Connections

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

Volume 1

Canada

National Energy Board | Office national de l'énergie

Canadian Environmental Assessment Agency | Agence canadienne d'évaluation environnementale

Connections

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

Volume 1

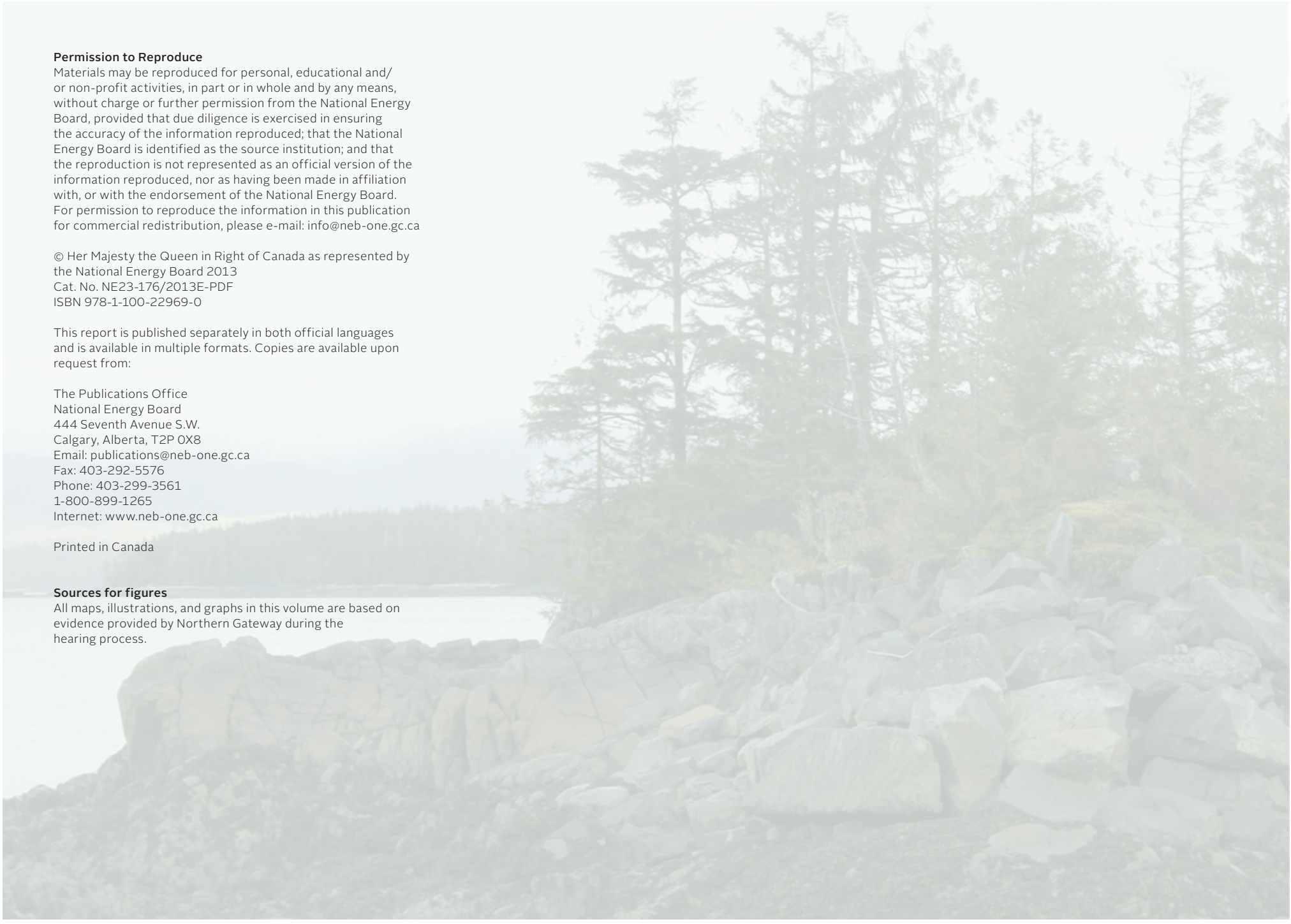
Cat. No. NE23-176/2013E-PDF
ISBN 978-1-100-22969-0

This report is published separately in both official languages and is available in multiple formats. Copies are available upon request from:

The Publications Office
National Energy Board
444 Seventh Avenue S.W.
Calgary, Alberta, T2P 0X8
Email: publications@neb-one.gc.ca
Fax: 403-292-5576
Phone: 403-299-3561
1-800-899-1265
Internet: www.neb-one.gc.ca

Printed in Canada

Sources for figures
All maps, illustrations, and graphs in this volume are based on evidence provided by Northern Gateway during the hearing process.



Contents

INTRODUCTION

Recognizing connections

This volume of our report, *Connections*, is about connections and linkages across time and place, on land and sea, between the economy and the environment, and among people, resources, cultures, wellbeing, safety, and way of life. It explains how we reached the conclusions and recommendations that are detailed in our second volume, *Considerations*.

During our hearings, we heard that many people feel a deep connection to the environment. Aboriginal people described their connections to the land and sea that continue to sustain their way of life. Many Aboriginal and non-Aboriginal people told us about how foods from the land and sea knit together the ecology, economy, and cultures along the proposed pipeline and tanker routes. People stressed the importance of water in their lives and environments. People expressed a spiritual connection to nature and a passionate commitment to stewardship of natural resources.

Some people said economic development like the Enbridge Northern Gateway Project could harm society and the environment, while others told us a strong economy was necessary to sustain and enhance environmental and social values. They all recognized the linkages among people, economy, and environment, and that these are all aspects of a shared ecosystem.

Our task was to recognize these connections. We weighed and balanced them to answer the fundamental question: Would Canada and Canadians be better off or worse off if the project goes ahead?

Connections explains how we answered this question.

JOINT REVIEW PANEL

Sheila Leggett,
Chairperson

Kenneth Bateman,
Member

Hans Matthews,
Member

Calgary, Alberta, December 2013

1 Project

Northern Gateway Pipelines Limited Partnership proposed to build and operate a terminal at Kitimat, British Columbia, and two pipelines between Bruderheim, Alberta, and Kitimat. The Minister of the Environment and the chair of the National Energy Board established this Joint Review Panel to assess the project's environmental, social, and economic effects. We were asked to recommend whether the project should be approved and to include conditions that we consider necessary.

1.1 What is the Enbridge Northern Gateway Project?

The Enbridge Northern Gateway Project is a proposal to create a new transportation route between Canada and world oil 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 products west from Bruderheim to Kitimat per day.
- 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.
- The Kitimat Terminal would have 2 tanker berths, 3 condensate storage tanks, and 16 oil storage tanks. At Bruderheim, there would be connections to pipelines and storage facilities serving producers and markets in Western Canada.

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 within the corridor would be determined after detailed engineering if the project were approved. An additional 25-metre-wide temporary work space along the entire route would be reclaimed after construction. Ten electric-powered pumping stations, including those at Kitimat and Bruderheim, would be located along the route. The final "footprint" on the landscape would be the 25-metre-wide right-of-way, recontoured and revegetated, plus the access roads at key points, power lines, and the 4-hectare fenced sites around pumping stations.

Northern Gateway said the project would cost about $7.9 billion to build, including pre-development costs and marine navigation enhancements, and could 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.

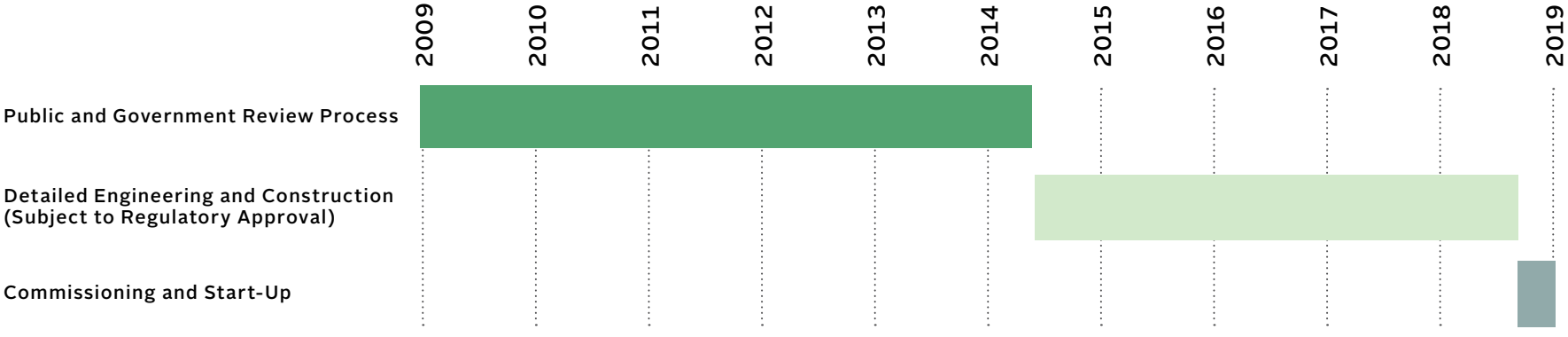
The westbound pipeline could carry a variety of crude oil products. Studies prepared for the project indicated that the majority of shipments would be diluted bitumen, which is a blend of light and heavy oil products.

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, led development of the project. Enbridge and 10 other energy companies invested more than $450 million to develop the proposal. Interested parties also invested funds and countless hours as active participants in our review of the project.

Up to 10 per cent of the equity was set aside for Aboriginal partners. Northern Gateway offered the equity package to 40 Aboriginal groups, and 26 accepted the offer.

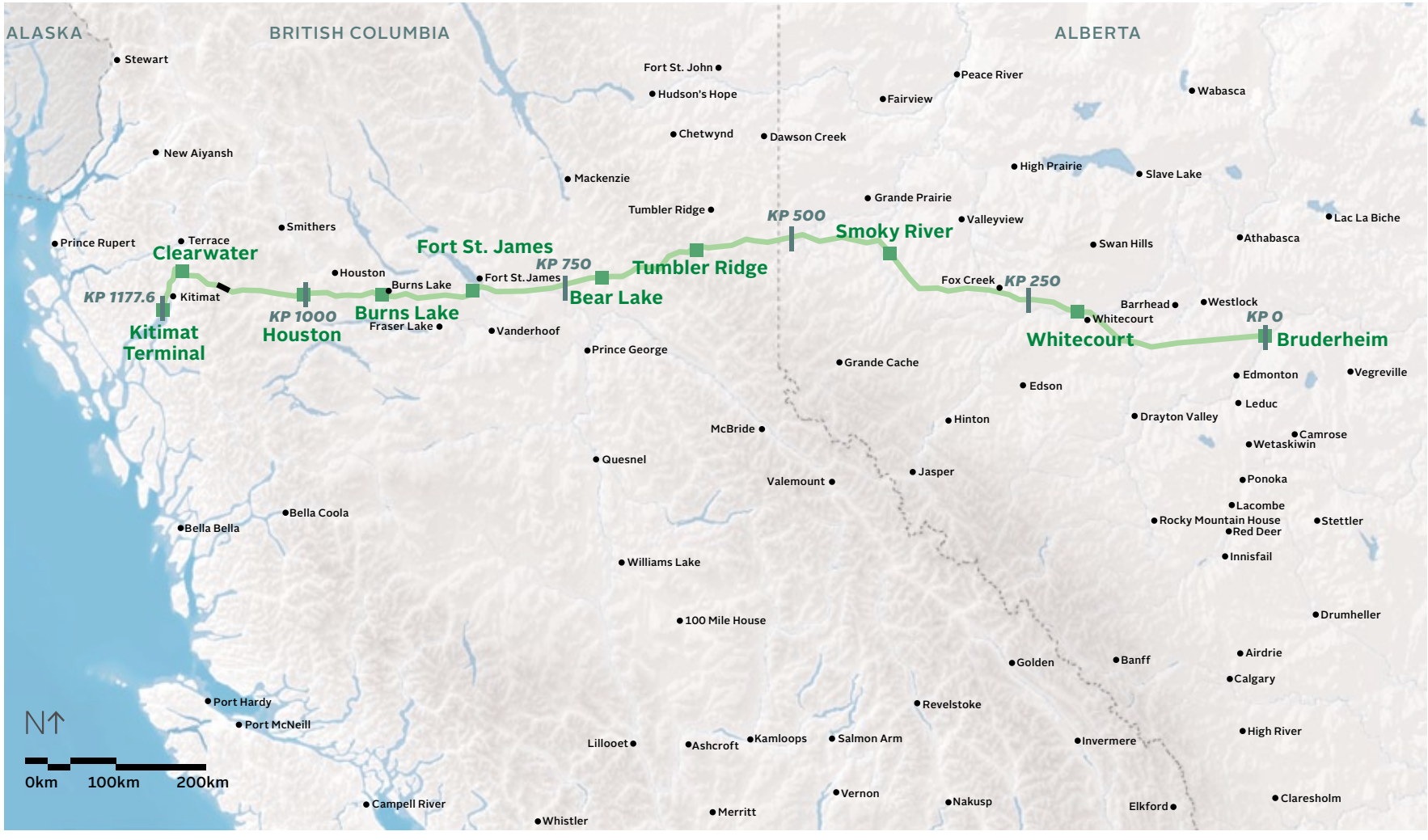
FIGURE 1.1 **PROJECT TIMELINE**

The review process for the project began in early 2009 when Northern Gateway said that it intended to seek regulatory approval.



MAP 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.



Pump Station | Kilometre Post (KP) | Clore and Hoult Tunnels

MAP 1.2 **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.

- Northern Approach
- Northern Approach Lane
- Southern Approach (direct)
- Southern Approach (direct) Lane
- Southern Approach (via Principe Channel)
- Southern Approach (via Principe Channel) Lane
- Kitimat Terminal
- Pipelines
- Provincial Parks

1.2 What commodities would the project transport?

The larger, westbound pipeline could carry a variety of oil types. The smaller, eastbound pipeline would only carry a product called condensate, which would be brought to Kitimat by tankers. Other tankers would take oil from Kitimat to international markets. Here are the four main types of products that could be transported:

CONDENSATE	DILUTED BITUMEN	SYNTHETIC CRUDE OIL	OTHER PETROLEUM PRODUCTS
Condensate is a gasoline-like mixture of light oil components usually obtained from natural gas production. The supply of condensate in Western Canada is limited, and there has been growing demand for condensate to dilute bitumen for pipeline shipment. Natural gas fields in the Middle East and the Asia-Pacific region are among the areas that might supply the condensate imports.	Bitumen is a viscous (thick and sticky) product obtained from the oil sands. Raw bitumen does not flow easily through pipelines, and it is blended with condensate to create a product called diluted bitumen or "dilbit" for pipeline shipment. Northern Gateway said diluted bitumen has similar properties to heavy crude oil, intermediate fuel oil, or lighter heavy fuel oils. The typical blend is roughly 30 per cent condensate and 70 per cent bitumen.	Bitumen can be converted into synthetic crude oil at facilities called upgraders. Upgraders can remove carbon from the bitumen, or add hydrogen, or both. Synthetic crude oil is similar to conventional medium crude oil. Upgraders located near production areas in Alberta convert about half of Canada's bitumen production into synthetic crude oil. An alternative method of diluting bitumen for pipeline shipment is in a mixture of roughly 50 per cent synthetic crude and 50 per cent bitumen. Synbit blend is another form of diluted bitumen and has similar characteristics to heavy crude oil, intermediate fuel oil, or lighter heavy fuel oils.	The westbound pipeline could also ship conventional light, medium, and heavy crude oils. Liquids can move through oil pipelines in separate batches, so it is possible to ship a variety of products in the same line. The pipeline's customers would determine what products to ship, depending on supply and demand.

1.3 What was the role of the Panel?

The National Energy Board and the federal Minister of the Environment established this Joint Review Panel in January 2010 to assess the Enbridge Northern Gateway Project. We considered environmental, social, and economic effects arising from construction and operation of the pipelines, the Kitimat Terminal, and the tanker traffic within Canadian territorial waters. We were required to determine the sufficiency of the application, hold public hearings, and conduct a technical analysis of the project based on all of the evidence, ultimately making a recommendation on whether the project should be approved or not. Our mandate was also to set out conditions for safe and responsible operations regardless of our recommendation.

As an expert tribunal, our responsibilities included:

- Assessing what significant effects the project could have on people and the environment and how these effects might be mitigated (controlled, reduced, or eliminated) in accordance with the *Canadian Environmental Assessment Act, 2012*
- Considering whether the project is in the public interest and therefore should be recommended for approval under the *National Energy Board Act*
- Setting out conditions for safe and responsible construction and operation of the project

We were asked to report our findings and recommendations, which the Governor in Council (federal Cabinet) will consider in making the decision on whether to approve or reject the proposed project. Our role was to conduct an independent, science-based, open, and respectful hearing process. We assessed the proposed design and operation to determine whether the project would be constructed and operated in a safe, reliable, environmentally responsible, and financially sound manner.

Our report sets out conditions for the construction and operation of the pipelines and the terminal that we consider to be required in the public interest. The conditions include technical standards and requirements for detailed plans, studies, scientific research, consultation, reports, monitoring, and financial assurances. The conditions would become part of the certificates authorizing the project if it were approved by the Governor in Council. The National Energy Board must reconsider a condition if the Governor in Council orders it to do so. The order may specify any factor that the National Energy Board must take into account in its reconsideration. On its reconsideration, the National Energy Board can confirm the condition, remove it, or replace it with another one.

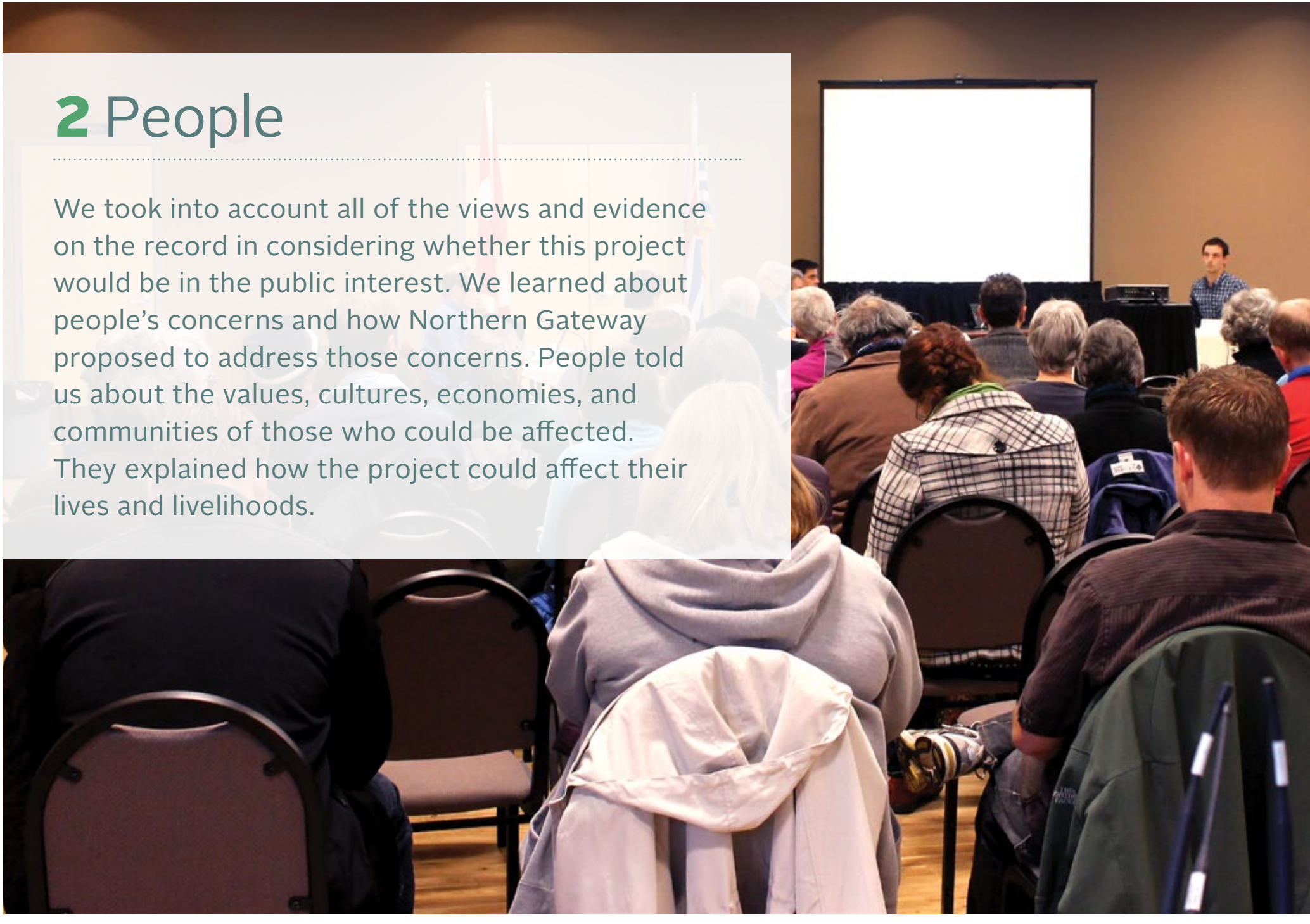
In addition, our conditions require Northern Gateway to implement all of its commitments, including those relating to marine navigation safety, design and inspection of tankers, and enhanced marine oil spill preparedness and response. All of Northern Gateway's commitments would take effect and be enforced through the certificates authorizing the operation of the terminal and pipelines. The National Energy Board does not have jurisdiction to enforce marine shipping and navigation regulations. Enforcement would occur through Transport Canada and other federal agencies that have jurisdiction over shipping in Canadian waters.

