inspections, at the times indicated: a) a high resolution in-line caliper inspection (i.e., a GEOPIG™ inspection) **within 6 months after commencing operations** to establish an accurate pipeline position and to detect pipe deformations; b) an in-line ultrasonic crack detection inspection **within 2 years after commencing operations**; c) an in-line corrosion magnetic flux leakage inspection in both the circumferential and longitudinal directions **within 2 years after commencing operations**; d) an in-line ultrasonic wall measurement inspection **within 2 years after commencing operations**; and e) an above-ground coating survey **within 2 years after commencing operations**. Northern Gateway must investigate all dents greater than 2 per cent of pipe diameter to ensure they are free of gouges and not associated with a weld, and must report to the NEB, **within 30 days of each field investigation**, any defects that were identified and repaired. Northern Gateway must file with the NEB, **within 3 years after commencing operations**, a report confirming completion of the surveys, investigations, and inspections.		206	207		
208-209	**Pipeline Geographic Information System (GIS) data** Northern Gateway must file with the NEB, **within 1 year after commencing operations**, GIS data in the form of an Esri® shape file that contains pipeline segment centre lines, where each segment has a unique outside diameter, wall thickness, MOP, external coating, field-applied girth weld coating, and pipe manufacturing specification. If the above values of the pipeline change at any point along the length of the pipeline, the pipeline should be segmented at that point. Northern Gateway must also provide GIS locations and names of pump stations, terminals, custody transfer meters, tunnel entrances, pipeline bridges, and block valves, as applicable. The datum must be NAD83 and projection must be geographic (latitudes and longitudes).		208	209		

APPENDIX 2
Description of the Enbridge Northern Gateway Project

Northern Gateway applied to the National Energy Board on 27 May 2010 for authorization to construct and operate a new transportation route for Canadian oil products to reach world markets. It would have three major components:

- one 914 millimetre (36 inch) outside diameter pipeline would carry an average of 83,400 cubic metres (525,000 barrels) of oil per day west from Bruderheim to Kitimat;
- a parallel pipeline, 508 millimetres (20 inches) in outside diameter, would carry an average of 30,700 cubic metres (193,000 barrels) of condensate per day east from Kitimat to the inland terminal at Bruderheim; and
- a terminal at Kitimat with 2 tanker berths, 3 condensate storage tanks, and 16 oil storage tanks.

The Bruderheim terminal would have connections to other pipelines serving producers and markets in Western Canada.

A map of the pipeline route is provided in Chapter 1, Figure 1.1.

The application identified a 1-kilometre-wide corridor for the proposed 1,178-kilometre-long route. The exact location of the pipelines' shared 25-metre-wide right-of-way would be determined after detailed engineering if the project is approved. Ten pumping stations, including those at Kitimat and Bruderheim, would be located on the route.

The total estimated capital cost of the project is $7.9 billion. Northern Gateway said that the project would be completed by late 2018. Once in operation, about 220 tankers would call at the Kitimat Terminal annually to deliver condensate or load oil products. The largest tankers would carry about three times as much oil as the tankers that have historically visited British Columbia ports.

The westbound pipeline could carry a variety of refined and crude oil products. Studies prepared for the project indicate that the majority of shipments would be diluted bitumen, which is a blend of light and heavy oil products.

Northern Gateway is a limited partnership registered in Alberta. It was formed in 2004 to build and operate the Enbridge Northern Gateway Project. Enbridge Inc., a major pipeline company, is currently the only shareholder in the project. Ten energy companies are Funding Participants that have together invested more than $140 million in developing the proposal; they would have options to get shipping capacity and equity (ownership shares) if the project goes ahead. Up to 10 per cent of the equity has been set aside for Aboriginal partners; Northern Gateway offered the equity package to 40 Aboriginal groups, and 26 accepted the offer.

APPENDIX 3
The joint review process

The Minister of the Environment and the Chair of the National Energy Board referred the Enbridge Northern Gateway Project to a Joint Review Panel on 29 September 2006. The Panel members were appointed on 20 January 2010.

The Panel's mandate is described in the Joint Review Panel Agreement, issued on 4 December 2009. The agreement was developed through an extensive public and Aboriginal consultation process, and is found in Appendix 4. It includes the Terms of Reference for the Panel and procedures for conducting the review.

The Panel was required to:

- assess the environmental effects of the project and the significance of those effects;
- consider measures to avoid or reduce any adverse environmental effects;
- consider whether the project is in the public interest;
- consider comments from the public and Aboriginal peoples;
- conduct public hearing sessions to receive relevant information about the project; and
- submit to the Governor in Council a report that includes an environmental assessment, as well as a recommendation on whether or not the project should proceed.

THE JOINT REVIEW PROCESS

Before issuing the Hearing Order, the Panel conducted Panel sessions and asked people interested in the project to comment on specific issues related to the application and the hearing process. Sessions were held in Whitecourt, Alberta, and in Kitimat and Prince George, British Columbia, in August and September 2010.

The Panel considered all comments and, on 19 January 2011, issued a Panel Session Results and Decision document. This document expanded and clarified the draft List of Issues, detailed the Panel's plan to conduct oral hearings along the pipeline route and near the marine components of the project, and included requests for more information from Northern Gateway.

On 5 May 2011, the Panel released Hearing Order OH-4-2011, outlining the various ways in which those who were interested could participate in the proceeding. The Hearing Order also specified key steps and timelines in the joint review process.

Over 450 members of the public and various Aboriginal groups attended 16 public information sessions held in the spring and summer of 2011 to discuss the hearing process, participation options, and to highlight key steps and deadlines. The Panel's Secretariat staff also met with approximately 70 representatives of various federal departments at 2 meetings in 2011 to talk about how they could participate in the hearing process. In addition, online workshops were held to assist participants in preparing materials and to further understand how the oral hearings would proceed.

Throughout the proceeding, the National Energy Board maintained the project's online public registry to provide easy access to all records in the proceeding. This registry included the submissions made by all participants in the Panel's process, as well as all public information produced by the Panel. Hearing transcripts were also available on the public registry.

PARTICIPATION OPTIONS

The fundamental purpose of the review was to gather information and views from all perspectives. In this process, someone wishing to participate had various options including: filing a letter of comment, making an oral statement, or registering as an intervenor or government participant.

