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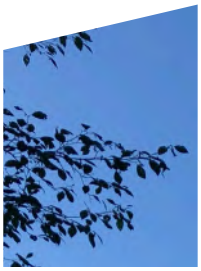

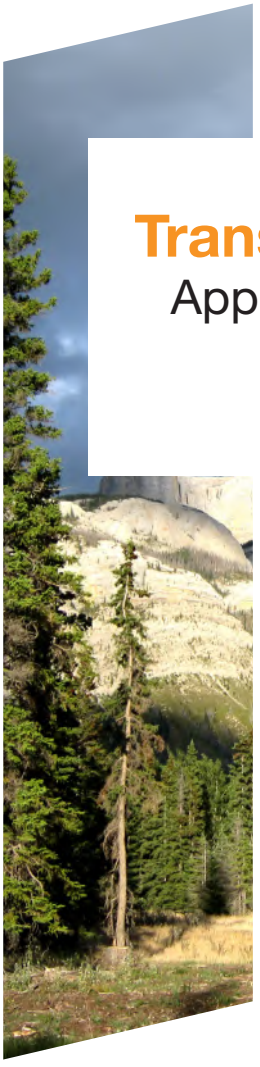

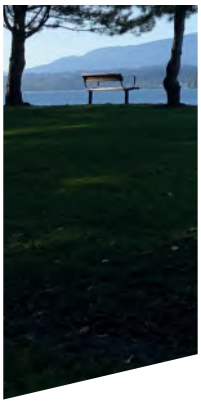
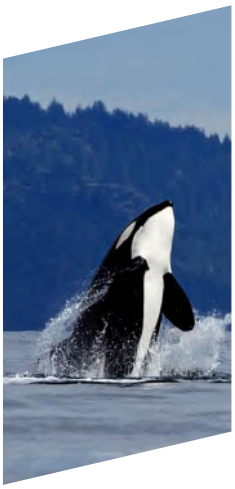

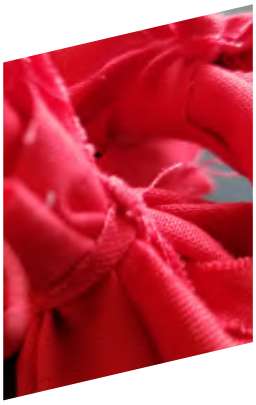

Trans Mountain Pipeline ULC

Application for the Trans Mountain Expansion Project

National Energy Board reconsideration of aspects of its OH-001-2014 Report as directed by Order in Council P.C. 2018-1177

MH-052-2018

February 2019

Canada

National Energy Board Report

Application for the Trans Mountain Expansion Project

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Introduction and disposition

This introduction contains the National Energy Board's (Board or NEB) overall conclusions and recommendations with respect to the Trans Mountain Expansion Project (Project). It also sets the context for how the Board approached the Reconsideration it was directed to undertake by the Governor in Council (GIC), and contains remarks on some of the multifaceted considerations that informed the Board's conclusions. This includes details regarding the holistic, systemic and precautionary approach that the Board took to examining and addressing effects likely to be caused by the Project on the Salish Sea and its complex and interconnected ecosystem. This introduction should be read together with – and not in isolation from – the detailed reasons that follow in the subsequent chapters of this report.

Disposition

After completing the Reconsideration hearing and having regard to all relevant considerations, the Board is of the view that the Project is and will be required by the present and future public convenience and necessity, and is in the Canadian public interest. Pursuant to the *National Energy Board Act* (NEB Act), the Board confirms the recommendation, and replaces certain conditions, that it provided to the GIC in its OH-001-2014 Report. The Board recommends that the GIC approve the Project by directing the issuance of a certificate of public convenience and necessity (CPCN) to Trans Mountain Pipeline ULC (Trans Mountain), subject to 156 conditions.

Pursuant to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) the Board is of the view that the designated Project is likely to cause significant adverse environmental effects. Specifically, Project-related marine shipping is likely to cause significant adverse environmental effects on the Southern resident killer whale, and on Indigenous cultural use associated with the Southern resident killer whale. This is despite the fact that effects from Project-related marine shipping will be a small fraction of the total cumulative effects, and the level of marine traffic is expected to increase regardless of whether the Project is approved. The Board also finds that greenhouse gas (or GHG) emissions from Project-related marine vessels would result in measureable increases and, taking a precautionary approach, are likely to be significant. While a credible worst-case spill from the Project or a Project-related vessel is not likely, if it were to occur, the environmental effects would be significant. While these effects weighed heavily in the Board's reconsideration of Project-related marine shipping, the Board recommends that, in light of the considerable benefits of the Project and measures to mitigate the effects, the GIC find that they can be justified in the circumstances. The Board has identified a recommended follow-up program to be implemented with respect to the designated Project.

Pursuant to the *Species at Risk Act* (SARA), the Board has identified the adverse effects of the Project and its related marine shipping on each SARA-listed wildlife species and its critical habitat, and has imposed (through conditions) and recommended (to the GIC) measures to avoid or lessen those effects and to monitor them.

Reconsideration background and process

If approved, the Project would expand the existing Trans Mountain Pipeline system between Edmonton, Alberta and Burnaby, British Columbia (B.C.), nearly tripling its capacity to ship oil from 300,000 to 890,000 barrels per day. Almost 90 per cent of the Project route parallels existing disturbance, including the right-of-way for the existing pipeline. The Project includes approximately 987 kilometres of new pipeline, new and modified facilities such as pump stations and tanks, and the reactivation of 193 kilometres of existing pipeline. The Westridge Marine Terminal (WMT) would also be expanded. Oil would be loaded onto tankers at the WMT for transit to Washington State, California, and Asia.

In May 2016, after an approximately two-year regulatory review (the OH-001-2014 hearing), the Board issued its OH-001-2014 Report recommending that the GIC approve the Project. Project-related marine shipping was considered as part of that review and report, but only under the NEB Act – not under the CEAA 2012. On 29 November 2016, the GIC approved the Project, issuing Order in Council (OIC) P.C. 2016-1069. Accordingly, on 1 December 2016, the Board issued CPCN OC-064 to Trans Mountain, along with amendments to other existing CPCNs. Additional related instruments in respect of the Project also came into effect at that time. These regulatory instruments authorized the construction and operation of the Project, subject to 157 conditions.

On 30 August 2018, the Federal Court of Appeal in *Tsleil-Waututh Nation v. Canada (Attorney General)*[1] set aside OIC P.C. 2016-1069, in part because, in the Court's view, the Board unjustifiably excluded Project-related marine shipping from the scope of the "designated project" reviewed under the CEAA 2012.

On 20 September 2018, the GIC issued OIC P.C. 2018-1177, directing the Board to conduct a Reconsideration taking into account the environmental effects of Project-related marine shipping in view of the requirements of the CEAA 2012, and the adverse effects of Project-related marine shipping on species at risk in view of any requirements of section 79 of the SARA. The OIC instructed the Board to complete the Reconsideration within 155 days.

In carrying out the Reconsideration, the Board held a public hearing (the MH-052-2018 hearing) and has prepared this MH-052-2018 Report as a result. As directed by the OIC and as reflected in the Board's List of Issues (see Appendix 1), this Reconsideration is focused on Project-related marine shipping – a comparatively narrow scope to the OH-001-2014 hearing. The Board's focus was on any necessary changes or additions to its OH-001-2014 Report in light of the inclusion of Project-related marine shipping in the designated Project being assessed under the CEAA 2012.

At the end of this introduction and disposition, there is a roadmap to this MH-052-2018 Report, which explains how it is laid out to incorporate both new information received through the MH-052-2018 hearing, and information received during the OH-001-2014 hearing. The Board has structured this MH-052-2018 Report in this manner to ensure that all pertinent information about the Project and its related marine shipping is captured in a single, consolidated report to the GIC.

Considering the evidence and submissions

While the Reconsideration was a focused hearing, the evidentiary record was nevertheless substantial, and included additional investigative and scientific studies that have been completed since the close of the OH-001-2014 hearing record. The level of participation was also substantial, with a total of 118 intervenors that included 52 Indigenous intervenors, and 8 federal government department intervenors. Any member of the public was able to file a letter of comment, and many took the opportunity to do so.

Prior to issuing a Hearing Order, the Board sought public comments on the scope of the environmental assessment and List of Issues, and the design of the hearing process. Intervenors provided evidence and argument, and were given an opportunity to question the evidence of other intervenors and Trans Mountain. A total of $4,981,760 in participant funding was offered to 69 recipients, 82 per cent of which was offered to Indigenous intervenors.

Much of the evidence and submissions presented was relevant, informative, and helpful to the Board. The Board appreciates the efforts and diligence of the Parties in preparing their evidence and submissions, including the Indigenous oral traditional evidence that the Board heard over approximately three weeks in Calgary, Alberta, and in Victoria and Nanaimo, B.C.

However, the Board observes that, regrettably, not all Parties and commenters adhered to the Hearing Order and many filed evidence or offered comments on issues canvassed in the OH-001-2014 hearing or that were not within the scope of this

[1] 2018 FCA 153

Reconsideration, adding unnecessarily to the complexity of the hearing process. The Board did not consider evidence or revisit issues that were outside of the scope of the Reconsideration.

In making their submissions, some Parties implored the Board to not only listen, but to hear what they were saying. Elder George Harris from Stz'uminus First Nation said it this way:

> You know, in our culture and traditional ways of our people, when we go into our longhouse, my speaker, when he says, "Listen, listen," that's a big part of our culture. We listen. I'm hoping that you, the Panel, are going to listen. I'm hoping our words are heard beyond this room.

The Board has endeavored to do this – to listen, hear, and share the evidence and views of the Parties with the GIC and Canadians.

The Board has carefully considered all of the relevant evidence and submissions it received. The Board is of the view that the MH-052-2018 hearing offered a fair and meaningful opportunity for Parties to participate and to fully present their case and represent their diverse points of view.

The Board's MH-052-2018 hearing also forms part of the overall consultation process with Indigenous peoples with respect to their constitutionally protected rights. In this regard, the GIC has indicated that it will rely on the NEB's process, to the extent possible, to discharge the duty to consult. The Board's MH-052-2018 Report may also inform the additional "Phase III" consultations being carried out separately by the Government of Canada with respect to the Project. Although the GIC has the responsibility of ultimately ensuring that the duty to consult has been fulfilled before a decision is made on the Project, the Board has considered those aspects of consultation which are relevant to the Reconsideration and for which evidence was filed on the record.

Weighing the public interest

The Board has undertaken this Reconsideration in accordance with the requirements of the NEB Act, the CEAA 2012, and the SARA, and with the Canadian public interest as a guide.

Weighing the public interest, as required by the NEB Act, is not a rigid or mechanical task. It is a complex, flexible, and multifaceted inquiry that requires the Board to conduct a thorough and scientific examination of evidence relating to economic, environmental, and social factors; to consider the impacts of the Project on Indigenous rights; to weigh and balance the overall benefits and burdens of the Project; and to draw conclusions. This consideration of benefits and burdens also informs the Board's recommendation under the CEAA 2012 regarding whether any significant adverse environmental effects can be justified in the circumstances. The various factors that the Board considers in this inquiry cannot be understood in isolation from one another, or divorced from the specific context and circumstances surrounding this Project.

In the Board's view, the benefits of the Project are considerable, including increased access to diverse markets for Canadian oil; jobs created across Canada; the development of capacity of local and Indigenous individuals, communities, and businesses; direct spending on pipeline materials in Canada; and considerable revenues to various levels of government.

However, the Board is also of the view that the Project and its related marine shipping carries risks. Its burdens include the significant adverse effects that are likely to be caused by Project-related marine shipping on the Southern resident killer whale and Indigenous cultural use associated with the Southern resident killer whale.

Further, the benefits and burdens of the Project and its related marine shipping are not distributed evenly across the country.

In light of these circumstances, reasonable people can and will disagree on what the best balance and outcome is for Canadians. Sometimes, Parties disagree on the evidence and facts, while other times, Parties agree on the facts but differ in their opinions, perspectives, or values. In carrying out the Reconsideration, the Board has listened carefully and taken into account diverse views. The Board has remained cognizant that the public interest is not regionally based, but is inclusive of all Canadians. It must also be responsive to Canadians' interests and values as they change over time.

It is through this holistic and contextual lens that the Board has carried out its environmental assessment, including the justification analysis; considered and weighed the Project's benefits and burdens; and determined that the Project is in the Canadian public interest.

Taking a precautionary approach

Many Parties in the MH-052-2018 hearing emphasized the application of the precautionary principle, despite the fact that there were different interpretations expressed as to exactly what the principle requires.

The Board recognizes the important role of the precautionary principle under the CEAA 2012. The precautionary principle requires that environmental measures must anticipate and prevent environmental harm. A lack of full scientific certainty should not be used as a reason for not implementing measures to prevent environmental harm. Adaptive management can, in certain circumstances, be an important part of a follow-up program for a project to allow for uncertainties in the environmental assessment process. The Board is of the view that certain activities may be permitted despite a lack of full scientific certainty regarding their effects, provided the activity and its effects can be effectively monitored and adaptively managed. This involves an exercise in balancing interests and weighing risks.

The Board has applied the precautionary principle to its environmental assessment in this case. As examples, the Board has applied the precautionary principle to its significance determinations, and to its consideration of measures to mitigate impacts through design, planning, follow-up, and monitoring. The Board has required that effects or consequences be minimized, even if they are only anticipated or possible and not certain.

The importance of taking a precautionary approach is evident when faced with the Salish Sea and its complex and not necessarily well-understood ecosystem. An approximately 18,000-square-kilometre body of water that includes the Straits of Juan de Fuca and Georgia as well as Puget Sound, the Salish Sea is home to diverse marine life. This includes a number of endangered and threatened species, some of which are of particular importance to Indigenous peoples and intrinsic to Indigenous cultural and spiritual practices.

Over 6.5 million people live on or in close proximity to the Salish Sea, and it is home to a population of over 35 types of mammals, 170 species of bird, 240 kinds of fish, and 3,000 species of invertebrates. Not surprisingly, the health of the Salish Sea is of significant importance to all who live in the area.

The evidence in the MH-052-2018 hearing is clear that the Salish Sea is not the healthy environment it once was. It is subject to a number of stressors, including vessel traffic and resulting noise, environmental contaminants, and a decline in salmon. The causes for the current state of the Salish Sea are numerous and diverse, and these effects have accumulated over time. There appears to be no serious controversy among the Parties with regard to these points, nor does there appear to be any serious controversy that Project-related marine shipping is likely to cause significant adverse environmental effects. This is despite the fact that Project-related marine shipping would comprise a relatively small increase in the total vessel traffic in the Salish Sea, and that increased pressure on the Salish Sea and its marine life can be anticipated regardless of whether the Project proceeds.

Taking an holistic approach

Given the cultural, environmental, and commercial importance of the Salish Sea, the Board has adopted an holistic approach to its consideration of the designated Project and how it fits into the wider context of the many current stressors on that body of water, the marine animals and fishes within it, and the people who derive cultural use, livelihood, or pleasure from it. The Board concludes that, while Project-related marine shipping's incremental addition to cumulative effects on the Salish Sea will not be large, it will add to already significant effects.

Addressing effects, and cumulative effects in particular, on the Salish Sea requires a broad, systemic, and multi-faceted approach. To understand the effects of Project-related marine shipping and how best to mitigate those effects, one needs to understand the complex and interconnected system that it would operate within. In order to be most effective in mitigating environmental harm to the Salish Sea and its ecosystem that is likely to be caused by the Project, a broader approach is required; one which extends beyond the NEB's regulatory authorities and one which will benefit the broader system. The Board has conducted its environmental assessment, set Project conditions, and made its broader recommendations to the GIC with this in mind. This includes making recommendations that use an offset-based approach. It is the Board's view that, should the GIC make changes to the operation of all marine traffic, including Project-related traffic, and take action to relieve other stressors within the broader system, it will offset the incremental effects of the designated Project and make material improvements to the health of the Salish Sea.

The Board is also supportive of the role of the Indigenous Advisory and Monitoring Committee (IAMC) for the Project. In the Board's view, the IAMC is well placed to help facilitate effective and ongoing Indigenous consultation and participation in Project-related Salish Sea monitoring and follow-up measures.

While the Board recognizes that scientific work to better understand the Salish Sea is continuing, it has heard a great deal of evidence, including from a variety of experts. The Board is satisfied that the evidence before it is sufficient for it to make the conclusions and recommendations it has reached in this MH-052-2018 Report.

Project conditions and recommendations to the GIC

The Board will impose 156 conditions on the Project if it is approved. It has also made 16 recommendations to the GIC. The conditions and recommendations are made in a manner consistent with the NEB Act, the CEAA 2012, the SARA, and they apply the precautionary principle.

The conditions cover a wide range of matters, including emergency preparedness and response, protection of the environment, consultation with affected Indigenous communities, socio-economic matters, pipeline safety and integrity, commercial support for the Project prior to construction, and financial responsibility on the part of Trans Mountain.

The Board's recommendations to the GIC relate to Project-related marine shipping, including cumulative effects management for the Salish Sea, measures to offset increased underwater noise and increased strike risk posed to SARA-listed marine mammal and fish species, marine oil spill response, marine shipping and small vessel safety, reduction of greenhouse gas emissions from marine vessels, and the IAMC.

In making its recommendations to the GIC, the Board drew guidance from the Federal Court of Appeal's decision in *Tsleil-Waututh Nation*. The Court indicated that the Board should identify mitigation measures within the authority of the federal government, despite the fact that the Board does not regulate marine shipping. The Board is also not limited to identifying measures that are within Trans Mountain's control to implement. With the addition of recommendations about matters beyond the Board's authority but within that of the GIC, the GIC will possess the requisite breadth of information to make the informed decisions required of it with respect to the Project.

Both the conditions and recommendations made by the Board are intended to mitigate, avoid, or lessen potential effects associated with the Project and its related marine shipping. The conditions are regulatory requirements imposed on Trans Mountain, which the Board would oversee and enforce as part of its regulatory mandate. In comparison, the recommendations to the GIC fall outside of the Board's regulatory mandate and are generally beyond the control of Trans Mountain. While the recommendations are sufficiently specific and are evidence-based, they are comparatively less prescriptive than the conditions. This provides a measure of flexibility for the GIC to determine the details of how best to implement them, and the resources required, should it decide to do so. This is appropriate given that the optimization of these mitigation measures may need to be based on a multitude of factors, including the GIC's overall approach for managing cumulative effects in the Salish Sea, multi- and cross-jurisdictional considerations, and the need to employ ongoing adaptive management in light of the complexities and uncertainties of the Salish Sea.

Although the Board's recommendations to the GIC are directly related to its environmental assessment of Project-related marine shipping, the Board is of the view that, if implemented, they may assist in mitigating effects of all marine traffic in the area. This would be a positive outcome that would extend beyond mitigating or offsetting the impacts of the Project and its related marine shipping. The Board encourages the Government of Canada in the direction it has already taken to both deepen the scientific understanding of the Salish Sea and its resident marine life, and to continue to put in place procedures, programs, equipment, and funding to safeguard this important Canadian marine resource.

Roadmap to the MH-052-2018 Report

Given that the Reconsideration focused on Project-related marine shipping, much of the OH-001-2014 Report is outside the scope of the MH-052-2018 hearing. However, the GIC must be informed about all aspects of the Project to make the decisions required of it. It is also important to be clear about what changed from the OH-001-2014 Report as a result of the MH-052-2018 hearing.

For this reason, this MH-052-2018 Report contains the sections that were reconsidered by the Board, as well as sections from the OH-001-2014 Report that were beyond the scope of the Reconsideration. This ensures that all pertinent information is captured in a single consolidated report to the GIC.

This MH-052-2018 Report contains the same chapter numbers and titles of the OH-001-2014 Report. Although sections of the OH-001-2014 Report are included in this MH-052-2018 Report, this does not mean that they were within the scope of the Reconsideration or reconsidered by the Board. The beginning of each chapter contains an explanation of what, if anything, was changed from the OH-001-2014 Report.

Most chapters in this MH-052-2018 Report were reproduced from the OH-001-2014 Report and include the views of the original Panel that undertook the OH-001-2014 hearing. These views remain valid and unchanged, and are labelled as **"Views of the Board."** Some chapters have undergone substantive changes as a result of the MH-052-2018 hearing and include the views of the Panel that carried out the Reconsideration. These are labelled as **"Views of the Reconsideration Panel."**

For issues that fall within the scope of the MH-052-2018 hearing, the Reconsideration Panel included views of the Parties from the OH-001-2014 hearing where they were still applicable. These are then followed by new or updated evidence raised by the Parties in the MH-052-2018 hearing. The views of the Reconsideration Panel contain Board views from the OH-001-2014 Report that were found to remain applicable after considering relevant evidence from both the OH-001-2014 and MH-052-2018 hearings. The views of the Reconsideration Panel include additional views to address the new or updated evidence and to explain if it confirms or modifies the Board's previous findings from the OH-001-2014 hearing.

The majority of the issues relevant to the MH-052-2018 hearing are covered in Chapters 5 and 14. An overview of what was considered by the Reconsideration Panel and changed from the OH-001-2014 Report is outlined below. The appendices from the OH-001-2014 Report have been reproduced, with updates to reflect the circumstances and factual underpinnings of the Reconsideration. Appendices 14 and 15 are new to this MH-052-2018 Report.

Chapter	Update
Introduction and disposition	New
Chapter 1 – The Board's review	Updated to reflect both hearing processes
Chapter 2 – Benefits, burdens, and recommendations	Updated to reflect the conclusions arising from the Reconsideration
Chapter 3 – Regulating through the Project lifecycle	Unchanged
Chapter 4 – Public consultation	Unchanged
Chapter 5 – Indigenous matters	Section 5.2 includes new or updated evidence and views with respect to Indigenous matters
Chapter 6 – Pipeline and facility integrity	Unchanged
Chapter 7 – Construction and operations	Unchanged
Chapter 8 – Environmental behavior of spilled oil	Section 8.2 includes new or updated evidence and views with respect to the environmental behavior of spilled oil
Chapter 9 – Emergency prevention, preparedness, and response	Unchanged
Chapter 10 – Environmental assessment	Mostly unchanged except for references about the scope of the environmental assessment completed under the CEAA 2012, and Project-related marine shipping
Chapter 11 – People, communities, and lands	Unchanged
Chapter 12 – Need for the Project and economic feasibility	Unchanged
Chapter 13 – Financial matters	Unchanged
Chapter 14 – Project-related increase in shipping activities	Revised significantly; covers the majority of the issues relevant to the Reconsideration

Conclusion

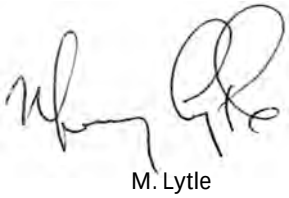
The Reconsideration has comprised a comprehensive, evidence-based, fair, and meaningful review of Project-related marine shipping. The Reconsideration process and this resulting report discharge the relevant requirements of the Board under the NEB Act, the CEAA 2012, and the SARA. The Board finds, in conclusion, that the Trans Mountain Expansion Project is in the Canadian public interest and recommends to the GIC that it be approved.

The Board thanks the Parties in the MH-052-2018 hearing for their thoughtful and thorough participation, which has resulted in better information, well-informed conclusions, and more effective conditions and recommendations that serve all Canadians.

Should the Project be approved, the NEB will regulate it throughout its full lifecycle. The NEB will oversee Project construction and operation, and will hold Trans Mountain accountable for meeting its commitments and applicable regulatory requirements, keeping its pipelines and facilities safe and secure, and protecting people, property, and the environment.

L. Mercier
Presiding Member

A. Scott
Member



M. Lytle
Member

Calgary, Alberta
February, 2019

The Board's review of the Trans Mountain Expansion Project

The content of this chapter has been updated since the Board's May 2016 OH-001-2014 Report to reflect the Reconsideration. The Reconsideration Panel has added information regarding the MH-052-2018 hearing process and its views on various issues raised in argument.

Section 1.6 contains the views of the Board from the OH-001-2014 Report (formerly Chapter 1.3), but has been included as it provides helpful background information.

Section 1.7 contains the views of the Board from the OH-001-2014 Report (formerly Chapter 1.4). The Reconsideration Panel adopts this approach to assessing risks from spills and has revised the conclusions related to spills from Project-related marine shipping.

In May 2016, after an approximately two-year regulatory review (the OH-001-2014 hearing), the Board issued its OH-001-2014 Report recommending that the GIC approve the Project. Project-related marine shipping was considered as part of that review and report, but only under the NEB Act – not under the CEAA 2012. On 29 November 2016, the GIC approved the Project, issuing Order in Council (OIC) P.C. 2016-1069. Accordingly, on 1 December 2016, the Board issued CPCN OC-064 to Trans Mountain, along with amendments to other existing CPCNs. Additional related instruments in respect of the Project also came into effect at that time. These regulatory instruments authorized the construction and operation of the Project, subject to 157 conditions.