All Northern Gateway documents demonstrating compliance with our conditions would be publicly available on the National Energy Board website. Northern Gateway would also be required to maintain an updated commitment tracking table on its website.

Our hearing process developed an extensive record of scientific, technical, Aboriginal, and community knowledge. We received a large amount of correspondence and evidence and heard a wide range of expertise and opinion. The entire record, including oral testimony and written evidence, is available on the National Energy Board website.

2 People

We took into account all of the views and evidence on the record in considering whether this project would be in the public interest. We learned about people's concerns and how Northern Gateway proposed to address those concerns. People told us about the values, cultures, economies, and communities of those who could be affected. They explained how the project could affect their lives and livelihoods.



2.1 What is the public interest?

The public interest is the interest of all Canadians. The public interest includes environmental, social, and economic considerations. Would Canada and Canadians be better off or worse off if the project were approved? We weighed the potential benefits and burdens to arrive at our recommendations.

The public interest is local, regional, and national in scope. The people living closest to the project and those having direct economic interests are more likely to experience large burdens, benefits, or both. Other burdens and benefits may be spread through the regional or national environment, economy, and society. Some effects can be measured in dollars and cents. Many effects cannot.

The public interest can change over time. The National Energy Board and other regulators learn about the evolution of the public interest by listening to what Canadians have to say about how energy projects are developed and operated. Science and law provided the framework for our hearing process. We considered the evidence in a careful and precautionary manner to reach our recommendations.

If approved and built, the Enbridge Northern Gateway Project could operate for 50 years or more. Sustainable development was an important factor in our environmental assessment and our consideration of the public interest. The project would have to meet today's needs without compromising the ability of future generations to meet their needs. We gained this perspective first-hand as many young people participated in our hearings. We heard about their hopes and fears and those of parents, grandparents, and great-grandparents.

Aboriginal groups told us that the proposed pipelines' right-of-way and the tanker routes pass through areas that they have used and continue to use. We learned a great deal about the connections linking their cultures, histories, and traditional uses of lands, waters, and resources. We considered potential effects of the project on Aboriginal communities, their use of resources, and their activities.

2.2 How did people participate in our review?

Northern Gateway's application attracted attention and controversy. Some of this was due to the nature of the project. It proposed the first oil and condensate pipelines to cross northern British Columbia. It would establish a new tanker terminal and result in an increase in tanker traffic on the West Coast. There were concerns about the products that would be transported, especially diluted bitumen. We heard concerns about effects on Aboriginal uses of lands, waters, and resources.

In 2005, after three years of planning and preliminary meetings, Northern Gateway began consulting with communities, Aboriginal groups, landowners, commercial interests, and government authorities. Northern Gateway also negotiated protocol agreements with many Aboriginal communities. In 2009, the company established Community Advisory Boards to share views and information with affected communities. The project's environmental assessment included detailed information from the company's consultations.

In early 2009, Northern Gateway said it intended to seek regulatory approval of the project. The Canadian Environmental Assessment Agency then invited public comment on a draft agreement to create this Joint Review Panel. This process, including consultation with Aboriginal groups, led to the signing of the Joint Review Panel Agreement and our appointment. The Joint Review Panel Agreement set out our terms of reference and broadly defined the factors to consider during our review. The agreement was amended in August 2012 to reflect changes in the legislation governing our hearing process.

MAP 2.1 **HEARING LOCATIONS**

We visited 21 communities in British Columbia and Alberta during 180 days of hearings.

After receiving the Enbridge Northern Gateway Project application in May 2010, we listened to everyone who wished to comment on the scope of issues. We held public sessions in Whitecourt, Alberta, and in Kitimat and Prince George, British Columbia. Many people told us that they wanted to share their views, experiences, and knowledge. In January 2011, we responded to what we had heard. We released a revised list of issues that clarified what we would consider. The main categories of issues were:

- Need for the project
- Potential effects of the project
- Environmental effects
- Socio-economic effects
- Consultation
- Financial and tolling matters
- Routing
- Design, construction, and operation
- Safety, accident prevention, and emergency response
- Follow-up and monitoring
- Recommendations and conditions

During community hearings, individuals shared with us their knowledge, views, or concerns about the project.

To help us understand the evidence, we viewed the pipeline route and portions of the shipping routes by air and by boat. In 2011, our staff provided 35 public information sessions and 32 online workshops to share procedural information and answer questions on how to participate in the hearing process. All documents and transcripts of the proceedings are publicly available on the National Energy Board website. The audio from the hearings was webcast live.

We received and read more than 9,000 letters of comment regarding the application. Most of the letters argued against approving the project. Many referred to the risk of spills and the effects on people and their wellbeing and on Aboriginal activities. People arguing for the project emphasized its economic benefits and the social benefits from employment opportunities and increased government revenues. Various organizations with large regional or national memberships submitted letters in support of the project. Some letters cited peer-reviewed scientific and technical data. Many relied on internet and media references.

We considered all the information and views filed on the public record. Our process was designed to receive all perspectives. Our recommendations are based on technical and scientific analysis rather than the on number of participants sharing common views either for or against the project.

From January to July 2012, we heard oral evidence from 393 participants in 17 communities. Aboriginal people, from youth to Elders, told us of their history and culture, traditional use of lands, waters, and resources, and how they could be affected by the project. We also heard from non-Aboriginal groups and individuals who shared their stories and experiences on the land and water. All of this knowledge informed our assessment.

Beginning in March 2012, we heard oral statements from 1,179 individuals in 17 communities. Unlike oral evidence, oral statements are untested evidence and are not subject to questioning by other parties. Young and old were represented. The statements covered a wide spectrum of styles and views. Many cited their personal or professional experience in areas such as forestry, fishing, recreation, business,

agriculture, government, environmental science, medicine, engineering, and education.

A total of 206 intervenors and 12 government participants registered in 2011 for the formal hearing process. These parties could provide written and oral evidence, request information, question witnesses, and present written and oral final argument. The formal hearing process in 2012 and 2013 included oral questioning in Edmonton, Prince George, and Prince Rupert, and oral final argument in Terrace, British Columbia. Experts presented evidence for and against the project. Northern Gateway and 56 other parties submitted written final arguments.

Northern Gateway made various changes in its proposal in response to concerns raised during the hearing process. Examples of changes included the use of thicker-walled pipe, a smaller distance between isolation valves, valves at water crossings, and complementary leak-detection systems. The company revised the proposed route – for example, moving it several kilometres farther from the Morice River. Three pump station locations were changed at the request of Aboriginal groups.

The views in oral statements and letters of comment told us what people thought was important. Scientific and technical review of the evidence led to our information requests. Information requests were also submitted by government participants and the intervenors. For example, we asked the company to provide more information about project design and risk assessment. Northern Gateway also made information requests to intervenors and government participants. The responses helped to clarify the application and the issues.

Some parties chose not to participate because they had concerns about the regulatory process or were opposed to the project. They lost the opportunity to present their views to us and have them considered during our deliberations. We sought to optimize opportunities for individuals and groups to present their evidence and opinions to us. We incorporated remote participation through video and telephone links into the hearing room during all aspects of the oral hearings. Many participants, including expert witnesses, commented that they found the remote participation options useful and effective. Some of the questioning phase of the hearing process was conducted through these methods. 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.

2.2.1 PARTICIPATION BY ABORIGINAL GROUPS

Our hearing process provided an opportunity for Aboriginal people to learn more about the project and to place on our record their views about:

- their traditional knowledge with respect to the environmental effects
- the effects 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 effects the project may have on those rights, and appropriate measures to avoid or mitigate such effects

Aboriginal people participated as intervenors in the final hearing process and through oral evidence, oral statements, and letters of comment. Many attended our information sessions and hearings.

Under the Joint Review Panel Agreement, our process received information on the nature and scope of potential or established Aboriginal and treaty rights that the project might affect and the effects that the project might have on these rights. We received a great deal of evidence from Aboriginal groups and other parties on these matters.

2.2.2 WHAT WAS OUTSIDE OUR MANDATE?

During our hearings and in written submissions, many people urged us to include assessment of matters that were beyond the scope of the project and outside our mandate set out in the Joint Review Panel Agreement. These issues included both "upstream" oil development effects and "downstream" refining and use of the products shipped on the pipelines and tankers. We heard these concerns initially during our sessions in 2010 and addressed them in our January 2011 decision accompanying the revised list of hearing issues.

Many people said the project would lead to increased greenhouse gas emissions and other environmental and social effects from oil sands development. We did not consider that there was 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. We based our decision on four factors:

- Provincial and federal energy and environmental authorities already regulate oil sands development and other oil production activities.
- Northern Gateway applied only for a transportation project and did not indicate any intention to develop oil sands or other oil production.
- The Bruderheim Station would not be located near oil sands developments and could receive oil from a variety of sources.
- Oil sands projects and activities were not included in our terms of reference under the Joint Review Panel Agreement. The agreement was reached after consultations with the public and Aboriginal groups.

In addition, some people asked us to consider the "downstream" emissions that could arise from upgrading, refining, and diluted bitumen use in China and elsewhere. These effects were outside our jurisdiction, and we did not consider them. We did consider emissions arising from construction activities, pipeline operations, and the engines of tankers in Canadian territorial waters.

Some people asked us to consider other issues such as trade policy, renewable energy, and industrial strategy. We did not consider them; they were outside our mandate.

2.3 What were the public concerns?

People raised a wide range of concerns regarding the project. The concerns included safety, environmental, social, and economic issues. Northern Gateway made commitments during the hearings to address many of these concerns. We also deal with these and other concerns in the conditions that will apply if the project is approved.

Within our mandate, there were major areas where widely held public perceptions and the evidence of other participants differed from the evidence provided by Northern Gateway and those arguing in favour of the project. We discuss the issues later in this volume and in more detail in Volume 2. The four main areas were:

- The likelihood and consequences of malfunctions and accidents (Section 5, *Safety and risk*, in this volume)
- Effects of construction and routine operations on the environment (Section 4, *Environment*)
- Economic soundness, costs, benefits, design, construction, and operations (Section 3, *Economy*)
- Effects of the project on society, culture, and Aboriginal people (later in this section, *People*)

In letters of comment, oral statements, and oral evidence, people cited their own experiences in the region and told us how the project might affect them.

Protecting the quality of water and land was a common theme of many presentations. People expressed concerns about the "catastrophic" effects they believed a major pipeline rupture or tanker spill could have on salmon and other fish. They said the salmon was as important to British Columbians as the buffalo had been to Aboriginal people on the Prairies. They said annual salmon runs sustained species such as grizzly bears and eagles as well as human economies, cultures, and recreation. They said the salmon plays a role in the health of forests near watercourses. People said that the region described as the Great Bear Rainforest, extending from north of Vancouver Island to southeastern Alaska, was a natural resource like no other. People also told us of the importance of protecting ecosystem integrity, including species considered at risk, such as woodland caribou and some marine mammals.

People were concerned about the effect of tanker traffic and potential oil spills on marine mammals such as humpback whales and killer whales. They also frequently cited potential effects on birds.

Weather on the coast and along the pipeline route was another common theme. People said storms, winds, waves, and fog made tanker accidents more likely. They said deep snow, heavy rains, fog, and spring runoff could make it difficult to reach the pipeline right-of-way in the event of a leak.

People said the project would have effects on society and cultural activities along the pipeline route and in coastal areas. People said spills would affect the way of life for communities, families, and individuals. They told us that, even in the absence of spills, the possibility of such incidents would have unacceptable social, economic, and cultural effects.

Aboriginal and non-Aboriginal participants said clean environments are crucial parts of traditional and present-day cultures. Foods such as salmon and other fish, mollusks, seaweeds, plants, berries, and moose are important to people's lifestyle and cultures as well as nutrition and subsistence. Some people said a major release like the 1989 Exxon Valdez oil spill would cause serious harm to the coastal way of life. We often heard a common expression in the coastal areas: "When the tide goes out, our table is set."

Some participants were concerned about social and cultural effects from large numbers of out-of-province contractors and workers flooding into sparsely populated areas for short periods during construction. People said short-term jobs in construction would not necessarily lead to long-term employment for residents of communities along the route.

The Alberta Federation of Labour and other participants said that more upgrading of bitumen should occur in Canada. People questioned the economic benefits of the project, especially in British Columbia. A former chief executive of BC Hydro warned against relying on economic forecasts, which he said were seldom accurate, even in the short term.

Those arguing for the project included organizations such as the Edmonton World Trade Centre. They emphasized the project's potential social and economic benefits and the need to diversify Canada's markets. They said the environmental effects and risks were acceptable.

2.4 How would the project affect residents and communities?

Communities along the pipeline route would see increased economic activity from local hiring and purchases of goods and services, especially during construction. Taxes and other government revenues would flow into the economy. Communities could also experience increased demand for police, fire, health, and social services. There could be negative effects on fisheries, hunting, recreation, tourism, and protected areas. Northern Gateway proposed monitoring, consultation, collaboration, education, training, and community investment programs to provide local benefits and address concerns.

People described the spiritual benefits they gain from living in a relatively untouched environment and the importance of preserving those benefits for future generations. Northern Gateway acknowledged these views and also said that the project area has seen industrial activity in the past, including mining, forestry, railway, and energy development.

Edmonton's Mayor, writing on behalf of northern Alberta municipal leaders, said the project would provide long-lasting economic benefits to Canadian communities and workers. The British Columbia Chamber of Commerce, many Alberta participants, and some national organizations shared this view. They said local, regional, and national economic benefits outweighed the potential negative environmental and social risks and effects.

Many British Columbia communities and individuals took the opposite view. The Municipal District of Fort St. James, for example, said Northern Gateway had not earned "social licence" to operate in and around the community. The community, like many others, said the risk of spills was just too great.

In communities affected by the project, Northern Gateway said that there would be joint study initiatives, employment, contracting, and procurement opportunities in areas such as environmental management and spill preparedness. The project would employ some coastal residents in building and operating the terminal facilities. There would also be opportunities for pilots, tugboat operators, and crews. A Fisheries Liaison Committee would provide coordination between the project's marine operations and the Aboriginal and non-Aboriginal fishing communities. Residents and groups said they remained concerned about effects of tanker traffic on fishing, especially during the short open seasons for some species.

Northern Gateway said that involving local communities in planning, environmental monitoring, and spill preparedness and response would help to address their concerns if the project goes ahead. The company said taxes and local purchases would benefit communities along the route.

The project would directly employ up to 3,000 people during peak construction periods. Northern Gateway said the construction camps would be self-contained and largely self-sufficient. The company said it would use local labour and providers of goods and services as much as possible. It held four "boot camps" for potential contractors to inform them about the project's needs. People along the route said they were concerned about the demand for social services and issues such as substance abuse during the construction period.

2.4.1 OUR ASSESSMENT OF THE PROJECT'S EFFECTS ON RESIDENTS AND COMMUNITIES

Considering Northern Gateway's project design, its commitments, and our conditions, we concluded that the project's potential effects on people's land, water, and resource use could be mitigated. We were not persuaded that construction and routine operations of the project would have a negative effect on the social fabric of communities in the project area. We also were not persuaded that the project would adversely affect the health and wellbeing of people and communities along the route or in coastal areas. We found that the net overall economic effects of the project would be positive and would provide potential benefits and opportunities to those individuals and businesses that choose to participate in the project.

We encourage continued dialogue between Northern Gateway and the public, landowners, stakeholders, and Aboriginal groups throughout the life of the project. Participation of these parties would be essential for the success of 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. Our conditions require the monitoring and adaptive management of Northern Gateway's socio-economic programs.

In the unlikely event of a large oil spill, we found that there would be significant adverse effects on lands, waters, or resources used by residents, communities, and Aboriginal groups. We found that the adverse effects would not be permanent and widespread. The effects of spills are discussed in Section 5 of this volume.

2.5 How could Aboriginal people be affected?

Northern Gateway said Aboriginal people could benefit from the project's community investments, education and training programs, employment and contracting, and share ownership. Aboriginal groups and others told us that the benefits could not outweigh the effects on their rights, interests, cultural and spiritual values, use of traditional sites, food sources, and other resources.

Northern Gateway committed to a target of having at least 15 per cent of construction jobs on the pipelines going to Aboriginal people, and at least 10 per cent of all construction-related labour being Aboriginal. In 2013, the company had already begun training programs for potential Aboriginal workers. The company said about $300 million would be set aside for purchases of goods and services from Aboriginal businesses. Northern Gateway said that Aboriginal workers and contractors could also receive up to $300 million from tunnel, terminal, and marine construction activity in the Kitimat area.

Northern Gateway said that many Aboriginal communities have high unemployment rates and are seeking to improve their economies. The company said economic opportunities from the project could help the communities to become more prosperous and better able to achieve their cultural and community goals and objectives. Coastal Aboriginal groups and others said their communities were developing and implementing plans to maintain and strengthen their economies and communities, and the project could have negative effects on those plans in areas such as fisheries and tourism.

Aboriginal groups said they put a high value on preserving their languages, culture, and traditional uses of lands, waters, and resources.

2.5.1 ABORIGINAL CONSULTATION

Northern Gateway filed detailed evidence about its consultation activities with Aboriginal groups since 2005. Aboriginal groups argued that the Government of Canada should have consulted more directly with them. If the project were approved, the company's consultation would continue through detailed design, construction, and the operational life of the project.

Some Aboriginal groups chose not to participate in some aspects of Northern Gateway's consultation program such as Aboriginal Traditional Knowledge studies. Northern Gateway did not have the benefit of such information from these groups early in its project design phase and assessment of potential effects.

Many Aboriginal groups said that the Government of Canada had a legal duty to consult with them and that this duty had not been discharged. The Government of Canada said that it would rely on our process to the extent possible to fulfil its legal duty to consult. The Government of Canada said that, if project-related issues that required Crown consultation could not be addressed through our process, it would consult directly with the potentially affected Aboriginal groups on these issues.

The Government of Canada's Aboriginal Consultation Framework for the Northern Gateway Pipeline Project stated that the federal government would make final determinations about the strength of an Aboriginal group's claim respecting Aboriginal rights.

We found that it would also be important for Aboriginal groups to have ongoing opportunities for their views and recommendations to be heard. Northern Gateway committed to ongoing engagement with Aboriginal groups throughout all phases of the project, including with coastal Aboriginal groups and others that have not yet participated in all opportunities provided to discuss the project.