Intervenors, government participants, and Northern Gateway were considered "parties" to the proceeding. Generally-speaking, parties played a more active role in the process. Parties who could not attend a particular hearing in person could participate remotely through a web-based application and teleconference calls. More information on each level of participation is found below:

Letters of comment – By submitting letters of comment, participants were able to provide the Panel with their knowledge, views, or concerns about the project in whatever level of detail they chose. Comments received orally or in writing as part of the 2010 Panel sessions were considered as letters of comment. People or groups who submitted letters of comment could not ask written or oral questions of the parties, or make final argument. In total, the Panel received, read, and considered more than 9,400 letters of comment.

Oral statements – Similar to a letter of comment, providing an oral statement allowed participants to share their knowledge, views, or concerns about the project. These statements were made in person during the community hearings. Presenters were required to register in advance. Those who provided an oral statement were not able to ask questions, or to make final argument. More than 4,300 individuals or groups registered to make oral statements, but not all registrants came forward to make a presentation. In the end, the Panel heard and considered 1,179 oral statements.

Intervenors – Intervenors were required to register with, and be confirmed by, the Panel. They were allowed to:

- ask questions of Northern Gateway, other intervenors, and, with Panel approval, government participants;
- submit written evidence or, with Panel approval, oral evidence during the community hearings;
- formally receive all documents filed in the joint review process;
- participate in processes for notices of motions; and
- make final argument, in writing and orally.

Intervenors were required to respond to any questions asked of them, unless an acceptable rationale for not answering was given. There were 206 registered intervenors, not including those that registered, but subsequently withdrew their involvement. A full listing of the intervenors is found in Appendix 6.

Government participants – This role was offered to government departments at all levels, however, these organizations were not limited to choosing this role over any others available during the process. Departments were required to register with, and be confirmed by, the Panel. Government participants had similar capabilities and responsibilities as intervenors. They could:

- ask written questions of Northern Gateway and, with Panel approval, other government participants or intervenors;
- submit written evidence;
- orally question Northern Gateway and, with Panel approval, intervenors at the final hearings;
- formally receive all documents filed in the joint review panel process;
- participate in processes for notices of motion; and,
- make final argument, in writing and orally.

Government participants were required to respond to written information requests and to answer oral questions during the final hearings if the Panel approved another Party's request to ask questions. There were 12 registered government participants in the joint review process.

Those who did not wish to actively participate in the joint review process were still able to follow the proceeding by viewing information in the online public registry, listening to the oral hearings via webcast, or by attending the hearings in person as an observer.

ORAL HEARINGS

The Panel gathered a significant portion of the information it received and considered through the oral hearings. There were two distinct categories of oral hearings: community hearings (for oral evidence and oral statements) and final hearings (for oral questioning and final arguments). More information on each type of hearing is provided below:

Community hearings, the majority of which were held along the proposed pipeline route and in the vicinity of the proposed marine terminal, served two purposes:

1. To allow intervenors to give a portion of their evidence orally, such as oral traditional evidence or evidence that could not be provided in writing (60 intervenors chose to present oral evidence).
2. To hear all oral statements.

There were approximately 77 days of community hearings in 21 communities. The Panel visited 10 communities more than once.

Final hearings occurred over a total of 96 days in Edmonton, Alberta, and Prince George, Prince Rupert, and Terrace in British Columbia. They were held in two distinct parts:

1. To hear oral questioning about filed evidence in order to test the credibility of that evidence (91 days). For planning and efficiency reasons, each hearing session devoted to oral questioning focused on specific pre-determined issues.
2. To hear parties' oral final arguments* (5 days).

THE PANEL'S REPORT

This report is not a decision. It is the Panel's recommendation to the federal government, which, through the Governor in Council, will be considered in deciding whether or not to approve the Enbridge Northern Gateway Project. With the release of this report, the Panel no longer has any involvement in the project.

This report includes conclusions relating to the environmental assessment of the project and recommendations on whether the project is in the public interest. It also includes the terms and conditions the National Energy Board would impose on the project, should the Governor in Council decide to approve it. These conditions are found in Appendix 1.

The Governor in Council can refer any of the recommended terms and conditions back to the National Energy Board for reconsideration. The National Energy Board would then be required to reconsider the condition(s), and report back to the Governor in Council within the specified time limit.

The final decision on whether or not the project should proceed will be made by the Governor in Council. As part of its decision, it will determine whether or not the project is likely to cause significant adverse environmental effects and, if so, whether those effects are justified in the circumstances. The Governor in Council will also provide reasons for its decision. If the Enbridge Northern Gateway Project is approved, the National Energy Board would be required to issue its certificates of public convenience and necessity within 7 days of the Governor in Council's order.

* Parties wishing to present oral final argument were first required to file written final argument. The oral portion of a Party's argument was to allow it to respond to all other parties' written final arguments.

APPENDIX 4
Joint Review Panel Agreement and Terms of Reference

AMENDED AGREEMENT BETWEEN THE NATIONAL ENERGY BOARD AND THE MINISTER OF THE ENVIRONMENT CONCERNING THE JOINT REVIEW OF THE NORTHERN GATEWAY PIPELINE PROJECT*

1 PREAMBLE

WHEREAS the National Energy Board (the Board) has regulatory responsibilities for interprovincial and international natural gas, oil and commodity pipelines pursuant to the

National Energy Board Act, as amended (the NEB Act) and for environmental assessment pursuant to the NEB Act and the *Canadian Environmental Assessment Act, 2012* (the Act);

WHEREAS the Minister of the Environment has statutory responsibilities pursuant to the Act and the Canadian Environmental Assessment Agency (the Agency) has administrative responsibilities under the Act;

WHEREAS the Northern Gateway Pipelines Limited Partnership (the Proponent) is proposing to construct and operate pipelines and a marine terminal as further described in the Appendix to this Agreement;

WHEREAS an application for a Certificate of Public Convenience and Necessity is expected to be filed with the Board pursuant to Part III of the NEB Act by or on behalf of Northern Gateway Pipelines Limited Partnership in respect of the Northern Gateway Pipeline Project (the project);

WHEREAS the Board, pursuant to the NEB Act, must hold a public hearing to consider the application for the project and conduct an environmental assessment of the project;

WHEREAS certain components of the project are within the jurisdiction of the Board and the Act applies to all aspects of the project;

WHEREAS the Board, Fisheries and Oceans Canada, Transport Canada, Aboriginal Affairs and Northern Development Canada, the Canadian Transportation Agency, Environment Canada and Natural Resources Canada are or may be federal authorities for the project under the Act;

WHEREAS the Board and the responsible authorities recommended that the Minister of the Environment refers the project to a review panel pursuant to section 25 of the *Canadian Environmental Assessment Act*;

WHEREAS the Minister of the Environment had determined that a Joint Review Panel (the Panel) should be established pursuant to paragraph 40(2)(a) of the *Canadian Environmental Assessment Act* to consider the project;