On 30 August 2018, the Federal Court of Appeal in *Tsleil-Waututh Nation v. Canada (Attorney General)*[2] set aside OIC P.C. 2016-1069, in part because, in the Court's view, the Board unjustifiably excluded Project-related marine shipping from the scope of the "designated project" reviewed under the CEAA 2012.

On 20 September 2018, the GIC issued OIC P.C. 2018-1177, directing the Board to conduct a Reconsideration taking into account the environmental effects of Project-related marine shipping in view of the requirements of the CEAA 2012, and the adverse effects of Project-related marine shipping on species at risk in view of any requirements of section 79 of the SARA. The OIC instructed the Board to complete the Reconsideration within 155 days.

[2] 2018 FCA 153

In carrying out the Reconsideration, the Board held a public hearing (the MH-052-2018 hearing) and has prepared this MH-052-2018 Report as a result. As directed by the OIC and, as reflected in the Board's List of Issues (see Appendix 1), this Reconsideration is focused on Project-related marine shipping – a comparatively narrow scope to the OH-001-2014 hearing. The Board's focus was on any necessary changes or additions to its OH-001-2014 Report in light of the inclusion of Project-related marine shipping in the designated Project being assessed under the CEAA 2012.

1.1 The Project

On 16 December 2013, Trans Mountain Pipeline ULC (Trans Mountain) submitted an application (Application) to the National Energy Board (NEB or Board) for a Certificate of Public Convenience and Necessity (CPCN) and other requested relief to construct and operate the Trans Mountain Expansion Project (Project).

In its Application, Trans Mountain said that it had received many requests from its shippers over the past few years to increase the capacity of the existing Trans Mountain Pipeline (TMPL) system. This pipeline is currently the only major pipeline route for Western Canadian producers who want to ship oil to the west coast of Canada. The pipeline ships oil from Edmonton, Alberta to Burnaby, B.C. At that point, oil is loaded onto tankers at the Westridge Marine Terminal (WMT) for Pacific Rim destinations, such as Washington State, California, and Asia.

The Project would result in the looping (or twinning) of the existing 1 147 km TMPL system between Edmonton and Burnaby with about 987 km of new buried pipeline. Most of the existing pipeline, along with two reactivated pipeline segments, would become Line 1. The proposed new pipeline segments, along with active pipeline segments, would become Line 2, as shown below in Figure 1.

The Project would increase the capacity of the existing TMPL system from 47 690 m^3/d (300,000 bbl/d) to 141 500 m^3/d (890,000 bbl/d) of crude petroleum and refined products.

Currently, Panamax tankers (less than 75,000 metric tonnes deadweight tonnage (DWT)) and Aframax tankers (75,000 to 120,000 metric tonnes DWT) call at the WMT. The existing WMT typically loads five tankers per month. The proposed expanded system associated with the Project would increase the WMT's loads to approximately 34 Aframax class vessels per month, with actual demand driven by market conditions.

Additional technical details about the Project can be found in Appendix 4.

Figure 1: Project map

1.2 Definitions of the Project, Project-related marine shipping, and the designated Project

The Project, as defined by Trans Mountain, includes only the facilities described above, which are between Edmonton and the WMT. Following the direction from the GIC in OIC P.C. 2018-1177, the Board concluded that Project-related marine shipping between the WMT and 12-nautical-mile territorial sea limit is "incidental" to the Project and therefore part of the "designated project," as those terms are defined in the CEAA 2012.

In this MH-052-2018 Report, the Board uses the term "Project" to describe those facilities between Edmonton and the WMT. Project-related marine shipping is identified separately. This terminology enables the Board to clearly distinguish what applies to the pipeline component and WMT and what applies to Project-related marine shipping. Defining "Project" in this way also maintains consistency with the sections from the OH-001-2014 Report that were included as part of this MH-052-2018 Report.

The term "designated Project" is used to describe the entirety of the Project and the Project-related marine shipping.

1.3 OH-001-2014 hearing

1.3.1 The hearing process

Public hearing processes are designed individually and independently by the Board based on the specific circumstances of the application. Each process is designed to provide for a fair hearing. Through the *National Energy Board Rules of Practice and*

Procedure, 1995 and the Filing Manual, the Board provides specific details about what information is required to be filed in regard to any application to build and operate a new pipeline.[3] The List of Issues (Appendix 1) provides an outline of the issues that would be considered by the Board during the hearing.

For the Board's review of the Application, the hearing had significant written processes as well as oral components. With the exception of oral traditional evidence described below, evidence was presented in writing, and testing of that evidence was carried out through written questions, known as information requests (IRs). Intervenors submitted over 15,000 questions to Trans Mountain over two major rounds of IRs. Hundreds of other questions were asked in six additional rounds of IRs on specific evidence. If an intervenor believed that Trans Mountain provided inadequate responses to its questions, it could ask the Board to compel Trans Mountain to provide a more complete response. Trans Mountain could do the same in respect of IRs it posed to intervenors on their evidence. There was also written questioning on various additional evidence, including supplemental, replacement, late and Trans Mountain's reply evidence.

The Board decided, in its discretion in determining its hearing procedure, to allow testing of evidence by IRs and determined that there would not be cross-examination in this hearing. The Board decided that, in the circumstances of this hearing where there were 400 intervenors and a legislated time limit, and taking into consideration the technical nature of the information to be examined, it was appropriate to test the evidence through written processes. In the final analysis, the written evidence submitted was subjected to extensive written questioning by up to 400 participants and the Board.[4] The Board is satisfied that the evidence was appropriately tested in its written process and that its hearing was fair for all parties and met natural justice requirements. Comments about process provided in this hearing will be passed on for the consideration of future Board panels.

With the participation of approximately 400 intervenors and 1,250 commenters, the Board received evidence from those with first-hand knowledge and understanding about the specific circumstances along the corridor. This is why holding the public hearing was so valuable to the Board.

Over 1,600 participants in the hearing, including Indigenous people, businesses, communities, landowners, individuals and non-government and government organizations, had the opportunity to provide evidence about specific considerations that the Board took into account when coming to its recommendation. While not all those who were granted participation status participated in the hearing, many did participate in some or all hearing steps.

The Board's recommendation is founded upon the entire evidentiary record built through the oral and written parts of the hearing that formed the basis for the Board's deliberations.

1.3.2 Public participation

Participation by those members of the public who are either directly affected or have relevant information or expertise is one means of identifying potential and real impacts of a project. The Board required Trans Mountain to contact anyone who lives, works or uses land and resources along the proposed pipeline route. The Board also took a number of steps, beginning before the Application was received, to ensure that those who could be potentially affected by the Project were aware of it and knew how they could get involved in the review (see Appendix 5). Full details of the application to participate notification are contained in the Board's letter to Trans Mountain, dated 31 December 2013.

It is not unusual for hearing participants to be unfamiliar with how the NEB carries out its reviews. For a major project such as this one, the Board assigns a Process Advisory Team to help participants understand the hearing process and decide how best to participate.

The *National Energy Board Act* (NEB Act), section 55.2 states:

> On an application for a certificate, the Board shall consider the representations of any person who, in the Board's opinion, is directly affected by the granting or refusing of the application, and it may consider the representations of any person who, in its opinion, has relevant information or expertise.

The Board decides for each hearing whether to grant participation rights to any person and, if granted, the appropriate method of participation. In addition, if it is the Board's opinion that a person has relevant information or expertise about the environmental assessment required under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), the Board must provide that person with an opportunity to participate. Full details of the Board's ruling on participation are found in the Board's ruling of 2 April 2014.

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[3] The term "pipeline" is defined in section 2 of the NEB Act.

[4] Ruling No. 14 dealt with a notice of motion to include oral cross-examination of witnesses. (Appendix 7 provides an overview of the notices of motions that were filed.)

The Board recognizes that good decisions and recommendations consider the thoughts, views and opinions of directly affected people and those with a broad range of relevant information or expertise. Participants for this Project's hearing could apply to:

- write a letter of comment (commenter); or
- become an intervenor.

A letter of comment gives the writer an opportunity to express his/her knowledge, views or concerns about a project. These letters are considered evidence in the proceeding. People who wrote letters of comment in this hearing could not ask questions about other participants' evidence or make final argument, nor were they asked questions about their letters.

Intervenors could file evidence, submit notices of motion, and ask questions of Trans Mountain and other intervenors. They also had the opportunity to provide final written and oral argument. The Board, Trans Mountain and other intervenors could also ask them questions about their evidence.

Full details about participation in the hearing are set out in the Board's OH-001-2014 Hearing Order, dated 2 April 2014. Additional rules regarding hearing participation are contained in *National Energy Board Rules of Practice and Procedure, 1995*.

More details about the process and participation are provided in the hearing timeline in Appendix 5.

1.3.3 Participant funding

Public participation is an important element of an open and balanced regulatory process. To facilitate public involvement, the NEB is responsible for a Participant Funding Program (PFP), a transfer payment program independent from the regulatory review process. The objective of the PFP is to provide funding to facilitate the participation of Indigenous groups, landowners, individuals and groups, associations and not-for-profit organizations.

On 22 July 2013, the NEB announced it would make $1.5 million available to eligible intervenors to participate in the Trans Mountain Expansion Project hearing. Some intervenors raised concerns that the PFP process took too long and, given the large number of intervenors requesting funding, the level of funding was not sufficient. While the decisions on who received participant funding, how much, and the timing of those decisions were entirely separate from the regulatory hearing process, the Board notes the funding envelope was increased to $3 million on 16 July 2014. There was also special participant funding offered in September 2015 for up to $10,000 per applicant to cover eligible replacement evidence. In total, the PFP offered funding valued at $3,085,370 to 72 eligible intervenors; 79 per cent of this funding was offered to Indigenous groups.

Awards are announced in the Participant Funding Report on the NEB website. For more information about the PFP or to see the Participant Funding Report, go to http://www.neb-one.gc.ca/pfp.

1.3.4 Gathering oral Indigenous traditional evidence

Indigenous people in the Project area have a long relationship and connection with the land, water and resources. The Board recognizes that Indigenous traditional knowledge can help provide relevant information, including historical information, which may otherwise be unavailable. This information can also help identify potential environmental effects, strengthen mitigation measures, and lead to better-informed decision-making.

The Board wants to provide opportunities for Indigenous people to share their traditional knowledge in a way that is both meaningful to them and valuable for the Board's deliberations. The Board recognizes that Indigenous people have an oral tradition for sharing stories, lessons and knowledge from generation to generation. This information cannot always be shared adequately in writing.

In this hearing, the Board asked participating Indigenous groups to let the Board know if they wanted to present oral traditional evidence. The Board received notices of intent from 49 groups and individuals. Originally, the Board intended to hear this oral evidence in August and September 2014. The Board later amended its hearing schedule in response to the input received from a number of Indigenous groups who expressed concerns that the proposed schedule would interfere with the sockeye salmon harvest. As a result, the Board held sessions in Edmonton, Alberta, in September; Chilliwack, B.C., in October; Kamloops and Victoria, B.C., in November 2014; and Calgary, Alberta, in January 2015.

Indigenous intervenors were able to file written evidence in addition to their oral traditional evidence. Other intervenors, Trans Mountain or the Board could ask questions about the oral traditional evidence. Each Indigenous group could then decide whether they would respond to any questions orally, in writing, or both.

1.3.5 Board rulings

As part of the hearing process, the Board provided participants with guidance on how they could ask the Board to do something, such as change or modify a particular deadline. This is known as filing a notice of motion. Depending on the nature of the request and the circumstances surrounding it, the Board had the option of providing an opportunity for Trans Mountain and intervenors to comment on a notice of motion. The Board issued rulings on approximately 291 motions and review applications. The motions focused on, among other things:

- requests to extend deadlines and/or the statutory time limits;
- the release of emergency response plans;
- allegations of apprehension of bias of Panel Members;
- requests to file late evidence;
- calls to include oral cross-examination in the hearing process;
- constitutional questions; and
- challenges to the limitations on public access during the oral hearing.

In the case of each of these notices of motion, the Board provided rulings, including reasons. Appendix 7 provides an overview of the notices of motions throughout the hearing.

As part of closing argument, a number of intervenors made requests for relief other than requests that specifically addressed the intervenors' positions on the recommendation that the Board ought to make to the Governor in Council (GIC).

In some cases, these requests were presented as alternative requests to the intervenor's primary request that the Board recommend denial of the Project application. In other cases, the relief was advanced as the intervenor's primary position. Trans Mountain also made a request for other relief in its reply evidence and in its closing argument.

The Board has addressed other relief requested in Appendix 7.

1.3.6 Modifying the hearing schedule

The NEB Act, subsection 52(4) sets a 15-month time limit starting when the Board decides an application is complete to when the Board submits its report to the GIC. This may be extended under particular circumstances specified in the Act. On 2 April 2014, the Board found the Trans Mountain Expansion Project application complete and issued the OH-001-2014 Hearing Order.

In June 2014, Trans Mountain advised that its preferred corridor for the delivery lines to the WMT would run through Burnaby Mountain instead of around it as described in the original Application.

The new proposed pipeline corridor included two possible construction options through Burnaby Mountain; a horizontal directional drill and a tunnel. Trans Mountain retained the original route around the mountain as an alternative corridor.

In order for the Board and hearing participants to assess the new preferred pipeline corridor, the Board needed more information from the company, and this required more time. The Board, with the approval of the NEB Chair, announced an excluded period that ran from 11 July 2014 until 3 February 2015. The excluded period was not counted in the 15-month time limit that the Board had to make its recommendation to the GIC.

This excluded period provided time for hearing participants and the Board to review the new evidence, once filed, and test it through IRs. The time limit for the Board to issue its Report to the GIC was revised to 25 January 2016, more than six months later than the original date of 2 July 2015.

As Trans Mountain's preferred pipeline corridor through Burnaby had now changed, the Board opened a second "application to participate" process for those who might have been directly affected by, or might have had relevant information or expertise on, the new preferred corridor. This process ran from 8 to 24 September 2014 (as illustrated in the hearing timeline at Appendix 5).

On 21 August 2015, the Board announced, on its own volition, that it was striking Trans Mountain's filed evidence that was prepared by or under the direction of Mr. Steven J. Kelly. This action was taken to ensure the integrity of the hearing. The stricken evidence addressed, among other things, the issue of oil market supply and demand.

On 18 September 2015, the Board, with the approval of the NEB Chair, announced a second excluded period so that it could acquire information from Trans Mountain and intervenors in relation to the issues previously addressed by the stricken

evidence. As a result of this second excluded period, the legislated time limit for the Board to issue its Report to the GIC was extended to 20 May 2016.

The updated hearing timeline is provided in Appendix 5.

1.4 MH-052-2018 hearing

1.4.1 Tsleil-Waututh Nation and OIC P.C. 2018-1177

On May 2016, after an approximately two-year regulatory review (the OH-001-2014 hearing), the Board issued its OH-001-2014 Report recommending that the GIC approve the Project. Project-related marine shipping was considered as part of that review and report, but only under the NEB Act – not under the CEAA 2012. On 29 November 2016, the GIC approved the Project, issuing Order in Council (OIC) P.C. 2016-1069. Accordingly, on 1 December 2016, the Board issued CPCN OC-064 to Trans Mountain, along with amendments to other existing CPCNs. Additional related instruments in respect of the Project also came into effect at that time. These regulatory instruments authorized the construction and operation of the Project, subject to 157 conditions.

On 30 August 2018, the Federal Court of Appeal in *Tsleil-Waututh Nation v. Canada (Attorney General)*[5] set aside OIC P.C. 2016-1069, in part because, in the Court's view, the Board unjustifiably excluded Project-related marine shipping from the scope of the "designated project" reviewed under the CEAA 2012. The Court noted that this exclusion permitted the Board to conclude that section 79 of the *Species at Risk Act* (SARA) did not apply to its consideration of the effects of Project-related marine shipping.[6] However, the Court noted that the Board had considered Project-related marine shipping under the NEB Act, and that the report was adequate for the purpose of informing the GIC about the effects of Project-related marine shipping on the Southern resident killer whales and their use by Indigenous groups.[7]

The Court stated that the issue of Project approval should be remitted to the GIC for redetermination, and the GIC must refer the Board's recommendations and its terms and conditions back to the Board for reconsideration.[8] At paragraph 770 of its judgment, the Court stated:

> Specifically, the Board ought to reconsider on a principled basis whether Project-related shipping is incidental to the Project, the application of section 79 of the [SARA] to Project-related shipping, the Board's environmental assessment of the Project in the light of the Project's definition, the Board's recommendation under subsection 29(1) of the [CEAA 2012] and any other matter the [GIC] should consider appropriate.

In OIC P.C. 2018-1177 dated 20 September 2018, the GIC, on the recommendation of the Minister of Natural Resources, pursuant to section 53 of the NEB Act and section 30 of the CEAA 2012:

a) refers back to the National Energy Board for reconsideration the recommendations and all terms or conditions set out in its May 19, 2016 report entitled *Trans Mountain Expansion Project OH-001-2014* that are relevant to addressing the issues specified by the Federal Court of Appeal in paragraph 770 of *Tsleil-Waututh Nation v. Canada (Attorney General)* (2018 FCA 153), including Conditions 91, 131 to 134, 144 and 151;

b) directs that the Board conduct the reconsideration taking into account the following factors:

   i. the environmental effects of Project-related marine shipping in view of the requirements of the *Canadian Environmental Assessment Act, 2012*, and

   ii. the adverse effects of Project-related maritime shipping on species at risk, including the Northeast Pacific southern resident killer whale population, and their critical habitat, in view of any requirements of section 79 of the *Species at Risk Act* that may apply to the Project; and

c) directs that the Board complete its reconsideration within 155 calendar days after the day on which this Order is made.

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5 2018 FCA 153

6 *Ibid* at para 469 & 765.

7 *Ibid* at para 439.

8 *Ibid* at para 768-769.

The Chair of the Board assigned a panel of three Board members (Lyne Mercier – presiding, Alison Scott, and Murray Lytle) to conduct the Reconsideration (the Reconsideration Panel). In carrying out the Reconsideration, the Board held a public hearing (the MH-052-2018 hearing) and has prepared this MH-052-2018 Report as a result.

1.4.2 The hearing process

Prior to issuing a Hearing Order and deciding on the scope of the Board's Reconsideration, on 26 September 2018, the Board sought public comments on:

1) whether, "on a principled basis,"[9] Project-related marine shipping should be included in the "designated project" to be assessed under the CEAA 2012;
2) the draft Amended Factors and Scope of the Factors for the Environmental Assessment pursuant to the CEAA 2012 (Amended Factors Document), and a draft List of Issues to be considered in the MH-052-2018 hearing;
3) the design of the hearing process to be used for the Reconsideration; and
4) which government departments or bodies the Board should require information from during the hearing.

On 5 October 2018, the Board sought additional, focused comments from the Parties on the following limited issue:

> Assuming Project-related marine shipping is included in the "designated project" to be assessed under the CEAA 2012, should the designated project be defined as including:
>
> a) Project-related marine shipping between the WMT and the territorial sea limit; or
> b) Project-related marine shipping between the WMT and the outer boundary of Canada's exclusive economic zone?

The comments received are found on the Board's online public registry. These comments were considered by the Board in reaching the various decisions it communicated in a series of documents on 12 October 2018, which included:

- Hearing Order MH-052-2018, to which the List of Issues and the Amended Factors Document were attached;
- a letter requesting specialist or expert information or knowledge in the possession of each of Fisheries and Oceans Canada, Environment and Climate Change Canada, Transport Canada, Vancouver Fraser Port Authority, Pacific Pilotage Authority, Health Canada, Parks Canada, and Natural Resources Canada (collectively, the Federal Authorities),[10] pursuant to paragraph 20(a) of the CEAA 2012; and
- filing requirements for Trans Mountain.

The Board released reasons for these decisions on 29 October 2018.

The Board's Hearing Order set out the steps and deadlines to guide all participants in the MH-052-2018 hearing. Via subsequent procedural updates and rulings, the Board revised or introduced certain steps and deadlines.

As described in the Hearing Order, the List of Issues, the Amended Factors Document, and the Reasons issued on 29 October 2018, the scope of the Reconsideration was limited. The Reconsideration Panel carried out an environmental assessment of Project-related marine shipping pursuant to the CEAA 2012. In carrying out this assessment, it considered relevant evidence filed in the OH-001-2014 hearing and the new or updated evidence submitted through the MH-052-2018 hearing. The Reconsideration Panel made its recommendations pursuant to the CEAA 2012, as detailed in this Report, then considered whether the submissions made in the Reconsideration process led to a confirmation or modification of the overall recommendation made in the OH-001-2014 Report.

The time limit set out in OIC P.C. 2018-1177 required the Board to complete the Reconsideration process and issue its Reconsideration Report no later than 22 February 2019. Despite the expedited hearing process, the MH-052-2018 hearing had many steps that were similar to the OH-001-2014 hearing. With the exception of oral traditional evidence described below, evidence was presented in writing and testing of that evidence was carried out through written IRs. Parties had the

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[9] *Supra* note 6 at para 770.

[10] The Board gave all of the Federal Authorities intervenor status, regardless of whether a particular Federal Authority registered for that role or not, meaning that they were required to answer any information requests asked of them by the Board or other Parties regarding the information or knowledge they filed in response to the Board's letter, or any other evidence they filed.

opportunity to ask the Board to compel other Parties to provide more complete responses to IRs and also to file final argument.

1.4.3 Public participation

Between 26 September and 3 October 2018, the Board held a process through which individuals and groups could apply or register to participate in the MH-052-2018 hearing. Information about the Board's application to participate process was contained in the Board's letter to all Parties to the OH-001-2014 hearing and all Indigenous groups on the Crown list, which was also posted on the Board's website and circulated to the media.

Intervenors in the OH-001-2014 hearing at the time that the Board issued its OH-001-2014 Report were guaranteed intervenor status in the MH-052-2018 hearing, if they chose to participate and register. Any other member of the public was able to apply to participate as an intervenor. For those that were not intervenors in the OH-001-2014 hearing, the Board indicated the following:

> Intervenor status will be granted to those who, in the Board's opinion, are directly affected or have relevant information or expertise. Applicants must demonstrate how they meet this criteria as they relate to the draft List of Issues for the MH-052-2018 hearing.

Anyone not granted intervenor status, as well as any other member of the public, was able to file a letter of comment on the hearing record by 20 November 2018. The Board received various letters after this deadline that did not include justification for lateness. These were not considered as part of the record.

In the Board's 5 October 2018 Ruling No. 1, it announced the List of Parties,[11] based on the applications to participate received by the deadline. The Board's reasons for its participation decisions were issued separately on 11 October 2018.

Throughout the hearing, the Board received and ruled on additional late applications to participate as intervenors. Some intervenors also withdrew from the hearing. At the time that the Board finalized its MH-052-2018 Report, there were 118 intervenors, the majority of which were intervenors during the OH-001-2014 hearing. The list of intervenors is found in Appendix 6.

1.4.4 Participant funding

On 26 September 2018, the Participant Funding Program announced a simplified funding process for this hearing to reduce administrative burden. Eligible groups could request up to $80,000, and individuals up to $12,000, to participate in the MH-052-2018 hearing. The Participant Funding Program offered a total of $4,981,760 to 69 recipients; of which 82 per cent was offered to Indigenous intervenors. The Participant Funding Program is a reimbursement-based program, therefore actual payments to groups and individuals depended on eligible costs claimed by recipients and approved for payment by the NEB.

1.4.5 Gathering oral Indigenous traditional evidence

The Board heard comments that Indigenous intervenors wanted the opportunity to provide traditional evidence orally for the MH-052-2018 hearing. The Board was honoured that Elders, Chiefs and community members chose to share their ceremonies, songs, prayers and stories. Throughout this MH-052-2018 Report the Board includes evidence heard through oral traditional evidence. This evidence was valuable to the Board as it undertook its deliberations.

Between 20 November and 6 December 2018, the Board heard oral traditional evidence from 25 Indigenous intervenors. Oral traditional evidence sessions were held in:

- Calgary, Alberta from 20-22 November;
- Victoria, B.C. from 26-29 November; and
- Nanaimo, B.C. from 3-6 December.

The Board described the process it would use to hear oral traditional evidence in Procedural Direction No. 1 and Procedural Direction No. 2.

The Board offered to hear oral traditional evidence in person at any of the announced locations, or remotely while it sat in Calgary. Two Indigenous intervenors that could not appear before the Panel provided their oral traditional evidence

[11] The Parties included Trans Mountain and all intervenors.

remotely by teleconference, one of which took place while the Board was in Nanaimo. Indigenous intervenors could also supplement their oral traditional evidence presentation – for example, if they felt they required more time – with an audio or video recording. Some indigenous intervenors provided the Board with a video recording of oral traditional evidence presentations.

Parties had an opportunity to respectfully ask questions about oral traditional evidence. The Board also asked questions of clarification. Indigenous groups could decide to answer questions orally, in writing, or both.