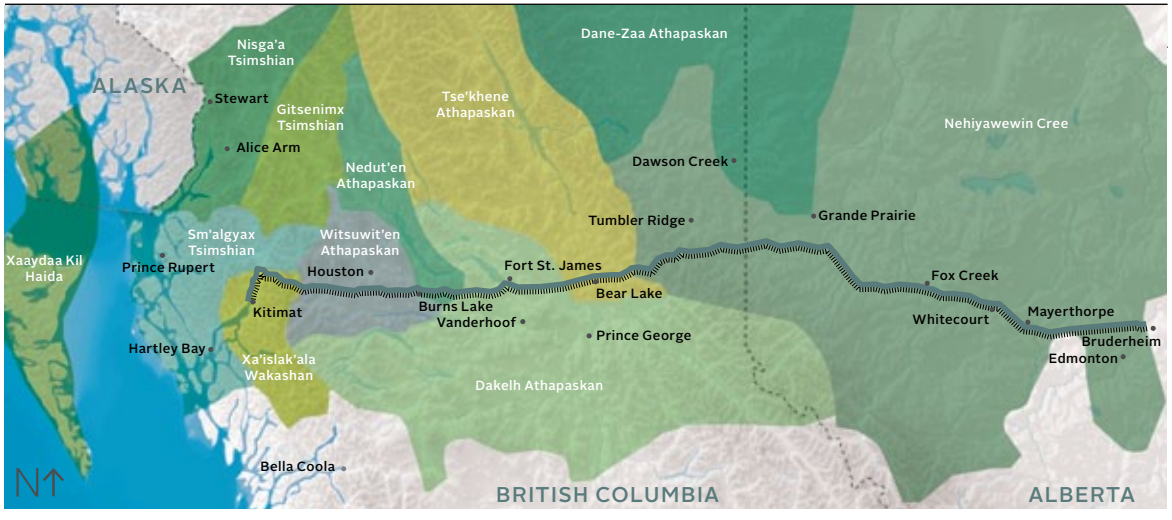
Our conditions require Northern Gateway to report on its ongoing consultations with Aboriginal groups, including consultations in developing a number of operational plans and employment-related programs. We concluded that the company could effectively continue to engage and learn from Aboriginal groups that chose to engage throughout the project's operational life.

2.5.2 ABORIGINAL EQUITY PARTICIPATION

Northern Gateway offered to share up to 10 per cent of the project equity among 40 eligible Aboriginal groups near the pipeline route. Northern Gateway said that 15 of the 18 offers in Alberta were accepted, and 11 of 22 were accepted in British Columbia. Northern Gateway said it would be prepared to consider later equity participation by coastal Aboriginal groups.

The estimated total value of the equity offer is $280 million. Northern Gateway would loan the Aboriginal equity participants the purchase price for their shares. The Aboriginal groups would repay the loans later out of their revenues from the project. In addition, the Aboriginal equity participants would not be subject to liability like other shareholders. Groups that accepted the equity offer were still able to raise concerns during the hearing process about specific aspects of the project.

MAP 2.2 **ABORIGINAL LANGUAGE GROUPS**



Oil Pipeline Condensate Pipeline

2.5.3 EFFECTS ON ABORIGINAL GROUPS

Aboriginal groups and individuals said the Enbridge Northern Gateway Project would have negative effects on their rights and interests. They said that construction, routine operations, and spills could potentially affect Aboriginal activities such as hunting, fishing, trapping, and gathering, and their use of traditional sites.

Northern Gateway said the project would have minimal effects on Aboriginal activities and sites during construction and routine operations, and it proposed measures to reduce or eliminate those effects or to compensate for them. The company said its mitigation measures would reduce the risk of a spill. Northern Gateway said that, if a spill were to occur, it would work with communities and spill response and that compensation would be provided, including provision of alternative water and food supplies.

The project would cross the territories of Treaty No. 6 in central Alberta and Treaty No. 8 in north-central Alberta and portions of northeast British Columbia. Aboriginal groups that were signatories to these treaties provided evidence regarding their rights to hunt, trap, fish, and gather throughout their traditional territories, and they described the effects the project could have on these rights.

The Heiltsuk Tribal Council placed evidence on the record about their Aboriginal right to trade herring spawn on kelp on a commercial basis as determined by the Supreme Court of Canada in *R. v. Gladstone*.

2.5.4 USE OF ABORIGINAL TRADITIONAL KNOWLEDGE

Aboriginal people in the project area have a long relationship and connection with the lands, waters, and resources likely to be affected by the project. The traditional knowledge of Aboriginal people was an important factor in Northern Gateway's planning and in our assessment of the project. Aboriginal traditional knowledge can:

- provide relevant biophysical information, including historical information, that may otherwise have been unavailable
- help identify potential environmental effects
- lead to improved project design
- strengthen mitigation measures
- contribute to the building of long-term relationships among the applicant, the Aboriginal groups, and the responsible government authorities
- lead to better decisions, and
- contribute to the building of capacity within Aboriginal communities and build an awareness of, and appreciation for, Aboriginal traditional knowledge in non-Aboriginal communities

Northern Gateway used available Aboriginal Traditional Knowledge studies and provided funds for preparation of additional studies. The company said the studies helped to determine where and how the project could affect traditional activities and uses. Northern Gateway said the information formed part of the engineering and environmental planning for the project.

We travelled to Aboriginal communities and gained valuable information and views on the public record from their leaders and community members. We heard and received a great deal of additional Aboriginal traditional knowledge during our hearing process. It came through letters, oral evidence, questioning, and the submissions of Aboriginal intervenors.

Many Elders provided detailed accounts of their people's traditions, activities, uses of land and water, and connection to natural resources. In many of these accounts, country foods – from fishing, hunting, and gathering – played an important role. The accounts frequently mentioned foods such as salmon, eulachon, seaweed, shellfish, and moose. They said these foods were part of their culture as well as their diet and economy. People told us that having access to clean water was also crucial for their communities' wellbeing.

Our record includes a wealth of information about Aboriginal people along the pipeline route and the coastal areas. For example, we heard about former practices such as caribou hunting in Alberta and the once-thriving trade in eulachon "grease" between coastal and inland groups. People told us about the spiritual importance of Lac Ste. Anne in Alberta. Elders told us about concerns relating to their society and the importance of opportunities for their youth. They told us of efforts to maintain and build their cultural heritage.

2.5.5 OUR ASSESSMENT OF THE PROJECT'S EFFECTS ON ABORIGINAL PEOPLE

We found that, during construction and routine operations, 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. We also found that the project would not significantly adversely affect the interests of Aboriginal groups that use lands, waters, and resources in the project area.

We found that there would be adverse effects associated with this project, and that these would be experienced by some Aboriginal groups. Based on the evidence, we found that, during construction and routine operations, these effects would be temporary.

We found that Northern Gateway had incorporated some of the information provided by Aboriginal groups in its studies, design, and mitigation measures. The company filed updates during the process regarding its consideration of traditional use information. In our view, the company could have done more to clearly communicate to some Aboriginal groups how it considered, and will continue to consider, information provided.

If the project were to proceed, our conditions require Northern Gateway to continue consultation. This would provide opportunities for improved understanding and adaptive mitigation through initiatives such as the Fisheries Liaison Committee, scientific research to improve the knowledge of the marine environment, and identifying any site-specific traditional use interests during detailed routing. Inclusion of Aboriginal groups in these and other processes would contribute to the success of an approved project and reduce potential effects on communities and people.

We found that there would be opportunities for potentially affected Aboriginal groups to benefit from project-related programs such as ongoing wildlife studies, monitoring programs, and Northern Gateway's commitment to support education, training, and business opportunities.

In the unlikely event of a large oil spill, we found that there would be significant adverse effects on lands, waters, or resources used by Aboriginal groups. We found that these adverse effects would not be permanent and widespread.

We recognize 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 practise their traditional activities. We recognize that such an event would place burdens and challenges on affected Aboriginal groups. We find that such interruptions would be temporary. We also recognize that, during recovery from a spill, users of lands, waters, or resources may experience disruptions and possible changes in access or use. The effects of spills are discussed in Section 5 of this volume.

3 Economy

The Enbridge Northern Gateway Project would make possible a large increase in Canadian oil exports to Pacific Basin markets. It would connect the growing supply of oil in Western Canada to the growing markets of the Asia-Pacific region, and it would help meet a growing demand for condensate in Alberta. Northern Gateway said economic benefits would include direct and indirect employment and revenues for Canadian industries, governments, and communities. Other parties questioned the economic assumptions.

3.1 Does the Enbridge Northern Gateway Project make economic sense?

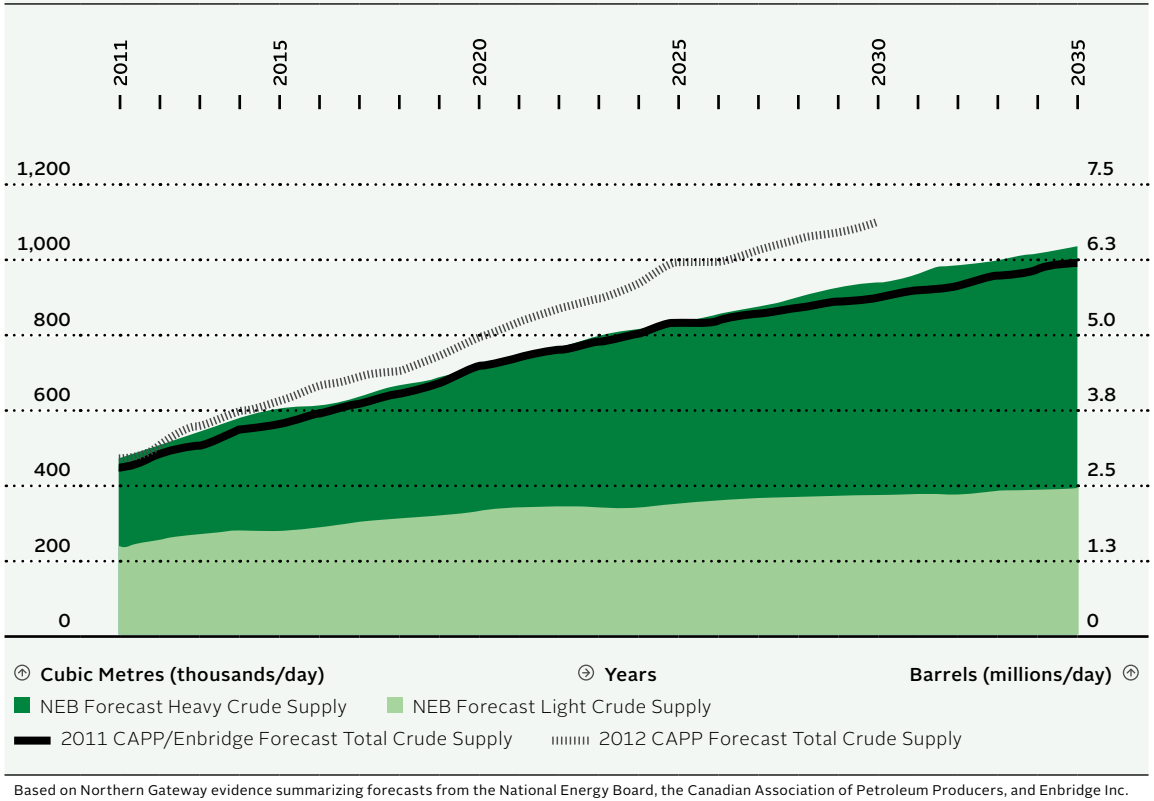
Northern Gateway said Canada needed to diversify the markets for its oil exports. Potential shippers said their financial backing of the application showed that the project made sense to them. Other intervenors said it would make more sense to upgrade and refine bitumen in Canada to supply domestic and export markets.

Northern Gateway said the project would provide a direct route to rapidly growing markets in the Asia-Pacific region and allow Canada to diversify crude oil exports to markets beyond North America. The Canadian Association of Petroleum Producers, the Government of Alberta, the project's funding participants, and some other intervenors agreed.

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. Northern Gateway said other forecasts showed the same trend. Almost all of the predicted increase would come from oil sands. Northern Gateway and others said that the demand for crude oil in North America would likely remain flat, and an increasing portion of North American demand would be met by light and medium oil from shale deposits.

The Government of Alberta and others said that most of the demand for bitumen comes from complex refineries that include processing facilities similar to those at upgraders. These refineries can obtain a higher proportion of transportation fuels from bitumen. Those arguing in favour of the project said bitumen production was growing faster than upgrading capacity in Canada. To obtain full value, they said, bitumen would need to reach complex refineries beyond those currently served in the North-Central and Gulf Coast regions of the United States. The next-nearest concentration of complex refineries is in East Asia, mainly in China. They said Northern Gateway would provide a relatively short and direct route to East Asia as well as access to other refining markets such as India and California.

FIGURE 3.1 **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.

Northern Gateway and others said the project's eastbound pipeline would meet a growing demand for condensate to dilute bitumen in Western Canada. They said domestic condensate production and the one current condensate import pipeline from the United States would not be able to meet the demand forecast by the National Energy Board for later in this decade or after 2020.

The Alberta Federation of Labour and others, including many letters of comment and oral statements, urged development of more upgrading capacity in Canada, which would reduce the need to import condensate and export diluted bitumen. They said the jobs and added value should remain in Canada.

The Government of Alberta, the Canadian Association of Petroleum Producers, and others said upgrading capacity was increasing in Canada but not as fast as bitumen production. They said in-situ oil sands operations would still require condensate to transport bitumen from producing fields to upgraders or domestic markets. If more upgrading were added in Western Canada, Northern Gateway said the project's oil pipeline could also transport the synthetic crude oil to export markets.

We concluded that the project would meet demonstrated needs for transportation of oil and condensate to and from Pacific markets. We were not persuaded that the project would prevent the development of upgrading capacity in Canada.

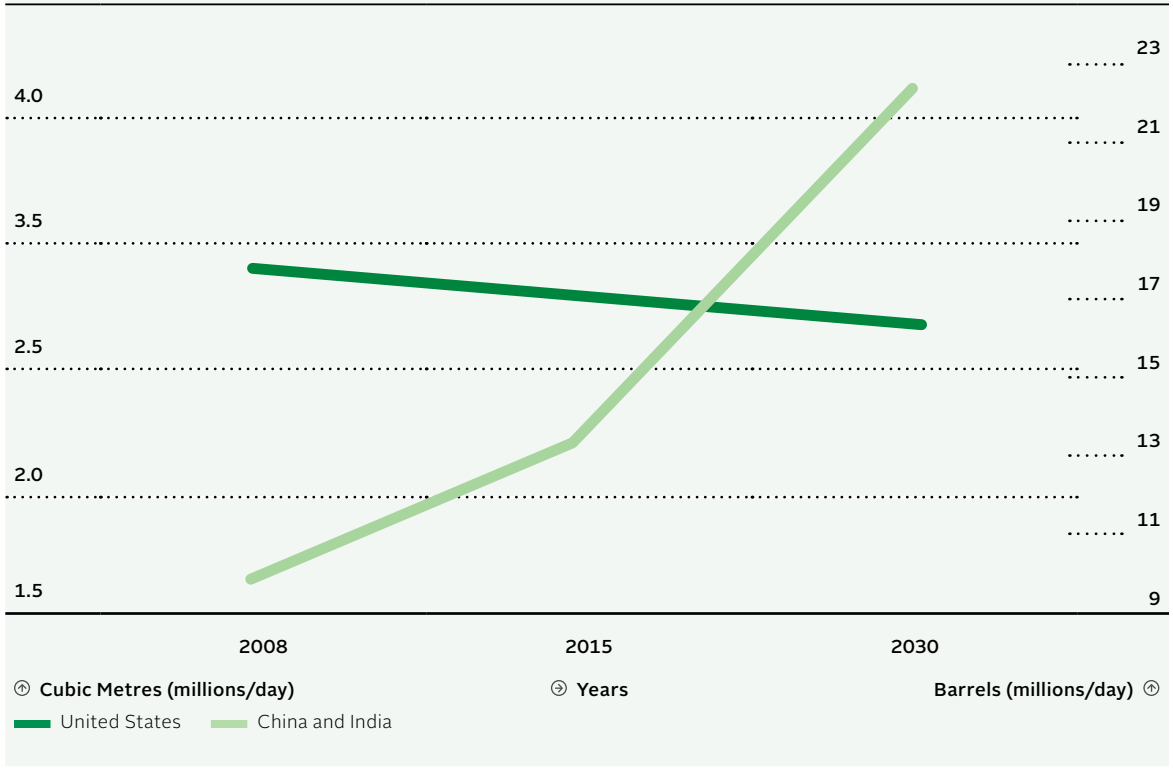
Six of the 10 funding participants were intervenors in our hearings. Although their shipping commitments were non-binding, they said they intended to sign transportation service agreements if the project were approved and proceeded as expected, with reasonable tolls and a clear in-service date. The funding participants would then become "founding shippers." They said the participants' financial contributions, totaling $140 million at the end of 2012, demonstrated their commitment to the project. Their options, if converted into service agreements, would account for at least 90 per cent of the capacity on the project's pipelines. The funding participants agreed with Northern Gateway that the project could be commercially sound. Coastal First Nations and others said the lack of binding agreements raised questions about whether the commercial need for the project had been demonstrated.

Northern Gateway said that before entering into unconditional transportation service agreements, prospective shippers would need to be satisfied that:

- the project had been approved by the regulator, subject to acceptable conditions
- the costs to construct the project were reasonable and could be satisfactorily managed
- the project's in-service date would meet shippers' commercial requirements

Northern Gateway said long-term firm transportation agreements would be in place before construction and project financing. Pro-forma versions of the agreements and tolling principles accompanied the application. These terms and conditions would be subject to National Energy Board approval before operations could begin. Final financial arrangements would depend on shippers signing the agreements and factors such as construction cost estimates developed during detailed design and engineering. Northern Gateway proposed a three-tiered toll structure: lowest tolls for founding shippers, higher for other long-term shippers, and highest for short-term shippers.

FIGURE 3.2 **NORTHERN GATEWAY FORECAST OF UNITED STATES VERSUS CHINA AND INDIA OIL DEMAND**



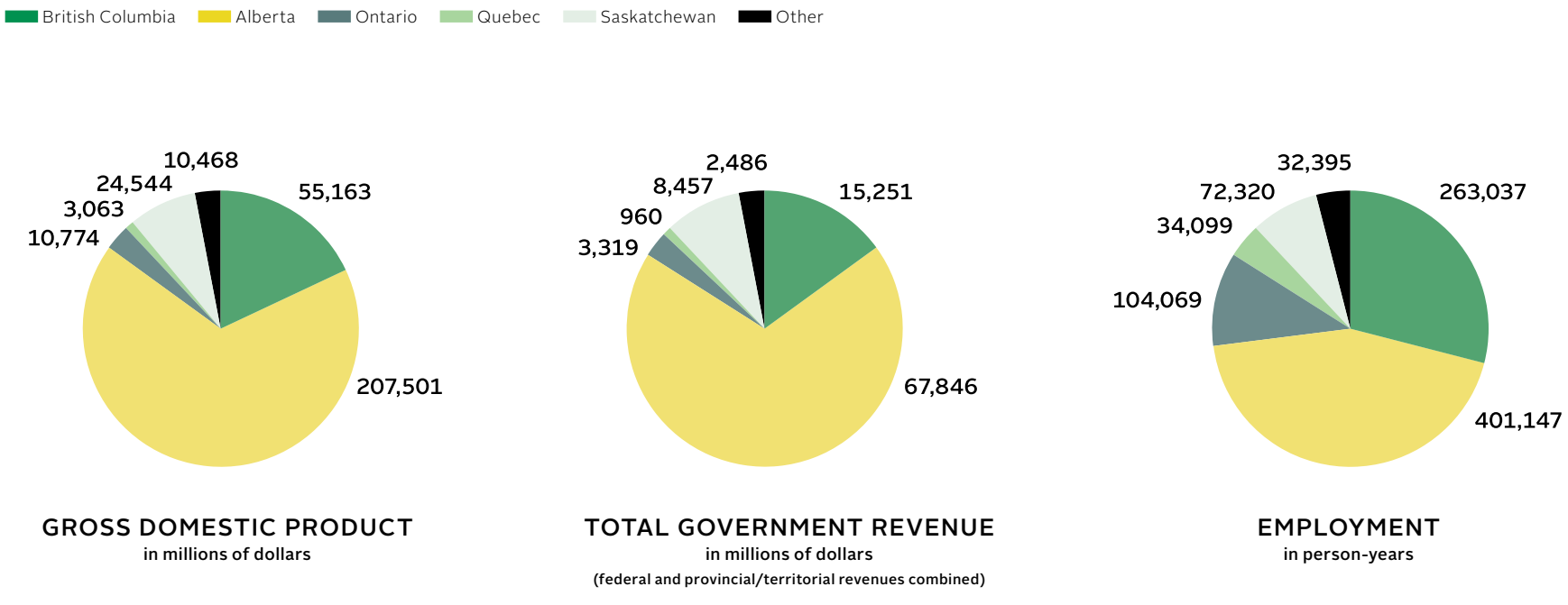
Using a careful and precautionary manner of reviewing this project, we find that, in order to proceed, Northern Gateway must secure long-term, firm transportation service agreements for not less than 60 per cent of the capacity of each pipeline prior to construction. We have taken into consideration that 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, we are satisfied that each pipeline would be well utilized and the economic benefits of the project would likely be significant and robust. We are of the view that requiring this initial 60 per cent minimum volume requirement would not place an unreasonable burden on the project, given Northern Gateway's expectation that it would be fully contracted.