WHEREAS the Board, the Agency, and the responsible authorities recognize that a TERMPOL review process, which will be coordinated by Transport Canada, will occur separately from this Joint Review Panel process;

WHEREAS the Parties to this Agreement wish to avoid unnecessary duplication that could arise from carrying out the environmental assessment requirements separately while maintaining a high-quality environmental assessment process under the Act and the NEB Act;

AND WHEREAS the Government of Canada will rely upon the consultation effort of the proponent, and the Joint Review Panel process, to the extent possible, to assist in meeting the duty to consult;

WHEREAS the *Canadian Environmental Assessment Act* has been repealed and the *Canadian Environmental Assessment Act, 2012* has come into force;

AND WHEREAS pursuant to section 126 of the *Canadian Environmental Assessment Act, 2012*, the assessment by the joint review panel is continued under the process established under the *Canadian Environmental Assessment Act, 2012* as if it had been referred to a review panel under section 38 of the *Canadian Environmental Assessment Act, 2012* and the Agreement is considered to have been entered into by the Federal Minister of the Environment and the Board under section 40 of that Act;

AND WHEREAS pursuant to section 104 of the *Jobs, Growth and Long-term Prosperity Act*, the time limit established for the submission of the environmental assessment is also the time limit specified by the Chairperson of the National Energy Board under subsection 52(4) of the NEB Act, for the submission of the report under section 52 of the NEB Act.

NOW THEREFORE, in accordance with this Agreement and the Terms of Reference attached as an Appendix to this Agreement, the Minister of the Environment and the Chairman of the Board hereby establish a Joint Review Panel to conduct the environmental assessment of the project.

* This is an unofficial version combining the original, finalized Joint Review Panel Agreement (dated 4 December 2009) with the changes outlined in the 3 August 2012 Amendment to the Agreement between the National Energy Board and the Minister of the Environment concerning the Joint Review of the Northern Gateway Pipeline Project.

2 DEFINITIONS

In this Agreement:

"**Aboriginal group**" means a collectivity of Indian, Inuit or Métis people that holds or may hold Aboriginal or treaty rights under section 35 of the Constitution Act, 1982;

"**Agency**" means the Canadian Environmental Assessment Agency;

"**Agreement**" means this Agreement including the Appendix;

"**Board**" means the National Energy Board;

"**Board rules**" means the *National Energy Board Rules of Practice and Procedure, 1995*, as amended, and made pursuant to section 8 of the NEB Act;

"**Board's public hearing process**" means the public hearings process followed by the Board under the NEB Act to assess a proposed project and the environmental effects of a project;

"**The Act**" means the *Canadian Environmental Assessment Act, 2012*;

"**Environment**" means, as set out in the Act, the components of the Earth, and includes
a) land, water and air, including all layers of the atmosphere,
b) all organic and inorganic matter and living organisms, and
c) the interacting natural systems that include components referred to in paragraphs a) and b);

"**Environmental assessment**" includes, as set out in the Act in respect of a project, an assessment of the environmental effects of the project that is conducted in accordance with the Act and its regulations and an assessment of the environmental effects of the project for the purposes of the NEB Act and its regulations;

"**Environmental effect**" means,
a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act,*
b) any effect of any change referred to in paragraph a) on
   i) health and socio-economic conditions,
   ii) physical and cultural heritage,
   iii) the current use of lands and resources for traditional purposes by Aboriginal persons, or
   iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or
c) any change to the project that may be caused by the environment,

whether any such change or effect occurs within or outside Canada;

"**Federal authority**" has the same meaning as set out in section 2 of the Act;

"**Follow-up program**" means, as set out in the Act, a program for
a) verifying the accuracy of the environmental assessment of a project, and
b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project;

"**Government participant**" means a federal authority or provincial department that has an environmental assessment or regulatory responsibility and that files a declaration with the Joint Review Panel stating that it wishes to participate in the hearing as a government participant;

"**Joint review**" means the assessment of the environmental effects of the project to be conducted pursuant to the Act and the consideration of the application under the NEB Act;

"**Panel**" means the Joint Review Panel established pursuant to Section 3 of this Agreement;

"**Parties**" mean the signatories to this Agreement;

"**Participant**" means anyone who participates in the joint review process for the project through one of the means set out in Part IV of this Agreement;

"**Pipeline**" has the same meaning as set out in section 2 of the NEB Act;

"**Project**" means the project as described in the Terms of Reference found in the Appendix to this Agreement and titled "Part I – Scope of the Project," and may also be referred to as the Northern Gateway Pipeline Project;

"**Proponent**" means Northern Gateway Pipelines Limited Partnership who proposes the project;

"**Report**" means the report set out in Section 9 of this Agreement;

"**Responsible authority**" has the same meaning as set out in section 2 of the Act; and

"**TERMPOL review process**" refers to the voluntary technical review process of Marine Terminal Systems and Transshipment Sites. The technical review process focuses on a dedicated design ship's selected route in waters under Canadian jurisdiction to its berth at a proposed marine terminal or transshipment site and, specifically, to the process of cargo handling between vessels, or off-loading from ship to shore or vice-versa.

3 ESTABLISHMENT OF THE PANEL

This Agreement:

a) establishes an administrative framework within which the Parties can cooperatively exercise their respective powers and duties as established by the Act and the NEB Act;
b) is a public document that is to be read with and interpreted in a manner consistent with the statutes referenced in a) and the regulations made pursuant to those statutes; and
c) does not create any new legal powers or duties, nor does it alter in any way the powers and duties established by the statutes referenced in a) and the regulations made pursuant to those statutes.

4 GENERAL

4.1 Purpose

The primary purpose of this Agreement is to coordinate the environmental assessment required under the Act and the NEB Act by providing for a review of the Environmental Effects likely to result from the project and the appropriate mitigation measures as part of the Board's public hearing process for the project. Nothing in this Agreement should be construed as limiting the ability of the Panel to have regard to all considerations that appear to it to be relevant pursuant to section 52 of the NEB Act.

4.2 Public Registry

4.2.1 A public registry will be maintained during the course of the review in a manner that provides for convenient public access. The registry will meet the purposes of compliance with sections 79 to 81 of the Act and the Board's requirement to maintain a record of the Board's public hearing process for the project.

4.2.2 The public registry will include hearing transcripts and all submissions, correspondence, exhibits and other information received by the Panel, as well as all public information produced by the Panel relating to the review of the project.

4.2.3 All information produced or received by the Panel will be made available to the public and to Aboriginal peoples, unless specific procedural rulings or legislative provisions prevent the disclosure of the information.