The Board broadcasted live audio of each day's oral traditional evidence presentations, made media files available for download, and produced written daily transcripts that can be found on the online public registry. The exception to this involved a portion of Tsleil-Waututh Nation's presentation, which, through Ruling No. 17, the Board decided to hear confidentially.

1.4.6 Board rulings

The Board received several process-related requests and notices of motion throughout the MH-052-2018 hearing. In response to these, the Board issued 30 rulings, some of which resulted in process changes, including to deadlines.

Following the issuance of the Hearing Order and Appendices, the Board issued its Reasons for the rulings contained in those documents, by letter dated 29 October 2018. The letter attached two appendices: Appendix 1 provided the reasons for including Project-related marine shipping between the WMT and the 12-nautical-mile territorial sea limit in the "designated project;" Appendix 2 provided the reasons for the remainder of the decisions made in relation to the Hearing Order and its attachments. Those reasons are referred to in this MH-052-2018 Report as the 29 October 2018 Reasons (Appendix 1 or 2).

The Board was also asked to review various decisions it made, including the spatial limit for its assessment of Project-related marine shipping under the CEAA 2012. Ruling 22 provided the Board's reasons related to these review requests.

A summary of the requests and notices of motions received, and the decisions the Board made with respect to them, is found in Appendix 7.

1.5 Issues raised in argument

During written argument-in-chief for the MH-052-2018 hearing, participants raised a numerous issues related to the hearing process, scope of the hearing, and other legal arguments. The Board's views on many of these issues are discussed in this section. However, the Board views regarding other legal issues related to mitigation under the CEAA 2012, and the SARA requirements are covered in Chapter 14.

1.5.1 Procedural fairness

Some parties argued that the Board's Reconsideration process breached requirements for procedural fairness. Their arguments included the following points:

- That significant procedural fairness was owed and the timelines in the Reconsideration were unreasonable. An extension under subsection 52(7) of the NEB Act should have been sought by the Board.
- More time was required because intervenors had to review approximately 8,000 pages of direct evidence from Government departments and Trans Mountain.
- Large quantities of evidence were provided in response to written information requests that were filed on 31 December 2018 and motions to compel better responses that were granted were only filed shortly before final argument was due.
- Participant funding was limited.
- Oral cross-examination was not offered and unsatisfactory responses were received to questions asked in the form of written information requests.
- Only written final argument and not oral final argument was provided.
- The locations for oral traditional evidence were too far away from the Lower Mainland.

Trans Mountain countered that in its view procedural fairness was satisfied. Its arguments included the following points:

- Procedural fairness varies with the context and interests at stake and here the Reconsideration was narrow in scope, which should inform procedural fairness.

- Having a fair but expedited hearing was consistent with the NEB Act and the direction from both the Federal Court of Appeal and the OIC for a prompt redetermination.
- All parties had an opportunity to fully and fairly present their case.
- In response to a notice of motion from Squamish Nation and supported by other intervenors the Board granted the request for an additional 15 days for filing intervenor evidence. In contrast Trans Mountain had a very limited time to file its reply evidence

Views of the Reconsideration Panel

Summary

The Board has determined that parties raising concerns about the fairness of the hearing process have not demonstrated that the Board breached any duty of procedural fairness. In considering individual issues raised as well as considering procedural fairness in the context of the entire hearing process, all parties had a meaningful opportunity to present their case fully and fairly. This included an opportunity to comment on the MH-052-2018 hearing process, file evidence, present Indigenous oral traditional evidence, ask written questions and receive responses and present final written argument. Parties had an opportunity to challenge evidence they did not agree with. The Board considers that hearing deadlines, as amended, were fair.

The Law: Was the Board's Reconsideration Process Procedurally Fair?

The Board as a public authority that makes decisions and recommendations that affects the rights, privileges or interests of individuals and groups, including Indigenous people, owes a duty of procedural fairness to the parties before it. [12]

In describing the variable nature of procedural fairness which depends on the context and circumstances in each case, the Court in *Tsleil-Waututh Nation* went on to list and apply the non- exhaustive factors from *Baker v. Canada (Minister of Citizenship & Immigration*) which are used in determining what procedural fairness requires in a particular circumstance. [13]

In discussing whether procedural fairness has been satisfied in a particular case it is useful to keep in mind that a variety of procedural options are available to meet the duty to be fair. While it is important to keep in mind individual claims specific to procedural fairness, it is also important to assess them in the context of the process for the Reconsideration as a whole. There is generally no right to the most advantageous procedure[14] but parties can expect a decision or recommendation pursuant to statutory authority will be made fairly.

Taking into consideration a number of factors, the Court in *Tsleil-Waututh Nation* determined that the procedural fairness owed in the OH-001-2014 hearing was "significant" and that parties were entitled "to a meaningful opportunity to present their cases fully and fairly." The Court stated that this "included in the right to present a case fully is the right to effectively challenge evidence that contradicts the case."[15]

Taking into consideration the importance of the Board's recommendations and the ultimate GIC decision on the rights of parties, and other factors discussed in *Tsleil-Waututh Nation*, the Board accepts that procedural fairness owed in the Reconsideration is significant. The main difference between the Reconsideration and OH-001-2014 is that the Reconsideration was more narrowly focused and the Reconsideration also had shorter time limit for completion. These differences were considered as part of the overall context of the Reconsideration.

Hearing timelines

At issue is whether when taking into account the new evidence filed by Trans Mountain and Federal Departments and Agencies, that the overall timelines for the Reconsideration were so tight that intervenors did not have an opportunity

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[12] *Tsleil-Waututh Nation*, para. 230

[13] [1999] 2 S.C.R. 817, 174 D.L.R. (4th) 193 (S.C.C.). The factors being the nature of the decision being made and the process followed in making it; the nature of the statutory scheme, including the existence of an appeal procedure; the importance of the decision to the lives of those affected; the legitimate expectations of the person challenging the decision; and, the choice of procedures made by the decision-maker.

[14] *Ironside v. Alberta (Securities Commission), [2009]* A.J. 376 at para 107 (Alta C.A.).

[15] *Tsleil-Waututh Nation* at para 235.

to fully and fairly make their case. Related to this point was whether there was a breach of procedural fairness that the Board did not make a request of the Minister under subsection 52(7) of the NEB Act to extend the time limit by an additional period.

The Board is of the view that its previous findings regarding the timeline still apply to assertions made about timing during final argument:

> The Board received comments stating that the timeline for the hearing, including the time allotted for the initial comment process, is too short. Others commented that the Board should extend the timeline or seek an extension from the GIC.
>
> The Board acknowledges that the timeline is not lengthy. This requires an expedited process and the need for Parties to stay focused on the hearing steps and to work diligently. Section 53 of the NEB Act authorizes the GIC to direct the Board to undertake a reconsideration based on any factor specified, and to specify a time limit for the Board to complete its reconsideration. In this focused Reconsideration, it is not necessary that the Board have the same timelines as a new application. There is already significant evidence on the record on numerous topics being examined. Many of the Parties will also be familiar with the record from the OH-001-2014 hearing. Consistent with subsection 11(4) of the NEB Act, there is a need for proceedings to be conducted expeditiously and fairly and, in any case, within the time limit set by the GIC.[16]

Consistent with both the Court's direction for a prompt redetermination[17] and the OIC, while the Reconsideration time line was expedited, the Board is satisfied that parties had a fulsome opportunity in the Reconsideration to make their case and challenge evidence from Trans Mountain and Federal Departments and Agencies. If there were particular circumstances requiring additional time, the Board explicitly stated that it was open to considering such requests.[18] Both Squamish Nation and Tsleil-Waututh Nation did file a request on 5 November 2018 requesting that intervener evidence be moved from 20 November to 5 December 2018 (Trans Mountain and Federal Departments and Agencies had filed direct evidence on 31 October 2018).

Squamish, for example, said it had been diligently working since the Board's letter of 26 September 2018 to retain experts. A number of intervenors wrote in support of the extension request. The Board fully granted the 15 day extension request. In doing so the Board recognized the fundamental importance of parties being able to full present their case with evidence. The Board also took into account the volume of evidence that Federal Departments and Agencies, in particular, had filed. This all factored into the extension request being granted in full. The Board stated that, in order to accommodate the 15-day extension, it had to shorten some other deadlines and compress the Board's own time for writing the MH-052-2018 Report.

On the revised deadline for intervenor evidence to be filed, the Board received dozens of reports and studies. This included those prepared by asserted experts from intervenors. There were a very limited number of parties that made requests to file late evidence, and those requests were considered on a case by case basis. In the Board's view, taking into consideration the limited scope of the Reconsideration, that parties had notice of the need to start preparing evidence since 26 September 2016 and that as requested a 15 day extension to the deadline of filing intervenor evidence was granted, the Board considers that parties had an adequate opportunity to fully and fairly present their case and procedural fairness was not breached.

With respect to the time lines to complete the balance on the Reconsideration process, while at times comment processes occurred on an expedited basis, parties appeared to have provided detailed comments within established time lines. Particularly for intervenors, in the Board's view there was a reasonable amount of time to ask written questions regarding other parties' evidence.[19] While responses to questions resulted in additional evidence being filed on 31 December 2018, intervenors had over 3 weeks from this time to file written argument-in-chief. Where motions to compel were granted, the responses were filed closer to written argument, although these additional responses added limited new materials.

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[16] 29 October 2018 NEB Appendix 2 – Trans Mountain Expansion – Reconsideration – reasons to the List of Issues and Hearing Process, pages 18 and 19.

[17] *Tsleil-Waututh Nation* at paras 768 and 774.

[18] *Supra* note 16 at pg 19. Hearing Order MH-52-2018 at pg 13.

[19] Information requests were due on 17 December 2018, which was more than 6 weeks after Trans Mountain and Federal Departments filed their direct evidence.

Taking all these facts and circumstances into consideration, the Board is of the view that hearing process deadlines, as amended, allowed parties to fully and fairly present their case and challenge evidence, and resulted in a procedurally fair hearing.

With regard to subsection 52(7) of the NEB Act, this extension provision arises in the context of the time limit that applies in a section 52 certificate hearing; its application to the time limit of a Reconsideration is questionable. Even if this subsection has application to a Reconsideration, the Board is not persuaded that a convincing case was made for the Board to make such a request of the Minister. Consistent with subsection 53(2) of the NEB Act which authorizes the Minister to impose a time limit for the Board to complete its Reconsideration, a 22 February 2019 time limit was imposed in the OIC, which is binding on the Board. The Board is not persuaded that such a time limit breached the requirement for a fair hearing. When a large number of parties made a specific request for more time, the request was granted. No party made a compelling case during the hearing process as to why the Board was required to request more time from the Minister in the context of a focused Reconsideration.

Participant funding

Limited comments were received that participant funding was insufficient to allow meaningful participation.

The Board provided information, forms and contact information regarding participant funding early in the hearing process. The Board's letter of 26 September 2018 stated:

> Participant funding is available to facilitate eligible intervenors' participation in this hearing. A simplified funding process will be used for this hearing to reduce administrative burden. Eligible groups may request up to $80,000, and individuals up to $12,000.
>
> For information about participant funding and eligible costs, visit www.neb-one.gc.ca/pfp or contact a Participant Funding Program Coordinator at 1-800-899-1265.
>
> The Participant Funding Request Form is found at the link above, and also attached to this letter as Appendix 3.

In the few instances that parties raised participant funding as an issue, there were no detailed comments filed explaining why the funding amounts were insufficient or could not be accessed on a timely basis. It is worth noting that parties were advised that intervenors from the OH-001-2014 hearing were guaranteed intervenor status in the Reconsideration. As a result, there should not have been a concern about whether intervenor standing would be granted. Also parties had the opportunity to work with other parties and divide up issues or jointly tackle issues. For example, Tsleil-**Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, and the** City of Vancouver filed joint evidence from Dr. Gunton and Dr. Joseph.

For all these reasons, in the circumstances of the Reconsideration the Board is not persuaded that concerns raised about participant funding established there was a breach of procedural merit.

Lack of cross-examination and oral final argument

The issue raised about having only written questioning, and not oral cross-examination, was covered in detail in Ruling No. 14 in OH-001-2014 and in *Tsleil-Waututh Nation* and the Board adopts those reasons. In the context of this multi-party public hearing that is a reconsideration of a past hearing resulting in recommendations to GIC, the Board is of the view that the duty of fairness does not necessarily require cross-examination. Parties had an opportunity to challenge evidence both by filing their own evidence in response and by asking written questions and receiving responses. Parties unsatisfied with answers received had an opportunity to file motions to compel a better answer. For parties now claiming that responses received were inadequate, such a concern should have been appropriately detailed and raised ahead of final argument.

With respect to a concern raised about not having final oral argument the issue is whether, in looking at the hearing process as a whole, the lack of oral final argument was unfair. Largely the main process difference from the OH-001-2014 hearing to the MH-052-2018 hearing is that the Reconsideration added a step of providing parties the option of filing an opening statement with their evidence but the Reconsideration did not have oral summary argument. Parties were advised early in the Reconsideration to include all pertinent argument in their written argument-in-chief. The Hearing Order clearly stated that oral summary argument or oral summary argument on specific issues only "may be

held if needed and time permits."[20] Later in Procedural Direction No. 4 the Board advised parties that it decided that oral argument was not necessary. The Board stated:[21]

> The Board is not persuaded that such argument is necessary. This takes into consideration that the Board provided additional time for intervenors to prepare their evidence and an opportunity for Indigenous groups to provide oral traditional evidence at two locations on Vancouver Island. There is not sufficient time to also have oral summary argument, nor is oral argument considered necessary given the specific focus in the MH-052-2018 hearing and the List of Issues.
>
> It is up to the Board's discretion whether it considers written versus oral argument to be the most helpful it making its decision or recommendation. As stated in the Hearing Order, "[t]he Parties should include all pertinent argument in their written argument-in-chief, as [oral summary argument] may not be held." The Board looks forward to considering written final argument from the Parties.

Consistent with the case law cited above, the Board is of the view that there is no one process that is necessary to satisfy procedural fairness in the circumstances of this Reconsideration. While some hearings at the Board have an oral final argument or summary argument component, in some instances the Board has had only written final argument so there is no legitimate expectation[22] of oral final argument.[23] Such an approach is consistent with section 22 of the *National Energy Board Rules of Practice and Procedure, 1995*.

In the case of this Reconsideration, the Board invited submissions on the process the Board should follow and considered those comments in designing a process. Necessarily, process steps may involve some compromise. Here the Board determined it was important to provide an opportunity for Indigenous oral traditional evidence, and many Indigenous intervenors participated by providing oral evidence. Additionally, part way through the hearing process, the Board was persuaded by a number of requests to provide additional time for the foundational step of preparing intervenor evidence. This limited the time available to hear a large group of parties provide oral final argument. In any event, parties had an opportunity to provide full final argument in written form and the Board determined in its discretion that it did not also require oral final argument. The Board does not dispute that there can be utility in the Board having oral final argument; however, it was not required in the circumstances of the Reconsideration. For all these reasons, in considering the Reconsideration process as a whole, the Board is not persuaded oral final argument was required for the hearing to be fair.

Concern that locations for Indigenous oral traditional evidence on Vancouver Island required too much travel

The Board previously ruled on this issue in Ruling No. 7 and found that the overall design of the hearing process was procedurally fair for Indigenous intervenors including those from the Lower Mainland. Those reasons continue to be relied upon by the Board and no basis has been provided to overturn this ruling.

Procedural fairness as a whole

The Board has responded to specific concerns raised which allege the Reconsideration process was procedurally unfair. However, as reflected in the views above, the whole of the Board's process must be considered in order to determine whether the Board's overall process for the Reconsideration was procedurally fair. Such a determination must take into consideration the circumstances that this was a focused Reconsideration with a specific time limit applying. Many of the parties would have been familiar with at least elements of the subject matter of the Reconsideration as they participated in the OH-001-2014 hearing. While the process was expedited, there were a number of steps, which when considered as a whole, allowed for meaningful participation. These process steps included opportunities to:

1. Comment on several aspects of the Reconsideration including the design of the hearing process.
2. File and respond to notices of motion and review applications as considered appropriate.

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[20] Hearing Order MH-52-2018 page 8.

[21] 10 January 2019, Procedural Direction No. 4, pages 1 to 2.

[22] Legitimate expectations as contemplated by *Baker, supra* note 12.

[23] As stated above, parties were advised early on that oral summary argument, or oral summary argument on specific issues would only be held if needed and time permits. Comparable although not identical participation opportunities were offered in the GH-002-2015 hearing regarding the 2017 Nova Gas Transmission Ltd. System Expansion Project (where the GIC decision and NEB recommendation were considered and affirmed in *Bigstone Cree Nation v. NGTL*, 2018 FCA 89). Hearing steps in GH-002-2015 included an opportunity to provide oral traditional evidence, written evidence, written information requests and written final argument.

3. File written evidence in response to the evidence of Trans Mountain and Federal Departments and Agencies, and to address the List of Issues for the Reconsideration. This included being granted a 15 day extension as many of the intervenors requested.
4. Present oral Indigenous evidence, either in person or remotely, on Vancouver Island or in Calgary, or through an audio or video recording.
5. Ask information requests of other Parties' written evidence, and to file motions to compel full and adequate answers if the responses are not considered adequate; and
6. Filing written-argument-in chief, including replying to the argument of Trans Mountain, the Federal Departments and Agencies and the advice provided by Marine technical advisor John A. Clarkson[24]. Parties could also comment on draft conditions and recommendations.

Participant funding was also available for hearing steps undertaken and travel costs. For all the above reasons, the Board is not persuaded that there was a breach in procedural fairness in the Reconsideration process.

1.5.2 Reliance on the OH-001-2014 hearing

In final argument, parties submitted diverging views regarding the extent to which the Reconsideration panel should rely on the assessment of Project-related marine shipping from the OH-001-2014 hearing. Some intervenors supported less reliance on the assessment from the OH-001-2014 hearing. For example, TWN argued that the extent to which the OH-001-2014 Report failed to meet the statutory requirements of the CEAA 2012 was not narrow in scope nor minor or technical in nature. TWN said that the FCA did not hold that the Board was permitted to simply re-use the findings it made on matters that were erroneously considered under the NEB Act. The Province of B.C. also said that the Board is not precluded from reconsidering evidence from the OH-001-2014 hearing and reaching different conclusions, so long as it limits its review to the scope of matters the GIC identified for reconsideration. Tsartlip First Nation argued that the Board's environmental assessment in this reconsideration under the CEAA 2012 is not functionally or legally the same as its environmental assessment conducted in the OH-001-2014 hearing. The Board is not bound to its past assessments in the OH-001-2014 hearing.

In contrast, Trans Mountain argued that the scope of the reconsideration was limited and nothing in the FCA's decision requires the Board to re-assess effects of Project-related marine shipping that were already assessed in OH-001-2014. Similarly, the Government of Alberta said that the scope of this reconsideration is targeted and narrow. The Board's original public interest inquiry was thorough and substantially complied with the requirements of the CEAA 2012. The "successive deficiencies" the Court identified in *Tsleil-Waututh Nation* flow not from the Board's approach to its public interest review of the environmental effects of Project-related marine shipping, but from its failure to "justify" its decision to exclude Project-related marine shipping from the "designated project." The underlying review itself was *not* deficient. In light of this, the primary focus of the Reconsideration is building upon the Board's original assessment of Project-related marine shipping by considering and evaluating mitigation or alternative measures.

Views of the Reconsideration Panel

As directed by the OIC and, as reflected in the Board's List of Issues, this Reconsideration is focused on Project-related marine shipping – a comparatively narrow scope to the OH-001-2014 hearing. The Board did not consider evidence or revisit issues that were outside of the scope of the Reconsideration. To understand the scope of the Reconsideration with respect to matters that fall within the List of Issues for the Reconsideration, it is important to look at what was assessed in the OH-001-2014 hearing. Although the Board did not include Project-related marine shipping under its CEAA 2012 environmental assessment during the OH-001-2014 hearing, the Board did consider Project-related marine shipping under the NEB Act. Issue #5 from the OH-001-2014 hearing List of Issues was "the potential environmental and socio-economic effects of marine shipping activities that would result from the proposed Project, including the potential effects of accidents or malfunctions that may occur." The Board also issued filing requirements specific to the issue of the potential effects of Project-related marine shipping activities.

The Board's reasons for its decision related to the List of Issues, Factors for the environmental assessment, and hearing process design outlines what was examined in the OH-001-2014 hearing:

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[24] Mr. Clarkson was appointed by the federal government pursuant to section 10 of the NEB Act. Mr. Clarkson provided advice to the Board in the form of written argument-in-chief about evidence and draft conditions and recommendations filed on the record. At least one party raised a concern in final argument that Mr. Clarkson's participation was unfair. However, the Board is of the view that since all parties had an opportunity to comment on Mr. Clarkson's advice, there was no breach of procedural fairness. Rules of evidence concerning experts that may apply in a Court process, do not strictly apply in the Board's hearing process.

> When carrying out its analysis under the NEB Act, the Board followed an approach similar to the [environmental assessment] conducted for the pipeline component under the CEAA 2012. As a result of this approach, the Board collected extensive evidence relevant to Project-related marine shipping. For example, Chapter 14 of the Board's OH-001-2014 Report extensively considered the effects of Project-related marine shipping, and the significance of those effects. Chapter 8 considered the environmental behaviour of spilled oil, and related environmental effects. This is reflected in the Federal Court of Appeal's decision in *Tsleil-Waututh*, when it stated that the Board, among other things, considered the effects of Project-related marine shipping on Southern resident killer whales (SRKW) and the significance of those effects,[25] and that the OH-001-2014 Report was adequate for the purposes of informing the GIC about the effects of Project-related marine shipping on SRKW and their use by Indigenous groups, and of the significance of these effects.[26]
>
> The Board has indicated that the entirety of the evidence filed in the OH-001-2014 hearing will be included as part of its record for this MH-052-2018 hearing, and will be considered by the Board to the extent it is relevant to the List of Issues for the MH-052-2018 hearing.

Accordingly, the Reconsideration List of Issues stated:

> Parties are expected to limit their evidence filings to **new or updated** evidence (including comments from the public, community knowledge, and Indigenous traditional knowledge) relevant to the above issues. Parties are not required to re-file or re-test evidence on the record of the OH-001-2014 hearing. It is recommended that Parties focus their evidence on aspects of the above issues that were not fully canvassed in the OH-001-2014 hearing.

The Board recognized that a couple of issues in the Reconsideration List of Issues had not been thoroughly canvassed in the OH-001-2014 hearing and ensured that these were addressed in the MH-052-2018 Report. For example, mitigation of significant adverse environmental effects of Project-related marine shipping (Issue #2) and measures to avoid or lessen the adverse effects of Project-related marine shipping on SARA-listed wildlife species and their critical habitat (Issue 5).

The Board also accounted for the fact that many aspects of Project-related marine shipping were thoroughly canvassed in the OH-001-2014 hearing, particularly the environmental effects of Project-related marine shipping. However, this did not mean that the Reconsideration Panel blindly adopted the Board's findings on these aspects of Project-related marine shipping from the OH-001-2014 hearing. For matters that fall within the List of Issues for the Reconsideration, the Reconsideration Panel was open to the possibility of altering the Board's previous findings based on new or updated evidence. In the Reconsideration, the onus remained on Trans Mountain to make the case for its Project.

The Board carried out a full environmental assessment of Project-related marine shipping in accordance with the requirements of the CEAA 2012, SARA, OIC and paragraph 770 of *Tsleil-Waututh Nation* in this MH-052-2018 hearing. This included a comprehensive assessment of the factors and environmental effects set out in sections 19 and 5 of the CEAA 2012, respectively. As a result of its EA, the Board made its recommendations under subsection 30(4) of the CEAA 2012. The Board also considered whether its recommendation under the CEAA 2012 resulted in changes or additions to the recommendations (including recommended terms or conditions) from the OH-001-2014 hearing.

The interplay between Project-related marine shipping matters canvassed in the OH-001-2014 hearing and Reconsideration is reflected in the layout of the MH-052-2018 Report. For issues that fell within the scope of the MH-052-2018 hearing, the Reconsideration Panel included views of the parties from the OH-001-2014 hearing where they were still applicable. These were then followed by new or updated evidence raised by the parties in the MH-052-2018 hearing. The views of the Reconsideration Panel contain Board views from the OH-001-2014 Report that they found to remain applicable after considering relevant evidence from both the OH-001-2014 and MH-052-2018 hearings. The views of the Reconsideration Panel also include additional views to address the new or updated evidence and explain if it confirms or modifies the Board's previous findings from the OH-001-2014 hearing.

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[25] *Tsleil-Waututh Nation* at para 438.

[26] *Ibid* at para 439.

1.5.3 Changed circumstances regarding need, economic feasibility, and financial matters

A number of parties filed evidence regarding the changed circumstances related to the need for and the economic feasibility of the Project since the OH-001-2014 hearing, including evidence on changes to supply and markets. Parties also argued that the Board should reconsider financial matters arising from Canada's purchase of the Project and associated changes to Trans Mountain's corporate structure.

Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, and Snuneymuxw First Nation submitted a report by Mr. David Hughes entitled "Report on the Need For, and Economics Of, the Trans Mountain Expansion Project." In this report, Mr. Hughes evaluated if any significant developments have occurred since the OH-001-2014 Report that materially affect the conclusions regarding the need for and the benefits of the Project. Based on the developments, Mr. Hughes evaluated the need for the Project and if the Project will increase the price per barrel of oil that Canadian producers obtain.

Some intervenors, including Stz'uminus First Nation, Snuneymuxw First Nation and City of Burnaby, argued that the Board must consider new information, including economics of the Project, when reweighing the Project's benefits and burdens.

In its Argument-in-Chief, Trans Mountain asked the Board to take judicial notice of recent events that support the need for increasing Canadian pipeline export capacity to tidewater and, therefore, support the conclusion in the OH-001-2014 Report that the economic benefit of the Project is significant.

Views of the Reconsideration Panel

In the MH-052-2018 hearing, the Board did not consider any new evidence filed on need for the project, economic feasibility, or financial matters.

The scope of the MH-052-2018 hearing was defined by the List of Issues, released by the Board on 12 October 2018, and did not include need for the project, economic feasibility, or financial matters. The Board developed the List of Issues following comments from parties. The Board addressed this matter in the 29 October 2018 Reasons (Appendix 2)[27] and Ruling No.22[28].

Therefore, Chapter 12: Need for the Project and economic feasibility and Chapter 13: Financial Matters in this MH-052-2018 Report are the same as they were in the OH-001-2014 Report, as they fall beyond the scope of the MH-052-2018 hearing. These chapters contain the views of the original panel from the OH-001-2014 hearing, including the requirement for Trans Mountain to comply with Conditions 57 and 121, which remain unchanged.

As economic feasibility and the need for the Project fall outside of the List of Issues, the Board did not consider or give any weight to Mr. Hughes' report or any other evidence filed by parties with respect to these issues. The Board also rejects Trans Mountain's request for the Board to take judicial notice of recent events that support the need for increasing Canadian pipeline export capacity to tidewater. Furthermore, the Board is not persuaded that it should consider new information on the economics of the Project when reweighing the Project's benefits and burdens for its public interest recommendation. This would essentially circumvent the List of Issues and open the MH-052-2018 hearing up to other issues indirectly, rendering the purpose of section 53 of the NEB Act and narrow scope of the OIC meaningless.

Consistent with section 53 of the NEB Act, both the Federal Court of Appeal and the OIC prescribed a limited scope for the Reconsideration. The Board went out for comment early on regarding the scope of the Reconsideration and after considering the comments made determinations about hearing scope. It is not appropriate for the parties to then file whatever evidence they wish on out-of-scope issues or, in the case of Trans Mountain, to ask the Board to take judicial notice of something that is out of scope. To include any evidence filed during the MH-052-2018 hearing on need for the project, economic feasibility, or financial matters would be inappropriate in light of the scoping decision made with respect to the List of Issues.

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[27] 29 October 2018 NEB Appendix 2 – Trans Mountain Expansion – Reconsideration – reasons to the List of Issues and Hearing Process at pg 11-12.

[28] NEB, Ruling No. 22 Applications for Review from Living Oceans, Raincoast and TWN (27 December 2018) at pg 22-23.

1.5.4 Issues dealt with in prior Board rulings

In final argument, some parties raised arguments related to issues which the Board had decided in earlier rulings. In particular:

- Some parties disagreed with the decision to include Project-related marine shipping between the WMT and the 12-nautical-mile territorial sea limit in the designated Project under the CEAA 2012 (the Spatial Limit Decision). They argued that the Board ought to also include shipping in the Exclusive Economic Zone. The Board first sought comments on this issue in its 5 October 2018 letter. In the 29 October 2018 Reasons (Appendix 1) the Board thoroughly explained the Spatial Limit Decision. On 16 November 2018, the Board received applications to review the Spatial Limit Decision. The Board established a comment process, considered all submissions on the merits, and denied the review of the Spatial Limit Decision on its merits, with reasons in Ruling No. 22 issued 27 December 2018.
- Some parties argued that a *de novo* hearing was required because the Reconsideration Panel did not hear the evidence and submissions of the parties in the OH-001-2014 hearing. The Board explained why it did not agree with this argument in the 29 October 2018 Reasons (Appendix 2), Section 4.3. On 16 November 2018, the Board received an application to review this decision. The Board established a comment process, considered all submissions, and denied the review of the decision not to conduct a *de novo* hearing, with reasons in Ruling 22 issued 27 December 2018.
- Some parties argued that Trans Mountain should have been required to conduct species-specific risk assessments. The Board established a comment process, considered all submissions and denied the motion to require Trans Mountain to conduct a new risk assessment of Project-related marine shipping, with reasons in Ruling no. 24 issued 4 January 2019. Additional Board views regarding the adequacy of Trans Mountain's risk assessment of Project-related marine shipping are contained in Chapter 14.
- Some parties argued that Canada's purchase of the Project created a conflict of interest for the federal agencies providing expert information and for the Board's assessment of the Project. The Board found that there is no conflict of interest in its 29 October 2018 Reasons (Appendix 2), Section 4.2. The Board addresses the alleged conflict of interest between the Crown's fiduciary role in respect of Indigenous peoples and its role as the owner of the Project in Chapter 5, finding that the Crown's fiduciary obligations toward Indigenous peoples can be balanced with its broader obligations with respect to the public interest.
- Some parties argued that the Board ought to have assessed the environmental effects of upstream and downstream activities, including greenhouse gas emissions. The Board decided not to include these effects in the List of Issues, and explained this in the 29 October 2018 Reasons (Appendix 2), Section 2.8. On 21 January 2019, the Board received an application to review this decision along with Ruling No. 25 from the OH-001-2014 hearing. The Board established a comment process, considered all submissions, and denied the review of the decision to exclude the effects of upstream and downstream greenhouse gas emissions from the List of Issues for the Reconsideration, with reasons in Ruling 30 issued 19 February 2019.

1.5.5 Request to strike Trans Mountain's reply evidence

Some parties, including Tsleil-Waututh Nation, BC Nature and Nature Canada argued that Trans Mountain's reply evidence ought to be inadmissible or given no weight, because it was not prepared by properly qualified experts and Trans Mountain has not demonstrated that it is fair, objective and non-partisan evidence.

In reply, Trans Mountain said that it has significant expertise within its organization, including internal subject matter experts and a long history of corporate experience with the issues raised by intervenors. Trans Mountain also said that parties could have asked more information about the experts through information requests, but that they did not do so.

Views of the Reconsideration Panel

Under the *National Energy Board Rules of Practice and Procedure, 1995*, the Board requires that filed written evidence be prepared by the party filing it, or under their direction and control, and that the party be able to answer questions about it. In this case, the evidence being challenged was prepared by Trans Mountain, or under their direction and control. No party demonstrated that Trans Mountain was unable to answer their questions related to that evidence.

As an administrative tribunal, the Board is not bound by strict rules of evidence including those regarding the admissibility of expert opinion and qualification of experts. The Board is an expert tribunal and has the ability to evaluate the evidence submitted in each hearing. The Board decides what weight, if any, to give evidence once the

record is closed and all submissions are made. The Board is of the view that Trans Mountain's reply evidence is admissible. With respect to weight, the views of the Reconsideration Panel are described throughout this Report.

1.5.6 Precautionary principle and adaptive management

Many parties in the MH-052-2018 hearing emphasized the application of the precautionary principle. Intervenors relied on the precautionary principle in relation to the mitigation measures that should be put in place. For example, PIPE UP said that consistent with the precautionary principle, the Board should require Trans Mountain to use a trenchless construction method for salmon watercourses, despite residual areas of uncertainty regarding SRKW diet.

A number of intervenors also interpreted the precautionary principle to mean that the Project should not be approved until there is a better understanding of the Project's effects and effectiveness of mitigation measures. Tsleil-Waututh argued that the precautionary principle leads to the conclusion that justification of significant adverse environmental effects cannot occur in these circumstances, given the environmental degradation marine shipping will visit upon Burrard Inlet and the Salish Sea, and the lack of any salutary benefits associated with the Project-related marine shipping.

Other parties interpreted the precautionary principle differently. Trans Mountain said that the precautionary principle should not be used or interpreted to the point of effectively paralyzing development, and that decision-makers should rely on the principle of adaptive management to address uncertainties in environmental assessment. The Government of Alberta argued that while the precautionary principle must inform the Board's review, its implications should not be overemphasized - particularly when the Project proponent and responsible agencies have demonstrated a willingness to develop and implement additional harm reduction and management strategies.

Views of the Reconsideration Panel

The Board recognizes the important role of the precautionary principle under the CEAA 2012. The mandate of the CEAA 2012 explicitly references the precautionary principle in subsection 4(2): The Government of Canada, the Minister, the Agency, federal authorities and responsible authorities, in the administration of this Act, must exercise their powers in a manner that protects the environment and human health and applies the precautionary principle. The purposes of the CEAA 2012 also include ensuring that designated projects that require the exercise of a power or performance of a duty or function by a federal authority under any Act of Parliament other than this Act to be carried out, are considered in a careful and precautionary manner to avoid significant adverse environmental effects (subsection 4(1)).

The Supreme Court of Canada used the definition of precautionary approach from the Bergen Ministerial Declaration on Sustainable Development (1990) in *114957 Canada Ltée (Spraytech, Société d'arrosage) v. Hudson (Town)*:

> In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.[29]

This definition of precautionary principle was subsequently cited and expanded upon by the Supreme Court of Canada in *Castonguay Blasting Ltd. v. Ontario (Environment)*:

> This emerging international law principle recognizes that since there are inherent limits in being able to determine and predict environmental impacts with scientific certainty, environmental policies must anticipate and prevent environmental degradation.[30]

Trans Mountain relies on *Blaney et al v. British Columbia (The Minister of Agriculture Food and Fisheries) et al* to support its views on the precautionary principle:

> [T]he precautionary principle does not require governments to halt all activity which may pose some risk to the environment until that can be proven otherwise. The decisions on what activity to allow and how to control it often require a balancing of interests and concerns and a weighing of risks.[31]

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[29] 2001 SCC 40 at para 31 [*Spraytech*].

[30] 2013 SCC 52 at para. 20 [*Castonguay*]. Both *Spraytech* and *Castonguay* were also followed by the Federal Court of Canada in *Morton v. Canada (Fisheries and Oceans)* 2015 FC 575.

[31] 2005 BCSC 283 at para 45 [*Blaney*].

The Board notes Tsleil-Waututh Nation's argument that aspects of *Blaney* can be distinguished from these circumstances. However, the Board finds it informative for supporting the notion that recommendations and decisions regarding project approval do require a balancing of interests and concerns and a weighing of risks.

The Board applies the precautionary principle in conducting its environmental assessments. The precautionary principle is applied in the Board's consideration of measures to mitigate impacts through design, planning, follow-up and monitoring, particularly where scientific uncertainty exists on the prediction of effects or effectiveness of mitigation. The Board requires proponents to minimize the effects or consequences that are *anticipated or possible* even if not certain. The Board also requires proponents to make considerable efforts to prevent or avoid environmental impact and, if impacts are unavoidable, to minimize and reduce them.

The Board also applies the precautionary principle in its significance determinations. The Canadian Environmental Assessment Agency guidance on "Determining Whether a designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012" notes that all project environmental assessments involve some level of uncertainty, and observed results will often deviate, to some degree, from predictions made in an environmental assessment.[32] Uncertainty could be related to a number of factors such as: project design and components, baseline environmental conditions, overall scope of effects, accuracy of environmental effects prediction, risk assessment methodologies, assumptions around the effectiveness of mitigation, significance determination, follow-up programs, and adaptive management. Uncertainty also triggers the need for additional monitoring, additional consultation, validation of the predictions of models, etc. The Reconsideration Panel confirms the views regarding adaptive management from the OH-001-2014 hearing as discussed in Section 10.1.6:

> [In] appropriate circumstances adaptive management can be an important part of the follow-up program for a project to allow for uncertainties. The Board's conditions also incorporate adaptive management, requiring the implementation of new or modified mitigation measures over the life of the Project in response to mitigation measures that do not achieve full success and to address unanticipated environmental effects.

The Board adds that the appropriate circumstances for relying on adaptive management include consideration of whether there is sufficient confidence that: (i) monitoring would detect an ineffective mitigation or unforeseen environmental impact, and (ii) responses would be available and have a reasonable chance of success.

The Board, consistent with the case law and statutory scheme of the CEAA 2012, does not interpret the precautionary principle to mean that approval of a project cannot be recommended if uncertainties remain about its effects or mitigation measures. The Board notes that environmental assessment is a planning and decision-making tool. The environmental assessment identifies potential adverse environmental effects, and proposes measures to reduce those effects, which the Board imposes through conditions or recommendations to the GIC. The precautionary principle cannot be applied in isolation; it must be applied in a manner consistent with the entire statutory scheme.

1.5.7 Justification pursuant to the CEAA 2012 and the SARA

Living Oceans and Raincoast argue that the effects of Project-related marine shipping cannot be justified under the CEAA 2012 because approving the Project would harm the SRKW and destroy critical habitat in contravention of section 32 and subsection 58(1) of the SARA, respectively. Living Oceans and Raincoast rely on *Alberta Wilderness Assn v. Cardinal River Coals Ltd.*[33] for the proposition that it is not lawful to issue an authorization under one federal law that will violate the provisions of another. Similarly, Tsleil-Waututh Nation said that justifying significant adverse environmental effects on SRKWs would defeat the purpose of the SARA and the protections it provides to endangered species.

In reply, Trans Mountain submits that the obligations under the SARA must be interpreted in the context of the entire statutory scheme, including CEAA 2012, which expressly contemplates that projects may proceed in the face of significant adverse environmental effects if those effects are justified in the circumstances.

Views of the Reconsideration Panel

The Board is of the view that these circumstances are distinguishable from *Cardinal River*, where the Federal Court in obiter found that the granting of a *Fisheries Act* authorization would permit the deposition of millions of tonnes of waste rock and materials in areas frequented by migratory birds. This was contrary to law because the *Migratory Birds*

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[32] Canadian Environmental Assessment Agency, *Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under CEAA 2012* (November 2015).

[33] [1999] 3 FC 425 at paras 104-105 [*Cardinal River*].

Convention Act prohibited a person from depositing or permitting the deposit of any substance harmful to migratory birds in any waters or areas frequented by migratory birds. The facts are not so clear in this case.

Pursuant to CEAA 2012, the Board has found that Project-related marine shipping is likely to cause significant adverse environmental effects on SRKW, a SARA-listed wildlife species. However, the Board is not persuaded that these effects necessarily result in harm to the SRKW or destruction of critical habitat that would contravene section 32 and subsection 58(1) of the SARA.[34] The Board found that while the effects from Project-related marine shipping will be a small fraction of the total cumulative effects, and the level of traffic is expected to increase with or without the Project, the increase in marine vessels associated with the Project would further contribute to cumulative effects that are already jeopardizing the recovery of SRKW. Furthermore, environmental effects on SRKW from underwater noise, as well as potential vessel strikes and spills from Project-related marine shipping, will be reduced by measures and monitoring under the CEAA 2012 and subsection 79(2) of the SARA; in some cases via Board conditions and in other cases if GIC implements the Board's recommendations.

The Board finds that the guidance on *Addressing Species at Risk Act Considerations Under the Canadian Environmental Assessment Act for Species Under the Responsibility of the Minister responsible for Environment Canada and Parks Canada* provides additional clarification:

> There is no direct link between the SARA subsection 79(2) requirement to identify adverse effects on listed wildlife species and their critical habitat, and the prohibitions set out in the Act. In other words, determining that an activity will lead to an adverse effect does not necessarily mean that the activity itself is prohibited. Prohibitions are set out in sections 32 to 36 and 58 to 61 of the SARA and their applicability depends on a variety of circumstances.
>
> ...
>
> In addition, the potential significance of an adverse environmental effect under CEAA is not necessarily an indication of whether an activity is prohibited under the SARA... [35]

Furthermore, such an expansive interpretation of the prohibitions in SARA would mean that existing vessels calling at Westridge Marine Terminal and a great proportion of marine shipping currently occurring (i.e., ferries, whale watching boats, commercial vessels) are all in violation of the SARA since they also increase underwater noise, and the risk of vessel strikes and spills (from fuel if not cargo). It is unclear if the SARA prohibitions were intended to be used to manage these types of cumulative effects.

The Board agrees that CEAA 2012 and SARA are related legislation, and the principles of statutory interpretation require each to be read in the context of the other in a coherent manner.[36] The prohibitions in section 32 and subsection 58(1) cannot be read in isolation from subsection 79 of the SARA or the overall statutory scheme of the CEAA 2012. In the context of a "designated project" as defined by CEAA 2012, SARA requires that adverse effects on listed species be identified, and that measures are taken to avoid or lessen those effects and to monitor them. There is no explicit requirement in section 79 for there to be no residual effects on SARA-listed species, only that measures are taken in a way that is consistent with applicable recovery strategies and action plans. CEAA 2012 also expressly contemplates the possibility that a finding of likely significant adverse environmental effects can be justified. The potential significance of an adverse environmental effect under the CEAA 2012 or adverse effect under section 79 of the SARA, does not necessarily mean an activity is prohibited under the SARA; the facts need to be carefully examined. If a project is likely to hinder the recovery of endangered or threatened wildlife species, contrary to the purpose of the SARA, this will weigh heavily in the justification analysis. However, the analysis of whether significant adverse environmental effects can be justified will ultimately involve the balancing of many factors.

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[34] Subsection 32(1) of the SARA states: No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species.

Subsection 58(1) of the SARA states: ... no person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species...

[35] Environment Canada and Parks Canada, *Addressing Species at Risk Act Considerations under the Canadian Environmental Assessment Act for Species under the Responsibility of the Minister responsible for Environment Canada and Parks Canada* (2010) at 51-52.

[36] Ruth Sullivan, *Sullivan on the Construction of Statutes*, 6th ed. (Markham, Ontario: LexisNexis Canada, 2014) at para 13.26.

1.6 The Project application stage – codes, commitments, and conditions

This section contains the views of the Board from the OH-001-2014 Report (formerly Chapter 1.3). Some of the general concepts are relevant to the Reconsideration, but much of the content relates to conditions that are outside the scope of the Reconsideration. However, the Reconsideration Panel has included this section of the MH-052-2018 Report as it provides helpful background information. A more detailed discussion about the conditions relevant to Project-related marine shipping examined in the MH-052-2018 hearing is in Chapter 2, Section 2.4.

Trans Mountain's Application was filed while the Project was at an initial phase of the regulatory lifecycle, as is typical of applications under section 52 of the NEB Act. As set out in the Board's Filing Manual, the Board requires a broad range of information when a section 52 application is filed. At the end of the hearing, the level of information available to the Board must be sufficient to allow it to make a recommendation to the GIC that the Project is or is not in the public interest. There also must be sufficient information to allow the Board to draft conditions that would attach to any new and amended CPCNs, and other associated regulatory instruments (Instruments), should the Project be approved by the GIC.

The Board does not require final information about every technical detail during the application stage of the regulatory process. For example, much of the information filed with respect to the engineering design would be at the conceptual or preliminary level.[37] Site-specific engineering information would not be filed with the Board until after the detailed routing is confirmed, which would be one of the next steps in the regulatory process should the Project be approved. Completion of the detailed design of the project, as well as subsequent construction and operations, would have to comply with:

- the NEB Act, regulations, including the *National Energy Board Onshore Pipeline Regulations* (OPR), referenced standards and applicable codes;
- the company's conceptual design presented, and commitments made in the Application and hearing proceedings; and
- conditions which the Board considers necessary.

The Board may impose conditions requiring a company to submit detailed information for review (and in some cases, for approval) by the Board before the company is permitted to begin construction. Further information, such as pressure testing results, could be required in future leave to open applications before a company would be permitted to begin pipeline operations. In compliance with the OPR, a company is also required to fully develop an emergency response plan prior to beginning operations. In some cases, the Board has imposed conditions with specific requirements for the development, content and filing of the emergency response plan (see Table 1). This would be filed and fully assessed at a condition compliance stage once detailed routing is known. Because the detailed routing information is necessary to perform this assessment, it would be premature to require a fully detailed emergency response plan to be filed at the time of the project application.

While the project application stage is important, as set out in Chapter 3, there are further detailed plans, studies and specifications that are required before the project can proceed. Some of these are subject to future Board approval, and others are filed with the Board for information, disclosure, and/or future compliance enforcement purposes. The Board's recommendation on the project application is not a final determination of all issues. While some hearing participants requested the final detailed engineering or emergency response plans, the Board does not require further detailed information and final plans at this stage of the regulatory lifecycle.

To set the context for its reasons for recommendation, the Board finds it helpful to identify the fundamental consideration used in reaching any section 52 determination. The overarching consideration for the Board's public interest determination at the application stage is: can this pipeline be constructed, operated and maintained in a safe manner. The Board found this to be the case. While this initial consideration is fundamental, a finding that a pipeline could be constructed, operated and maintained in a safe manner does not mean a pipeline is necessarily in the public interest as there are other considerations that the Board must weigh, as discussed below. However, the analysis would go no further if the answer to this fundamental question were answered in the negative, as an unsafe pipeline can never be in the public interest.

[37] Pipeline projects generally follow a three phase design process consisting of a conceptual phase, a preliminary engineering phase, and a detailed engineering phase leading to final design.

1.6.1 Safety

The Board's regulations focus on results and there are NEB requirements that companies must follow in order to design, construct and operate their pipelines safely. These requirements cover everything from the selection of materials used to build a pipeline to the processes, controls, manuals and programs designed to manage risk and mitigate potential consequences during construction and operation. The Board requires NEB-regulated pipeline companies to consider thoroughly all of the hazards and potential hazards that are associated with their pipeline systems, and demonstrate to the Board that the appropriate safety and risk management plans and measures are in place. The Board provides considerable regulatory oversight throughout the pipeline lifecycle to verify that companies comply with regulatory requirement, and adequately and effectively anticipate, prevent, manage and mitigate risks to people and the environment.

1.6.2 Project-specific commitments and conditions

The Board considered the Project and associated risks in the context of the Board's stringent regulatory requirements, Trans Mountain's Application and the commitments Trans Mountain made during the hearing. The Board also considered the information from participants in the proceeding, including information about community-specific and environment-specific circumstances along the corridor.

The Board found that in addition to existing regulations, codes and standards, and Trans Mountain's commitments, Project-specific conditions would be required to mitigate residual effects posed by the Project and to make sure the Project is designed, constructed and operated safely, and in a manner that protects the environment (see conditions in Appendix 3). For example, evidence provided by the Grasslands Conservation Council of British Columbia led to the inclusion of conditions about grassland protection and management, and evidence submitted by municipalities of the lower mainland of B.C. led to the inclusion of conditions for the creation and operation of technical working groups.

The Board issued draft conditions throughout the hearing and gave participants the chance to consider and provide comments on them, and to propose other potential conditions. The Board used these suggestions and its own analysis of the evidence to create a final, comprehensive list of conditions that address a wide range of issues identified through this hearing process.

The Board concluded that the Project could be constructed and operated safely if designed, constructed, and operated in compliance with this list of conditions, which would mitigate risks posed by the Project.

1.6.3 Conditions

Should the GIC approve the Project, the Board would issue the CPCNs and Instruments, and impose 156 conditions to address the identified, outstanding issues.

In addition to conditions addressing specific technical issues, the Board would impose overarching Conditions 1, 2, 3, 4 and 5. The effect would be to make all commitments, plans or programs included, referenced or agreed to on the hearing record, regulatory requirements of the Board. Furthermore, to assist the Board and all stakeholders in tracking construction progress and compliance, and to assist the Board in planning appropriate compliance verification activities, the Board would impose conditions requiring Trans Mountain to file commitments tracking tables, phased filing information, a list of temporary infrastructure sites, construction schedules, construction progress reports, and a signed confirmation of Project completion and compliance (Conditions 6, 10, 61, 62, 106, 139).

The 156 conditions listed in Appendix 3 are arranged in approximate chronological order of the required filings. While the Board encourages those with an interest to review all of the conditions, we are aware it is a long list. In order to assist readers with specific areas of concern, Table 1 is provided, as a guide only.

It will be clear that there is overlap between conditions and categories, and a condition may apply to more than one category. For example, air emissions conditions may fall within the *Air quality and greenhouse gases* category, as well as within the Terminal categories. Conditions of interest to Indigenous people may appear under the Specific effects on Indigenous interests category, as well as various Environment and People categories.

Table 1 also illustrates that conditions would require fulfillment at the appropriate stage of the regulatory lifecycle.