3.2 How would the project affect the Canadian economy?

Northern Gateway said the project would benefit the Canadian economy through the creation of direct and indirect employment and spending during construction, spending on goods and services over years of operation, generation of tax revenues, and diversification of oil export markets and condensate supply. Many hearing participants said that the assumptions behind the predicted benefits were questionable and that the conclusions were unreliable.

FIGURE 3.3 **NORTHERN GATEWAY'S ESTIMATES OF TOTAL ECONOMIC EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS OVER 30 YEARS, INCLUDING DIRECT, INDIRECT, AND INDUCED EFFECTS**



Northern Gateway said the economic benefits of the project over 30 years would include:

- $312 billion increase in Canadian gross domestic product
- $44 billion in federal government revenues
- $54 billion to provincial or territorial governments
- $70 billion in Canadian labour income
- 907,000 person years of employment

These figures include direct, indirect, and induced results as the project's effects ripple through the economy. Aboriginal, labour, and environmental groups and other hearing participants said some of the benefits were over-estimated or would occur whether or not the project went ahead. They also said Northern Gateway had not fully accounted for the costs of environmental and social effects and the possible costs of spills. They said catastrophic malfunctions or accidents could wipe out the economic benefits. Northern Gateway said it made a reasonable allowance for the potential cost of spills.

Intervenors questioned Northern Gateway's estimated "uplift" of $114 billion in increased Canadian oil producer revenues due to international market access. They said the uplift would likely only last for a year or two, not for the life of the project. Northern Gateway said there would still be benefits even without the uplift. The company's analysis also included scenarios with smaller uplift over shorter time periods. Northern Gateway said its calculations took into consideration any negative effect on Canadian refiners and consumers from higher domestic oil prices due to any uplift. Northern Gateway said the effect on Canadian gasoline prices would be an increase of no more than 1.5 cents per litre.

The Sustainability Coalition – representing ForestEthics Advocacy, Living Oceans Society, and Raincoast Conservation Foundation – said we should not consider "upstream" economic benefits to oil producers and governments if we were not going to consider the environmental and social costs of upstream oil sands development. During our deliberations, we did not assign weight to estimates of potential induced upstream benefits.

The Alberta Federation of Labour and others said Northern Gateway did not allow for the profits of project owners and oil companies flowing to shareholders outside Canada. Northern Gateway said a portion of those profits would be reinvested in Canada. The labour group also argued that the project would have a negative effect on the economy by raising the value of the Canadian dollar, which would make manufacturing and other exports less competitive in international trade; Northern Gateway said this so-called "Dutch disease" was unproven and disputed by many economists.

Northern Gateway, the Canadian Association of Petroleum Producers, the Government of Alberta, and others said market diversification was important for the health of the petroleum industry and the Canadian economy. They said that reliance on the United States market had contributed to price discounting for Canadian crude oil and that market diversification was needed to manage risk for the future. These parties said that the petroleum industry was an important driver of the Canadian economy and contributed to the Canadian standard of living. They said that the economic and social benefits arising from increased investment and government revenues were much larger than the negative effect of higher oil prices.

A large part of the project's direct economic effect would occur during three and a half years of construction, prior to operations. Northern Gateway said it would spend an estimated $7.9 billion, including pre-development costs and navigational improvements, and would generate 13,870 person-years of direct employment during this period. The largest effects would occur in Alberta and British Columbia, although purchases of goods and services would spread the effects across Canada.

Many people and parties commented on the economic benefits and burdens that could be brought about by the Enbridge Northern Gateway Project.

In our view, opening Pacific Basin markets would be important to the Canadian economy and society. Though difficult to measure, we found that the economic benefits of the project would likely outweigh any economic burdens.

3.3 How would the project affect regional economies?

The Province of British Columbia and many hearing participants argued that most of the project's economic benefits would flow to Alberta, the rest of Canada, and foreign shareholders in oil and pipeline companies. They said British Columbia would bear too many of the environmental and economic burdens and risks compared to the benefits.

Northern Gateway said about three-quarters of construction employment would occur in British Columbia, and the province would get the largest share of direct benefits from continuing operations. The company said operations would create 268 permanent jobs – including 52 at the Kitimat Terminal, 26 elsewhere in British Columbia (Prince George and pump stations), 26 in Edmonton and the Alberta pump stations, and 113 in Kitimat-based marine operations such as tug operators, pilots, and emergency response staff. Annual spending on operations would average about $192 million (in 2009 Canadian dollars) – $94.8 million in British Columbia, $77.6 million in Alberta, and $19.5 million in federal corporate income taxes.

The United Fishermen and Allied Workers Union said fishing is the largest private-sector employer in the northern coast region. The union, Gitga'at First Nation, and others told us that the project could have negative effects on fishing and other economic sectors such as tourism, hunting, trapping, guiding, wilderness recreation, forestry, and agriculture. Northern Gateway said that preventing spills would address many of the concerns raised by people in these sectors. Northern Gateway proposed measures such as a Fisheries Liaison Committee and Community Advisory Boards to reduce potential conflicts and identify opportunities for cooperation. Northern Gateway maintained that insurance and other funds would be large enough to compensate for the costs, up to and including the costs of a potential large spill.

The Alberta Federation of Labour said the project could have negative effects in Alberta by driving up the cost of labour and materials such as steel. The federation said exporting bitumen would reduce Canadian opportunities in upgrading and refining. The Communications, Energy and Paperworkers Union of Canada said upgrading and refining bitumen in Canada could create 26,000 jobs. Northern Gateway, the Government of Alberta, and various other intervenors said industry would build more upgrading capacity in Canada if it were economic to do so. They said the increased revenues of oil producers and provincial governments would offset the negative economic effects of the project.

Northern Gateway said it would provide regional and local benefits by offering employment, contracting, and procurement opportunities to regional and Aboriginal residents and businesses. The company said it would work with contractors to give first consideration for employment opportunities to qualified regional and Aboriginal residents. Other initiatives would include:

- identifying barriers to regional employment and procurement
- $3 million in funding for capacity-building initiatives such as training programs, scholarships, and on-the-job training
- dividing contracts into manageable sizes for smaller regional firms
- using a tendering and bid system that treats regional and Aboriginal contractors fairly
- developing strategies to enhance opportunities for Aboriginal people

Northern Gateway said that it had been working with trade unions, contractors' associations, and community colleges along the route to make them aware of plans in an effort to match specific skills to potential jobs. The company said it had funded skills and training activities involving more than 500 people since mid-2011. The company indicated that, although there was no guarantee, it expected many of these individuals would work on the project.

In our view, there would be significant potential benefits to local, regional, and national economies associated with the project. We found that construction and routine operation of the project would likely result in substantial positive economic effects on employment, income, gross domestic product, and revenues to all levels of government. We also agreed with intervenors that economic effects are difficult to estimate precisely.

We accept 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 utilized in decision-making. We found that more work would be needed to fully understand these potential costs. We did not agree with the Alberta Federation of Labour that the project would result in negative long-term effects on the Canadian economy.

We recognized that there would be temporary adverse effects associated with this project and that these are likely to affect primarily local communities along the pipeline route and in coastal communities. We also acknowledged that the potential opportunities and benefits would not be distributed evenly. On balance, we found that the potential economic effects of the project would be positive, and would likely be significant.

We found that the participation of local people and businesses in the project would be a vital component and that some benefits would only be realized to the extent that Aboriginal groups and other affected parties chose to pursue these opportunities. It would be appropriate for the benefits of the project to flow to local individuals, communities, and businesses. Our conditions require Northern Gateway to submit its plans to the National Energy Board for implementing training, employment, and educational opportunities for Aboriginal and local people and its programs to track and measure the success of these.

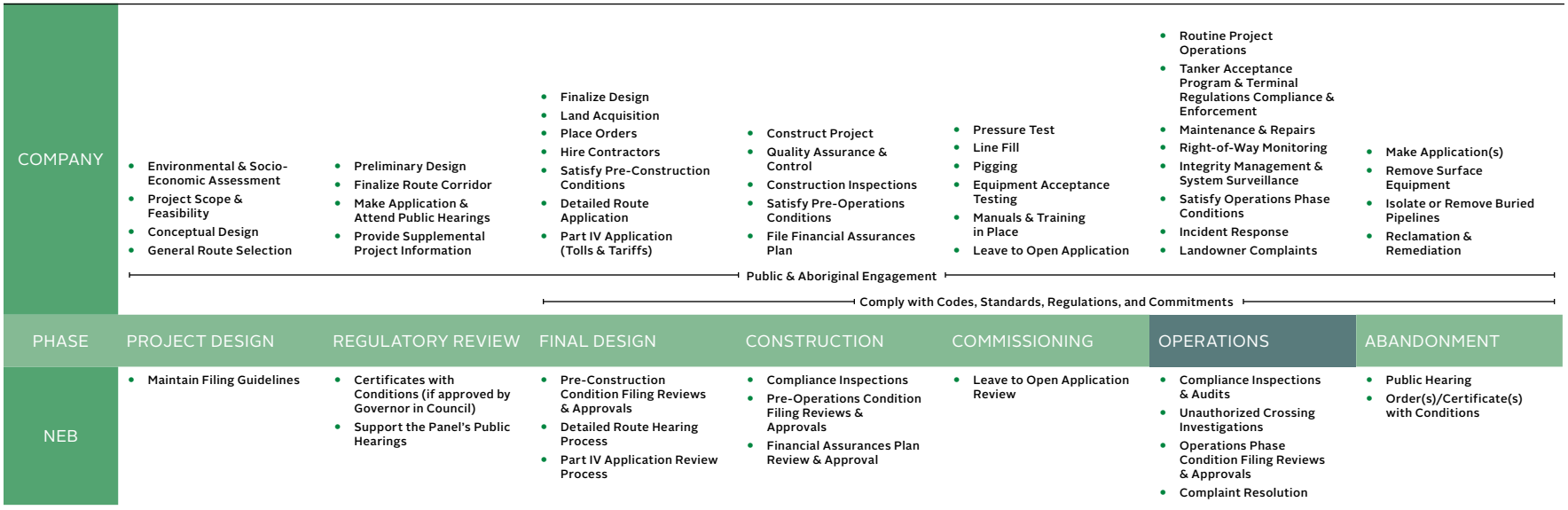
We concluded that Northern Gateway's commitments and our conditions would likely lead to positive net economic benefits to local, regional, and national economies, and could provide positive benefits and opportunities to those local, regional, and Aboriginal individuals, communities, and businesses that choose to participate in the project.

Kitamaat Village, across Douglas Channel from the proposed terminal.

3.4 How would Northern Gateway design and build the project?

Detailed engineering and selecting the final route within the proposed corridor would only occur after government approval and the company's commitment to proceed with the project. The plans would all be subject to approval by the National Energy Board and other regulators. The process would include many requirements for further environmental and technical surveys and consultation with Aboriginal groups and affected communities.

FIGURE 3.4 **PROJECT LIFESPAN**



Northern Gateway said it investigated alternative pipeline routes and West Coast ports before selecting Kitimat. The selection included engineering, environmental, economic, and social considerations. Although Prince Rupert met most of the criteria, the company decided the route to Kitimat was safer, had fewer environmental effects, and was more economical. Pipelines to Prince Rupert would be longer, encounter greater risks from landslides and avalanches, and cross the Skeena River.

Some hearing participants were concerned that so much of the detailed planning would occur after a government decision on approval. Northern Gateway said it had provided more detail than most projects at this stage of regulatory review, and it committed to additional surveys, scientific research, consultation, and detailed planning. We found that Northern Gateway presented a level of engineering design information that met or exceeded regulatory requirements for a thorough and comprehensive review as to whether or not this project could be constructed and operated in a safe and responsible manner that protected people and the environment. The National Energy Board would enforce our conditions to provide continued oversight during final engineering design.

Northern Gateway said pipeline construction would involve 12 "spreads." A spread is a segment of the pipeline project constructed by a single prime contractor. Large, self-contained work camps at 11 locations along the route would each house between 500 and 940 workers during construction periods. There would also be a camp in Kitimat for an average of about 230 people working on the terminal site and on pipeline construction in the Kitimat Valley area. Northern Gateway said that whenever possible, work would take place during times of year with the least effect on wildlife, people, land, and water resources. The company also committed to developing comprehensive management plans to reduce negative effects on the environment.

Typical pipeline construction involves a series of steps:

1. **Clearing and grading the right-of-way and work area, and building access roads if needed**
2. **Stringing (laying out) lengths of pipe**
3. Bending the pipe if needed
4. **Welding the pipe, coating the weld areas, and inspecting the welds and coating**
5. **Digging a trench deep enough to bury the pipe at least 90 centimetres below the surface in soil, 60 centimetres in rock**
6. Lowering the joined pipe into the trench
7. Backfilling the trench with soil stockpiled for this purpose
8. Hydrostatic testing (filling the pipe with water at high pressure to test for leaks)
9. Reclaiming (contouring and seeding or planting) the disturbed areas

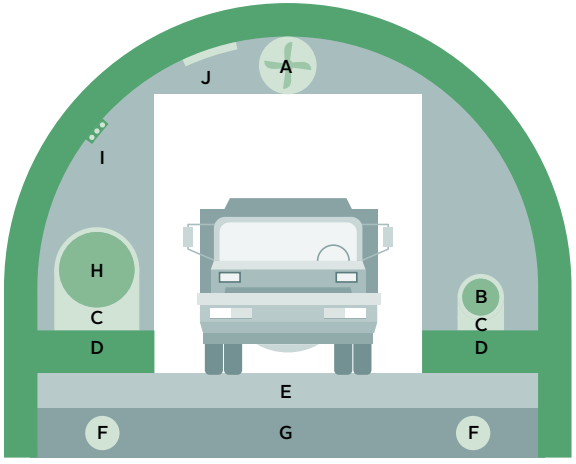
After construction, Northern Gateway said it would seed or plant the 25-metre-wide permanent right-of-way with native vegetation wherever possible. The additional 25-metre-wide temporary work area used during construction would be returned as close as possible to its previous state, such as forest or agricultural land. Crews would also reclaim some roads, while other roads would be kept open for ongoing maintenance and emergency response. Power lines would be built to serve the pumping stations.

Northern Gateway said it would work with forest companies and Aboriginal groups to salvage cut timber wherever possible. The company said it would plant trees in reclaimed work areas and elsewhere to compensate for forest removal on a tree-by-tree and hectare-by-hectare basis.

To avoid avalanche and landslide hazards in narrow valleys, Northern Gateway would tunnel through two mountains in the Coast Range. The tunnels would each be about 6.5 kilometres long and would be large enough to provide access for maintenance and emergency response. Northern Gateway said that measures such as protective barriers or deeper burial would shelter the pipelines in other areas subject to potential slides.

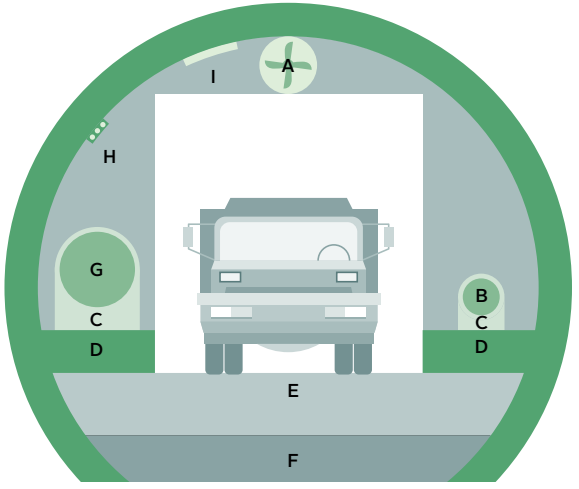
Northern Gateway said that it would consider two possible methods for building the tunnels: drilling and blasting or boring. The choice would be made during detailed engineering if the project is approved.