4.3 Participant Funding Program

The Agency will administer a participant funding program that includes an Aboriginal funding envelope and a regular funding envelope. The Aboriginal Funding Envelope contributes limited funding specifically to Aboriginal groups to participate in and be consulted throughout the joint review process. The Regular Funding Envelope contributes limited funding to members of the public, not-for-profit organizations and Aboriginal people to participate in the joint review process.

5 CONSTITUTION OF THE PANEL

5.1 The Panel will consist of three members and be composed of no less than two permanent members of the Board.

5.2 Two members of the Panel, including the Panel Chair, will be appointed by the Board. The Minister of the Environment will approve the appointment of the Panel Chair and select the third panel member who will satisfy the eligibility requirements for a temporary member of the Board.

5.3 The Chair of the Board will make a request to the Minister of Natural Resources to recommend to the Governor in Council the appointment of the third panel member as a temporary member of the Board.

5.4 The members of the Panel are to be unbiased and free from any conflict of interest in relation to the project and are to have knowledge or experience relevant to the anticipated environmental effects of the project.

6 CONDUCT OF THE ENVIRONMENTAL ASSESSMENT BY THE PANEL

6.1 The Panel will meet the requirements of the Act and the NEB Act in the joint review of the project.

6.2 The Panel will conduct its review in accordance with the Board Rules and in accordance with Part IV of the Terms of Reference attached as an Appendix to this Agreement. The Panel will have the powers set out in the NEB Act and section 45 of the Act.

6.3 The Panel will review the project in a careful and precautionary manner.

6.4 The Panel will conduct its review in a manner which will facilitate the participation of the public and Aboriginal peoples, and enable them to convey their views on the project to the Panel by various means, such as oral statements, letters of comment or participation as intervenors as outlined in Part IV of this Agreement.

6.5 In order that the Panel may be fully informed about the potential impacts of the project on Aboriginal rights and interests, the Panel will require the proponent to provide evidence regarding the concerns of Aboriginal groups, and will also carefully consider all evidence provided in this regard by Aboriginal peoples, other participants, federal authorities and provincial departments.

7 SECRETARIAT TO THE PANEL

7.1 Administrative, technical and procedural support required by the Panel shall be provided by a secretariat, which shall be the joint responsibility of the Board and the Agency.

7.2 The Secretariat will report to the Panel and will be structured so as to allow the Panel to conduct its review in an efficient and cost-effective manner.

7.3 The Agency will ensure that all other activities performed by Agency staff while assigned to the Secretariat are conducted in a way so as to avoid a conflict of interest with this joint review. Likewise, the Board will ensure that all other activities performed by the Board staff while assigned to the Secretariat are conducted in a way so as to avoid a conflict of interest with this joint review.

8 ABORIGINAL CONSULTATION

8.1 In addition to Subsection 6.5, the Panel will receive information from Aboriginal peoples related to the nature and scope of potential or established Aboriginal and treaty rights that may be affected by the project and the impacts or infringements that the project may have on potential or established Aboriginal and treaty rights. The Panel may include in its report recommendations for appropriate measures to avoid or mitigate potential adverse impacts or infringements on Aboriginal and treaty rights and interests.

8.2 The Panel shall reference in its report:

a) the information provided by Aboriginal peoples regarding the manner in which the Project may affect potential or established Aboriginal and treaty rights; and

b) in the case of potential Aboriginal rights, the information provided by the Aboriginal groups regarding the Aboriginal groups' strength of claim respecting Aboriginal rights.

9 REPORTING AND DECISION MAKING

9.1 The Panel will prepare a report under section 52 of the NEB Act setting out its recommendation on whether a certificate of public convenience and necessity should be issued taking into account whether the project is and will be required by the present and future public convenience and necessity, the reasons for the recommendations, as well as the terms and conditions that the Panel considers necessary or desirable in the public interest to which the certificate will be subject if the Governor in Council were to direct the Board to issue the certificate. The report will also set out the Panel's rationale, conclusions and recommendations relating to the environmental assessment of the project, including any mitigation measures and follow-up programs and a summary of any comments received from the public and Aboriginal peoples, as well as information referred to in Section 8. The report will also identify:

- those conclusions that relate to the environmental effects to be taken into account under section 5 of the *Canadian Environmental Assessment Act, 2012*; and
- recommended mitigation measures that relate to the environmental effects to be taken into account under section 5 of the *Canadian Environmental Assessment Act, 2012*.

9.2 Once completed, the report will be submitted to the Minister of Natural Resources who will make it available to the public and Aboriginal peoples.

9.3 The Governor in Council will make the decision on the environmental assessment (whether the project is likely to cause significant adverse environmental effects and if so, whether such effects are justified in the circumstances). The Governor in Council will also decide, by order, whether the Board should issue a certificate and will give reasons for the order.

10 SPECIALIST ADVISORS TO THE PANEL

10.1 The Panel may request federal authorities and provincial departments having specialist information or knowledge with respect to the project to make this information or knowledge available.

10.2 The Panel may retain the services of independent non-government experts to provide evidence on certain subjects within the Panel's Terms of Reference.

10.3 The names of the experts retained pursuant to Subsection 10.2 and any documents obtained or prepared by such experts and that are submitted to the Panel will be placed on the public registry. For greater certainty, this shall exclude any information subject to solicitor-client privilege where the expert is a lawyer.

10.4 Any federal authorities or provincial departments from which specialist or expert information or knowledge has been requested, and any independent nongovernment experts retained pursuant to Subsection10.2 may be required to appear at the oral hearing and testify in regard to the documents they have submitted to the Panel.

10.5 Nothing in this Agreement will restrict the participation by way of submission to the Panel by other federal or provincial departments or bodies.

11 AMENDMENTS, INTERPRETATION AND TERMINATION

11.1 Amendments to this Agreement may be made upon written notice by a Party to the other Party and upon the mutual consent of the Chair of the Board and the Minister of the Environment.

11.2 To the extent practicable, the Parties will seek to resolve differences of opinion in the interpretation and application of this Agreement at a working level, through good faith reasonable efforts.

11.3 Any Party may terminate this Agreement upon one month's written notice to the other Party.

11.4 Subject to section 62 of the Act, a Party's eligibility to withdraw from or terminate this Agreement will end at the commencement of the oral hearings.

11.5 The attached Appendix forms an integral part of this Agreement.

APPENDIX

Terms of Reference

The definitions in the Agreement between the National Energy Board and the Minister of the Environment concerning the joint review of the Northern Gateway Pipeline Project will apply to this Appendix.