Table 1: Conditions by subject matter and regulatory lifecycle stage

		Pipeline Lifecycle Stage			
		Over-arching	Prior to construction	Prior to operation	During operation
Regulatory Oversight		1, 2, 5	6, 10, 61, 62	6, 10, 62, 106	6, 139
Economics and Financial Responsibility			57	121	121
Emergency Preparedness and Response			89, 90	117, 118, 119, 120, 123, 124, 125, 126, 127, 136, 138	120, 145, 153
Environment	**General**	3	7, 60, 72, 78, 81		145, 151
	Air quality and greenhouse gases		52, 53, 54, 55, 79, 85	137	140, 142
	Water quality		35, 39, 47, 71, 87	113, 130	151, 154
	Soil, vegetation and wetlands		40, 41, 42, 45, 46, 47, 71, 76, 92		151, 154, 155, 156, 157
	Wildlife and wildlife habitat		36, 37, 38, 44, 47, 56, 71, 92	128	37, 128, 149, 150, 151, 154
	Fish and fish habitat		43, 47, 71, 75, 92	75, 108, 109, 110	108, 109, 110, 151, 154
	Marine mammals		92	132	151
People, communities and lands	**Effects on communities (including Indigenous)**		7, 13, 14, 48, 49, 59, 60, 72, 73, 74, 78, 80, 81, 82, 86, 93, 94, 95, 99, 100, 102, 103	49, 94, 99, 131	94, 99, 141, 145
	Specific effects on Indigenous interests		7, 39, 77, 96, 97, 98	96	146
	Training, skills and employment		11, 12, 58	58, 107	
	Lands and routing		7, 60		
Engineering and Safety	**Project**	4	9, 50, 51, 63, 64, 66, 69, 88	63, 66, 105, 111, 112, 114, 116	147, 148
	Line 1 (existing pipeline and reactivated segments)		18, 19	115, 135	152
	Line 2 (new pipeline & segments transferred from Line 1)		15, 16, 17, 65, 67, 68, 70	104, 115, 122, 135	143
	Pump Stations		8, 30, 31, 101	30	
Multidisciplinary	**Westridge Delivery Pipelines and Burnaby Mountain Tunnel**		15, 16, 20, 21, 26, 27, 28, 29, 72, 85, 86, 87	104, 125	143
	Westridge Marine Terminal		8, 21, 30, 33, 34, 35, 52, 53, 80, 81, 82, 83, 84, 97, 101	30, 109, 118, 119, 123, 126, 127, 129, 130, 136, 138	109, 141
	Edmonton, Sumas and Burnaby Terminals		8, 22, 23, 24, 25, 30, 32, 54, 78, 79, 80, 101	30, 118, 123, 125, 127, 129, 130, 136, 137, 138	141, 153
	Watercourses (freshwater)		43, 47, 48, 65, 67, 71, 72, 74, 75, 87, 92, 94	75, 94, 108, 110, 113	94, 108, 110, 151, 154
	Project-related marine shipping		91	131, 132, 133, 134	134, 144

1.7 Risk overview

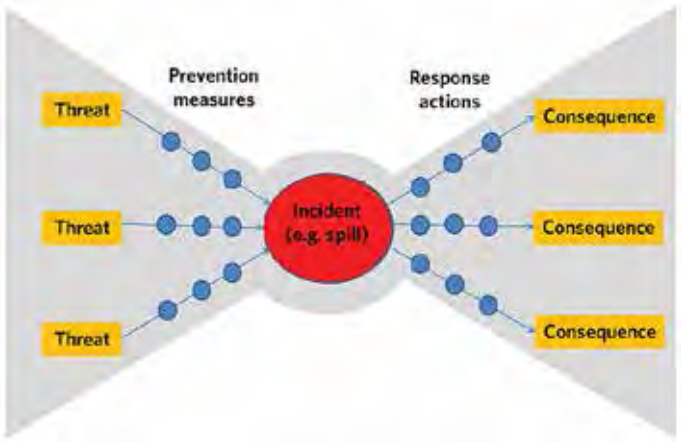
This section contains the views of the Board from the OH-001-2014 Report (formerly Section 1.4). The Reconsideration Panel adopts this approach to assessing risks from spills. The only change it has made is to revise the conclusions related to spills from Project-related marine shipping to reflect the Reconsideration.

It is important to carefully analyze the risks created by the Project and Project-related marine shipping. This includes considering the probability of incidents occurring and the severity of the consequences that could result from such incidents, even if such incidents are unlikely to occur. It also includes considering the acceptability of such risks in the context of the benefits and burdens of the proposed Project and Project-related marine shipping as part of the Board's public interest determination.

A bowtie diagram Figure 2), as exemplified below, is a useful and common aid in illustrating:

- the various threats that could lead to an incident (such as a spill);
- prevention measures that reduce the probability of such threats leading to an incident;
- the various consequences that could result from an incident; and
- response actions that reduce the severity of such consequences.

Figure 2: Bowtie diagram for assessing risk



In addition, risk tables, such as that shown in Figure 3, can be useful to illustrate the combination of the probability (P) of an incident occurring and the anticipated consequences (C) if such an incident does occur, and the magnitude of the resulting risk (R). The Board notes, however, that the labels used for probability, consequences and risk (e.g., Very low to Very high) and the placement of risk labels in such tables can vary widely according to use and author, and can contain considerable subjectivity. Nevertheless, such tables are conceptually useful to illustrate the relationship that R = P x C, that both probability and consequences need to be considered in fully understanding the risk of a spill, and to assist in prioritizing risk mitigation efforts.

Figure 3: Risk as combination of probability and consequence

Probability (P)						
	Very high P	Medium R	High R	High R	Very high R	Very high R
	High P	Medium R	Medium R	High R	High R	Very high R
	Medium P	Low R	Medium R	Medium R	High R	High R
	Low P	Very low R	Low R	Medium R	Medium R	High R
	Very low P	Very low R	Very low R	Low R	Medium R	Medium R
		Very low C	Low C	Medium C	High C	Very high C
		Consequences (C)				

1.7.1 Consideration of spill risks

Throughout this Report, the Board has considered the risks associated with spills. For example, Chapter 6 discusses pipeline and facility integrity, which includes the assessment of risk-based design methods proposed by the company to identify, prevent or reduce the frequency of potential releases from the pipelines and terminals, as well as consequence reduction measures, such as leak detection, containment and valve placement. Chapter 8 discusses the environmental behaviour of spilled oil, which is relevant when considering spill response and the consequences of a spill. Chapter 9 discusses prevention, preparedness and response, and considers the likelihood of accidents and malfunctions. Chapter 10 includes a discussion of the potential environmental effects of a spill that might result from such an incident, while Chapter 11 discusses potential socio-economic effects. Chapter 14 discusses spills from Project-related marine shipping.

The Board acknowledges that achieving zero risk is impossible for most developments. The Board finds that there is very low probability of a Project spill (i.e., from the pipelines, tank terminals, pump stations or the WMT) that may result in a significant effect (high consequence). In regard to spills from the Project-related marine shipping, the Board finds that there is a very low probability of a marine spill from a Project-related tanker that may result in a significant effect (high consequence).

Having considered all of the evidence and in light of the spill prevention, preparedness and response measures discussed in Chapter 9, and the regulatory framework for marine oil spill preparedness and response discussed in Chapter 14, the Board finds that the risks associated with potential spills from the Project and Project-related marine vessels are acceptable.

Views of the Reconsideration Panel

The Board considered the risks associated with potential spills from Project-related marine shipping in the MH-052-2018 hearing. For example, Sections 14.9 and 14.10 of Chapter 14 includes a discussion of potential environmental and socio-economic effects of malfunctions and accidents. Chapter 8 discusses the environmental behaviour of spilled oil, which is relevant when considering spill response and the consequences of a spill. Section 14.11 of Chapter 14 discusses spill prevention, risk analysis, preparedness and response, and considers the likelihood of accidents and malfunctions.

Having considered all of the evidence and in light of the spill prevention, preparedness and response measures, the Board finds that there is a very low probability of a large marine spill from a Project-related tanker that may result in a significant effect (high consequence).

2.0

Benefits, burdens, and the National Energy Board recommendation

The content of this chapter has been updated since the Board's May 2016 OH-001-2014 Report to reflect the Reconsideration.

This chapter provides the Board's reconsideration of the overall benefits and burdens of the Trans Mountain Expansion Project (Project) in relation to its mandate under section 53, Part III of the *National Energy Board Act* (NEB Act). This chapter also summarizes the Board's reconsidered findings and recommendations in relation to the Project under section 30 of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and the *Species at Risk Act* (SARA).

2.1 The Board's mandate

With respect to the Project application, the Board's original role was to determine if the Project is in the public interest, pursuant to section 52 of the NEB Act (as further described below). In the OH-001-2014 Report, the Board concluded that the Project is in the present and future convenience and necessity, and in the Canadian public interest. The Board recommended that a CPCN be issued under section 52 of the NEB Act along with 157 conditions.

The Board also has a mandate to conduct an environmental assessment under the CEAA 2012. In the OH-001-2014 hearing, Project-related marine shipping was not included within the scope of the Board's environmental assessment under the CEAA 2012. Rather, Project-related marine shipping was assessed under the NEB Act. Accordingly, in the OH-001-2014 Report, the Board recommended that the GIC decide that the Project is not likely to cause significant adverse environmental effects under the CEAA 2012.

As a result of the *Tsleil-Waututh Nation* decision by the Federal Court of Appeal, the Board was directed by the Governor in Council (GIC) in OIC P.C. 2018-1177 to conduct a reconsideration of aspects of its recommendations and terms or conditions for the Project relevant to Project-related marine shipping, pursuant to section 53 of the NEB Act and section 30 of the CEAA 2012 (Section 1.4 of this report contains complete details regarding the OIC).

The Reconsideration Panel conducted the Reconsideration in accordance with OIC P.C. 2018-1177. The Reconsideration Panel decided to include Project-related marine shipping between the Westridge Marine Terminal (WMT) and the 12-nautical-mile territorial sea limit in the "designated project" to be assessed under the *Canadian Environmental Assessment Act, 2012*. As a result, the Reconsideration Panel carried out an environmental assessment of Project-related marine shipping under the CEAA 2012. The entirety of the evidence filed in the OH-001-2014 hearing was included as part of the record for the MH-052-2018 hearing. In making its findings, the Reconsideration Panel considered new or updated evidence submitted during the MH-052-2018 hearing, as well as relevant evidence from the OH-001-2014 hearing.

The Board's environmental assessment of the Project can be found in Chapter 10, with the socio-economic components assessed in Chapter 11. The Reconsideration Panel's assessment of Project-related marine shipping is in Chapter 14. The Reconsideration Panel necessarily relies on Chapter 10 and 11 views and findings of the Board from the OH-001-2014 hearing in order to make the required recommendation to GIC under subsection 30(4) of the CEAA 2012 for the designated Project.

Under paragraph 30(4)(a) of the CEAA 2012, in its Reconsideration Report, the Board must:

> (i) confirm the recommendation or set out a different one with respect to the decision that may be made under paragraph 31(1)(a) in relation to the designated project, and
>
> (ii) confirm, modify or replace the mitigation measures set out in the report with respect to the environmental assessment.

Specifically, the Board must confirm or set out a different recommendation regarding whether the designated Project is likely, or is not likely, to cause significant adverse environmental effects after taking into account the implementation of mitigation measures, including the Board's recommended conditions.

Under paragraph 30(4)(b) of the CEAA 2012, in its Reconsideration Report, the Board must also confirm the recommendation or set out a different one with respect to the follow-up program that is to be implemented in respect of the designated project.

The Board then considered whether its recommendation under the CEAA 2012 resulted in changes or additions to the recommendations (including recommended terms or conditions) under the NEB Act from its OH-001-2014 Report. Under subsection 53(6) of the NEB Act, in its Reconsideration Report, the Board must:

> (a) if its recommendation was referred back, either confirm the recommendation or set out a different recommendation; and
>
> (b) if a term or condition was referred back, confirm the term or condition, state that it no longer supports it or replace it with another one.

Specifically, the Board must confirm or set out a different recommendation as to whether or not the certificate should be issued for the Project, taking into account whether the pipeline is and will be required by the present and future public convenience and necessity.

2.1.1 Public interest test

The NEB Act provides the Board with flexibility and broad powers, but the Board must interpret and implement the Act in ways that serve the Canadian public interest.

Part III of the NEB Act provides a test for the Board to apply when making its assessment of a project and providing its recommendation to the GIC. When applying the "present and future public convenience and necessity" test under Part III of the NEB Act, the Board makes a recommendation in the overall Canadian "public interest." In its consideration of an application, the Board is required to weigh all relevant evidence on the record and come to a recommendation whether, overall, the project is in the public interest. This is referred to in the NEB Act as the present and future public convenience and necessity.

The Board has described the public interest in the following terms:

> The public interest is inclusive of all Canadians and refers to a balance of economic, environmental and social interests that change as society's values and preferences evolve over time. As a regulator, the Board must estimate the overall public good a project may create and its potential negative aspects, weigh its various impacts, and make a decision.[38]

In section 52 of the NEB Act, under which the Board's original recommendation was made, Parliament has given direction about the factors relevant to the Board's consideration in reaching a public interest determination.

> 52(2) In making its recommendation, the Board shall have regard to all considerations that appear to it to be directly related to the pipeline and to be relevant, and may have regard to the following:
>
> a) the availability of oil, gas or any other commodity to the pipeline;

[38] NEB Reasons for Decision, Emera Brunswick Pipeline Company Ltd., GH-1-2006.

b) the existence of markets, actual or potential;

c) the economic feasibility of the pipeline;

d) the financial responsibility and financial structure of the applicant, the methods of financing the pipeline and the extent to which Canadians will have an opportunity to participate in the financing, engineering and construction of the pipeline; and

e) any public interest that in the Board's opinion may be affected by the issuance of the certificate or the dismissal of the application.

52(3) If the application relates to a designated project within the meaning of section 2 of the CEAA 2012, the report must also set out the Board's environmental assessment prepared under that Act in respect of that project.

52(4) The report must be submitted to the Minister within the time limit specified by the Chairperson. The specified time limit must be no longer than 15 months after the day on which the applicant has provided, in the Board's opinion, a complete application. The Board shall make the time limit public.

With respect to the Project application, the Board's role is to determine if the Project is in the public interest, pursuant to section 52 of the NEB Act.

The Board also has a mandate to conduct an environmental assessment of the Project under the CEAA 2012. As a responsible authority under the CEAA 2012, the Board must, in its report to the GIC, set out its recommendation regarding the environmental effects of the Project. Specifically, the Board must provide a recommendation that the Project is likely, or is not likely, to cause significant adverse environmental effects after taking into account the implementation of mitigation measures, including the Board's recommended conditions. The Board's environmental assessment of the Project can be found in Chapters 10, 11 and 14.

2.2 Benefits and burdens of the Project

As directed by the OIC, and as reflected in the Reconsideration List of Issues, this was a reconsideration focused on Project-related marine shipping - a comparatively narrow scope to the OH-001-2014 hearing. However, under subsection 30(4) of the CEAA 2012, the Reconsideration Panel is required to confirm or set out a different recommendation regarding whether the designated Project is likely, or is not likely, to cause significant adverse environmental effects after taking into account the implementation of mitigation measures. Similarly, under subsection 53(6) of the NEB Act, the Reconsideration Panel is required to confirm or set out a different recommendation as to whether or not the certificate should be issued for the Project, taking into account whether the pipeline is and will be required by the present and future public convenience and necessity. In order to make these recommendations regarding the overall designated Project, it was necessary for the Reconsideration Panel to rely on the previous findings and views of the Board regarding benefits and burdens from the OH-001-2014 Report that were outside the scope of the List of Issues for the Reconsideration.

Some intervenors argued that the Board must consider new information when reweighing the Project's benefits and burdens. As discussed earlier in Chapter 1.5.3, the Board is not persuaded that it should consider new information unrelated to the Reconsideration List of Issues (i.e., economics) when reweighing the Project's benefits and burdens. This would essentially circumvent the List of Issues and open the MH-052-2018 hearing up to other issues indirectly, rendering the purpose of section 53 of the NEB Act and narrow scope of the OIC meaningless. Therefore, the benefits and burdens summarized in Tables 2 and 3 contain a mixture of findings from the Board in the OH-001-2014 hearing and the Reconsideration Panel.

Table 2 and Table 3 summarize the key benefits and key residual burdens, respectively, of the designated Project as outlined in the various chapters of this MH-052-2018 Report. Both tables indicate whether the benefits or burdens would apply locally (e.g., within the immediate vicinity of the Project, such as the specific municipalities along the route), regionally (i.e., Alberta and B.C.) or nationally.

These tables are not intended to be a comprehensive list of all benefits and burdens mentioned by participants during the OH-001-2014 and MH-052-2018 hearings. Rather, it is a summary of the key benefits and key residual burdens that the Board identified during its analysis of the evidence. A description of how the Board considered the balance of benefits versus residual burdens is found in Section 2.5 and a more in-depth assessment of the evidence is provided in the various chapters of the MH-052-2018 Report that follow.

2.2.1 Benefits

In the OH-001-2014 hearing, the Board found that the benefits associated with the Trans Mountain Expansion Project, taken as a whole, are considerable.[39] This includes market diversification, jobs, competition among pipelines, spending on pipeline materials, Community Benefit Program, capacity development and Government revenues. The Reconsideration Panel relies upon these findings of the Board from the OH-001-2014 Report, for matters that are outside the scope of the Reconsideration List of Issues.

As a result of the MH-052-2018 hearing, the Reconsideration Panel confirms that there is a modest benefit associated with enhanced marine spill response, and capacity development connected to Project-related marine shipping and spill response. The Reconsideration Panel also finds that, if GIC implements its recommendations to make changes to the operation of all marine traffic, including Project-related traffic, and takes action to relieve other stressors within the broader system, there will be the added benefit of material improvements to the health of the Salish Sea.

Table 2: Summary of key benefits

Benefit associated with:	Brief description	Type of impact	Report chapter(s)
Market diversification	The Board finds there would be a **considerable** benefit gained by providing Canadian shippers with more flexible and diverse markets, the ability to manage risk associated with competing in multiple markets, the ability to manage development and operational risk, and a likely reduction of discounts to Canadian crude.	Regional National	12
Jobs	The Board finds a **considerable** benefit in the form of jobs created across Canada: · Pipeline construction - 400-600 workers per spread · Tank construction - between 60 and 370 workers · Westridge Marine Terminal construction - 95 workers · Over the first 20 years of operation – 443 jobs/year (313 in B.C., with remainder in Alberta)	Local Regional National	11
Competition among pipelines	The Board finds a **considerable** benefit would be gained from the increase in flexibility and optionality for those producers looking to get their product to markets, and that all western Canadian producers are likely to benefit from the Project in the longer term, through greater customer choice and efficiencies gained through competition among pipelines.	Regional National	12
Spending on pipeline materials	The Board finds there would be a **considerable** benefit to local and regional economies from the direct spending on pipeline materials in Canada and spending within the regions where the Project is located.	Local Regional	11
Community Benefit Program	The Board finds a **modest** benefit to local communities and the environment along the Project from the establishment of a Community Benefit Program, including: · local emergency management capacity enhancements; · improvements to community parks and infrastructure; · support for events and educational programs; and · Environment Stewardship Program.	Local Regional	10 11
Enhanced marine spill response	The Board finds there would be a **modest** benefit from the enhanced marine spill response planning for and capacity to respond to spills from vessels not associated with the Project (e.g., fuel spills from container ships and cruise ships).	Local Regional	14
Capacity development	The Board finds that a **modest** benefit from local economic and educational opportunities, and the development of capacity of local and Indigenous individuals, communities and businesses.	Local Regional	5 11
Government revenues	The Board finds that direct Project expenditures will likely result in **considerable** revenues to various levels of government.	Local Regional National	11

[39] Definitions for the terms “considerable” and “modest” are not provided. Rather, the terms are meant to illustrate the weight the Board attributed to the benefits and burdens relative to each other.

2.2.2 Burdens

As described below, there are impacts or residual burdens associated with the Project. In the OH-001-2014 Report, the Board stated:

> A number of concerns are identified in this Report. Many of the issues underlying these concerns can be mitigated, and the Board assessed and weighed the likely success of potential mitigative options in reaching its recommendation. For example, one of the most significant mitigating factors is that most of the pipeline route for the Project parallels existing disturbance, including the right-of-way for Trans Mountain's existing pipeline. The Board finds this to be appropriate, as this reduces the requirements for new right-of-way disturbance, minimizes the potential impacts of construction, and reduces effects on nearby residents and communities.
>
> Other mitigation would be found in the commitments from Trans Mountain and through conditions that the Board would attach to the new Certificate of Public Convenience and Necessity (CPCN), amended CPCNs, and other associated regulatory instruments (Instruments) should the GIC approve the Project, and which cover a wide range of matters including:
>
> - emergency response and emergency management;
> - protection of the environment, including marine mammals;
> - consultation with those affected;
> - socio-economic matters;
> - safety and integrity of the pipeline;
> - commercial support for the Project prior to construction; and
> - financial responsibility.
>
> Nevertheless, some impacts or residual burdens remain, and they must be considered and weighed in the Board's recommendation under Part III of the NEB Act.

In the OH-001-2014 hearing, the Board found there were burdens associated with municipal development plans; Indigenous groups', landowners' and land users' ability to use the land and water during construction and operation; and Project spills. The Reconsideration Panel relies upon these findings of the Board from the OH-001-2014 Report, to the extent that are outside the scope of the Reconsideration List of Issues.

The Reconsideration Panel confirms various burdens arising from Project-related marine shipping, including the likely significant adverse effects to Southern resident killer whales and associated Indigenous traditional use, as well as likely significant effects from marine greenhouse gas emissions. The Reconsideration Panel also finds that the level of risk associated with spill from a Project-related tanker to be acceptable. In Section 2.5 of this chapter the Reconsideration Panel has made recommendations to the GIC that, in the Board's view, would further reduce the residual burdens of Project-related marine shipping, as well as address broader effects on the Salish Sea.

Table 3: Summary of key residual burdens

Burden associated with:	Brief description	Type of impact	Report chapter(s)
Southern resident killer whales	The Board finds that the operation of Project-related marine vessels would likely result in **significant** adverse effects to the Southern resident killer whale. Although the effects from Project-related marine vessels on the Southern resident killer whale would be a small fraction of the total cumulative effects, the Board recognizes that the increase in Project-related marine vessels would further contribute to cumulative effects that are already jeopardizing the recovery of the Southern resident killer whale.	Local Regional National	14
Indigenous cultural use associated with Southern resident killer whales	The Board finds that the operation of Project-related marine vessels would likely result in **significant** adverse effects on Indigenous cultural use associated with Southern resident killer whales. The Board acknowledges concerns raised by a number of Indigenous groups about the social and cultural effects that would result from impacts of Project-related marine shipping on the Southern resident killer whale.	Local Regional	5 14

Burden associated with:	Brief description	Type of impact	Report chapter(s)
Marine greenhouse gas emissions	The Board finds that greenhouse gas emissions from Project-related marine vessels would result in measureable increases and, taking a precautionary approach, are likely to be significant.	Regional National	14
Municipal development plans	The Board finds that the Project may pose a **modest** burden on municipalities with respect to potentially constraining future plans for municipal development. There is the potential for reduced flexibility and/ or additional municipal time constraints with respect to planned or possible future municipal projects that may be impacted by the Project.	Local	11
Indigenous groups' ability to use the land and water during construction and operation	The Board finds that there would be **modest** burdens sustained by Indigenous groups as their ability to use the lands, waters and resources for traditional purposes would be temporarily impacted by construction and routine maintenance activities, and that some opportunities for certain activities such as harvesting or accessing sites or areas of traditional use would be temporarily interrupted. For activities directly affected by the Westridge Marine Terminal, the Board finds that these effects would persist for the operational life of the Project, as traditional activities would not occur within the expanded water lease boundaries. The Board finds that while the effects would be long term in duration, they would be reversible in the long term and would be confined to the water lease boundary for the WMT.	Local	11
Landowners' and land users' ability to use the land and water during construction and operation	The Board finds that there would be **modest** burdens sustained by Landowners and land users as their ability to use the land and water would be affected by construction and routine maintenance activities during operations. Construction and routine maintenance activities will cause temporary, limited effects on recreational and commercial hunting, fishing, agricultural practices and access to property, and will cause nuisance disturbance such as noise.	Local	11
Project spill (i.e., from pipeline, tank terminals, pump stations, or Westridge Marine Terminal)	The Board finds that there is a very low probability of a Project spill (i.e., from pipeline, tank terminals, pump stations, or Westridge Marine Terminal) that may result in a significant effect (high consequence). The Board finds this level of risk to be **acceptable**.	Local Regional	2 9 10 11
Spill from a Project-related tanker	The Board finds that there is a very low probability of a large marine spill from a Project-related tanker (a spill along the marine shipping lanes out to the 12-nautical-mile boundary) that may result in a significant effect (high consequence). The Board finds this level of risk to be **acceptable**.	Local Regional	2 14

2.3 Recommendation and decisions of the Reconsideration Panel

2.3.1 Recommendation under the CEAA 2012

In the OH-001-2014 Report, the Board recommended that the GIC find that the Project is not likely to cause significant adverse environmental effects under the CEAA 2012. This resulted from the fact that Project-related marine shipping was not included within the scope of the Board's environmental assessment under the CEAA 2012 in the OH-001-2014 hearing. The Board also made a recommendation with respect to the follow-up program to be implemented in respect of the Project under the CEAA 2012.