FIGURE 3.5 **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

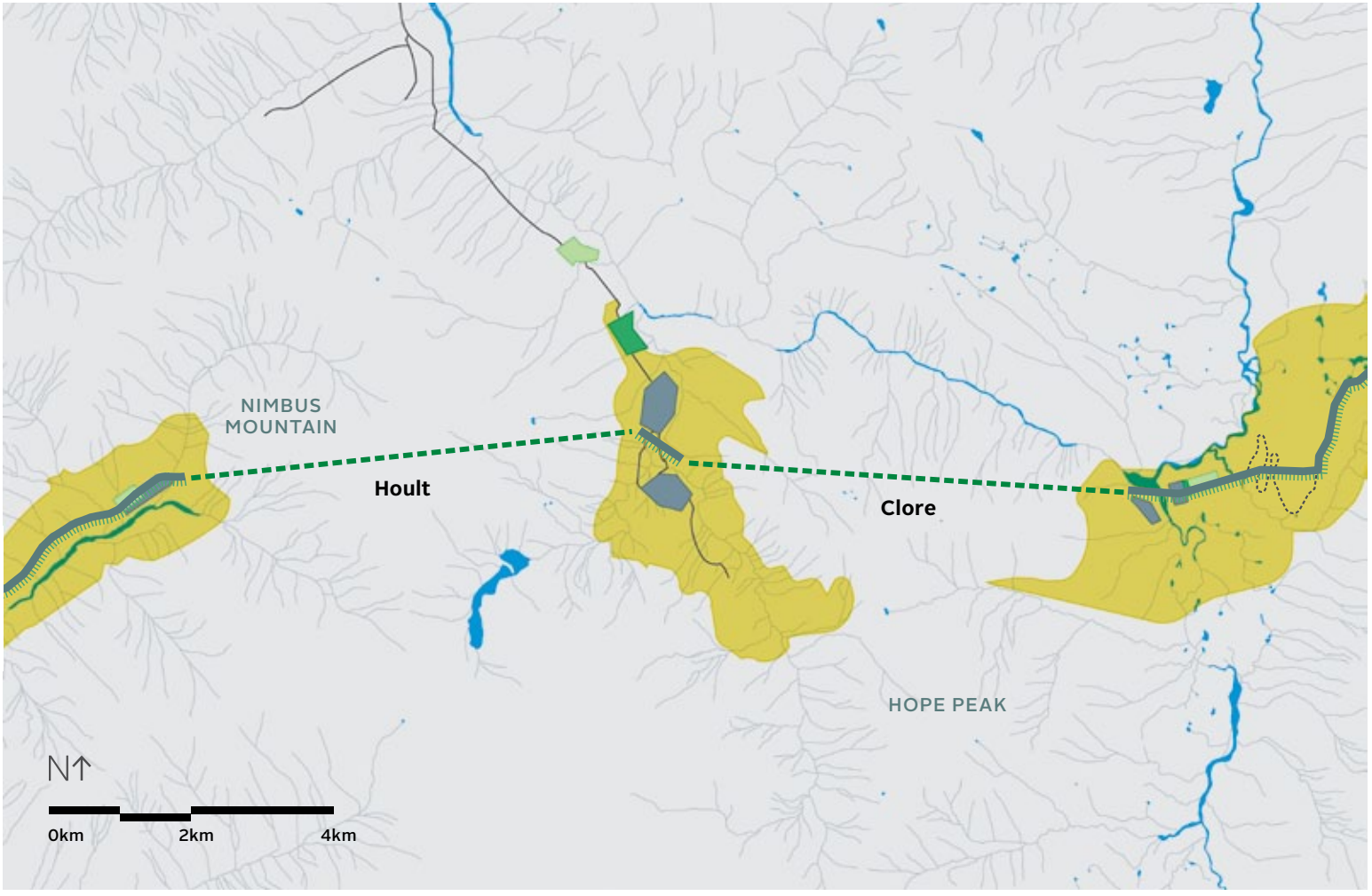
FIGURE 3.6 **CONCEPTUAL BORED TUNNEL**



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

MAP 3.1 **PROPOSED TUNNEL LOCATIONS**

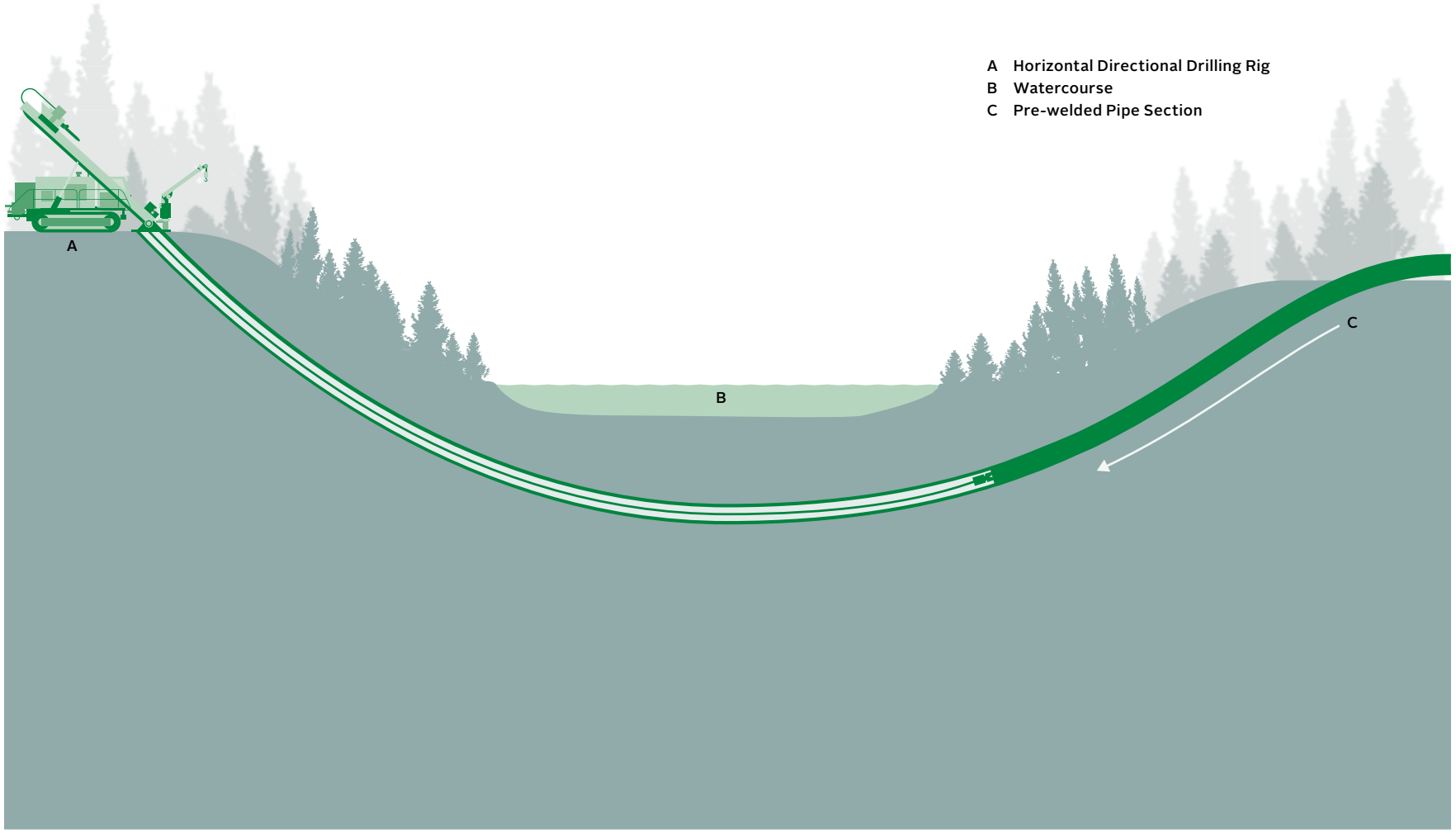
Tunnels through two mountains would avoid numerous watercourse crossings, sensitive alpine terrain, and potential geohazards.



- Tunnel
- Oil Pipeline
- Condensate Pipeline
- Project Effects Assessment Area
- Proposed Excess Cut Disposal Area
- Proposed Staging Area
- Proposed Construction Camp
- Proposed Permanent Access Road
- Existing Access Road

FIGURE 3.7 **HORIZONTAL DIRECTIONAL DRILLING**

Directional drilling or boring would avoid disturbing the bed and banks of fish-bearing watercourses.



Northern Gateway said field surveys showed that many of the smaller watercourses along the route are not fish-bearing and have little or no flow for part of the year. Northern Gateway proposed to cross these in the conventional manner by digging a trench and laying the pipe in it, temporarily diverting the stream flow if necessary. The company would use trenchless crossings on the larger, fish-bearing watercourses wherever possible. In these instances, horizontal directional drilling or boring beneath the watercourse would avoid surface effects by taking the pipe well under the bottom of the water body and away from the banks.

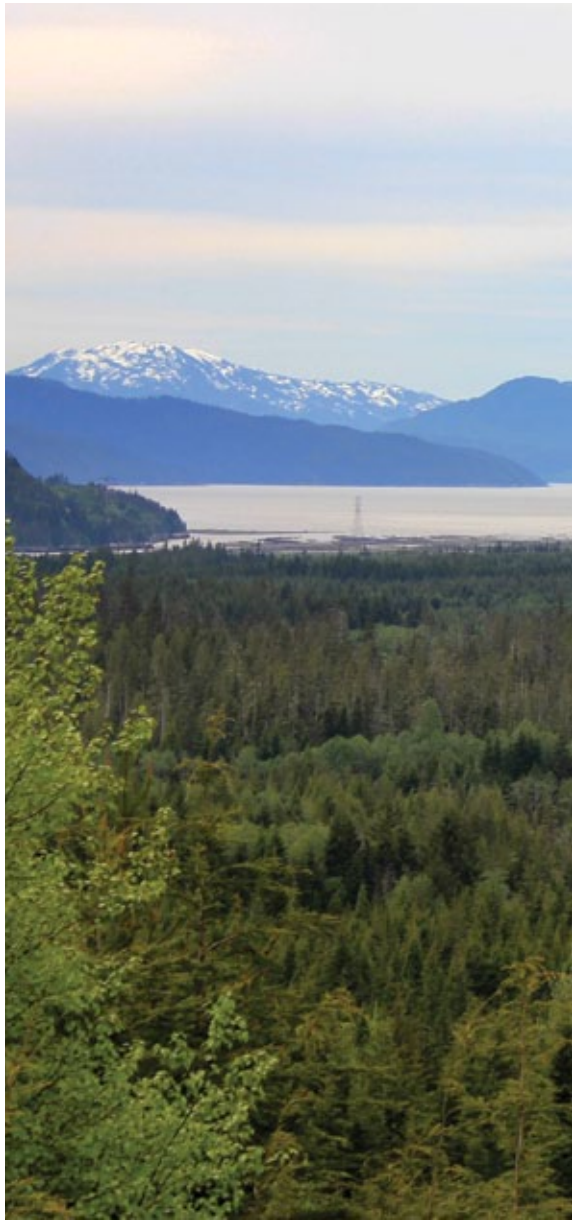
The company said trenchless water-crossing methods would avoid problems such as silt and erosion that can be harmful to fish. Special measures such as screens and bubble curtains would contain silt during construction of the Kitimat Terminal. The terminal would also have berms and containment areas to prevent oil or contaminated water from reaching Douglas Channel should an accident occur.

The Office of the Wet'suwet'en and others said cutting trenches through sulphide-bearing rocks could lead to acidic runoff water that could affect water quality in fish-bearing streams. Northern Gateway said it would address these effects with measures such as lining trenches with limestone to neutralize the acids. Some hearing participants were also concerned about exposure of potential sulphide-bearing waste rock from cutting the two mountain tunnels. Northern Gateway said it would separate sulphide-bearing tunnel cuttings and use established mining industry techniques such as encapsulation, containment, or neutralization to prevent acidic runoff.

Northern Gateway said that construction and operations would cause only small increases of total suspended solids concentrations from land disturbances and would not degrade water quality or affect drinking water. The company would address this issue by using erosion control methods and sediment traps and by establishing a vegetation cover. Construction monitoring programs would be standard procedure at each watercourse crossing.

Northern Gateway said that the walls of both pipelines would be about 20 per cent thicker than the current standards for pipelines in Canada (wall thickness varies along the route, depending on factors such as expected pressures and environmental conditions). The minimum wall thickness would be 19.8 millimetres on the oil pipeline and 7.1 millimetres on the condensate pipeline. The pipe would have a protective coating applied before delivery to the site, and workers would apply additional coating over weld areas before lowering the pipe into the trench.

During construction, Northern Gateway or its contractors would also build custom-designed harbour and escort tugs for the project. In addition, Northern Gateway committed to fund the installation of new radar and navigational aids. The navigational aids would be subject to approval by the Canadian Coast Guard. Northern Gateway said that the Canadian Hydrographic Service was updating several charts of the area to ensure the most accurate information would be available for safe navigation.



3.5 How would the project operate?

The Enbridge Control Centre in Edmonton would operate the pipelines, while Northern Gateway's Kitimat Control Centre would handle loading and unloading of tankers. Northern Gateway said that the eight pumping stations along the pipeline route between Bruderheim and Kitimat would be staffed continuously "24/7" to monitor operations, provide security, and respond to emergencies.

Northern Gateway said that pressure transducers and meters would monitor flow rates and pressure to detect signs of leakage. The company committed to enforce a strict "10-minute rule" to begin shutting down the lines within that period if an unexpected reading occurred. It would take another 3 minutes for the valves to close fully, for a total elapsed time of 13 minutes.

Northern Gateway said that the placement of the remotely operated isolation valves in sensitive areas would limit the maximum release from a pipeline rupture in those areas to 2,000 cubic metres (12,600 barrels). There would also be valves on either side of major watercourses. Fibre-optic cables and satellite communication would connect the control centre to the valves. Northern Gateway said valve placement would be part of the final engineering design, which would require National Energy Board approval.

Some hearing participants referred to widely circulated documents asserting that diluted bitumen was more corrosive and abrasive than other crude oils. Northern Gateway said that scientific research and pipeline operating experience showed there was no significant difference in corrosion and abrasion between diluted bitumen and conventional heavy crude oils. We were not persuaded that diluted bitumen was significantly more corrosive or abrasive than other crude oils transported in Canadian pipelines.

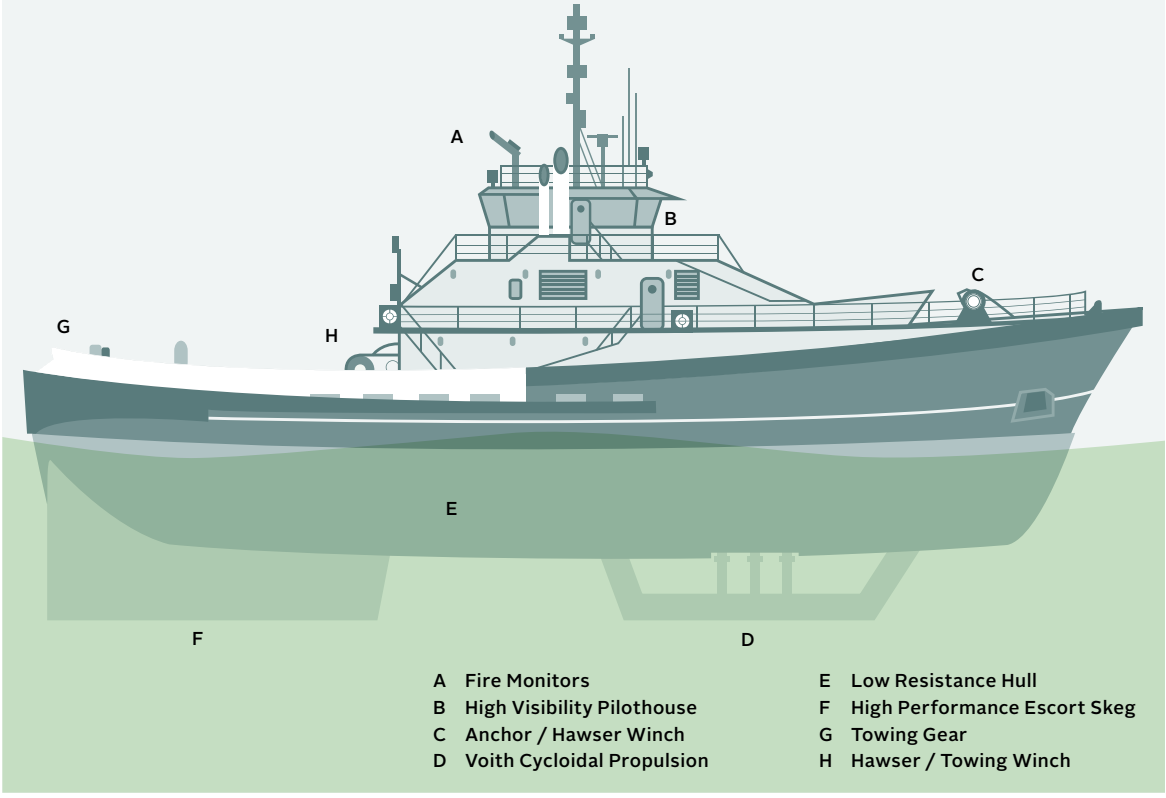
The company said that aircraft would routinely patrol the right-of-way to detect signs of leakage or other problems that could affect the pipelines. In-line inspection devices, sent through the lines periodically, would include sensitive instruments to detect early signs of pipe damage such as corrosion, cracking, or denting. Crews would make repairs or replace sections of pipeline as needed during routine maintenance.

Northern Gateway said it would plough snow on key roads and ensure access to the right-of-way in all seasons for maintenance, inspection, and emergency response. Kitimat Valley Naturalists, Haisla Nation, other intervenors, and many letters of comment and oral statements said conditions such as heavy snowfalls, rain, fog, storms, and spring runoff would make it very difficult to reach parts of the right-of-way at all times.

In a future separate regulatory application, Northern Gateway could apply to the National Energy Board to have the capacity of the pipelines expanded. Additional pumping stations would require a new process of environmental assessment and National Energy Board approval.

FIGURE 3.8 **ESCORT TUG MODEL DESIGN**

Ocean-going escort tugs would be 46.9 metres long. They would have deep keels and powerful directional drives.



3.5.1 MARINE OPERATIONS

Northern Gateway said that custom-designed escort tugs would accompany tankers between open waters and Kitimat. The escort tugs would have deep keels and directional drives that give them great maneuverability and stopping power. An escort tug would accompany all tankers.

Loaded tankers would have a second tug tethered (attached by cable) to the tanker's stern. The tethered tug could halt a tanker or change its course even if the tanker had a mechanical failure or malfunction. The tug crews would be trained in emergency response, and the vessels would carry oil spill emergency response and firefighting equipment.

Tankers in the Confined Channel Assessment Area (Map 4.2) would operate at speeds between 8 and 12 knots (nautical miles per hour). Northern Gateway said that these relatively low speeds would improve the safety of navigation and reduce vessel wakes, underwater noise levels, and the likelihood of striking marine mammals. The company said that cargo vessels in the area typically operate at speeds up to 18 knots, passenger vessels up to 22 knots. Gitxaala Nation said that not enough was known about the effects of ship noise on herring spawning and herring fisheries.

Northern Gateway said that it would lead the creation of a Fisheries Liaison Committee to reduce conflicts between tanker traffic and fishing activities. The committee would include participants from the shipping industry and commercial, Aboriginal, and recreational fishing communities. Northern Gateway said that similar committees on Canada's East Coast have reduced conflicts between the energy industry and fishing communities. The company said the committee could develop procedures for documenting and reporting lost fishing gear and determine appropriate levels of compensation. The committee could also keep tanker operators informed about things such as fishing seasons and harvest activities.

Once at the Kitimat Terminal, tankers would load or unload within about 48 hours. Northern Gateway said that containment booms around the oil tankers would prevent accidental spills of oil from spreading into Kitimat Arm.

FIGURE 3.9 **HARBOUR TUG MODEL DESIGN**

Harbour tugs would be 29.5 metres long and would include fire-fighting equipment.

3.5.2 ABANDONMENT AND RECLAMATION

When pipelines and related facilities are no longer needed, surface facilities are typically removed, and disturbed land is reclaimed. Buried pipes may be removed or left in place; the decision depends on the best way to address safety, land use, and environmental concerns. Northern Gateway would have to apply to the National Energy Board and other agencies for authorization to abandon the pipelines and facilities. The application would then be subject to public consultation, hearings, and environmental assessment.

3.5.3 OUR ASSESSMENT OF PLANS FOR CONSTRUCTION AND ROUTINE OPERATIONS

The project's pipelines and terminal would incorporate new, proven technology and materials that were not available in the 1970s and earlier. Pipeline technologies, materials, codes, and regulations were developed as a result of lessons learned from previous failures, and scientific research continues to find ways to improve pipeline performance. We found that the risk assessment methodology used by Northern Gateway was a proactive approach to managing potential threats to pipeline integrity at the design stage of the project. Further, we require Northern Gateway to conduct a valve optimization analysis to minimize consequences should a failure occur.

We noted areas where Northern Gateway showed a commitment to improve and in some cases to go beyond the current regulations, codes, and technologies to apply a precautionary approach. We also recognized Northern Gateway's commitment to a corporate culture of continuous improvement, for example, relating to its pipeline integrity programs. One example was the company's intention to implement new complementary detection technologies to improve its ability to detect leaks.

The evidence indicated 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 would address 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 it provided several examples. These changes led to a substantial reduction in the number and size of oil tanker spills since the 1970s and, in particular, since 1990. Northern Gateway committed to exceed regulatory requirements through its marine voluntary commitments in relation to navigation, safety, and oil spill preparedness and response planning.

Transport Canada confirmed that there were no provisions in Canadian marine shipping legislation that would make Northern Gateway's marine voluntary commitments mandatory or enforceable. We concluded that these voluntary commitments should be mandatory and enforceable as conditions under any certificates that may be issued under the *National Energy Board Act*. These conditions would be enforced by the National Energy Board.

4 Environment

Northern Gateway said the project would have the largest potential effects on the environment along the route during three and a half years of pipeline and terminal construction. Routine operation of the pipelines, terminal, and tankers would have smaller effects throughout the lifespan of the project. The company proposed mitigation measures to avoid or reduce negative environmental effects.

4.1 What is the environment?

According to the *Canadian Environmental Assessment Act, 2012*, "environment" means 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 these components.

The interacting natural systems, or ecosystems, are all connected and depend on one another. Ecosystems include humans, and human activities affect ecosystems. The Enbridge Northern Gateway Project passes through six major types of ecosystems from prairie to mountain to coast.

Aboriginal people told us that in their cultures there is no distinction among the biological, physical, economic, social, and spiritual aspects of the environment. Many non-Aboriginal people shared similar views of environmental unity and interconnectedness. They said much of the ecological and human value of the environment cannot be expressed in economic terms. They said the environment shaped and defined people's values and their views of stewardship.

Laws and regulations for development are designed to protect workers, the public, property, and the environment – including the diversity and integrity of ecosystems. Protection involves combinations of effective planning, engineering, construction, operation, monitoring, regulation, maintenance, emergency response, and, ultimately, abandonment and reclamation.

4.2 How would the environment be protected?

Northern Gateway committed to reduce or avoid negative environmental effects through design and engineering. The company said it would meet or exceed industry and regulatory standards. It proposed measures to protect water bodies, improve tanker safety, and reduce effects on wildlife. Our conditions would require further consultation, detailed plans, and regulatory approvals before construction and during operation.

Concerns about construction and routine operations included the effects on wildlife, forests, plants, and fish from construction activities and from the creation of the permanent right-of-way and access roads. Some hearing participants said tanker traffic and underwater noise would have negative effects on fisheries and marine mammals. Some were concerned about effects on at-risk species such as humpback whales and woodland caribou. Northern Gateway and some others said the project could proceed responsibly and

without long-term negative effects. Many of the environmental concerns that we heard involved the potential effects of malfunctions and accidents rather than from construction and routine operations.

Local environmental issues included disturbance of native vegetation, the possibility of acidic water leaching from certain types of rock cuttings, and air emissions from the marine terminal at Kitimat. Some hearing participants said Northern Gateway had not adequately addressed engineering issues and hazards such as avalanches and landslides.