The Panel will conduct a review of the Environmental Effects of the project and the appropriate mitigation measures based on the project description and consideration of the project application under the NEB Act.

The Panel will include in its review of the project, consideration of the factors identified in this Appendix and the scope of the factors.

Part I – Scope of the Project

The project includes the construction, operation, decommissioning and abandonment of

the following components:

- An oil pipeline commencing near Fort Saskatchewan, Alberta and terminating at a new marine terminal located in Kitimat, British Columbia;
- A condensate pipeline commencing at a new marine terminal in Kitimat, British Columbia and terminating near Fort Saskatchewan, Alberta;
- The right-of-way for the two pipelines as well as any temporary workspace required for the construction;
- Associated pump stations, a pressure letdown station (oil) and a pressure initiation station (condensate);
- Tunnels through North Hope Peak and Mount Nimbus to facilitate crossing of the Coast Mountains by the pipelines;
- A tank terminal, including hydrocarbon tanks, pump facilities and other land facilities, adjacent to the marine terminal;
- All-weather road access and electrical power requirements for the pump stations, the tank terminal and the new marine terminal in Kitimat, British Columbia;
- Block valves located at pump stations, selected watercourse crossings and other locations along the route;
- Pigging facilities at either end of the pipeline system and in selected intermediate locations;
- Cathodic protection system for the pipelines and tanks, including anode beds at selected locations along the pipeline route;
- Two marine loading and unloading berths (one each for oil and condensate) including:
    - loading and unloading platforms;
    - breasting dolphins;
    - mooring dolphins;
    - gangway tower;
    - walkway bridges between platform and breasting dolphins;
    - utility boat floating dock;
    - oil contingency deployment system with storage platforms;
    - fire fighting systems;
    - offshore anchorages in Kitimat Arm or elsewhere; and
    - pipeline interconnects between the berths and the tankage.
- Marine transportation of oil and condensate within:
    - the Confined Channel Assessment Area, as defined by the proponent,
    - which includes the marine and shoreline area of Kitimat Arm, Douglas
    - Channel to Camano Sound, and Principe Channel to Browning Entrance;
    - Hecate Strait; and
    - the proposed shipping routes to be used for the project that are within the 12 nautical mile limit of the Territorial Sea of Canada.
- All related works and activities including:
    - all temporary electrical power supply lines, such as those supplying energy for camps and worksites;
    - temporary work camps;
    - temporary access roads;
    - bridges and watercourse crossings (new or modified);
    - management and treatment of wastewaters and waste management;
    - water withdrawals;
    - borrow pits and quarries;
    - management of excavation material, including stockpiles (e.g. overburden);
    - log handling and storage facilities;
    - construction worksites, storage areas and staging areas;
    - handling and storage of petroleum products and hazardous materials;
    - handling, storage and use of explosives; and
- Any other components described by the proponent in its Preliminary Information Package, filed with the National Energy Board on November 1, 2005

Any additional modifications or decommissioning and abandonment activities would be subject to future examination under the NEB Act and consequently, under the Act, as appropriate. Therefore, at this time, the Proponent will be required to examine these activities in a broad context only.

Part II – Factors to be Considered During the Joint Review

The joint review will include a consideration of the following factors:

- The environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- The significance of the effects referred to above;
- Comments from the public and Aboriginal peoples that are received during the review;
- Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- The purpose of the project;
- Alternative means of carrying out the project, that are technically and economically feasible and the environmental effects of any such alternative means;
- The need for, and the requirements of, any follow-up program in respect of the project; and
- The capacity of renewable resources that is likely to be significantly affected by the project to meet the needs of the present and those of the future.
- Need for the project;
- Alternatives to the project;
- Community knowledge and Aboriginal traditional knowledge received during the review;
- Measures to enhance any beneficial environmental effects; and
- Environmental protection, environmental monitoring, and contingency and emergency response plans.

Part III – Scope of Factors

The Panel in conducting its consideration of the factors outlined in Part II will have regard to the following:

- The National Energy Board's Filing Manual dated 2004 as amended from time to time; and
- The document issued by the Canadian Environmental Assessment Agency, in response to comments received on the draft Joint Review Panel Agreement, entitled "Scope of the Factors – Northern Gateway Pipeline Project, August, 2009."

Part IV – Review Process

The main steps of the joint review process will be as follows:

- After the application has been filed with the Board by the Proponent, the Panel will review it to determine if there is sufficient information in the application to initiate the joint review process. If it is determined by the Panel that there is sufficient information, it will proceed to issue a Hearing Order. If there is not sufficient information, the proponent will be notified and the process will not proceed until the required information has been filed with the Panel.
- The Panel will issue a Hearing Order which sets out the procedures that will be followed for the joint review of the project including:
  - a description of the methods by which the public and Aboriginal peoples can participate in the review of the project;
  - the draft list of issues (i.e. the project-related issues) that will be considered in the joint review;
  - how and when intervenors can issue information requests to the Proponent or other parties in order to clarify evidence or obtain further information regarding the project;
  - the distribution of and access to all evidence, correspondence and other documents which will be used in the joint review and which will form the public registry;
  - the timetable of events for the joint review, including the deadlines for filing evidence and information requests as well as the date when the oral hearings will commence; and
  - how motions or questions of procedure or substance can be raised with the Panel.
- The Secretariat to the Panel will conduct information sessions with the public and Aboriginal peoples to assist them in understanding the joint review process and the ways in which they can participate. The location and timing of the sessions will be determined by the Panel.
- The Panel will conduct sessions with the public and Aboriginal groups for the purpose of seeking comments on:
  - the draft list of issues (included in the Hearing Order);
  - whether the proponent ought to be required to file any additional information which was not included in its application in view of the proposed changes to the list of issues, the NEB Filing Manual and the Agency's document entitled "Scope of the Factors – Northern Gateway Pipeline Project, August 2009"; and
  - the location of the oral hearings.
- The public and Aboriginal peoples may choose the manner in which they wish to participate in the review of the project. These options include:
  - **filing a letter of comment**: This is a written statement of the writer's views on the project and any relevant information that will explain or support their comments;
  - **providing an oral statement**: This is similar to a letter of comment except that the statement is delivered orally at a prescribed time during the oral hearings. A party wishing to provide an oral statement must advise the Panel of their intention to do so in advance; and
  - **intervention**: Intervenors may choose the extent to which they wish to participate in the hearing, but have the ability to do the following: file written evidence, ask questions regarding the evidence of others, be questioned on their evidence, participate in cross-examination and make a final argument at the oral hearings. There will be a minimum of 90 days between the deadline for requesting intervenor status and the commencement of the oral hearings.