In the MH-052-2018 hearing, the Board carried out an environmental assessment of Project-related marine shipping under the CEAA 2012 (see Chapter 14). Pursuant to the CEAA 2012, the Board is of the view that Project-related marine shipping is likely to cause significant adverse environmental effects on the Southern resident killer whale, and on Indigenous cultural use associated with the Southern resident killer whale. The Board also finds that greenhouse gas emissions from Project-related marine vessels would result in measureable increases and, taking a precautionary approach, are likely to be significant. The Board finds that, although a credible worst-case spill from a tanker associated with the Project would result in significant adverse environmental effects, such an event is not likely. Therefore, under subsection 30(4) of the CEAA 2012, the Board is setting out a different recommendation and modifying the mitigation measures set out in this MH-052-2018 Report with respect to the environmental assessment. Taking into account the implementation of any mitigation measures specified in the MH-052-2018 Report, the Board concludes, that the Designated Project is likely to cause significant adverse environmental effects. Having so concluded, the Board must consider whether these effects can be justified in the circumstances.

2.3.1.1 Justification analysis under the CEAA 2012

The justification analysis under the CEAA 2012 involves balancing adverse environmental effects against social, economic and other benefits summarized in Table 2. In considering whether the significant adverse environmental effects of the designated Project could be justified in the circumstances, the Board accounted for the following:

- The Board's finding of likely significant adverse environmental effects on SRKW and Indigenous traditional uses associated with the SRKW was made because although the environmental effects from Project-related marine vessels would be a small fraction of the total cumulative effects, the Board found that the operation of Project-related marine vessels would further contribute to cumulative effects that are already jeopardizing the recovery of the SRKW. These effects will be reduced by Project-specific mitigation measures covered by Trans Mountain commitments and Board conditions.

  Furthermore, the Board has also included recommendations to GIC relating to regional initiatives that have broader implications on marine shipping generally, but are all also relevant to avoiding or lessening the adverse effects of Project-related marine shipping. In particular, if the Board's recommendation to offset the additional underwater noise and strike risk from Project-related marine shipping is implemented, then adverse effects from Project-related marine shipping would be reduced to net zero if and when offsets are successful. The Board did not assume that the recommendations to GIC would be accepted, but the Board did factor in that some of the programs and initiatives are already partially implemented by those with regulatory responsibility.[40]

- With respect to GHG emissions from Project-related marine vessels, in addition to Trans Mountain's commitments to mitigate the significant effects, which the Board's conditions require it to meet, the Board has made a recommendation to the GIC on greenhouse gas reduction measures related to marine shipping.

- Although the Board has found that the effects of a credible worst-case spill would probably be adverse and significant, the Board also found that this is unlikely to occur. Regardless, these effects will be mitigated by Trans Mountain commitments and Board conditions related to enhanced tug escort, enhanced marine oil spill response regime, and the supporting and adopting of TERMPOL Review Committee findings and recommendations. Board notes the broad range of existing initiatives, both currently underway and planned, to decrease the risk of spills and to address spill response (i.e., the Oceans Protection Plan). In addition, the Board has provided recommendations to the GIC that would further reduce the risk, and mitigate the effects, of spills from Project-related vessels (i.e., the review of federal marine shipping oil spill response regime).

- The Board placed significant weight on the considerable social benefits from jobs, the Community Benefit Program and development of capacity of local and Indigenous individuals, communities and businesses.

- The Board also placed significant weight on the considerable economic benefits from market diversification and likely reduction of discounts to Canadian crude, increased competition among pipelines, spending on pipeline materials, and revenues to various levels of government.

Therefore, in light of Trans Mountain's commitments, Board conditions and recommendations to GIC to mitigate and reduce adverse environmental effects, the Board is of the view that the expected significant social and economic benefits outweigh the significant adverse environmental effects of the Designated Project that have been identified in the MH-052-2018 Report. For these reasons, and the reasons provided throughout this MH-052-2018 Report, the Board recommends that the GIC find the Project is likely to cause significant adverse environmental effects that can be justified in the circumstances. The Board has also identified a recommended follow-up program to be implemented with respect to the designated project.

2.3.2 Overall recommendation under the NEB Act

Having identified the benefits and residual burdens of the Project and Project-related marine shipping (summary in Section 2.2 and details throughout the MH-052-2018 Report), the Board must weigh and balance all of them to determine whether to confirm its recommendation from the OH-001-2014 hearing. In particular, the Board considered whether its recommendation under the CEAA 2012 resulted in changes or additions to its previous recommendation under the NEB Act. In the OH-001-2014 Report, the Board concluded:

> The Board must balance the totality of benefits against the totality of residual burdens to come to its final determination under section 52 of the NEB Act as to whether the Project is in the present and future public interest and necessity.

[40] The Board's approach to considering current regional, federal, and international initiatives and additional recommended measures is explained in Section 14.5.4 and Table 23.

> In making its recommendation, the Board must focus on the overall Canadian public interest. On the whole, taking into account all of the evidence in this hearing, considering all relevant factors, and given that there are considerable benefits nationally, regionally and, to some degree, locally, the Board finds that the benefits of this Project outweigh the residual burdens. Accordingly, the Board concludes that the Project is in the present and future public convenience and necessity, and in the Canadian public interest.

In its assessment of the public interest in the Reconsideration, the Board considered its recommendation under the CEAA 2012 that the designated Project is likely to cause significant adverse environmental effects that can be justified in the circumstances. As discussed above in the justification analysis, the Board carefully considered the significant adverse effects relating to SRKW, indigenous cultural use associated with SRKW, greenhouse gas emissions and spills. The Board is of the view that some of these environmental effects will be mitigated by Trans Mountain's commitments, Board conditions, and regulatory requirements (a summary can be found in Table 23 in Chapter 14).

An important outcome of the MH-052-2018 hearing that differs from OH-001-2014 hearing is the Board's recommendations to GIC which have broader implications on marine shipping generally, as well as relevance to avoiding or lessening the adverse effects of Project-related marine shipping. In addition, the Board accounted for the measures taken to avoid or lessen effects on SARA-listed species and to monitor them under subsection 79(2) of the SARA.

After considering the relevant evidence from the OH-001-2014 and MH-052-2018 hearings, the Board also affirms the following reasons from the OH-001-2014 Report:

> Many of the benefits, as can be seen from the foregoing analysis and the Report chapters, are national or regional in scope; fewer are strictly local. With respect to the burdens, the reverse is true; the majority of the burdens of the Project and Project-related marine shipping would be shouldered by local and regional communities.
>
> In balancing the benefits and burdens, the Board placed significant weight on the economic benefits from the Project. There would be considerable local, regional and national benefits from market diversification. These include enabling increased capacity to access Pacific Rim markets. There will also be considerable spending on pipeline materials in Canada, as well as considerable jobs that would be created for Canadians, including jobs and opportunities for Indigenous communities. Many of the benefits would be realized throughout Canada, particularly in B.C., Alberta, Ontario, and Quebec. The national nature of the benefits was important to the Board.

In the Board's view, the benefits of the Project are considerable, including increased access to diverse markets for Canadian oil; jobs created across Canada; the development of capacity of local and Indigenous individuals, communities, and businesses; direct spending on pipeline materials in Canada; and considerable revenues to various levels of government.

However, the Board is also of the view that the Project and its related marine shipping carries risks. Its burdens include the significant adverse effects that are likely to be caused by Project-related marine shipping on the Southern resident killer whale and Indigenous cultural use associated with the Southern resident killer whale.

Further, the benefits and burdens of the Project and its related marine shipping are not distributed evenly across the country.

Addressing effects, and cumulative effects in particular, on the Salish Sea requires a broad, systemic, and multi-faceted approach. To understand the effects of Project-related marine shipping and how best to mitigate those effects, one needs to understand the complex and interconnected system that it would operate within. In order to be most effective in mitigating environmental harm to the Salish Sea and its ecosystem that is likely to be caused by the Project, a broader approach is required; one which extends beyond the NEB's regulatory authorities and one which will benefit the broader system. The Board has conducted its environmental assessment, set Project conditions, and made its broader recommendations to the GIC with this in mind. This includes making recommendations that use an offset-based approach. It is the Board's view that, should the GIC make changes to the operation of all marine traffic, including Project-related traffic, and take action to relieve other stressors within the broader system, it will offset the incremental effects of the designated project and make material improvements to the health of the Salish Sea.

The Board has completed the MH-052-2018 hearing, has conducted an environmental assessment of Project-related marine shipping, has considered all of the relevant evidence filed on the record, and has relied upon the findings of the Board from the OH-001-2014 hearing for matters that are beyond the scope of the reconsideration. On the whole, the Board finds that the benefits of this Project outweigh the residual burdens and concludes that the Project is in the present and future public convenience and necessity, and in the Canadian public interest.

Accordingly, the Board confirms its recommendation that a Certificate should be issued and the Project should be approved.

2.3.2.1 Instruments

The Board recommends that a CPCN be issued under section 52 of the NEB Act, and that CPCNs OC-2 and OC-49 be amended to permit the construction and operation of the Project, including the complete looping (or twinning) of the existing Trans Mountain Pipeline system between Edmonton, Alberta, and Burnaby, B.C., and the construction and operation of associated facilities. The details of the work/activities to be undertaken pursuant to each of the CPCNs the Board would issue, should the Project be approved by GIC, are provided in Appendix 2. In Appendix 3, the Board has set out the terms and conditions that it considers necessary and desirable in the public interest, and to which the new and amended CPCNs would be subject if the GIC were to direct their issuance.

The other instruments required for the construction and operation of the Project as proposed by Trans Mountain are also subject to terms and conditions as outlined in Appendix 3. Details of the work/activities to be undertaken pursuant to each Instrument are provided in Appendix 2. These include four NEB Act section 58 orders approving temporary infrastructure and the construction, operation, and/or modification of pump stations and tanks; and an order, pursuant to section 44 of the OPR, for the deactivation of one pump station.

Since this Project overall is subject to the GIC approval, all of these additional orders contain a precondition that makes them ineffective unless and until the GIC approves issuance of new and amended CPCNs approving the Project

2.4 Conditions

For the Reconsideration, the Board was directed by GIC in OIC P.C. 2018-1177 to reconsider all conditions set out in the OH-001-2014 Report that are relevant to addressing the issues specified by paragraph 770 of the *Tsleil-Waututh Nation* decision, including Conditions 91, 131 to 134, 144, and 151.

Regardless of what the Board sets out in its Reconsideration Report, subsection 53(7) of the NEB Act requires the Board to set out in the report all the terms and conditions that it considers necessary or desirable in the public interest, should the Project be approved by the GIC. The conditions that are the focus of this Reconsideration are intended to reduce or eliminate the effects of Project-related marine shipping in accordance with the requirements of the CEAA 2012 and SARA. The conditions outline requirements that are within the scope of the Board's regulatory authority and which Trans Mountain, as the proponent, would be required to meet in order for the Project to be carried out. Conditions imposed by the Board are attached to Board regulatory instruments, are legally binding, and enforced pursuant to the NEB Act.

On 10 January 2019, the Board issued draft conditions relevant to Project-related marine shipping for comment. The submissions made in response are summarized in Appendix 16. The various chapters of this MH-052-2018 Report provide reasons for changes made or not made, as do the summaries in Appendix 15. There were suggestions made by parties to include different conditions, but none of these were found by the Board to be appropriate or necessary in the circumstances of the Reconsideration.

The Board has decided to:

- confirm Condition 151;
- replace (amend) Conditions 2, 91, 132, 133, 134, and 144; and
- turn Condition 131 into a recommendation to the federal government which has the necessary authority to address such matters.

#	Conditions
91	**Plan for marine spill prevention and response commitments** Trans Mountain must file with the NEB, **within 6 months from the issuance date of the Certificate**, a plan describing how it will ensure that it will meet the requirements of Condition 133 regarding marine spill prevention and response. The plan must be prepared in consultation with Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, Vancouver Fraser Port Authority, British Columbia Coast Pilots, Western Canada Marine Response Corporation, Fisheries and Oceans Canada and the Province of British Columbia, and must identify any issues or concerns raised and how Trans Mountain has addressed or responded to them. Trans Mountain must provide the plan to the above-mentioned parties at the same time as it is filed with the NEB.
131	**Marine Public Outreach Program** The Board has converted this condition into a recommendation (see Recommendation 12).
132	**Marine Mammal Protection Program** Trans Mountain must file with the NEB, **at least 3 months prior to commencing operations**, a Marine Mammal Protection Program that focuses on mitigating effects from the Project and associated cumulative effects, and on fulfilling Trans Mountain's commitments as a terminal operator with regard to Project-related marine shipping. The program must include: a) the goals and objectives of the program, including a discussion on how they align with the objectives of applicable Fisheries and Oceans marine mammal Recovery Strategies and Action Plans; b) a summary of the issues related to marine mammals from the Project and from Project-related marine vessels; c) a summary of the initiatives that Trans Mountain has supported or undertaken to-date, including the goals of each initiative and how they relate to the goals and objectives of the program; d) a discussion of the outcomes or progress updates of the initiatives identified in c), and how these outcomes have met or are contributing to the objectives of the program; e) any other initiatives that Trans Mountain intends to undertake or support in the future that are relevant to the program; and f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the program, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding, MH-052-2018 Reconsideration proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information.
133	**Confirmation of marine spill prevention and response commitments** Trans Mountain must file with the NEB, **at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project**, confirmation, signed by an officer of the company that: a) Trans Mountain has included in its Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide a requirement for tankers nominated to load at the Westridge Marine Terminal to have a suitable arrangement for the proposed enhanced tug escort between the Westridge Marine Terminal and Buoy J prior to departure. The tug escort should be suitable for foreseeable meteorological and ocean conditions and be based on tanker and cargo size; and b) an enhanced marine oil spill response regime is in place that is capable of: i) delivering 20,000 tonnes of capacity within 36 hours of notification, with dedicated resources staged within the study area; and, ii) initiating a response within 2 hours for spills in Vancouver Harbour, and within 6 hours for the remainder of the Salish Sea shipping route to the 12-nautical-mile territorial sea limit.
134	**Updated Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide** Trans Mountain must file with the NEB, **at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project, and thereafter on or before 31 January of each of the first five years after commencing operations,** an updated Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide, and a summary of any revisions made to each.
144	**Ongoing confirmation of marine spill prevention and response commitments** Trans Mountain must file with the NEB, **on or before 31 January of each year after commencing operations** confirmation, signed by an officer of the company, that it is continuing to meet the requirements of Condition 133 regarding Trans Mountain's marine spill prevention and response commitments. Trans Mountain must provide each filing to Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, Vancouver Fraser Port Authority, British Columbia Coast Pilots, Western Canada Marine Response Corporation, Fisheries and Oceans Canada and the Province of British Columbia at the same time as it is filed with the NEB. If a particular party mentioned above requests that it not be provided the annual filing, Trans Mountain may cease providing it to that party.

#	Conditions
151	**Post-construction environmental monitoring reports** Trans Mountain must file with the NEB, **on or before 31 January following the first, third, and fifth complete growing seasons after completing final clean-up,** a post-construction environmental monitoring report for the Project that must include: a) a description of the valued components or issues that were assessed or monitored; b) measurable goals for each valued component or issue; c) monitoring methods for each valued component or issue, results of the monitoring, and a comparison to the defined measurable goals; d) corrective actions taken, their observed success, and their current status; e) identification on a map or diagram of the locations where corrective actions were taken; f) any further corrective actions planned and a schedule for monitoring and reporting; and g) a summary of its consultations with appropriate government authorities and any potentially affected Indigenous groups and affected landowners/tenants. In the post-construction environmental monitoring report filed after the fifth full growing season after completing clean-up, Trans Mountain must include: i) an assessment of the effectiveness of mitigative and corrective actions and how learnings have been or will be applied to Trans Mountain's Environmental Protection Program; ii) a detailed description of all valued components or issues for which the measurable goals have not been achieved during the duration of the post-construction monitoring program; and iii) an evaluation of the need for any further corrective actions, measurable goals, assessments, or monitoring of valued components or issues, including a schedule for those. All filed post-construction environmental monitoring reports must address issues related, but not limited, to: soils; weeds; watercourse crossings; riparian vegetation; wetlands; rare plants, lichens and ecological communities; municipal tree replacement; wildlife and wildlife habitat; fish and fish habitat; marine fish and fish habitat; marine mammals; marine birds; and species at risk.

The remaining conditions from the Board's OH-001-2014 Report would still apply to the overall Project. The final list of 156 recommended conditions is provided in Appendix 3.

2.5 Recommendations to the GIC for the purposes of the CEAA 2012 and the SARA

For the GIC's consideration in deciding whether or not to approve the Project, the Board is including recommendations for measures to mitigate, avoid, or lessen the effects of Project-related marine shipping that are beyond the scope of the Board's regulatory authority and Trans Mountain's control, but within the authority of the GIC. This is consistent with the direction of the Court of Appeal in *Tsleil-Waututh Nation*:

> While the Board lacked authority to regulate marine shipping, the final decision-maker was not so limited… the GIC required the Board's exposition of all technically and economically feasible measures that are available to avoid or lessen the Project's effects on the Southern resident killer whale.[41]

Unlike conditions, recommendations would not be attached to any Board regulatory instruments or enforced by the Board. However, the reporting requirement in Recommendation 2 provides an added layer of accountability for the implementation of the recommendations.

Recommendations were not taken into account in the Board's current significance evaluation under the CEAA 2012, but could result in future mitigation. Recommendations are also relevant to the justification analysis under the CEAA 2012 and the requirements of the SARA. Although the Board's recommendations to the GIC are directly related to its environmental assessment of Project-related marine shipping, the Board is of the view that, if implemented, they may assist in mitigating effects of all marine traffic in the area. This would be a positive outcome that would extend beyond mitigating or offsetting the impacts of the Project and its related marine shipping.

On 10 January 2019, the Board issued draft recommendations for comment. The Board revised some of the recommendations and also added three new recommendations. The various chapters of this MH-052-2018 Report provide reasons for changes made or not made, as do the summaries in Appendix 15. These recommendations and the Board's views on them are found in Chapter 14 of this MH-052-2018 Report.

[41] *Tsleil-Waututh Nation* at para 456.

#	Recommendations
1	The Governor in Council should develop and implement a regional cumulative effects management plan. This plan should assess the overall environmental state of, and cumulative effects on, the Salish Sea (including the Strait of Juan de Fuca and out to the 12-nautical-mile territorial sea limit), and should include a long-term strategy for managing those cumulative effects. It should also be used to inform the consideration of future proposed projects. This plan should include, but not be limited to: a) consideration of the many impacts on the Salish Sea, including contamination from point and diffuse land-based sources, the multiple impacts on salmon and other fish stocks, and the impacts from all vessel traffic; b) incorporation of the work the federal authorities are already planning in the area, such as under the Coastal Environmental Baseline Program and the Cumulative Effects of Marine Shipping initiative (including its regional cumulative effects assessment); c) development of short-, medium-, and long-term targets for addressing cumulative effects, including consideration of the feasibility of reducing total underwater noise, strike/collision risk of vessels with marine species, and key contaminant levels over time, and feasible and effective measures for achieving those targets; and d) monitoring to help determine the extent of cumulative effects, the success of measures to manage those effects, and progress towards meeting targets. The Governor in Council should consider whether a regional study pursuant to sections 73 or 74 of the CEAA 2012 should be undertaken as part of the cumulative effects management plan, and include in its public reporting a rationale on whether this would be advantageous. The plan should be developed and implemented in consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, Vancouver Fraser Port Authority (VFPA), and other relevant stakeholders.
2	The Governor in Council should report publicly, on an annual basis, on the oversight, progress, and status of initiatives and measures to address cumulative effects on, and to support the health of, the Salish Sea (including the Strait of Juan de Fuca and out to the 12-nautical-mile territorial sea limit), including but not limited to: a) progress on addressing Recommendation 1 above, including monitoring results and progress towards meeting targets; b) the Ocean Protection Plan, the Whales Initiative, and any other relevant commitments made by federal authorities during the Board's MH-052-2018 Reconsideration hearing; c) relevant initiatives and measures being undertaken by others, such as the marine shipping measures of the Enhancing Cetacean Habitat and Observation Program (ECHO) Program, for the duration such initiatives or measures are undertaken; d) species status updates for *Species at Risk Act*-listed species, including any relevant measures proposed in recovery documents under the *Species at Risk Act*; e) progress on addressing Recommendations 3 through 16 below, including results of monitoring to determine the effectiveness of measures and any adaptive management as part of a follow-up program; and f) consultation activities related to these initiatives and measures, including with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders. The public reporting should include an explanation of how these various initiatives and measures work together, the identification of any notable gaps, and plans for how those gaps will be addressed.
3	The Governor in Council should develop and implement, with support from industry, a marine bird monitoring and protection program to better understand impacts of all vessel use within the Salish Sea on marine bird species, including species at risk, and, if adverse effects are found, implement mitigation from those impacts. This program should include adaptive management measures by the Government of Canada where warranted by monitoring results, to avoid or reduce marine bird mortality and sensory disturbance. This program should be developed and implemented in consultation with relevant marine shipping stakeholders and Indigenous peoples.
4	The Governor in Council should expedite the work in completing the feasibility study for establishing a Southern Strait of Georgia National Marine Conservation Area Reserve, publicly report on the outcomes of that study, and (if considered feasible) proceed to establish it. Its potential establishment should include consideration of other initiatives under the Oceans Protection Plan, such as the Ports Modernization Review and the National Anchorage Strategy. This work should be done in consultation with potentially affected Indigenous and coastal communities and with relevant marine shipping stakeholders including Transport Canada, Canadian Coast Guard and the VFPA.
5	The Governor in Council should develop an Offset Program to offset both the increased underwater noise and the increased strike risk posed to *Species at Risk Act*-listed marine mammal and fish species (including Southern resident killer whale) due to Project-related marine shipping, at each relevant section of the marine shipping route (i.e., Strait of Georgia, Boundary Pass, Haro Strait, Strait of Juan de Fuca, and out to the 12-nautical-mile territorial sea limit), and at the relevant times of year. Each offset measure should apply to all appropriate vessels for that measure (i.e., not limited to Project-related vessels), to be determined on a case-by-case basis according to the type of measure and the type(s) of vessels it is targeted at. The Offset Program should be developed and implemented in consultation with Indigenous peoples, other marine users, the Province

#	Recommendations
	of British Columbia and local governments, VFPA, and other relevant stakeholders. The Offset Program should include any further research and data collection that is necessary to successfully undertake it, including consideration of whether further information on the number of vessel strikes on marine mammals can be gathered. There should be periodic public reporting that provides, at the appropriate times, the information necessary to demonstrate a robust Offset Program. This should include measured or estimated underwater noise and strike risk due to Project-related marine shipping, and the extent over time to which that additional noise and strike risk has been offset in each section of the route, including the monitoring/modelling used to demonstrate that.
6	As part of the Offset Program in Recommendation 5, the Governor in Council should further consider each of the following specific measures, each applicable to all appropriate vessels (i.e., not limited to Project-related vessels), and publicly report on the feasibility and likely effectiveness of each (including consideration of navigational safety, international coordination and socio-economic effects): a) Slowdowns in each section of the marine shipping route (i.e., Strait of Georgia, Boundary Pass, Haro Strait, Strait of Juan de Fuca, and out to the 12-nautical-mile territorial sea limit). b) Potential limits on the activities of whale watching boats (such as the number of boats and/or their time on water, and other potential ways to limit their impacts). c) Noise reduction efforts for regularly operating ferries in the area, and an accelerated schedule for implementation. d) Identification of specific foraging, congregation and migration areas of the *Species at Risk Act*-listed species (including Humpback, Grey, Fin and killer whales, as well as Basking shark and Leatherback sea turtle) and consideration of mitigations in those areas (including Swiftsure Bank). e) Further incentives and requirements for quiet vessel design and refits to address underwater noise over the long term, including maximal participation in relevant initiatives and committees of the International Maritime Organization. Consideration of the above measures should include consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders.
7	The Governor in Council should review and update federal marine shipping oil spill response requirements. This review should include consideration of the following: a) updating the 1995 Response Organization Standards; b) response planning methodologies; c) response planning for *Species at Risk Act*-listed species, including marine mammals; d) how completed and ongoing research related to oil fate and behaviour and response methods and technology will be considered in response planning, procedures, and equipment; e) salvage requirements; f) public reporting by response organizations to promote transparency of information; g) inclusion of Indigenous peoples and local communities in response planning; and h) a requirement for additional response resources on all ocean-going vessels.
8	The Governor in Council should develop a regulatory framework for making enhanced tug escort mandatory in the Salish Sea for Project-related tankers. The framework should include oversight and enforcement mechanisms. Mandatory enhanced tug escort should also be considered for other vessels as appropriate.
9	The Governor in Council should, in conjunction with relevant United States regulatory authorities, consider the need for a Canada/United States Transboundary Vessel Traffic Risk Assessment.
10	The Governor in Council should actively support the development and implementation of greenhouse gas reduction measures related to marine shipping that would align with the final International Maritime Organization Strategy by year 2023 for reducing greenhouse gas emissions. These measures could include, but not be limited to: a) facilitating the use of low-carbon alternate fuels (such as liquefied natural gas) for marine vessels by developing any necessary marine safety regulatory framework, training programs, and bunkering infrastructure requirements; b) use of energy efficient technologies, such as engine and propulsion upgrades and hull modifications; and c) market-based measures, such as providing economic incentives for industry investment in the development and use of energy efficient technologies, and offsetting any increases in ship emissions. In implementing the measures, the Governor in Council could also consider a mechanism to establish and monitor such reductions and to develop regulations under an appropriate legislation.