All parties acknowledged that pipelines already transport oil and condensate to and from locations in Canada, and vessels carrying petroleum have called at West Coast ports for decades. Northern Gateway said about 1,500 tankers had visited Kitimat since 1978. The company said its proposed measures would go beyond those used for previous pipeline projects and shipping arrangements. The additional measures included:

- Thick-walled pipe, shorter intervals between isolation valves, and complementary leak-detection systems to reduce the likelihood and consequences of releases into the environment
- Trenchless crossings (drilling or boring) under many fish-bearing streams and rivers to avoid disturbance of bed and banks
- Habitat improvements and offsets to compensate for wildlife effects
- Tunnelling through two mountains to reduce slide hazards
- Navigation improvements and use of escort tugs to reduce the risk of tanker accidents
- Reduced tanker speeds to lessen effects on navigation, fisheries, and marine mammals
- A whale monitoring vessel in place from May through October to survey the core humpback area before tanker passage and recommend course adjustments
- A Fisheries Liaison Committee as a mechanism for mitigating the potential effects of the project on marine fisheries

Preventing malfunctions and accidents would address many of the hearing participants' environmental concerns. Northern Gateway said improvements in management systems, design, materials, detection technology, preparedness, and spill response would make such events less likely and would reduce the negative effects if malfunctions or accidents did occur.

Some hearing participants asked for more detail about environmental effects and mitigation measures. Northern Gateway said it had provided more studies and information than usually required at this stage of environmental assessment. If the project is approved, the company would prepare and submit more detailed plans in accordance with regulations and our conditions. The conditions require many steps before construction could begin. We concluded that we received all evidence required to determine whether we should recommend that the project be approved or not. The hearing process generated a great deal of information beyond the initial application.

Northern Gateway said that it identified the ecological pathways by which the project could affect valued parts of the environment. It identified potential negative effects and proposed ways to reduce or eliminate those effects. The company said that scientific research, surveys, and monitoring would continue if the project is approved, and these could result in additional mitigation measures. Northern Gateway said some effects could not be determined until completion of detailed engineering and surveying the "centre line" of the final right-of-way within the proposed 1-kilometre-wide corridor.

The company said that it would continue gathering baseline information in order to understand existing conditions as completely as possible. Our conditions require environmental monitoring before and during operations. If monitoring identifies the need for additional protection measures, Northern Gateway said it will use adaptive management to mitigate or offset the effects.

Some intervenors said that the information provided by Northern Gateway was not sufficient to determine whether the project would have significant negative effects, nor whether the project was in the public interest. These parties argued that the company failed to incorporate the principles of sustainable development and the precautionary approach as required under the *Canadian Environmental Assessment Act, 2012*.

Northern Gateway said that its goal would be to leave the natural environment in as good a condition as it was before the project. In some cases, the company said that it would leave previously disturbed environments in better condition. For example, it said that it would reclaim other disturbed areas, like roads and seismic lines near the project, to compensate for adverse effects.

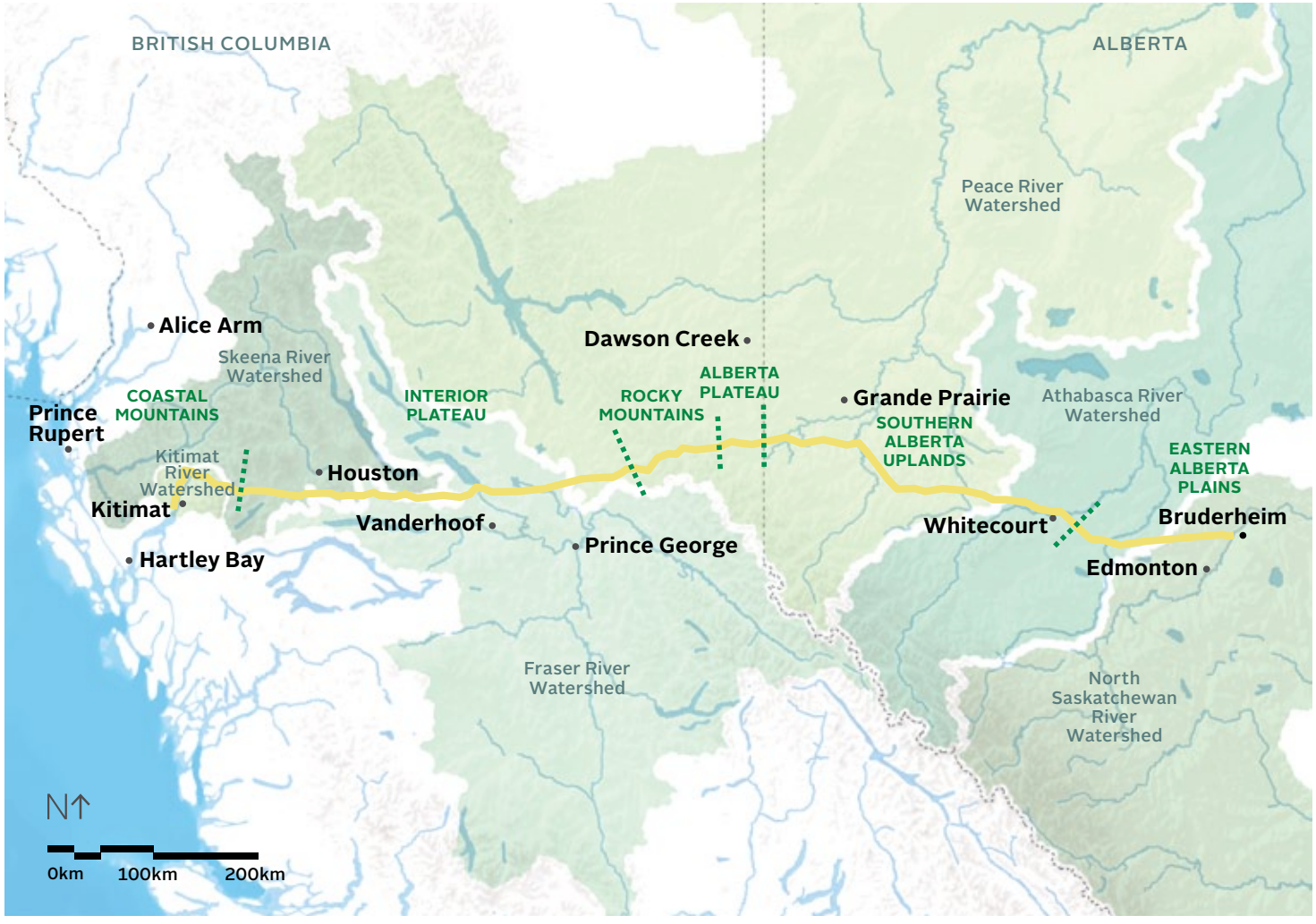
Northern Gateway said that it proposed practical solutions for avoiding negative effects wherever feasible and for minimizing those effects that could not be avoided.

Our conditions require Northern Gateway to follow through on all of its commitments, including those for scientific research, monitoring, and mitigation. The commitments included funding a marine research chair at one or more British Columbia universities to examine knowledge gaps about ecosystems in the Pacific north coastal region and to develop research programs in those areas. The company committed to fund research on woodland caribou and to evaluate the effectiveness of habitat offsets for caribou. Northern Gateway would also participate in establishment of a scientific advisory committee to study what happens to diluted bitumen when released into the environment.

The National Energy Board would regulate the project to protect ecosystems through all stages of construction, operation, abandonment, and reclamation. Northern Gateway would require many approvals of its detailed engineering design and final route selection. The company would submit monitoring reports, and regulatory inspectors would verify compliance. Marine operations would be regulated by Transport Canada, the Canadian Coast Guard, and other federal authorities such as Fisheries and Oceans Canada.

MAP 4.1 **WATERSHED BOUNDARIES**

The proposed pipeline route would cross six major watersheds between Alberta and the West Coast.



4.3 How would construction and routine operations affect the environment?

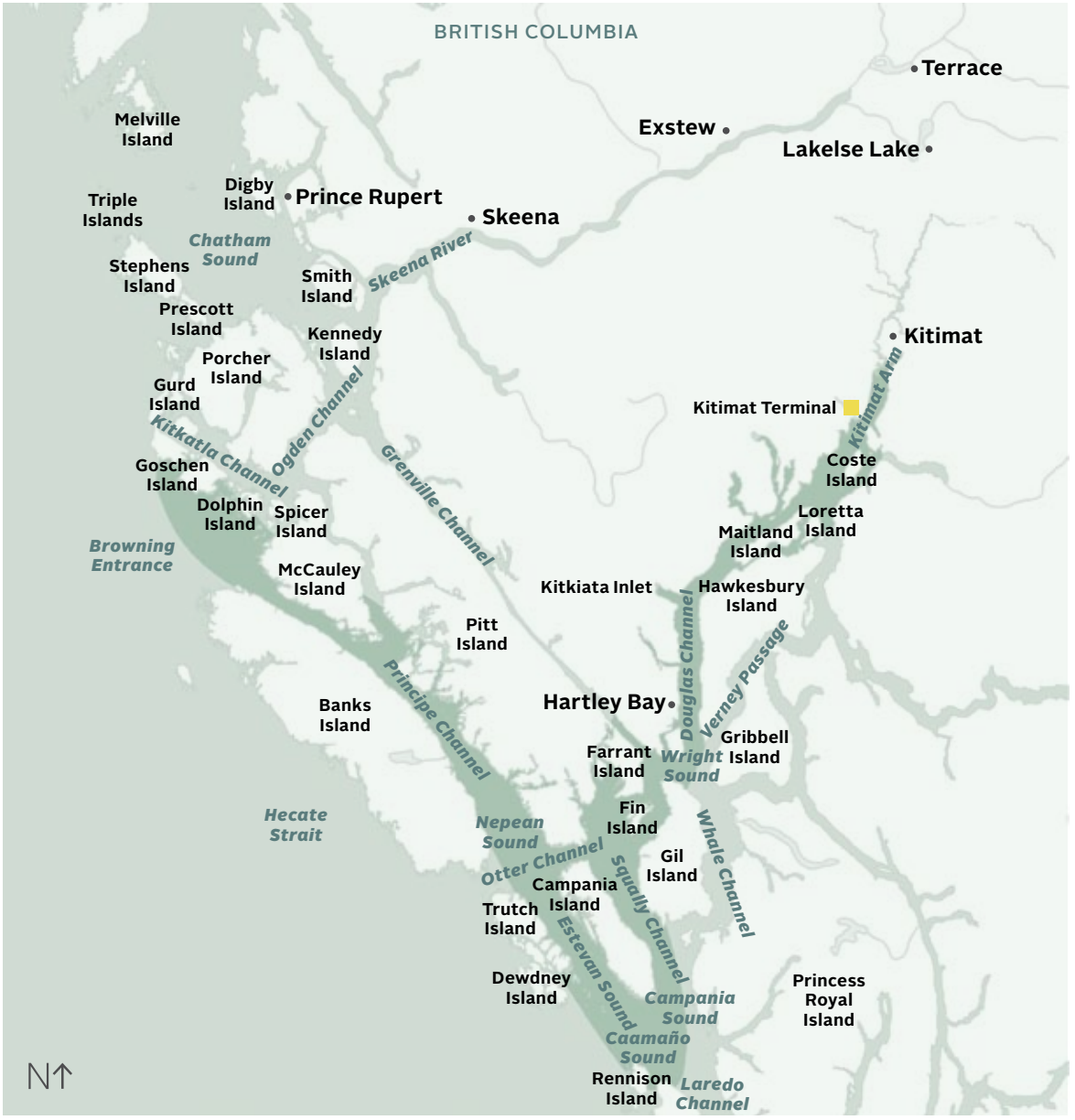
The Enbridge Northern Gateway Project would have temporary effects on the environment during construction and routine operations. The effects would vary according to time, space, and intensity. Northern Gateway said its mitigation measures would reduce or avoid many negative effects. In some instances, the company proposed to offset potential negative effects by conserving or enhancing the environment elsewhere.

The application included plans to address key issues during construction: wildlife encounters, access management, traffic control, blasting management, waste rock management, tunnel installation, watercourse crossing and riparian area management, watercourse reclamation, noise management, vegetation protection, wildlife protection, non-traditional land use, and waste and hazardous materials management. Construction would occur during least-risk periods for fish and wildlife whenever possible.

Issues during operations included effects on wildlife, air emissions, and cumulative effects in combination with other projects and activities. Northern Gateway said it would monitor environmental indicators and address negative effects through a process of adaptive management.

MAP 4.2 **CONFINED CHANNEL ASSESSMENT AREA**

Northern Gateway assessed marine environmental effects in both the Confined Channel Assessment Area (shaded portions) and the Open Water Area (Canadian territorial waters).



4.3.1 FRESHWATER ECOSYSTEMS AND FISHERIES

Many hearing participants stressed the environmental, social, cultural, and economic importance of salmon and other fish species. Traditional, commercial, and sport fisheries occur throughout coastal and interior British Columbia. The Skeena and Kitimat River drainages support all five Pacific salmon species (chinook, coho, sockeye, pink, and chum) and steelhead. 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 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, and destruction under the federal *Fisheries Act*. The Nechako River white sturgeon is present in the Stuart and Endako Rivers in British Columbia.

Northern Gateway said that the use of trenchless crossings would avoid most effects on freshwater ecosystems during construction and operation. The company said the design and construction of bridges on its access roads would minimize the effects on streams. Northern Gateway said it would use industry best practices to prevent silt from affecting watercourses. A route revision during our hearings moved the proposed pipelines several kilometres away from the Morice River; many people had expressed concern about the previous route.

4.3.2 MARINE ECOSYSTEMS

Many individuals and groups expressed concern about the lack of scientific information on the effect of underwater noise from tankers on whales and about the possibility of tankers hitting these marine mammals. Northern Gateway said that slower tanker speeds, compared to other shipping in the area, would reduce the amount of noise and allow more time for the mammals to avoid contact.

The company said further research could reduce scientific uncertainty in areas such as the habitat of certain killer whale populations. This would contribute to the existing knowledge base for all future shipping activities, including those currently undertaken by tankers, cruise ships, and recreational, commercial, and traditional fisheries traffic. From May through October, observers on a whale-monitoring vessel would advise pilots where whales were present, allowing ships to change course and avoid contact where it was safe to do so.

Some hearing participants also said tanker traffic could affect salmon and herring. Northern Gateway said the tankers would represent between 10 and 35 per cent of ship traffic in the Confined Channel Assessment Area and about 3 per cent in the open waters off Prince Rupert. Northern Gateway said that the environmental effect of acoustic disturbances from marine transportation on marine fish populations would not be significant.

During oral evidence, we heard about the importance of eulachon in coastal Aboriginal culture



and the sharp decline in eulachon populations in recent decades. People said it was critical to avoid further negative effects on this small, fatty smelt species, also known as candlefish. Northern Gateway said its support of marine research would help to address the scientific uncertainty about eulachon as well as other species such as rockfish.

4.3.3 LAND AND BIOLOGICAL DIVERSITY

We heard evidence that linear clearings like the right-of-way and the access roads would make it easier for wolves to prey on caribou. Construction and maintenance activity and potentially increased human and predator access could affect at-risk woodland caribou populations.

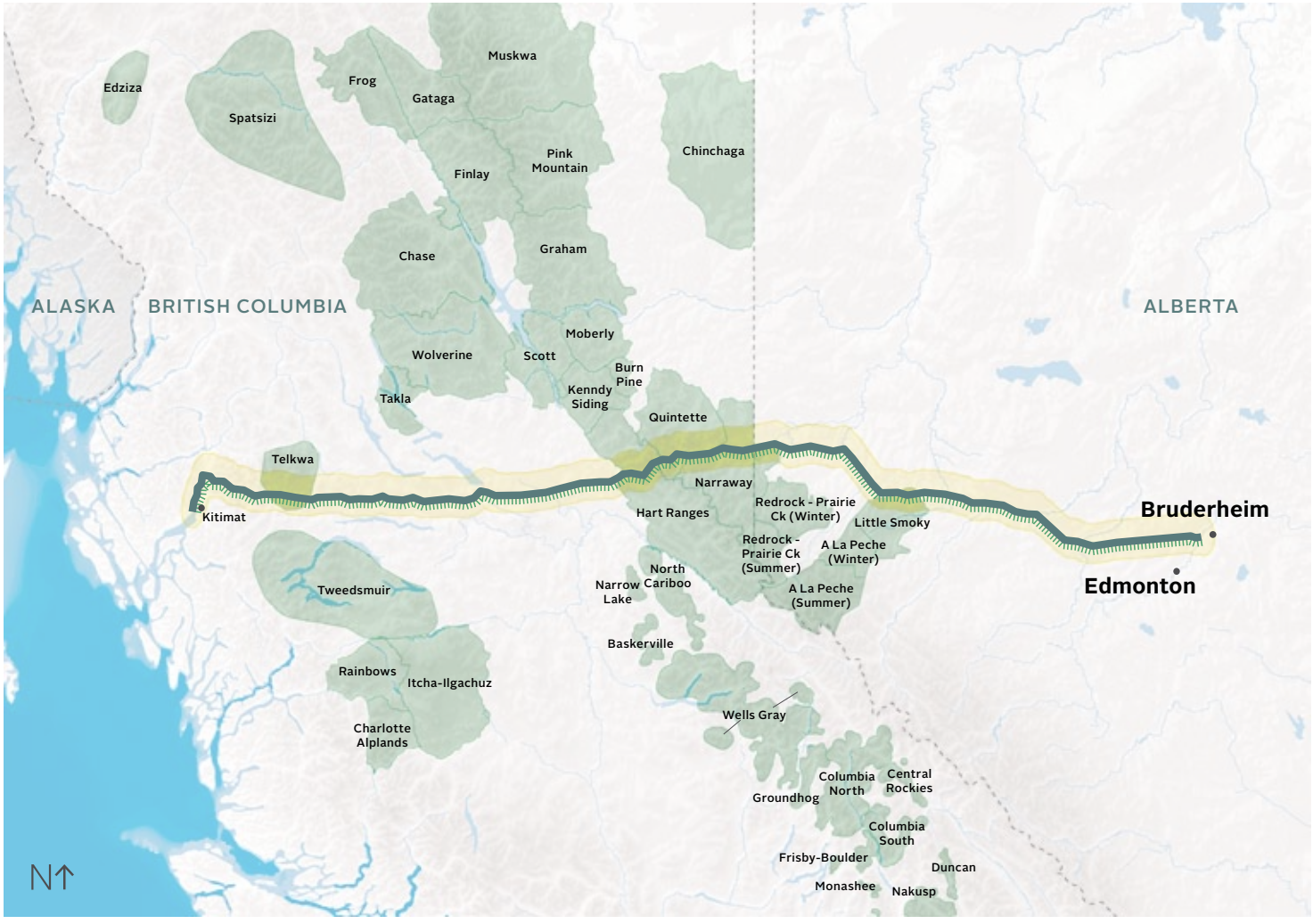
Northern Gateway said that its proposed route would avoid caribou habitat wherever possible, and it consulted federal and provincial wildlife authorities about caribou protection while developing plans for the project. The company said that it would schedule construction during least-risk periods for caribou. Northern Gateway also proposed to reclaim other disturbed areas like roads and seismic lines near the project to compensate for these effects. Some participants argued that, despite the proposed mitigation measures, there would still be negative effects on caribou populations.

Northern Gateway estimated that 69 per cent of the pipeline right-of-way would be on or next to land that already had some "human footprint" such as roads, pipelines, utility corridors, agriculture, or forestry clear-cuts. The project would use existing clearings, such as forestry roads, for access wherever possible.

Northern Gateway said that the proposed pipeline corridor includes 527 hectares of old-growth forest. The company said the effects on these forests would depend on the final route selection within the corridor. Northern Gateway said it would also identify other environmental factors such as rare plant communities and bird nesting areas in surveys prior to the final route selection, and it would avoid these areas wherever possible.

MAP 4.3 **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.



Oil Pipeline | Condensate Pipeline | Regional Effects Assessment Area (30 kilometres wide) | Caribou Herd Range

4.3.4 EMISSIONS AND AIR QUALITY

Northern Gateway said construction activity and camps could have some limited, short-term effects on local air quality. Electric motors on pumps would not produce emissions. The company said tankers and tugs would burn low-sulphur diesel fuel while in Canadian waters. The Kitimat Terminal would include vapour emission control systems.