- Government participant status will be afforded to federal authorities and provincial departments with an environmental assessment or regulatory responsibility and who file a declaration to this effect. The requirements of a government participant will be outlined in the Hearing Order.
- Prior to the scheduled start of the oral hearings as set out in the Hearing Order, the Panel will announce the location and timing of the oral hearing. When determining the location and timing of the oral hearings, the Panel will take into consideration the location of those most impacted by the Project and any special needs of participants.
- The public and Aboriginal peoples will have a minimum of 90 days prior to the commencement of the oral hearings to review the proponent's application.
- The oral hearings will be accessible via the Internet so the public and Aboriginal peoples not attending the oral hearing can listen to the proceedings. Transcripts of the oral hearings will be prepared and be available through the public registry.
- The Panel will deliver its report to the Minister of Natural Resources following the close of the oral hearings. The report will take into account and reflect the views of all Panel members.

Part V – Time Limits

- The Panel shall complete its mandate and submit its final report to the Minister of Natural Resources within 543 days from the coming into force of the Act.
- Pursuant to subsection 52(5) of the NEB Act, with the approval of the Chairperson of the National Energy Board, the time period between the issuance by the Panel of any request for information from the proponent and the submission of the requested information by the proponent is not included in the time limit referred to in the above paragraph.

APPENDIX 5
List of Issues

The Panel's environmental assessment and public interest determination for the Enbridge Northern Gateway Project included, but was not limited to, consideration of the following issues. Where applicable, these issues applied to both the terrestrial and marine components of the project. The issues also include those considered under the *Canadian Environmental Assessment Act, 2012,* as outlined in Parts I, II, and III of the Terms of Reference (see Appendix 4).

NEED FOR THE PROPOSED PROJECT

1. Need for the project as proposed by the applicant
    - 1.1 supply and markets for the oil and condensate to be transported by the project
    - 1.2 commercial support for the Project
    - 1.3 economic feasibility of the proposed facilities

POTENTIAL IMPACTS OF THE PROPOSED PROJECT

2. Potential impacts on:
    - 2.1 Aboriginal interests including:
    - 2.1.1 socio-economic matters listed in Issue 4
    - 2.1.2 asserted and proven Aboriginal rights (including Aboriginal title)
    - 2.1.3 treaty rights
    - 2.2 commercial interests
    - 2.3 landowners and land use including issues related to:
    - 2.3.1 crossings of the pipeline with vehicles and farm machinery
    - 2.3.2 depth of cover for the pipeline
    - 2.3.3 impacts of the project on agricultural soils

ENVIRONMENTAL EFFECTS

3. Potential effects on the environment including:
    - 3.1 protected areas
    - 3.2 wildlife and wildlife habitat
    - 3.3 fish and fish habitat
    - 3.4 atmosphere including greenhouse gas emissions
    - 3.5 vegetation
    - 3.6 species at risk
    - 3.7 marine environment
    - 3.8 water, hydrology, and wetlands
    - 3.9 soils, terrain and geology
    - 3.10 cumulative effects
    - 3.11 effects of the environment on the project, including geohazards

SOCIO-ECONOMIC EFFECTS

4. Potential effects on socio-economic matters, including:
    - 4.1 human occupancy and resource use
    - 4.2 heritage resources
    - 4.3 traditional land and resource use
    - 4.4 social and cultural wellbeing
    - 4.5 human health
    - 4.6 infrastructure and services
    - 4.7 employment and economy

CONSULTATION

5. Consultation with the public and Aboriginal groups on the project

FINANCIAL AND TOLLING MATTERS

6. Proposed differentiated tolling structure and tolling methodology
7. Proposed method of financing
8. Financial responsibility of the applicant

ROUTING

9. General route of the pipeline (including the proposed 1 km wide general route corridor) and route selection criteria
10. General location of the proposed facilities and the siting of the marine terminal

DESIGN, CONSTRUCTION AND OPERATION

11. Suitability of the proposed design, construction, operation and abandonment of the facilities recognizing the project risks and challenges
12. Capacity of the applicant to safely build and operate the proposed facilities in the range of physical conditions along the Rocky and Coastal Mountains and at the Kitimat Terminal

SAFETY, ACCIDENT PREVENTION AND RESPONSE

13. Risks of potential hydrocarbon releases related to the project including:
    - 13.1 likelihood of failures, accidents and malfunctions
    - 13.2 potential release volumes
    - 13.3 consequences of any release, including geographical extent
14. Safety measures in place to protect people, communities and the environment
15. Whether the proposed risk assessment, mitigation and prevention measures and programs are appropriate for the design, construction, operation and abandonment of the proposed facilities
16. Proposed plans and measures for emergency preparedness and response
17. Financial resources and other compensation measures available in the event of an accident or malfunction

FOLLOW-UP AND MONITORING

18. Follow-up and monitoring plans for the project

RECOMMENDATIONS, TERMS AND CONDITIONS

19. Recommendations to be included in the Panel report
20. Terms and conditions to be included in any decision the Panel may issue

APPENDIX 6
List of intervenors and government participants

INTERVENORS (NOT INCLUDING REGISTRANTS WHO SUBSEQUENTLY WITHDREW THEIR INVOLVEMENT):