#	Recommendations
11	The Governor in Council should, in conjunction with Transport Canada and the Canadian Coast Guard, facilitate opportunities, as appropriate, to engage and seek feedback from the Indigenous Advisory and Monitoring Committee on the marine safety system, including on the marine inspections and enforcement regime; in addition to identifying engagement opportunities for Project-related marine shipping activities that intersect with Canadian Coast Guard operational programs.
12	The Governor in Council should, in conjunction with the Pacific Pilotage Authority and Transport Canada, continue engagement and awareness activities targeting coastal Indigenous communities, recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. This should include incorporating the resources and information that Trans Mountain has already provided or will provide to the Pacific Pilotage Authority, such as applicable information on Project-related vessel timing and scheduling.
13	The Governor in Council should, in order to enhance the safety of all sizes of marine vessels, accelerate the development and implementation of the Enhanced Maritime Situational Awareness initiative and the proposed extension of the Automatic Identification System to smaller passenger vessels.
14	In order to foster a more rapid development and employment of new oil recovery technologies, the Governor in Council should administratively combine its current initiatives and investigate the use of new paths for the delivery of government grants and contributions in order to provide financial incentives to promote innovation in such developments.
15	The Governor in Council, in conjunction with Transport Canada, should review the federal marine oil spill compensation regimes with regards to compensation for non-use values, for Indigenous and non-Indigenous communities, including any non-coastal communities that may be impacted as a result of a marine oil spill.
16	The Governor in Council, in conjunction with VFPA, should develop a formal complaint resolution program that gathers community feedback, brings together diverse community stakeholders to facilitate discussions about port-related impacts, and resolves complaints about marine vessels anchored at the VFPA-managed anchorages.

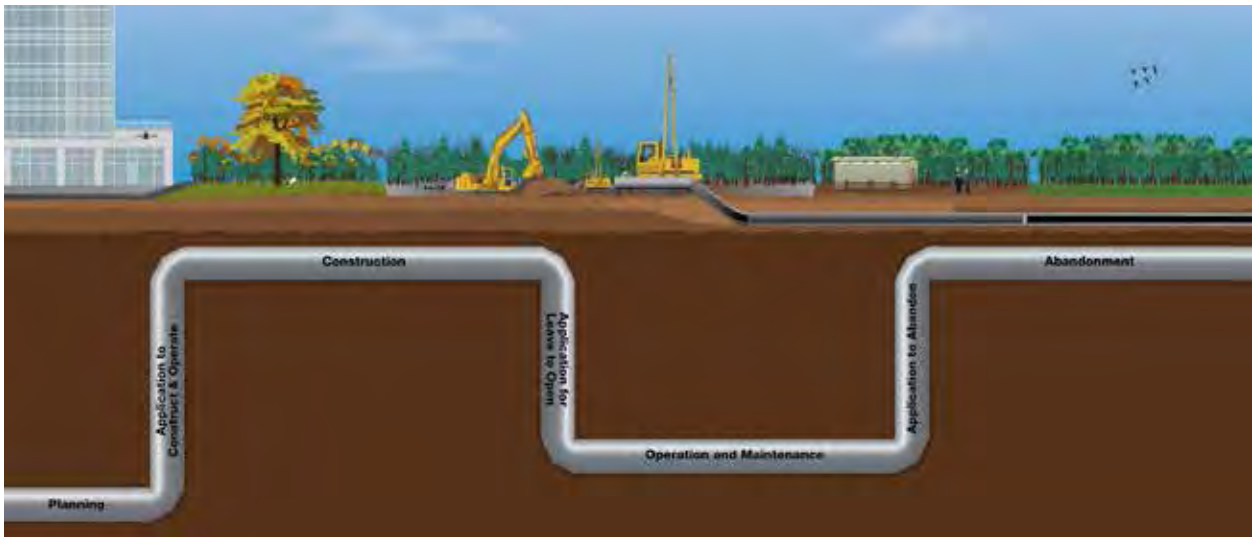
3.0

Regulating through the Project lifecycle

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.), the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report.

The approval of a project, through issuance of one or more Certificates of Public Convenience and Necessity (CPCNs) and/or orders incorporating applicable conditions, forms just one phase in the Board's lifecycle regulation. The Board's public interest determination relies upon the subsequent execution of detailed design, construction, operation, maintenance and, ultimately, abandonment of a project in compliance with applicable codes, commitments and conditions, such as those discussed in Chapter 1. Throughout the lifecycle of an approved project, as illustrated in Figure 4, the Board holds the pipeline company accountable for meeting its regulatory requirements in order to keep its pipelines and facilities safe and secure, and protect people, property and the environment. To accomplish this, the Board reviews or assesses condition filings, tracks condition compliance, verifies compliance with regulatory requirements, and employs appropriate enforcement measures where necessary to quickly and effectively obtain compliance, prevent harm, and deter future non-compliance.

Figure 4: Lifecycle regulation



After a project application is assessed and the Board makes its section 52 recommendation (as described in Chapter 2), the project cannot proceed until and unless the Governor in Council approves the project and directs the Board to issue the necessary CPCN. If approved, the company would then prepare plans showing the proposed detailed route of the pipeline and notify landowners. A detailed route hearing may be required, subject to section 35 of the *National Energy Board Act* (NEB Act). The company would also proceed with the detailed design of the project and could be required to undertake additional studies, prepare plans or meet other requirements pursuant to NEB conditions on any CPCN or related NEB order. The company would be required to comply with all conditions to move forward with its project, prior to and during construction, and before commencing operations. While NEB specialists would review all condition filings, those requiring approval of the Board would require this approval before the project could proceed.

Once construction is complete, the company would need to apply for the Board's permission (or "leave") to open the project and begin operations. While some conditions may apply for the life of a pipeline, typically the majority must be satisfied prior to beginning operations or within the first few months or years of operation. However, the company must continue to comply with the *National Energy Board Onshore Pipeline Regulations* (OPR) and other regulatory requirements to operate the pipeline safely and protect the environment.

The Board's regulatory requirements focus on preventing incidents and emergencies, and the Board promotes development of pipeline company safety culture as an important element in meeting this goal. It is a company's responsibility to keep its pipelines safe through implementation and continuous improvement of a comprehensive management system, and effective pipeline integrity, safety, security, environmental protection, and crossing and public awareness programs, with a target of zero spills. While the prevention of incidents is the Board's top priority, the Board also believes that being prepared for any situation is a critical part of energy safety. NEB-regulated companies must have robust emergency management programs to manage conditions and reduce consequences during an emergency. Should an incident occur, the NEB investigates the incident and holds the company accountable for corrective actions and clean-up.

If the Project is approved, the Board would employ its established lifecycle compliance verification and enforcement approach to hold Trans Mountain accountable for implementing the proposed conditions and other regulatory requirements during construction, and the subsequent operation and maintenance of the Project.

3.1 Condition compliance

If the Project is approved and Trans Mountain decides to proceed, it would be required to comply with all conditions that are included in the CPCNs and associated regulatory instruments (Instruments). The types of filings that would be required to fulfill the conditions imposed on the Project, if approved, are summarized in Table 4.

Table 4: Conditions by filing type

Filing type	Number of conditions requiring one or more of this type of filing
Supplementary study, assessment or survey that contributes to Project planning	17
Engineering/risk assessments, detailed design and/or related information or confirmation	33
Plan or program (such as management, monitoring, financial or habitat offset plans)	67
Report on outcomes of activities	27
Other compliance filings	31

If the Project is approved, the Board would oversee condition compliance, make any necessary decisions respecting such conditions, and eventually determine, based on filed results of field testing, whether the Project could safely be granted leave to open.

Documents filed by Trans Mountain on condition compliance and related Board correspondence would be available to the public on the NEB website. All condition filings, whether or not they are for approval, would be reviewed and assessed to determine whether the company has complied with the condition, and whether the filed information is acceptable within the context of regulatory requirements and standards, best practices, professional judgement and the goals the condition sought to achieve. If a condition is "for approval," the company must receive formal approval, by way of a Board letter, for the condition to be fulfilled.

If a filing fails to fulfill the condition requirements or is determined to be inadequate, the Board would request further information or revisions from the company by a specified deadline, or may direct the company to undertake additional steps to meet the goals that the condition was set out to achieve.

3.2 Construction phase

During construction, the Board would require Trans Mountain to have qualified inspectors onsite to oversee construction activities. The Board would also conduct field inspections and other compliance verification activities (as described in Section 3.5) to confirm that construction activities meet the conditions of the Project approval and other regulatory requirements, to observe whether the company is implementing its own commitments and to monitor the effectiveness of the measures taken to meet the condition goals, and ensure worker and public safety and protection of the environment.

3.3 Leave to open

If the Project is approved and constructed, the Board will require Trans Mountain to also apply, under section 47 of the NEB Act, for leave to open the pipelines and most related facilities. This is a further step that occurs after conditions applicable to date have been met and the company wishes to begin operating its pipeline and facilities. The Board reviews the company's submissions for leave to open, including the results of field pressure testing, and may seek additional information from the company. Before granting leave to open, the Board must be satisfied that the pipeline or facility has been constructed in compliance with requirements and that it can be operated safely. The Board can impose further terms and conditions on a leave to open order, if needed.

3.4 Operations phase

If the Project is approved and constructed, once the Project is in operation, Trans Mountain would be required to restore the right-of-way (RoW) and temporary work areas to a condition similar to the surrounding environment and consistent with the current land use. The NEB would require Trans Mountain to monitor the RoW and file post-construction monitoring reports that identify any environmental issues caused by construction activities and what the company plans to do about unresolved issues. The NEB would also conduct post-construction inspections to verify compliance with regulatory

requirements, including conditions and commitments, and to monitor the company's mitigation measures for success in restoring the land.

During the operational phase, as for its existing pipeline system, Trans Mountain would be required to conduct monitoring and maintenance of its pipelines and facilities, including running measurement tools through the pipelines and conducting investigative digs at the locations of any anomalies, to ensure the ongoing integrity of the pipelines. Trans Mountain would also be required to regularly monitor the RoW for signs of pipeline leaks or impacts to the land (such as slope movement, erosion, compaction, or invasive plants), as well as infringements on the RoW by third parties. When issues are identified, the Board can require further action to correct the situation. The Board also assists in addressing and resolving landowner complaints.

The Board would monitor compliance with the remaining CPCN and Instrument conditions and other regulatory requirements throughout the operating life of the Project. To evaluate Trans Mountain's performance and compliance, the Board would, where appropriate, conduct compliance meetings, audit Trans Mountain's management systems and protection programs, and/or inspect its facilities, operations and maintenance activities.

3.5 Compliance verification and enforcement

The Board recognizes that properly constructed and well-managed pipelines are not entirely free of risk. That is why the Board's compliance and enforcement programs are designed to make sure companies are effective in managing safety and environmental protection throughout the lifecycle of a pipeline, from design to construction to operation and through to abandonment. In addition to conditions of NEB orders and CPCNs, companies must comply with applicable acts and regulations, including the NEB Act and the OPR, applicable codes and standards, and companies' own policies, plans, programs, systems and commitments.

In order to hold companies accountable to these requirements, the Board evaluates their facilities, activities, and condition filings on an ongoing basis, including before, during, and after construction. Once construction is complete, the Board continues to evaluate compliance throughout the operation of a project until it is eventually abandoned. Compliance verification activities include field inspections, management system audits, various compliance meetings, review of company programs, manuals and reports (including regularly updated Emergency Response Plans), and evaluation of emergency response exercises. This proactive approach allows the Board to identify potential problems and address them with the appropriate enforcement tool or tools before they become an issue.

The Board uses a risk-informed approach when planning compliance verification activities. This means that the Board evaluates regulated companies and their facilities on an ongoing basis to determine the appropriate compliance verification activities. The Board then focuses its oversight according to the level of risk to public and worker safety and the environment.

The Board looks at the potential consequences a facility could pose to people and the environment based on a number of criteria, including the facility's location and the type of product carried. The Board also looks at the probability of effects on people and the environment based on a company's operating history and performance.

While all companies are subject to regulatory oversight, some companies receive more than others. In other words, high consequence facilities, challenging projects and those companies that are not meeting the Board's regulatory expectations and goals can expect to see the Board more often than those companies and projects with routine operations.

Board Inspection Officers have the authority to take immediate action if they have reasonable grounds to believe that a hazard to the safety or security of the public or employees of a company, or a detriment to property or the environment, will be caused by the construction, operation, maintenance or abandonment of a pipeline. The Board's goal is to obtain regulatory compliance as quickly and as effectively as possible in order to prevent harm to people, property or the environment, and the Board has a number of tools to make this happen, as well as to deter future non-compliance. These tools include suspending construction or operations, and revoking the CPCN or order that allows a company to continue operating a pipeline or facility. In addition, every person that contravenes certain provisions of the NEB Act or regulations may be subject to criminal prosecution and sentencing in criminal court, including fines up to $1,000,000 or imprisonment for up to five years, or both. For contraventions of Board decisions or orders (including conditions and referenced company commitments), the NEB Act or regulations, the Board also has the ability to issue Administrative Monetary Penalties of up to $100,000 per day. Furthermore, most of the Board's enforcement tools are not mutually exclusive and more than a single measure may be used concurrently, depending on the situation.

The Board is committed to providing information to the public on the safety of NEB-regulated pipelines and facilities by posting compliance and enforcement documents on its website. Condition filings are publicly posted on the NEB's Regulatory Document Index and condition compliance status, inspection reports, audit reports, Inspection Officer Orders, Board Orders, and Administrative Monetary Penalty Notices of Violation are all publicly posted on the NEB's Compliance and Enforcement webpage.

3.6 Regulating emergency response

One of the key goals of the Board's compliance and enforcement program is to prevent pipeline incidents from happening in the first place. However, should an incident occur, the Board is ready to respond, as and when required.

In addition to reporting all incidents through the Board's Online Event Reporting System, companies are responsible for reporting significant incidents, including ruptures or larger spills which leave company property or the RoW, to the Transportation Safety Board which then notifies the Board. Each company is expected to implement its emergency response plan immediately, which must be on file with the Board prior to beginning operation and which must be kept up to date. An emergency response plan outlines the emergency management procedures that the company will follow during an incident. The procedures must address emergency management, environmental protection, and worker and public safety. The Board also requires a regulated company to develop a training program and conduct emergency exercises. The Board often independently observes these exercises to verify the company's capabilities in responding to incidents.

When the Board is notified of an incident, its top priorities are the safety and security of people, and the protection of property and the environment. The Board holds the company fully responsible and accountable for clean-up and site remediation, regardless of the size of the release.

When an incident is reported, the Board initiates its emergency response procedures and, if appropriate, activates its Emergency Operations Centre (EOC) or deploys field personnel. The Board coordinates, from the EOC, field staff at the incident site and provides situation reports to the Government of Canada's EOC. The Board also has working agreements with other government departments and agencies to coordinate responses and communicate effectively during emergencies.

In the case of a spill, once Board staff arrives at the incident site, they make sure that the company is properly cleaning up the spill and remediating any environmental effects caused by the incident. The Board's long-term goal with any incident is the full restoration of the site, including mitigating any potential sub-surface effects on groundwater. Companies are required to meet the most stringent applicable remediation criteria for all contaminants of concern.

3.7 Developing a safety culture

The Board believes that one of the best ways to prevent an accident from happening in the first place is to promote a workplace culture where safety is a way of life. This means that safety, not production or deadlines, must be a company's very first priority.

In some of the worst tragedies in the energy industry,[42] there was often an observable disconnect between the company's vision and policies, and the planning, implementation, monitoring and review of these policies. While the direct causes of these incidents varied, investigators found the lack of a strong safety culture was a factor in all of the incidents.

To achieve a strong safety culture, companies set the tone, beginning at the very top of the organizational chart. It is the senior executives who shape and reinforce a robust safety culture in which the company demonstrates a continual respect for threats to its defenses. The required investment of time, energy and resources means it cannot simply be an intellectual exercise to meet a prescribed minimum standard. It has to be a personal mission for the person at the top. It is their duty to drive the culture and values down and across the organization.

When committed safety leadership exists, safety performance and oversight are considered part of the organization's governance model in the same way as financial performance. This means that leaders stand up for safety even when production may be impacted.

The OPR requires senior company leadership to be accountable for building a safety culture and supporting management systems. Companies must appoint a senior officer who is accountable to ensure that the company's management system and programs are in compliance with the OPR.

[42] Det Norske Veritas. (2011). Major Hazard Incidents. Prepared for the National Energy Board's Arctic Offshore Drilling Review. Report No.: NEB 2010-04 / DNV Reg. No.: ANECA 851

4.0

Public consultation

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.) and to replace "Aboriginal" with "Indigenous," the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report.

The Board's expectations of an applicant regarding public consultation are set out in the Board's Filing Manual. Applicants are expected to undertake a level of public consultation commensurate with the setting, nature, and magnitude of their project. The Board uses the information gained through the company's consultation process, and filed on the hearing record, to contribute to its understanding of the concerns and interests of those who are potentially affected by the project, and to help inform its public interest determination. The Board requires companies to involve the public during each phase in the lifecycle of a project (that is, project design, construction, operation and maintenance, and decommissioning or abandonment) in order to address potential impacts of that project.

This chapter addresses Trans Mountain's public consultation program. Trans Mountain's engagement and consultation with potentially affected Indigenous groups are discussed in Chapter 5.

4.1 Trans Mountain's Stakeholder Engagement Program

4.1.1 Principles and goals of Trans Mountain's Stakeholder Engagement Program

Trans Mountain said that its Stakeholder Engagement Program is designed to foster participation from the public who have an interest in the scope, activities and routing of the Project. The program seeks input from stakeholders regarding the proposed pipeline corridor, environmental effects, and socio-economic effects and benefits. The program also shares information with stakeholders to keep them informed throughout the process.

Prior to launching its Stakeholder Engagement Program in 2011, Trans Mountain said that it consulted with local governments and community leaders to seek input on the program. These early conversations with local governments and community leaders provided Trans Mountain with direction on areas of greatest interest to local communities, appropriate means of engagement for different communities and local stakeholders who should be engaged in the process.

Trans Mountain identified a number of stakeholder groups that could have an interest in the Project, including: private and public landowners and occupants, government authorities, industry and business development agencies, environmental non-governmental organizations, special interest groups and the general public. Trans Mountain said that its Stakeholder Engagement Program allows for the identification of new information and additional stakeholders as Trans Mountain proceeds through the life of the Project.

In consideration of the potential impacts to the marine environment from an increase in Project-related marine vessel traffic, Trans Mountain said that it extended stakeholder engagement to include coastal communities beyond the pipeline terminus

at the Westridge Marine Terminal (WMT) in Burnaby, B.C. In recognition of this and the high level of stakeholder interest in marine shipments of petroleum products, Trans Mountain engaged communities on Vancouver Island and the Gulf Islands along established marine shipping corridors transited by oil tanker traffic, as well as communities in and around Port Metro Vancouver.

Trans Mountain described the principles it used to guide the development and execution of the Stakeholder Engagement Program. These included principles regarding accountability, communication, local focus, mutual benefit, relationship building, respect, responsiveness, shared process, sustainability, timeliness and transparency.

Trans Mountain said it is committed to ongoing engagement throughout the life of the Project, including the continuation of engagement opportunities through hosting facility open houses, providing newsletters and Project updates, making safety and public awareness presentations; and participating in community events, regulatory processes and ongoing informal meetings with stakeholders.

4.1.2 Public consultation activities

Trans Mountain said that its engagement activities were designed to reflect the diverse and varied interests of the various communities and areas along the proposed pipeline route, and provided various engagement opportunities, including public open houses, community workshops, and online discussion activities. Trans Mountain said that since 2012, there were tens of thousands of exchanges with stakeholders through face-to-face meetings, presentations, public forums, technical meetings, community meetings, social media sites, community investment events, emails, telephone calls, letters, advertisements and website postings. It noted that some of these exchanges included:

- providing 159 open houses or workshops along the pipeline and marine corridors, including topics focused on routing, emergency management, economic benefits, regional environmental and socio-economic assessment (ESA), and terminal information;
- organizing more than 1,700 meetings between Project team members and stakeholder groups;
- responding to approximately 550 phone inquiries and 1,500 emails received from the public; and
- providing responses to approximately 950 media inquiries and giving 430 media interviews.

Trans Mountain translated various documents, such as news releases, newspaper advertisements and information material, into French, Chinese, Punjabi and Korean with the goal to provide Project information in other languages that would help inform and serve public audiences and media in communities along the proposed pipeline and marine corridor. Trans Mountain said that community and technical workshops, and public open houses were advertised in numerous newspaper and online advertisements and direct mail postcard drops.

Trans Mountain said that feedback received from the stakeholder engagement initiatives helped shape various aspects of the Project, including topics and issues related to construction, routing, economic benefits and impacts, employment and training, environment, liability and safety. Examples of how Trans Mountain said that it incorporated stakeholder feedback into the design of the Project included:

- exploring alternative methods of construction in order to avoid the use of temporary workspace in Colony Farm Regional Park;
- establishing access plans, construction schedules, pipeline alignments and compensation plans to minimize impacts to Ledgeview Golf Course;
- having horizontal directional drilling entry and exit points more than 30 metres away from the watercourse in order to avoid routing the proposed pipeline through riparian zones; and
- assigning community construction liaison roles as part of its construction team as a key point of contact, in response to concerns raised by the Wembley Estates Strata Council.

4.1.3 Landowner Relations Program

Trans Mountain said that the primary objectives of its Landowner Relations Program were to:

- introduce the Project to landowners and occupants;
- obtain approval for land access on a timely basis to support engineering and environmental surveys;
- obtain landowner understanding, acceptance, and land rights for survey, construction, restoration, and transition to operations; and

- preserve good relationships that currently exist and reinforce positive relations into operations.

Trans Mountain identified a study corridor of, generally, 150 metres width along the entire length of the Project. Since the commencement of the Landowner Relations Program, Trans Mountain's Project representatives identified and contacted more than 4,400 owners and occupants of properties located in part or in whole within the proposed pipeline corridor and alternative corridors in Alberta and B.C. A standard information package was provided that included information regarding the Project, NEB publications and a copy of the original easement. As route refinements were made, some landowners and occupants were no longer within the 150-metre-wide pipeline corridors. Those who no longer fell within the consultation areas were notified and no longer engaged. Those landowners or occupants that were identified as being within these areas were contacted.

Trans Mountain said that it continued to engage with landowners into 2014 to obtain permission for environmental and engineering surveys, discuss changes in potentially affected lands resulting from routing modifications, and provide Project notification and details to any new landowners or occupants potentially affected by these changes. In addition to commencing discussions on land rights acquisition, land agents continued efforts to obtain survey consent for those lands where landowners had not yet provided their consent, to collect issues and concerns, and to provide information to landowners in response to any questions and concerns. Trans Mountain said that the questions, issues or concerns raised by landowners commonly included topics such as land access, compensation, environmental and land impact, land value, legacy concerns, opposition to the Project, and construction and routing.

Some of the evidence filed and concerns raised by intervenors related to issues that occurred respecting the existing Trans Mountain Pipeline (TMPL) system. Trans Mountain said that although these specific issues related to the existing TMPL system and are therefore not within the scope of this hearing, Trans Mountain representatives attempted to meet with landowners and address the concerns identified.

Trans Mountain said that its Landowner Relations Program continues to be an ongoing process, and questions or concerns will continue to be addressed throughout the life of the Project.