Northern Gateway said that the main sources of greenhouse gas emissions from the project would be the diesel engines of tankers and tugs. Most of the electric power for pumps in British Columbia would be renewable hydroelectricity, while a portion of power for pumps in Alberta would be from non-renewable, fossil-fuel sources. The company said equipment and camps would also produce emissions during construction. Northern Gateway said it would use an Enbridge program to offset new emissions with investments in renewable power generation.

4.3.5 CUMULATIVE EFFECTS

Cumulative environmental effects are the likely effects of the project after mitigation in combination with other physical activities that have been or will be carried out. At various points, the effects of the Enbridge Northern Gateway Project would combine with those of agriculture, oil and gas production, forestry, mining, electric transmission, other pipelines, and shipping. For example, we heard concerns about the effects of increased shipping on marine mammals in the north coastal region.

In the Kitimat area, cumulative factors include the existing residential, commercial, and industrial activity and the liquefied natural gas facilities that are planned or under construction there. Some hearing participants expressed concerns about the project's effects such as air emissions and ship traffic in combination with those of current and reasonably foreseeable projects. Northern Gateway said that the effects would be minimal.

In western Alberta and the British Columbia Interior, Northern Gateway said that the project's right-of-way and roads would add to the "footprint" previously left by forestry, oil and gas activity, mining, roads, railways, and power lines. The company said these activities have reduced the habitat of species such as woodland caribou and grizzly bear, and some of these wildlife populations are of conservation concern. Woodland caribou are listed as "threatened" under the *Species at Risk Act.* Northern Gateway proposed to reclaim some of the existing footprint to compensate for its own effect. The company said most of the right-of-way was either on previously disturbed land or within 2 kilometres of existing infrastructure such as roads.

4.3.6 OUR ASSESSMENT OF ENVIRONMENTAL EFFECTS FROM CONSTRUCTION AND ROUTINE OPERATIONS

We concluded that we had all evidence required to make our recommendations on all matters relevant to the environmental assessment of the project. We found that Northern Gateway's mitigation measures would provide environmental protection to species present in the area of the project, 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. We found that Northern Gateway generally took a precautionary approach and has made commitments related to additional scientific research that would contribute to improved scientific understanding of some terrestrial and marine ecosystems.

In our view, even considering Northern Gateway's proposed mitigation measures and our conditions, the project would cause adverse environmental effects, after mitigation, on a number of valued ecosystem components. These include the atmospheric environment, rare plants, 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. We do not recommend a finding that potential effects, from the project alone, are likely to be significant for any of these valued ecosystem components.

We also considered cumulative effects for each valued ecosystem component. In two cases we recommend that project effects, in combination with effects of past, present, and reasonably foreseeable projects, activities, and actions, be found likely to be significant. These were effects on woodland caribou (for 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) and eight grizzly bear populations that would be over the linear density threshold.

In these cases, despite Northern Gateway's substantial mitigation and scientific research commitments, uncertainties related to the effectiveness of that mitigation led us to take a precautionary approach and recommend a finding of significance. Considering the overall benefits and burdens of the project, we recommend that significant effects in these two cases be found to be justified in the circumstances.

Our recommendations are dependent on full implementation of Northern Gateway's proposed measures and compliance with the conditions we set out. Most of the conditions regarding the biophysical environment are intended to ensure that, if the project proceeds, the biophysical baseline information is enhanced and detailed design and mitigation plans are developed and made available before construction begins. This would increase the effectiveness of mitigation, inform interested or affected parties, and support regulatory oversight by the National Energy Board in particular. Implementation of Northern Gateway's commitments and our conditions with respect to follow-up, monitoring, and adaptive management would verify the accuracy of environmental assessment predictions and effectiveness of mitigation measures. The commitments and conditions would inform and track corrective measures where they were required.

5 Safety and risk

Much of our hearing process focused on the risks of the project. Many people and groups said that something was likely to go wrong and the consequences could be unacceptably large. Northern Gateway said it evaluated risks carefully and proposed measures to reduce or eliminate risks wherever possible. The company said it would continue a process of adaptive management to reduce risks during detailed design, engineering, construction, and operations. A major concern of hearing participants was how pipeline leaks and marine spills could affect the environment. Northern Gateway proposed measures to reduce the likelihood and consequences of leaks and spills.

5.1 What would be the risks of the project?

Northern Gateway said it would build and operate the project in a safe, responsible, economically sound, and socially beneficial manner. The company said that there would always be uncertainties and that risk assessment was a way to consider in advance what might happen in the future. Northern Gateway said that the calculation of likelihood times consequence is a tool for evaluating uncertainty so that the issue can be addressed. Many hearing participants said the risk calculations showed that Northern Gateway could not guarantee the safety of the project.

Northern Gateway said it evaluated risks for each component of the project as a way to determine what would require mitigation. For example, identifying the risks could lead to changes in the proposed route or valve locations or to alterations in access, maintenance, or emergency response plans. The company said this process of risk identification and management would continue through planning, engineering, construction, and operations.

Northern Gateway said that advances in technology and modern pipeline design, materials, construction, and operating practices would greatly reduce environmental risks from pipeline spills. The company said most of the recent spills on Enbridge and other pipelines occurred on older lines not built to today's standards. Enbridge witnesses described improvements in training and procedures since 2010 to improve the safety culture in the Edmonton Control Centre and throughout the organization.

Many hearing participants raised the issue of human error as a risk factor for both the pipelines and marine operations. Northern Gateway said the company and shipping industry were well aware of this factor and would continue to improve management systems, training, and technology to reduce the risks.

In oral statements and letters of comment, many people said severe weather and narrow, twisting channels increased the likelihood of tanker spills in coastal waters. Some described their personal experiences in the area's storms. Many referred to past accidents such as the grounding and sinking of the Queen of the North, a BC Ferries vessel,

near the Douglas Channel in 2006. Northern Gateway said ships carrying oil already operate safely on Canada's coasts. The company said that its proposed enhancements such as tethered tugs, slower speeds, and navigation aids would reduce the risks further.

Some hearing participants said the use of super-tankers (Very Large Crude Carriers or VLCCs) would increase the potential risk of a spill. These vessels can carry three times as much oil as the tankers currently calling at the terminal in Burnaby, British Columbia. Similar supertankers already call at East Coast ports. Northern Gateway said the larger ships could reduce the risk because they would not need to make as many transits of the Confined Channel Assessment Area.

Northern Gateway voluntarily submitted shipping aspects of the proposal to Transport Canada's multi-agency Technical Review Process of Marine Terminal Systems and Transshipment Sites, known as TERMPOL. The TERMPOL review concluded that no regulatory concerns were identified for the vessels, vessel operations, the proposed routes, navigability, other waterway users, and the marine terminal operations.

A letter from the Pacific Pilotage Authority noted that tankers already call on the terminal in Burnaby and pass through Vancouver's Second Narrows, which is less than one-tenth as wide as the narrowest place in the proposed sea routes to Kitimat. The Pacific Pilotage Authority, a Crown corporation providing pilots for British Columbia ports, said the weather conditions in the routes to Kitimat were no worse than what tankers currently encounter at Canadian East Coast ports.

According to Northern Gateway risk assessments, the probability of a tanker spill of any size would be about 0.4 per cent in any given year. The company estimated the return period (average interval between events) would be 250 years for a marine spill. Northern Gateway said the probability of a full-bore rupture on the oil pipeline would be 0.2 per cent in a given year, based on an estimated return period of 464 years. The company said the assessments were not forecasts, and mitigation measures would likely further reduce the risks. The company said the main purpose of the risk analyses was to compare the effects of mitigation measures such as the use of escort tugs.

Some hearing participants also referred to the risk of earthquakes or tsunamis affecting the project. Northern Gateway said that Kitimat was 300 kilometres from the major fault west of Haida Gwai, and the pipeline route did not cross any known faults. The company's evidence indicated the seismic risk was low to moderate on the pipeline route. It also said that there was low risk from tsunamis in Douglas Channel, whether from landslides or earthquakes. Northern Gateway said that the Kitimat Terminal would be built on bedrock, which would reduce the seismic risk to the facility.

5.2 How would malfunctions and accidents affect the environment?

Northern Gateway and other hearing participants stressed the importance of protecting water quality, fisheries, and all aspects of the environment. The company said that the project's design and management systems would make large releases of oil or condensate highly unlikely. If spills occurred, the company said prompt response and mitigation measures would reduce or eliminate the negative environmental effects. As with construction and routine operations, the seriousness of the effects would depend on their magnitude, duration, frequency, geographic extent, ecological context, and environmental recovery.

Northern Gateway and others said a spill of any product carried by the project could have serious effects in freshwater or marine environments. There could be direct effects on birds, mammals, fish, mollusks, and plants, and lingering effects on the ecosystems of shore, riparian, and wetland areas. Witnesses said skimmers and other mechanical systems would typically recover only a portion of oil spilled in water. They said some components of the oil dissolve in water, and other components degrade naturally over time. Natural processes include evaporation, oxidation, and digestion by microorganisms. Northern Gateway said that, ultimately, spilled oil is broken down into carbon dioxide and water by sunlight (photolysis) and microbes (biodegradation). Compared to lighter crude oils, heavier oils and diluted bitumen take longer to degrade naturally.

Northern Gateway and others said a spill of condensate would disperse and degrade more rapidly than crude oil. A large portion would quickly evaporate, and those vapours could be toxic, in the short term, to humans and wildlife. Safety and protecting human health would be the first priorities in the event of a condensate spill.

Northern Gateway said that there had been a sharp reduction in the number and volume of marine oil spills over the past two decades due to the introduction of double-hulled tankers, the adoption of high standards for vessel certification and crew training, and the use of advanced navigation and communication systems. For vessels calling at Kitimat, the company said that escort tugs and local pilots would further enhance safety and reduce the likelihood of spills. In the event of a spill, there would be immediate response by the escort tugs, followed by major recovery efforts that include a certified response organization.

For spills on land, Northern Gateway said the pipelines' design, location, and management systems would aim to minimize the potential volume released and keep oil from reaching waterways. The company used modelling and mapping to identify locations along the proposed route where spills could have serious environmental effects. It would construct barriers, berms, or other containment to limit the potential spread of oil in these locations. These mitigation measures would be part of detailed engineering if the project were approved. Modelling and mapping would also be used in spill response planning.

ENBRIDGE SPILLS 2002–2012

(11 years) for 24,000 kilometres of liquid pipelines

635 on surface facilities such as terminals and pump stations

83 on right-of-way and less than 16 cubic metres or 100 barrels

21 on right-of-way and greater than 16 cubic metres or 100 barrels

The company and others said that negative effects could occur if malfunctions and accidents led to a release of oil or condensate into fresh water. The oil or condensate could affect fish and fish habitat. Oil could mix with sediments and sink to the bottom of waterways. If oil spilled on land, a portion could be recovered, some contaminated soil could be removed to landfill, and some oil could degrade naturally. The oil could affect wildlife and vegetation. Some oil could reach groundwater.

Several intervenors were concerned about the potential effects of a release in the upper Kitimat Valley, which could affect both fish habitat and the town water supply. The Fort St. James Sustainability Group expressed similar concerns about potential negative effects on Stuart Lake. Aboriginal groups in Alberta said that spills could affect groundwater there. Northern Gateway said that its prevention measures and response plans would address those concerns.

Many people referred to the number of spills reported over various periods by Enbridge and other pipeline companies in Canada and the United States. Northern Gateway said the great majority of those involved small volumes – less than 16 cubic metres or 100 barrels – and were contained on the right-of-way or facility locations. The company said Enbridge's performance was better than the industry averages for both number and volume of spills.

Many hearing participants referred to the July 2010 Enbridge pipeline rupture near Marshall, Michigan, which spilled at least 3,180 cubic metres (20,000 barrels) of diluted bitumen into Talmadge Creek near the Kalamazoo River. Part of the oil reached the river, mixed with sediments in the water, and sank to the bottom. The sunken oil was much more difficult to recover than oil floating on the water, and cleanup efforts continued more than three years later. The United States National Transportation Safety Board criticized Enbridge personnel and procedures that allowed the release to continue for 17 hours before the line was shut down.

Company officials said that Enbridge accepted all of the National Transportation Safety Board's recommendations for improvements in the safety culture of the Edmonton Control Centre that would also operate the Northern Gateway pipelines. The officials said that there had been improvements in procedures, training, supervision, leak detection, public awareness, emergency response, and pipeline integrity programs such as inspection, maintenance, and repair. Northern Gateway said that these changes, combined with the pipelines' design and mitigation measures, would limit the maximum release and ensure quick response.

Many hearing participants said the possibility of human error should still be taken into account in risk assessment for both pipeline and marine operations. They referred to both the Marshall incident and others such as the sinking of the Queen of the North ferry.

Many hearing participants, including the Province of British Columbia, were also concerned that conditions such as deep snow, avalanche hazard, heavy rain, or high water flows could make response less effective. They said that a release into freshwater ecosystems could affect commercial, recreational, and Aboriginal fisheries, species at risk such as Nechako white sturgeon, and activities such as cultural uses, tourism, and recreation. Northern Gateway said it would maintain equipment caches at key locations and develop alternative access plans using means such as tracked vehicles, boats, and helicopters.

Northern Gateway said any release, large or small, would have a unique ecological context, and the effects would depend on the conditions in those particular circumstances. For the purposes of the application, the company described potential effects of large releases at representative sites and ecosystems along the pipeline and tanker routes. It also described mitigation measures that could prevent or reduce negative effects from those releases, and it presented examples of response plans during our hearing process. Northern Gateway would develop more detailed response plans and mitigation measures prior to operations if the project were approved. The plans would be subject to regulatory approval. Some intervenors argued that more detailed plans should have been provided prior to a decision on approval.

We also heard and received a great deal of evidence on the question of environmental recovery. Northern Gateway said that most of the negative effects from oil spills would not be permanent and that ecosystems recovered over time. Many hearing participants said effects of the 1989 Exxon Valdez spill in Alaska's Prince William Sound persisted more than two decades later.

Northern Gateway said recovery of the natural environment from oil spills could range from days to weeks all the way up to 2 to 20 years, depending on the ecosystem component affected and the circumstances:

- Fast-moving rivers and streams tend to recover more quickly than slow-moving watercourses.
- Freshwater fisheries may recover fully in as little as four years, with signs of partial recovery after a few months.
- Fisheries generally recover within 2 to 5 years, while the recovery of birds and mammals depends on reproductive rates and whether there is migration from other areas.
- Spills can affect drinking water and other water uses for weeks to months. Groundwater can take years to decades to recover if oil reaches it.
- Sheltered, soft-sediment marshes are slowest to recover, and the company said keeping oil away from shorelines and wetlands would be a priority for response operations.

Northern Gateway said scientific research has demonstrated that species and ecosystem recovery occurs after a spill. It said that most, if not all, species recover within a time period of months to years. Where there is uncertainty about specific species recovery, Northern Gateway said that research is continuing and currently attributes most species recovery difficulties to factors beyond spills. The company said studies indicated that residual oil buried along coastlines had not interfered with recovery of the environment.

The company said local involvement in planning and spill response could reduce negative effects on communities and speed recovery of fisheries and other harvesting activities. Human uses could be interrupted by cleanup activities, safety closures, and harvesting bans for periods of months to a few years.

The Living Oceans Society said the effects of spills on marine ecosystems were very difficult to measure. Some components such as plankton and kelp beds are highly tolerant, while others such as sea otters and estuaries are highly vulnerable. It said physical contamination and smothering were the primary mechanisms that had negative effects on marine life, particularly intertidal organisms. Other conclusions included:

- Birds and mammals suffer the greatest acute impact when exposed to oil at or near the water surface. The Exxon Valdez oil spill killed many birds and sea otters.
- Population-level effects on 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 showed surprisingly good recovery. Many shorelines that were heavily oiled and then cleaned appeared much as they did before the spill. There was still residual buried oil on some beaches. Some mussel and clam beds had not fully recovered.
- The marine environment recovered with little intervention beyond initial cleaning. Natural flushing by waves and storms could 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 affected area of Prince William Sound showed 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 some people and communities.

Northern Gateway said that the environment of Prince William Sound returned to good health in the two decades since the Exxon Valdez oil spill. The company said coastal communities and Aboriginal people there were affected and did not endure lasting negative effects from the spill.

Our views on the potential effects of malfunctions and accidents on the environment are presented in Section 5.5.

5.3 Would diluted bitumen sink in freshwater and marine environments?

Northern Gateway and other hearing participants did not agree on the behaviour of diluted bitumen spilled into water.

Northern Gateway said that laboratory tests and experience with similar products indicated that diluted bitumen would float. The maximum density of any product shipped on the oil pipeline would be 940 kilograms per cubic metre (at 15 degrees Celsius) – that is, it would be lighter than water. The density of fresh water is about 1,000 kilograms per cubic metre, and seawater is about 1,025 kilograms per cubic metre.

Northern Gateway acknowledged that the density of diluted bitumen can become greater than the water due to prolonged weathering or if the oil combined with sand particles and other sediments. The company said that the oil would not sink as a mat to the bottom. It said that sinking would be less likely in denser seawater. Hearing participants said that submerged and sunken oil would be difficult to recover and could have serious effects on freshwater and marine fisheries and ecosystems.

Northern Gateway said that the only spill of a bitumen-based product in water in Canada was a spill of 243 cubic metres (1,530 barrels) in Burrard Inlet, Burnaby, British Columbia, in 2007. The company said 95 per cent of the oil in that spill was recovered, and none sank. The company said that about 15 to 20 per cent of the diluted bitumen in the 2010 Enbridge spill in Michigan sank after mixing with a heavy sediment load in the Kalamazoo River.

Many hearing participants said they believed the bitumen would separate from the condensate in diluted bitumen and sink. Northern Gateway said heating and blending the two creates a new product that would not separate back into the two original products, bitumen and condensate. Northern Gateway said the product to be shipped would be similar to an intermediate fuel oil or a lighter heavy fuel oil such as Bunker C.

The Gitxaala Nation said weathering studies conducted by Environment Canada on two bitumen products indicated diluted bitumen could sink due to weathering in certain circumstances. Northern Gateway expressed concerns regarding the methodology used by Environment Canada and noted that the testing conditions did not approximate environmental conditions in the field.

Gitxaala Nation also questioned evaporation rates assumed by Northern Gateway in its studies and concluded that additional scientific research would be required to address the behaviour of diluted bitumen spilled in the marine environment. Environment Canada said that numerous factors in addition to evaporation rates would have to be considered in a spill scenario. Environment Canada said that additional research would be required to support the conclusions in both Northern Gateway's and the Gitxaala Nation's work.

Fisheries and Oceans Canada said that experience with intermediate and heavy fuel oil spills in marine environments, and scientific research regarding these products, could provide useful information about the likely behaviour of products transported on the Enbridge Northern Gateway Project. The Department said that there were knowledge gaps and that additional research would be required regarding the behaviour, fate, and environmental effects of the products.

Northern Gateway committed to participate in and contribute funding to a collaborative government-industry-university research effort on the environmental behaviour and fate of diluted bitumen. A scientific advisory committee would facilitate this research, as recommended by Environment Canada. Northern Gateway said the committee would also have a role in the project's emergency preparedness and response planning.

There is some uncertainty regarding the behaviour of diluted bitumen spilled into water. We found that diluted bitumen is no more likely to sink to the bottom than other heavier oils with similar physical and chemical properties. We found that diluted bitumen is unlikely to sink due to natural weathering processes alone, within the timeframe within which initial on-water response may occur, or in the absence of interaction with sediments in the water. We found that a diluted bitumen spill is not likely to sink as a continuous layer that coats the seabed or river bed.