Alberta Enterprise Group
Alberta Federation of Labour
Alberta Lands Ltd.
Alexander First Nation
Alexis Nakota Sioux Nation
Andrews, M.
Ashley, A.
B.A. Blackwell and Associates
Baird, B.W.
Baytex Energy Ltd.
BC Nature and Nature Canada
Beckett, D.
Bergman, C.
Binnema, D.
Boreal Retreats Ltd.
Bowles, M.
BP Canada Energy Company
Brain, L.
British Columbia Hydro and Power Authority
Brown, C.
Brown, F.
Brown, V.
Bullock, M.
C.J. Peter Associates Engineering
Canadian Association of Petroleum Producers
Canadian Natural Resources Limited
Canadian Oil Sands
Canadian Pipeline Advisory Council
Cenovus Energy Inc.
Chamber of Shipping of British Columbia
City of Prince George
City of Prince Rupert
City of Terrace
Coastal First Nations
Collins, E.-S.
Collins, F.
Communications, Energy and Paperworkers Union of Canada
ConocoPhillips Canada Resources Corp.
Coons, G.
Council of the Haida Nation
Cowpar, J.D.
Cullen, N.
Cullis-Suzuki, S.
Daewoo International (America) Corp.
Daiya-Mattess Keyoh
Darimont, Dr. C.
Dean, K.
Dene Nation
Depey, F.
Donaldson, D.
Douglas Channel Watch
Driftpile First Nation
East Prairie Métis Settlement
Easterbrook, C.
Edmonton Chamber of Commerce
Enbridge Northern Gateway Alliance
Enerplus Corporation
Enoch Cree Nation
Ermineskin Cree Nation
ExxonMobil Oil Corporation
Fait, Dr. K.
Flint Hills Resources Canada LP
ForestEthics Advocacy*
Fort St. James Sustainability Group
Foster, C.
Fox, N.
Friends of Morice Bulkley
Gitga'at First Nation
Gitxaala Nation
Golden, L.
Grande Alberta Economic Region
Haida Gwaii CoASt
Haida Gwaii Discovery Tours
Haisla Nation
Halyk, R.
Harrison, S.
Heiltsuk Economic Development Corporation
Heiltsuk Hereditary Chiefs
Heiltsuk Nation
Heiltsuk Tribal Council
Heiltsuk Youth Voice
Kitasoo Hereditary Chiefs and Elder Council
Hopkins, E.
Horse Lake First Nation
Horwood, D.
Housty, M.
Husky Energy Marketing Inc.
Imperial Oil Limited
In Situ Oil Sands Alliance
Initiatives Prince George
Innes, L.M.
INPEX Canada, Ltd.
Ivanhoe Energy Inc.
Izzard, K.
Japan Canada Oil Sands Limited
Kelly Lake Cree Nation
Kelly Lake Métis Settlement Society
Kendrick, C.
Kinder Morgan Canada Inc.
King, P.G.
Kitasoo Band Council
Kitasoo / Xaisais Co-Management Fisheries
Kitasoo / Xaisais Integrated Resource Authority
Kitimat Valley Naturalists

Kitselas First Nation
Kitsumkalum First Nation
Kochanek, K.
Korolyk, S.
K.T. Industrial Development Society
Kucheran, J.
Lake Babine Nation
Lakes District Clean Waters Coalition
Living Oceans Society*
Loranger-Saindon, A.
Louis Bull Tribe
Martin, G. (Geraldine)
Martin, G. (Greg)
Mason, L.
McKenzie, J.
McLeod Lake Indian Band
MEG Energy Corp.
Métis Nation British Columbia
Métis Nation of Alberta – Region 6
Métis Nation of Alberta – Regions 4 and 6
Métis Nation of Alberta Association Local #1994 of Grande Cache
Metlakatla First Nation
Michel First Nation
Misfeldt, N.
Mitchell, K.
Montana First Nation
Moresby Island Management Committee
Mounce, W.R.
Myshrall, D. and Pineault, J.-P.
Naylor, G.
Naylor, M.A.
Naylor, S.
Ned'u'ten Nation
Nexen Inc.
Nilsen, E.
North Coast Cetacean Society
North West Redwater Partnership
Northern Gateway Landowner Committee / Canadian Association of Energy and Pipeline Landowner Associations
Northwest Institute for Bioregional Research
Office of the Wet'suwet'en
Oil Sands Developers Group Association – Athabasca Region
Old Masset Village Council
Paddle for the Planet
Pattison, V.
Pearson, C.
Pembina Pipeline Corporation
Physicians of Haida Gwaii
Plan Implementation Committee for the Kalum Land and Resource Management Plan
Pollard, C.
Province of British Columbia
Qqs (Eyes) Projects Society
Queen Charlotte Secondary School
Raincoast Conservation Foundation*
Regional District of Bulkley-Nechako
Reid, C.
Reid, I.
Resource Stewardship Board, Klemtu
Richardson, P.
Rigney, D.
Robinson, C. Jr.
Robinson, F.
Robinson, G.
Robinson, H.
Roth, C.
Sagalon, L.
Samson Cree Nation
Saskatchewan Ministry of Energy and Resources
Saulteau First Nations
Sea to Sands Conservation Alliance
Shannon, D.
Sherwood Park Fish & Game Association
SinoCanada Petroleum Corporation
Skidegate Band Council
Stanyer, K.
Strathcona County
Sucker Creek First Nation
Sulyma, S.
Suncor Energy Marketing Inc.
Swan River First Nation
T. Buck Suzuki Environmental Foundation
Total E&P Canada Ltd.
Town of Whitecourt
TransCanada Keystone Pipeline GP Ltd.
Tuchscherer Husband, A.M.
United Fisherman and Allied Workers Union
University of Northern British Columbia
Village of Burns Lake
Village of Queen Charlotte
Vulcano, T.
Waldhaus, R.
Water Policy and Governance Group, University of Waterloo
Welton, J.
West Moberly First Nations
Wheele, N.
White, D.
Whitecourt & District Chamber of Commerce
Whitefish (Goodfish) Lake First Nation
Wier, J.
Wilson, J.D.
Wilson-Lewis, A.C.
Wong, D.
World Trade Centre Edmonton

GOVERNMENT PARTICIPANTS:

Aboriginal Affairs and Northern Development Canada (formerly Indian and Northern Affairs Canada)
Environment Canada
Fisheries and Oceans Canada
Natural Resources Canada
Transport Canada
Alberta Transportation
Government of Alberta
District of Chetwynd
District of Fort St. James
District of Kitimat
Village of Masset
Woodlands County

* Participated together as the "Coalition"

APPENDIX 7
Oral hearing locations and dates

MONTH	LOCATIONS AND DATES (all locations in British Columbia, unless noted)	What was heard			
		Oral evidence	Oral statements	Oral questioning	Oral final argument
JAN 2012	Kitamaat Village (10-11)	x			
	Terrace (12)	x			
	Smithers (16)	x			
	Burns Lake (17)	x			
	Prince George (18)	x			
	Edmonton, Alberta (24-27, 31)	x			
FEB 2012	Fort St. James (2)	x			
	Prince Rupert (17-18)	x			
	Old Massett (28-29)	x			
MAR 2012	Hartley Bay (2-3)	x			
	Kitkatla (12-15)	x			
	Skidegate (21-22)	x			
	Grande Prairie, Alberta (26-28)	x	x		
	Comox (30-31)	x	x		
APR 2012	Bella Bella (3-5)	x			
	Klemtu (11-12)	x	x		
	Prince Rupert (16-17)	x			
	Smithers (23-27)		x		
MAY 2012	Terrace (7-9)		x		
	Prince Rupert (24-25)		x		
JUN 2012	Old Massett (1-2)		x		
	Skidegate (13-14)		x		
	Kitamaat Village (25-26)		x		

MONTH	LOCATIONS AND DATES (all locations in British Columbia, unless noted)	What was heard			
		Oral evidence	Oral statements	Oral questioning	Oral final argument
JUL 2012	Prince George (9-10)		x		
	Burns Lake (17)		x		
	Fort St. James (19)		x		
	Denny Island (27)	x	x		
	Smithers (30)		x		
AUG 2012	Port Hardy (7-8)		x		
	Comox (10)		x		
SEP 2012	Edmonton, Alberta (4-8, 17-22, 24-28)			x	
OCT 2012	Prince George (9-13, 15-19, 29-31)			x	
NOV 2012	Prince George (1-3, 5-9, 22-23, 26-28)			x	
DEC 2012	Prince Rupert (10-15)			x	
JAN 2013	Victoria (4-5, 7-11)		x		
	Vancouver (14-18, 30-31)		x		
	Kelowna (28)		x		
FEB 2013	Vancouver (1)		x		
	Prince Rupert (4-8, 18-23, 25-28)			x	
MAR 2013	Prince Rupert (1, 11-16, 18-22)			x	
APR 2013	Prince Rupert (4-6, 8-11, 22-27, 29-30)			x	
MAY 2013	Prince Rupert (1)			x	
JUN 2013	Terrace (17-20, 24)				x

APPENDIX 8
Sources of information and evidence from Aboriginal groups

As required by Article 8.2 of the Joint Review Panel Agreement, the table below refers to the information and evidence sources provided by Aboriginal groups who participated in the Panel's process, and where this information can be found within the project's online registry on the National Energy Board's website.

Anyone wishing to fully understand the context of the information and evidence provided by Aboriginal groups should familiarize themselves with the entire public record.

ABORIGINAL GROUP	DURING PANEL SESSIONS		AS INTERVENORS			LETTERS OF COMMENT / ORAL STATEMENTS	
	Written submissions (registry folder ID)	Oral comments (transcript volume)	Written evidence (registry folder ID)	Oral evidence (transcript volume)	Oral hearing (transcript volume)	Letters of comment (registry folder ID)	Oral statements (transcript volume)
Alexander First Nation	C004	6	D006	16, 35	71, 81, 107, 173, 176		
Alexis Nakota Sioux Nation	C005		D007				
BC Métis Federation						A43795	
Burns Lake Band						A45850	
Coastal First Nations/Great Bear Initiative	C015-C016, C140	3	D035		76-78, 84, 112-113, 133, 176, 180		
Cowichan Valley Métis Nation						A41638	
Daiya- Mattess Keyoh			D048	19	101, 149, 177		
Dene Nation			D050	17			
Driftpile First Nation			D055	18	177		
East Prairie Métis Settlement	C028		D056	33			
Enoch Cree Nation	C033		D061	14	90, 94, 102, 152		
Ermineskin Cree Nation			D062		90, 94, 102, 152,178		
Gitga'at First Nation		3	D071	24 -25	163-165, 178		
Gitxaala Nation	C125-C135	4	D072	26-29, 42-43	72, 115, 138-139, 150, 160, 165, 167, 169-170, 173-175, 178, 180		
Gitxsan Hereditary Chiefs Office	C136	6					
Council of the Haida Nation	C018		D042	22 -23, 30	77, 136, 149, 177		

ABORIGINAL GROUP	DURING PANEL SESSIONS		AS INTERVENORS			LETTERS OF COMMENT / ORAL STATEMENTS	
	Written submissions (registry folder ID)	Oral comments (transcript volume)	Written evidence (registry folder ID)	Oral evidence (transcript volume)	Oral hearing (transcript volume)	Letters of comment (registry folder ID)	Oral statements (transcript volume)
Haida Gwaii CoASt			D78	23, 31			
Haisla Nation	C144-C146	3	D080	8	74-76, 83, 87-88, 95-97, 103-104, 107-110, 113-114, 139-142, 146-147, 153, 161-162, 164, 167-168, 170-171, 173, 178, 180		
Heiltsuk Economic Development Corporation			D083		178		
Heiltsuk Hereditary Chiefs			D084		178		
Heiltsuk Tribal Council		3	D085	37-39, 64	116, 142-144, 153, 161, 168, 174, 179-180		
Heiltsuk Youth Voice			D086		179		
Horse Lake First Nation	C149		D089	33			
Kapewe'no First Nation						A39728	
Kehewin Cree Nation						A49959	129
Kelly Lake Cree Nation			D103	32			
Kelly Lake Métis Settlement Society			D104	32			
Kitamaat Village Council	C156-C157						
Kitasoo Band Council			D108	40-41			
Kitasoo Hereditary Chiefs and Elder Council			D109				
Kitasoo/Xaixais Co-Management Fisheries			D110				
Kitasoo/Xai'xais First Nation		4					
Kitasoo/Xaixais Integrated Resource Authority			D111				
Kitselas First Nation	C160-163	6	D113	10			
Kitsilano Indian Band						A43163	
Kitsumkalum First Nation			D114	10			
Lake Babine Nation			D119	12			
Lheidli T'enneh Nation						A47820	
Louis Bull Tribe	C033		D125				
McLeod Lake Indian Band		6	D132				
Métis Nation of Alberta – Region 6			D135	33			

ABORIGINAL GROUP	DURING PANEL SESSIONS		AS INTERVENORS			LETTERS OF COMMENT / ORAL STATEMENTS	
	Written submissions (registry folder ID)	Oral comments (transcript volume)	Written evidence (registry folder ID)	Oral evidence (transcript volume)	Oral hearing (transcript volume)	Letters of comment (registry folder ID)	Oral statements (transcript volume)
Métis Nation of Alberta – Regions 4 and 6			D136	17			
Métis Nation of Alberta Association Local #1994 of Grande Cache			D137				
Métis Nation British Columbia			D134	9, 10-13, 19, 23			
Metlakatla First Nation			D138	20			
Michel First Nation	C173		D139		153-154, 163		
Montana First Nation	C033		D142				
Ned'u'ten Nation			D149	12			
Old Masset Village Council			D159	22 -23			
Samson Cree Nation	C033		D183	14	90, 94, 102, 152, 178		
Saulteau First Nations	C196-C197		D185	34			
Sawridge First Nation						A46864	
Skidegate Band Council			D190	30			
Sucker Creek First Nation	C033		D194				
Swan River First Nation			D197	16	103		
Tl'azt'en Nation						A45161, A45188	
Union of BC Indian Chiefs						A46849	
Office of the Wet'suwet'en		3, 6	D157	11-12	104-105, 115, 154, 179		
West Moberly First Nations			D211				
Whitefish (Goodfish) Lake First Nation	C033		D216				
Wilp's Gwininitxw		5					

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