5.4 How would Northern Gateway respond to spills?

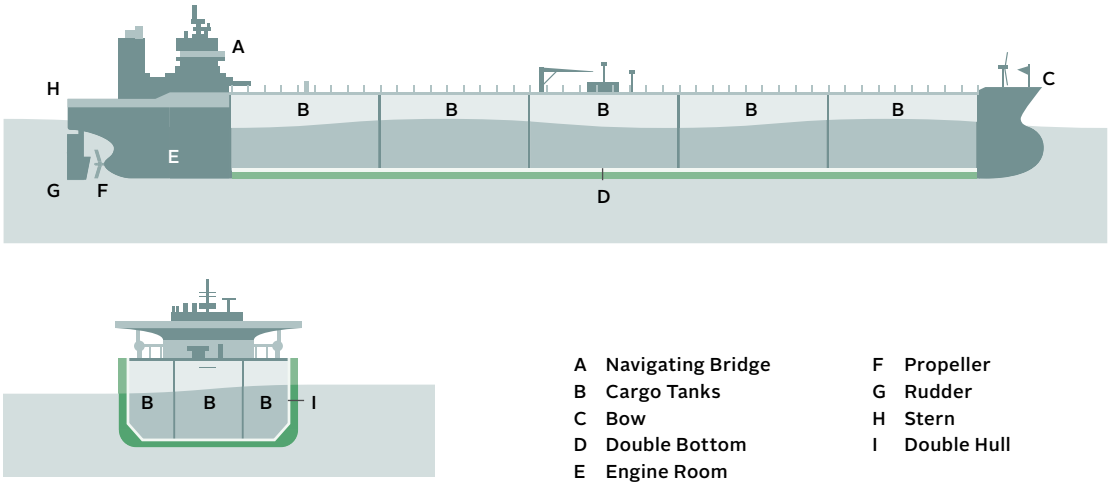
If the project were approved, Northern Gateway said it would develop detailed spill response plans for particularly sensitive marine areas and for high consequence areas along the pipeline route. Our conditions also require detailed response planning for each 10-kilometre-long segment of the pipeline route. The company provided examples of response plans and described the planning process. Effective response would depend on training, practice, readiness, coordination, equipment, and resources. Rapid response would help to limit negative effects on the environment and aid species recovery. Planning would include consultation with Aboriginal groups, local communities, and government authorities.

Our conditions for the pipeline require Northern Gateway to submit the detailed response plans prior to operations. Prior to operations, the company would also be required to conduct spill response exercises, including an unannounced exercise. Northern Gateway said it would use a risk-based approach to develop the plans, based on the potential effects of releases. Computer models would help to determine the likely paths of spills and the best ways to prevent harm to people and the environment.

The company would stockpile equipment and have trained personnel at strategic locations for quick response, and it could call on the Enbridge organization, other industry groups, and government agencies for additional support if needed. The National Energy Board would monitor and assess the company response to incidents on the pipelines and at the Kitimat Terminal. The Canadian Coast Guard would oversee the response to spills from ships.

FIGURE 5.1 **TYPICAL DOUBLE-HULLED TANKER**

Northern Gateway said that the use of double-hulled tankers has helped to reduce both the number and volume of marine oil spills since the early 1990s.



A Navigating Bridge
B Cargo Tanks
C Bow
D Double Bottom
E Engine Room
F Propeller
G Rudder
H Stern
I Double Hull

Northern Gateway said that under its tanker acceptance program, all tankers calling at Kitimat would be double-hulled and would be required to comply with national and international regulatory frameworks and certification programs. The ship owners would have a Shipboard Oil Pollution Emergency Plan and arrangements in place with the spill response organization. Ship owners, overseen by the Canadian Coast Guard, would take the lead in responding to spills.

For marine spills, the company said the response organization would be capable of responding to a spill up to 32,000 tonnes (about 36,000 cubic metres or 225,000 barrels). Northern Gateway said the organization would be able to have a task force at a spill site within 6-12 hours in the Confined Channel Assessment Area or 12 hours plus travel time in the Open Water Area. Spill response equipment and vessels would be located at Kitimat and strategic locations in the region. Northern Gateway said it would develop response plans for communities and sensitive geographic areas in the region.

For marine spills, the escort tugs would carry fire-fighting, containment, and oil recovery equipment to provide the initial response. Northern Gateway would either provide its own certified marine response organization or contract with another organization for response to larger incidents. Equipment would be stockpiled at key locations.

The Province of British Columbia and others said Northern Gateway should have provided more complete response plans. Northern Gateway said it would have three years to develop response plans prior to beginning operations if the project were approved. The plans would be subject to further consultation and regulatory review.

Many hearing participants questioned whether Northern Gateway and ship owners would be able to pay for the costs of a major spill. Our conditions require Northern Gateway to provide financial assurances totaling $950 million to cover potential costs of a spill from the pipelines or terminal. Under maritime arrangements, up to $1.35 billion would be available for cleanup and damages after a tanker spill.

Northern Gateway provided a range of estimates for the costs of cleanup and third-party compensation in the event of spills. The estimates varied widely because each incident would have unique circumstances and because comparable incidents in the United States generally have had much higher costs than those in Canada and other jurisdictions. For the pipelines and terminal, the company said the most costly potential incident would be a full-bore rupture on the oil pipeline, which might cost as much as $200 million for cleanup and damages.

TABLE 5.1 **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	250 cubic metres (1,575 barrels)	2,242 cubic metres (14,100 barrels)	95 cubic metres (600 barrels)
Return Period	61 years	240 years	4 years
Annual Probability	0.0164	0.00417	0.25
Cleanup Costs	$69,188 per cubic metre ($11,000 per barrel)	$25,159 per cubic metre ($4,000 per barrel)	$56,608 per cubic metre ($9,000 per barrel)
Damage Costs	$56,608 per cubic metre ($9,000 per barrel)	$62,898 per cubic metre ($10,000 per barrel)	$5,032 per cubic metre ($800 per barrel)

For tanker spills, Northern Gateway estimated potential cleanup costs of $94,500 per cubic metre ($15,000 per barrel) and damages of $141,750 per cubic metre ($22,500 per barrel). The company said these figures were higher than international averages but lower than costs in the United States. Transport Canada said that under the *Marine Liability Act,* up to $1.35 billion from Canadian and international funds and insurance would be available to cover cleanup and compensation costs.

Aboriginal and environmental groups and the Province of British Columbia questioned Northern Gateway's assumptions and estimates. Many letters of comment and oral statements said catastrophic spills were likely at some point in the life of the project. Intervenors and others said the likelihood and consequences of spills were much greater than Northern Gateway anticipated. The Province of British Columbia said that the company had not adequately considered geological and hydrological risks in its estimates of likelihood and that these factors could also make response and cleanup more difficult.

Northern Gateway said it would be financially responsible for the full costs of cleanup and damages for any spill from the pipelines or the terminal. In addition to insurance coverage, the company said it would have cash reserves and could raise funds based on its assets, revenues, and equity. As a separate partnership, Northern Gateway said it would not have access to Enbridge financial resources. Several intervenors said Northern Gateway should be required to carry insurance coverage of $1 billion or more.

In April 2013, we set out a potential condition that would have required Northern Gateway to provide financial assurances, and parties provided their views of this during final argument. Our final condition requires the company to maintain insurance and other financial resources totaling $950 million. This was based on a potential spill volume of 5,000 cubic metres (31,500 barrels) and potential costs of $138,376 per cubic metre ($22,000 per barrel), which would amount to about $700 million, plus $250 million for contingencies. The financial assurances would include $100 million in ready cash for immediate costs, $600 million in insurance or similar instruments, and $250 million in financial backstopping such as guarantees by equity partners.

5.5 How did we assess the risk of spills?

In our assessment, we distinguished between small spills and large spills. Smaller spills would be more likely but would have fewer consequences. Larger spills, though less likely, would have greater consequences.

We found 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. We found that a large spill, due to a malfunction or accident, from the pipeline facilities, terminal, or tankers, is not likely. We found 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 that we require to reduce the risk of a large spill include:

- thicker pipe
- additional isolation 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
- navigational safety enhancements.

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

We found that, in the unlikely event of a large oil spill, there will be significant adverse environmental effects, and that functioning ecosystems recover through mitigation and natural processes. We found 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. Scientific research from past spill events indicates that the environment recovers to a state that supports functioning ecosystems similar to those existing before the spill.

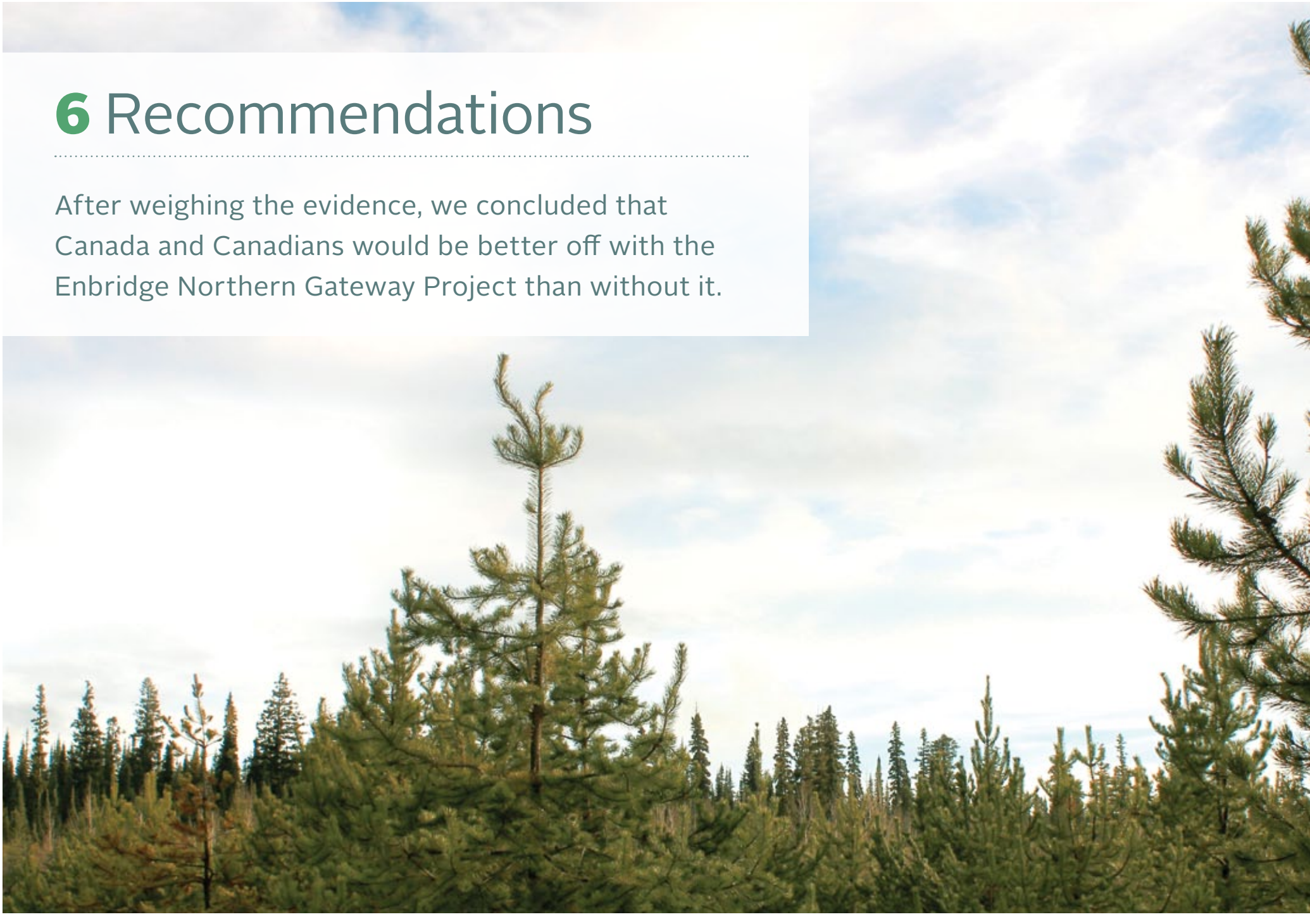
We found that, in the unlikely event of a large oil spill, there would be significant adverse effects on lands, waters, or resources used by residents, communities, and Aboriginal groups. We found that, in rare circumstances, a localized population or species could potentially be permanently affected by an oil spill. Scientific research from a past spill event indicates that this will not impact the recovery of functioning ecosystems.

In our view, Northern Gateway's research commitments regarding the behavior and cleanup of heavy oils spilled in aquatic environments and the company's enhanced fate and trajectory modelling will further inform emergency preparedness and response planning for the project. This research will also contribute to other current and proposed research activities in both the public and private sector.

We found that small spills are unlikely to cause significant adverse environmental effects. Small spills would be caused by relatively minor equipment failures or human error and would likely be contained 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. Any residual oil would be naturally dispersed and degraded. Some remediation might be necessary. Environmental recovery from a small spill 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.

6 Recommendations

After weighing the evidence, we concluded that Canada and Canadians would be better off with the Enbridge Northern Gateway Project than without it.



6.1 What do we recommend?

We recommend approval of the Enbridge Northern Gateway Project, subject to the 209 conditions set out in Volume 2 of our report. We have concluded that the project would be in the public interest. We find that the project's potential benefits for Canada and Canadians outweigh the potential burdens and risks.

We have taken a careful and precautionary approach in assessing the project. We are 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. We find that the environmental burdens associated with project construction and routine operation can generally be effectively mitigated.

Some environmental burdens may not be fully mitigated in spite of reasonable best efforts and techniques. Continued monitoring, research, and adaptive management of these issues may lead to improved mitigation and further reduction of adverse effects. We acknowledge that this project may require some people and local communities to adapt to temporary disruptions during construction.




The environmental, societal, and economic burdens of a large oil spill, while unlikely and not permanent, would be significant. Through our conditions we require 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 potential scenarios and contingencies on land and water, and would be tested through live exercises.

We recommend that project effects, in combination with cumulative effects, be found likely to be significant for certain populations of woodland caribou and grizzly bear. We used a precautionary approach in arriving at our 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. We recommend that the Governor in Council find these cases of significant adverse environmental effects are justified in the circumstances.

It is our 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, we are of the view that, overall, the Enbridge Northern Gateway Project, constructed and operated in full compliance with the conditions we required, is in the Canadian public interest. We find that Canadians will be better off with this project than without it.

Our recommendation takes into account the conditions we set out in Appendix 1 of Volume 2, including all commitments made by Northern Gateway during the hearing process. This conclusion reflects our consideration of the entire record of the Enbridge Northern Gateway Project proceeding, including the environmental and social effects we assessed under provisions of the *Canadian Environmental Assessment Act, 2012.*

We therefore recommend to the Governor in Council that Certificates of Public Convenience and Necessity incorporating our conditions be issued pursuant to the *National Energy Board Act.*

6.2 How did we weigh the balance of burdens, benefits, and risks?

We adopted a careful, precautionary approach to our review of the evidence. We acknowledged that different people placed different values on the burdens, benefits, and risks of the project. We considered the certainty or uncertainty of predicted effects, and we weighed the credibility of scientific and technical evidence. We took into account the views and knowledge of Aboriginal people and how the project could affect their uses and activities.

Considering the burdens and benefits, we found that the project would bring significant local, regional, and national benefits. These benefits, on balance, outweighed the potential burdens of the project. These benefits would be both social and economic. In addition, Northern Gateway has made commitments that we believe would contribute to improved environmental knowledge and protection, especially in the marine ecosystems along the British Columbia northern coast.

We found that the construction and operation of the project would have adverse environmental effects on some ecosystems. They would be temporary. In two cases we recommend the project effects, in combination with effects of past, present, and reasonably foreseeable projects, activities, and actions, be found likely to be significant. We found that these would be justified in the circumstances.

We found that a large spill is unlikely. We further found that a large spill would initially have significant adverse environmental effects on ecosystems, and we accepted the scientific evidence that indicates that the environment would ultimately recover and return to a functioning ecosystem similar to that existing prior to the spill.

Recognizing the interconnectedness that many parties pointed out, including Northern Gateway, we note that any development cannot occur without impacts.

We have taken a scientific and precautionary approach to this complex review. We respect, and have carefully sought to understand the expert testimony and individual views and perspectives of all participants.

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

We found that the Enbridge Northern Gateway Project would diversify Canada's oil markets and condensate supply. We found that the project would produce economic and social benefits for Canadians. We acknowledge that some social benefits will only be realized to the extent that Aboriginal groups and other affected parties choose to accept and implement these opportunities and benefits. Examples include training and education opportunities, participation in ongoing scientific research, Community Advisory Boards, and the Fisheries Liaison Committee.

The environmental, social, and economic aspects of this project and our recommendations are all connected. In our view, environmental protection and economic activity that benefits society are important aspects of the determination of the public interest. When we speak of environmental protection, we consider all facets of the environment including humans, animals, plants, our geographic surroundings, and areas of cultural significance. In this context, there is no differentiation between the environment and the economy. They are inextricably connected and are integral aspects of the public interest.

Societal and economic benefits can be expected from the project. The environmental burdens associated with project construction and routine operation would generally be effectively mitigated. Continued monitoring, scientific research, and adaptive management of these issues could lead to further reduction of adverse effects.

Fisheries and aquatic ecosystems are central to the economy and way of life along the pipeline route and coastal areas. Northern Gateway committed to improve protection of freshwater and saltwater environments. Some of these enhancements were announced during the hearing process and addressed concerns raised by other participants.

Scientific and technical information was presented to us. In a number of cases, the information resulted in opposing conclusions, and we had to analyze all that was given to us and determine our own independent conclusion. In some areas, such as the fate and behaviour of diluted bitumen spilled in water, we found that further scientific research would be needed for definitive answers, and our conditions require Northern Gateway's participation in that research. In other areas, we did not find the evidence persuasive. For example, we did not accept the assertion by some parties that diluted bitumen was more corrosive and abrasive than conventional crude oils.

Information on Aboriginal uses of lands, waters, and resources was provided to us both orally and in writing. All of this information is in the record of this proceeding. We also received people's views and thoughts about the project. In many cases, these views were based on individuals' values and traditions.

All parties did not agree on whether this project should proceed or not, and it was our job to weigh all aspects and deliver our recommendations to the Minister of Natural Resources for consideration by the Governor in Council. In the end, we were persuaded that the Enbridge Northern Gateway Project would meet an economic need by diversifying Canada's oil markets and condensate supply. We found that the project would produce economic and social benefits for Canadians. We determined that Northern Gateway's proposed measures would reduce, eliminate, or offset the potential negative environmental effects. Our conditions require monitoring, scientific research, and adaptive management to continue addressing other negative effects. Regulatory oversight would continue throughout design, construction, and operation of the project.

6.3 Panel's concluding remarks

We each accepted our responsibilities to conduct this review with full accountability to Canadians. We were humbled by the authenticity and commitment of all who participated in this review. We were honoured to receive oral and written evidence and argument that was the result of thousands of hours of thoughtful consideration.

We thank everyone who participated in the review. People shared knowledge with us in many areas – oral evidence about traditional land use activities by Aboriginal groups; social, economic, and health information about communities; information about the potential economic contributions that this project might make to Canadians; and the presentation of detailed data on engineering and environmental aspects of the project. This information allowed us to do the important work we were requested to do.

As a regulatory tribunal, our role was to conduct a fair and accessible process that allowed those who participated to be respected and to have their views taken seriously. The ultimate purpose was to obtain the most accurate information available on all aspects of a proposed project. Our task was to design and implement a rigorous process that would result in recommendations to the Governor in Council based on a thorough and independent analysis of all aspects of the project.

To do this, we studied and analyzed all aspects of the application. The body of evidence and testing in this proceeding has been substantial. We took all evidence and views seriously. We learned about the connectedness of everything and that our approach must be holistic, understanding the entirety as well as the parts.

We took the time required to fully understand all aspects of this complex application. We travelled the route and had the privilege of being welcomed into communities to hear from people who live close to the proposed project. This included communities along the proposed pipeline corridor and also in coastal communities close to the marine terminal and proposed tanker routes.

We heard and read evidence that provided us with a thorough understanding of a broad range of facts and views about the project. In considering all of the evidence, we found that some views were shared among all parties. For example, everyone agreed that environmental protection was important and that society benefits from a strong economy. There were different descriptions of a strong economy.

We took all of this information into account and ultimately decided what recommendations we should provide to the Governor in Council. We determined what we believed were the major benefits and burdens associated with this project and found that the public interest of Canada was best served by recommending that the project should be approved.

As a Panel, we take full accountability for our recommendations contained in this report and for all of the analysis and our views presented. We have provided you with an overview of our results in this volume, and we encourage you to read Volume 2 *Considerations* to gain a deeper understanding of how we arrived at our recommendations.

In closing, we thank the Panel Secretariat members and both of our organizations, the Canadian Environmental Assessment Agency and the National Energy Board, as well as the Secretariat's contractors, for all of their support and dedication to helping us conduct this review.