4.2 Trans Mountain's consultation with governments

Trans Mountain said that it incorporated consultation with municipal, provincial and federal governments into its consultation activities for the Project, as it anticipated that they would have an interest in shaping project planning. The company said that local government officials from relevant jurisdictions in Alberta and B.C. were invited to and participated in, stakeholder and issues identification, public information and input gathering, community conversations and continuing engagement. In June and July 2012, a Project information package was mailed to municipal governments, members of the legislative assemblies, and members of parliament along the proposed pipeline corridor and in marine communities.

Trans Mountain said that it held more than 250 government meetings to provide information on the Project and respond to questions on a wide range of topics, including routing, Indigenous and stakeholder engagement, the marine ESA, Transport Canada's Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL) marine risk studies, and economic benefits.

Several government authorities requested further information from Trans Mountain on aspects of its consultation with various stakeholders, landowners and other government authorities. They also requested further information from Trans Mountain on aspects of its ongoing engagement program with regard to concerns about the impact of the Project on emergency services, transportation rights-of-way, infrastructure, permits and further route refinements.

In the joint final argument of the City of Abbotsford, Township of Langley, Fraser Valley Regional District, Fraser-Fort George Regional District and Village of Valemount, the intervenors expressed concerns regarding Trans Mountain's overall consultation methods and its failure to communicate with them or incorporate their feedback on important matters that would impact them, specifically during the design and construction phase of the Project. These intervenors said that Trans Mountain had not fully recorded all of the commitments it made to them, and it had failed to identify and adequately mitigate the risk and impacts to the local governments.

The City of Burnaby said that it had not made formal or informal arrangements with Trans Mountain for many of the necessary services, resources, and planning initiatives that Trans Mountain contemplates will be available. It said that Trans Mountain made many assumptions concerning emergency services, emergency planning, evacuation, availability of external resources, fire services, police services, traffic management, planning and development, land use, access to water, noise and compensation that were either incorrect or unsupported by commitments from the City of Burnaby.

Trans Mountain said that the City of Burnaby declined several attempts by Trans Mountain to engage with the city about its concerns.

Trans Mountain said that it maintained regular engagement with the governments of Alberta and B.C., facilitating effective participation in the assessment process by provincial authorities. Trans Mountain said that it will continue ongoing municipal and regional government engagement, including undertaking a number of specific engagement commitments it has made during the hearing process that extend from approval through the entire lifecycle of the Project. It also committed to work jointly with municipalities to identify and address specific municipal issues and concerns through joint technical working groups. Trans Mountain said that it would review intervenor submissions and incorporate all applicable commitments into the commitments tracking table to ensure no commitments are missed.

Views of the Board

The Board regards engaging the public as an essential and ongoing activity throughout the Project's entire lifespan. Thorough and effective consultation requires a process that must provide timely, appropriate and effective opportunities for all potentially affected parties to learn about the Project, provide their comments and concerns, and to discuss how Trans Mountain could address them.

The Board is of the view that Trans Mountain has developed and implemented a broadly based public consultation program, offering numerous venues and opportunities for the public, landowners, governments and other stakeholders to learn about the Project, and to provide their views and concerns to the company.

Since a company's relationship with directly affected stakeholders will continue for several decades throughout the lifecycle of a project, it is critical for all parties to recognize and understand their respective roles and responsibilities for achieving effective dialogue during consultation, including those offered outside of the NEB hearing process. The Board expects affected parties, including municipalities, to engage with Trans Mountain by communicating their concerns to the company and making themselves available to discuss potential solutions. The Board observes with regret that not all municipalities accepted the opportunity to engage with the Trans Mountain effectively. In particular, the City of Burnaby declined a number of opportunities to engage with Trans Mountain. The Board is of the view that when municipalities decline opportunities to engage, this diminishes the quality of information available to both the company and the Board, and creates the potential that less than satisfactory solutions to municipal concerns may be the result.

The Board acknowledges the concerns raised by municipalities regarding ongoing consultation, particularly during the design and construction phase of the Project. Trans Mountain has committed to offer continued engagement opportunities to affected municipalities through the formation of technical working groups, with the stated goal to build trust and good relationships where the company operates. The Board views such working groups as useful opportunities to explore collaborative approaches through the design and construction phases of the Project, and to pursue ongoing dialogue. To facilitate the establishment and development of the technical working groups, the Board would impose Condition 14 requiring Trans Mountain to file with the Board, prior to commencing construction, the terms of reference for the technical working groups, to be developed in collaboration with participating affected municipalities, and facility owners and operators.

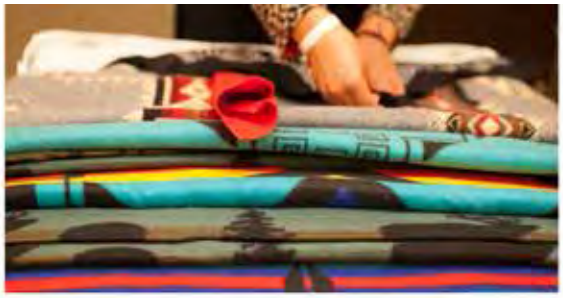
Although consultation with government authorities was initiated early in the process, the Board expects Trans Mountain to continue to offer opportunities for effective and timely consultation with government stakeholders, as appropriate, through the lifecycle of the Project in order to further identify and adequately address concerns regarding the Project's potential effects on governments, including municipalities. To facilitate Trans Mountain's ongoing consultation with government stakeholders, and to apprise the Board and all parties of the outcomes of this ongoing consultation, the Board would impose Condition 49 requiring Trans Mountain to file with the Board reports of the meetings of the technical working groups. In the Board's view, this reporting would allow the Board and all parties to understand the outcomes achieved by the technical working groups, and provide for the transparent reporting to the Board of any potential issues regarding the design and construction of the Project. The reporting would also allow the Board and all parties understand how these issues have been addressed, to the extent possible, by Trans Mountain and the members of the technical working groups.

As discussed in Chapter 7, the Board would impose a condition requiring Trans Mountain to file with the Board an updated commitments tracking table prior to the start of construction (Condition 6). This update should include all commitments made to landowners and government stakeholders. The Board reminds Trans Mountain that even where commitments may not be specifically included in Trans Mountain's filings submitted pursuant to Condition 6, Trans Mountain would still be required to implement all commitments made in its Project application, or as otherwise agreed to in the evidence it filed during the hearing, or in its related submissions (Condition 2).

Trans Mountain has committed to continue consulting with and addressing issues raised by affected landowners, both before and after pipeline construction. The Board is of the view that an effective and responsive process for responding to issues that may be raised by affected landowners is an important part of the company's ongoing engagement with landowners. To that end, the Board would impose Condition 102 requiring Trans Mountain to

confirm that it has created, and will maintain, a process/system that tracks Project-related landowner and tenant complaints or concerns and how Trans Mountain has addressed them, up until the Project is abandoned or decommissioned pursuant to the NEB Act. The Board would also impose Condition 99. Some groups were critical of the approach requiring Trans Mountain to maintain and file with the Board records of its landowner and tenant consultations, and provide confirmation that it will make available to a landowner or tenant, upon request, a copy of the consultation records related to that landowner or tenant. The Board is of the view that these requirements would facilitate an effective and responsive process for responding to issues raised by landowners and tenants in order that potential concerns can be appropriately addressed, to the extent possible.

The Board is of the view that with Trans Mountain's commitments and the Board's recommended conditions, Trans Mountain can continue to effectively engage the public, landowners and other stakeholders, and address issues raised throughout the Project's operational life.



Indigenous matters

The potential impacts of Project-related marine shipping on Indigenous interests was relevant to the List of Issues for the Reconsideration. The content of this chapter has been updated since the Board's May 2016 OH-001-2014 Report to reflect the Reconsideration.

Section 5.1 is unchanged from the OH-001-2014 Report (with the exception of administrative adjustments and to replace "Aboriginal" with "Indigenous"), as the Reconsideration Panel found that the views of the Parties and of the Board from the OH-001-2014 Report were still valid.

Section 5.2 sets out the submissions of the Parties from the MH-052-2018 hearing, followed by the Views of the Reconsideration Panel. In order for the Reconsideration Panel to reach its views, it reviewed all relevant evidence from both the OH-001-2014 hearing and the MH-052-2018 hearing.

5.1 Indigenous matters – OH-001-2014 hearing

5.1.1 Overview

The Board's process was designed to obtain as much relevant evidence as possible on Indigenous concerns about the Project, the potential impacts on Indigenous interests, and possible mitigation measures to minimize adverse impacts on Indigenous interests. The Board was provided with and considered extensive information about concerns related to the Project, and the measures that would be required to address those concerns, as brought forward through consultation undertaken by the applicant and through the participation of potentially affected Indigenous groups and others in the hearing process. In assessing the potential impacts on Indigenous interests, the Board considered all of the evidence provided.

This chapter includes summaries of evidence provided directly by Indigenous groups through their participation in the hearing, as well as summaries of Indigenous concerns and interests as recorded by Trans Mountain in its evidence. Appendix 8 refers to information and evidence sources provided by Indigenous groups who participated in the hearing. The Board notes that identifying and referring to specific passages within the record can lead to other direct and indirect references being overlooked. Therefore, anyone wishing to fully understand the context of the information and evidence

provided by Indigenous groups should familiarize themselves with the entire record of the hearing.[43] In addition, evidence provided by Indigenous groups and evidence of Indigenous concerns and interests recorded by Trans Mountain in its evidence is summarized in chapters throughout this Report, including matters relating to the use of lands, waters and resources for traditional purposes by Indigenous groups as described in Chapter 11 and Chapter 14.

5.1.2 Trans Mountain's consultation with Indigenous groups

Trans Mountain said it views working with Indigenous communities along the Project route as part of its commitment to promote open and transparent consultation and communication with Indigenous communities, and to build lasting and mutually beneficial relationships with these communities and Indigenous businesses.

Trans Mountain said it embarked on an extensive consultation program commencing in 2012 to engage with Indigenous communities about the Project. To ensure meaningful engagement continues to occur, the company committed to continue its engagement with Indigenous communities, groups, associations, councils and tribes throughout the life of the Project.

5.1.2.1 Trans Mountain's Indigenous Engagement Program design

Trans Mountain said it worked in collaboration with the Government of Canada and provincial ministries to identify Indigenous groups in Alberta and B.C. that might have an interest in the Project, or have Indigenous interests potentially affected by the Project.

Trans Mountain said that its final engagement list for Indigenous communities and groups with traditional territories in the Project area was developed in collaboration with federal departments, provincial ministries, the Major Projects Management Office (MPMO), the NEB, and the B.C. Oil and Gas Commission. The company said it followed the recommendation of Indigenous and Northern Affairs Canada (INAC) and used a 10-kilometre buffer area around the proposed pipeline corridor in B.C. to identify Indigenous groups with traditional territory in the Project area. Trans Mountain said, given the lower degree of certainty regarding traditional territories in Alberta, a 100-kilometre buffer was used. In Alberta, the pipeline would cross Treaty 6 territory, Treaty 8 territory, and the Métis Nation of Alberta Region 4, but would not cross any Indian Reserves. In B.C., the Project would cross both Crown lands and privately held lands, and is proposed to cross seven Indian Reserves utilized by five Indigenous communities:

- Zoht #4 – Lower Nicola Indian Band
- Zoht # 5 – Lower Nicola Indian Band
- Joeyaska # 2 – Lower Nicola Indian Band
- Ohamil # 1 –Shxw'ōwhámel First Nation
- Popkum # 1 – Popkum First Nation
- Tzeachten #13 – Tzeachten First Nation
- Matsqui Main # 2 – Matsqui First Nation

Trans Mountain said that it extended its Indigenous engagement program to include coastal communities, beyond the pipeline terminus at the Westridge Marine Terminal (WMT). Trans Mountain said it engaged with communities on Vancouver Island and the Gulf Islands along established marine shipping corridors transited by tanker traffic, as well as communities in and around Port Metro Vancouver. At the recommendation of Transport Canada, for the Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL) review process, Trans Mountain also engaged with Indigenous groups located in the Burrard Inlet Region and Marine Corridor.

Trans Mountain said it added Indigenous groups to its engagement when groups expressed an interest in the Project. Trans Mountain's final list included 120 Indigenous groups, two non-land-based B.C. Métis groups, and 11 Indigenous associations, councils and tribes. The list of Indigenous groups engaged by Trans Mountain can be found in Appendix 9.

Trans Mountain said its Indigenous Engagement Program for the Project was guided by the Kinder Morgan Canada Indigenous Relations Policy and focused on:

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[43] Indigenous groups provided evidence and made argument addressing all the chapters contained in this Report. Their evidence and views were fully considered as is reflected throughout the Report. As noted above, this chapter of the Report cannot be considered in isolation from the Report as a whole.

- enhancing trusting and respectful relationships;
- sharing Project information such as the Project scope, routing options, safety and emergency response, scheduling and environmental field study components;
- negotiating group and community-specific protocols, capacity agreements, Letters of Understanding (LOUs) and Mutual Benefit Agreements (MBAs);
- facilitating traditional land use (TLU) and traditional marine resource use (TMRU) studies, including traditional ecological knowledge (TEK) and socio-economic research;
- identifying potential impacts and addressing concerns;
- discussing the adequacy of planned impact mitigation and opportunities; and
- identifying education, training, employment, and procurement opportunities.

Trans Mountain said it considered Indigenous Traditional Knowledge according to subsection 19(3) of the *Canadian Environmental Assessment Act, 2012*, the filing requirements and guidance provided in the Board's Filing Manual, as well as pertinent issues and concerns identified through Indigenous engagement for the Project. Trans Mountain said that Indigenous Traditional Knowledge was typically collected from Indigenous communities through the participation of their members in biophysical field studies for the Project, and that their knowledge about the land formed part of the documented studies.

5.1.2.2 Trans Mountain's consultation activities with Indigenous groups

Trans Mountain said it made substantial efforts to provide Indigenous groups with opportunities to participate in planning the Project. It said that it used a number of methods to inform Indigenous communities, obtain feedback and identify issues about the Project. Activities began in 2012, including sending out Project letters, holding open houses during 2012 and 2013, maintaining a project website, providing Project update letters, and holding a number of Project meetings. Trans Mountain said more than 24,000 engagement activities were completed with Indigenous groups based on the following framework of activities:

- project announcement;
- initial contact with Indigenous community or Indigenous group;
- negotiation and execution of confidential LOUs or capacity agreements;
- host community information session(s);
- conduct TLU, TMRU and TEK studies;
- identify interests and concerns;
- review key mitigation options;
- provide additional capacity funding, if required; and
- negotiate and execute confidential MBA.

Trans Mountain said the communications materials that it sent to communities included:

- advanced notice of field study work and a field study process brochure;
- Project update letters and newsletters including updates to the Project website content, regulatory filings and participation funding; and
- invitations to meet to discuss routing options for those communities where the existing Trans Mountain Pipeline system encounters Indian Reserve lands.

Trans Mountain said its process for engagement allowed each community and group to engage in meaningful dialogue in the manner they chose, and in a way that met its objectives and values. Trans Mountain said many communities worked cooperatively with Trans Mountain in relation to the Project, some openly and others on a strictly confidential basis at their request.

Trans Mountain said that in March 2013, it provided a copy of the environment and socio-economic assessment (ESA) approach summary to Indigenous groups. Trans Mountain requested feedback on the methodology for field studies that would be undertaken starting in May 2013.

Trans Mountain said that potential environmental elements interacting with the Project were identified through consultation with Indigenous groups. These elements included air and water quality, fish and fish habitat, wetland loss or alteration, vegetation, wildlife and wildlife habitat, and species at risk. Effects from potential accidents and malfunctions were also identified. Issues raised through consultation were included in the assessment of potential Project effects. Trans Mountain said the feedback it received informed its Project planning in a number of areas including routing, the scope of ESA, the identification of mitigation measures to reduce environmental and socio-economic impacts, emergency management, construction planning, Project-related benefits and routing alternatives.

Trans Mountain said that engagement with participating Indigenous communities about socio-economic issues occurred in parallel with its Indigenous Engagement Program. Activities included one-on-one meetings with leaders and staff members, and meetings, interviews and discussions with people living in the area. Trans Mountain said that information related to socio-economic elements (e.g., cabin locations, resource use and employment and economy concerns) is often provided during meetings and discussion associated with TLU and TEK. As a result, information made available from the non-confidential TLU study reports and TEK discussions as it relates to the socio-economic elements was incorporated into the socio-economic assessment.

Trans Mountain said traditional land and resource use (TLRU) and TMRU studies were initiated for the Project in 2012 and were consultant-facilitated or independently directed by the group. Trans Mountain said the aim of the TLRU and TMRU studies was to identify and mitigate effects of the Project on current use of traditional land and marine resources. At the time of the submission of its evidence, Trans Mountain said a total of 52 communities participated in TLRU studies, 15 communities participated in TMRU studies and 57 communities provided TEK.

Trans Mountain said that the remainder of the Indigenous groups consulted on the Project either did not request to participate in a TLRU study or, in other cases, funding for a TLRU study had been discussed but the parties were unable to reach agreement.

Trans Mountain said it executed 94 agreements, including LOUs (which include components for TEK, TLRU and TMRU studies), capacity funding, and integrated cultural assessments with an aggregate value of $36 million.

Trans Mountain said it received 30 letters of support from Indigenous groups.

Trans Mountain said it is committed to working with Indigenous groups to address Project-related interests and concerns. The company said this is an ongoing and iterative process that is part of the ongoing dialogue with Indigenous groups. Trans Mountain said its ongoing consultation process is designed to refine and optimize the work based on knowledge of the mitigation measures to be implemented in the field. Trans Mountain said this would include regional workshops with Indigenous groups to discuss Environmental Protection Plans (EPPs) and emergency management, including mitigation measures to minimize Project-related effects.

Trans Mountain said that through its Environmental Education Program, all personnel working on the construction of the Project would be informed of the location of known TLRU sites.

Trans Mountain said that it is committed to the continuation of an effective Indigenous Engagement Program that satisfies all parties, and that it will continue engagement into Project development and through operations.

5.1.2.3 Concerns raised about Trans Mountain's consultation with Indigenous groups

A number of Indigenous groups raised concerns in their written evidence and submissions filed with the Board about Trans Mountain's consultations, including Adams Lake Indian Band, Asini Wachi Nehiyawak Traditional Band, Cheam First Nation, Chawathil First Nation, Coldwater Indian Band, Cowichan Tribes, Katzie First Nation, Lyackson First Nation, Métis Nation of Alberta Gunn Métis Local 55, Métis Nation of British Columbia, Matsqui First Nation, Michel First Nation, Musqueam Indian Band, Nooaitch Indian Band, Pacheedaht First Nation, Stk'emlupsemc Te Secwépemc, Stó:lō Collective, Snuneymuxw First Nation, Squamish Nation, Tsartlip First Nation, Tsawout First Nation, Tsawwassen First Nation, Tsleil-Waututh Nation, and Upper Nicola Band. The concerns raised in relation to Trans Mountain's consultation for the Project included:

- the engagement process and/or timing;
- Project benefits;
- emergency response management and planning;
- capacity funding;

- the opportunity to provide input; and
- the potential Project-related effects on the assertion of Indigenous rights and title governing traditional and cultural use of the land and/or marine environment.

Cheam First Nation and Chawathil First Nation said that Trans Mountain has not engaged in any consultation with respect to emergency response, and did not give consideration to their Indigenous rights and title.

Adams Lake Indian Band said that Trans Mountain's engagement has been impersonal, inaccurate, and lacking sincerity. It also said that Trans Mountain offered to engage on its Aquatics Offset Plans. However, when Adams Lake Indian Band expressed interest and proposed engagement, Trans Mountain retreated from its offer of engagement.

Cowichan Tribes said that Trans Mountain's approach to consultation limited the measures available to mitigate impacts, and that to properly account for the Project's potential impacts on the Cowichan Tribes' Indigenous rights and title, Trans Mountain must have understood Cowichan Tribes' strength of claim at a stage where Trans Mountain could have fundamentally altered the Project design and been open to all options for mitigation measures. Cowichan Tribes said that did not occur.

Coldwater Indian Band said targeted and specific consultation with Coldwater is required to develop appropriate avoidance, mitigation and accommodation of impacts, and this has not occurred. Coldwater Indian Band also said that meaningful consultation on the Project, including routing, has not occurred.

Katzie First Nation said it had difficulties in reaching agreement with Trans Mountain on capacity funding or Mutual Benefit Agreements, and therefore could not provide all of the information Trans Mountain needed to understand the potential impacts to traditional sites and uses.

Kwantlen First Nation expressed concerns with Trans Mountain's lack of consultation and consideration of Indigenous rights and title for emergency response in Trans Mountain's identification of "High Consequence Areas" for emergency response.

Lyackson First Nation said that Trans Mountain did not discuss mitigation measures and without further consultation, issues remain unresolved.

Métis Nation of Alberta Gunn Métis Local 55 said that it wishes for meaningful consultation beyond the hearing and construction phase. It said this should include operation of the pipeline, since a spill could impact water bodies downstream of the Project, as well as lands holding burial, archaeological and heritage sites, and lands used for harvesting. It also said it has been excluded from discussions on developing a fish and fish habitat offset program.

Michel First Nation said Trans Mountain only initiated consultation with Michel First Nation on the proposed Project once Michel First Nation made Trans Mountain aware of the need to consult with them, and that the late start to the consultation process and collection of TLU information has resulted in a failure to include Michel First Nation in the overall development of the assessment, failure to assess effects on Michel First Nation rights and interests, and failure to include Michel First Nation in discussions of mitigation and accommodation.

The Stó:lō Collective raised a number of concerns regarding its consultation with Trans Mountain. The Stó:lō Collective expressed concern about Trans Mountain's reluctance to formalize commitments to the Stó:lō Collective outside of a Mutual Benefit Agreement, to directly involve Stó:lō technical and cultural experts in Project mitigation and Environmental Protection Planning (EPP development), emergency response planning, or environmental survey work in order to mitigate concerns pertaining to traditional fisheries, spiritual and cultural sites, wetlands, old growth forests, communication protocols, capacity development, economic development or emergency response procedures. The Stó:lō Collective also raised concerns with the engagement process, in that communication has been on a proponent to Band level, when Trans Mountain was asked to have communication sent through the Stó:lō Collective as the process for engagement established by the Collective, leading to negative impacts on the engagement process.

Stk'emlupsemc Te Secwépemc said that there had been no discussion with Trans Mountain on the proposed routing of the pipeline.

Tsawwassen First Nation said in their written evidence that Trans Mountain mischaracterized its engagement with Tsawwassen First Nation through the Indigenous Engagement Logs filed by Trans Mountain. Trans Mountain acknowledged errors and omissions, and accepted the updated information on consultation filed by Tsawwassen First Nation.

Simpcw First Nation, First Nations of Maa-nulth Treaty Society, and Adam Olson said they were not meaningfully consulted by Trans Mountain about the Project and its potential impacts to their Indigenous rights, title and interests.

In response to the concerns expressed, Trans Mountain said it made every effort to provide Indigenous groups with opportunities to engage in meaningful dialogue in the manner they chose, and in a way that met their objectives and values. Trans Mountain said it tailored its engagement approach to accommodate the myriad of diverse objectives and values it

encountered. The sharing of information was integral to this process. As a result of the information it received, Trans Mountain said it made modifications to the Project in order to reduce impacts on the land and marine environment, address concerns regarding routing and construction, address socio-economic considerations, and enhance Indigenous involvement and engagement.

Trans Mountain said during engagement activities, Indigenous groups expressed an interest in participation in emergency response planning and programs (ERPs). Trans Mountain said the integration of Indigenous groups into ERPs provides opportunities for reduced response time in some locations and additional workforce to respond to a spill and participation of Indigenous communities in emergency planning and response also aligns with the principles outlined in the B.C. land-based spill initiative. Trans Mountain said ERPs will be developed with the participating Indigenous group(s) and Indigenous groups will be invited to participate in regional workshops regarding emergency response planning. Finally, Trans Mountain committed to file a consultation plan related to their Emergency Management Program (EMP), including its ERPs.

Trans Mountain said the company and the Stó:lō Collective have had multiple engagements throughout the hearing process. Trans Mountain said it has proactively engaged with the communities represented by the Stó:lō Collective, with the Stó:lō Collective, and with Ts'elxweyeqw Tribe Management Limited (TTML) to ensure Stó:lō interests are heard, and potential issues and concerns can be avoided or mitigated. Trans Mountain's evidence of the engagement activities, completion of land use studies, and the provision of funding to support engagement is outlined in its evidence filed throughout the hearing process.

Trans Mountain also said it has continued to share information with Stó:lō, in response to the information received through the Integrated Cultural Assessment Report.

Trans Mountain said it has made multiple efforts to share information regarding procurement, employment, and training for the Project, including with Tsartlip First Nation, and has requested that Tsartlip share information regarding the abilities of the Nation and its membership to participate in the business and employment-related opportunities that would arise as a result of the Project.

In response to Tsawwassen First Nation, Trans Mountain said that starting in 2012, Trans Mountain has been engaging Tsawwassen First Nation on the Project to provide comprehensive information to them, to seek feedback from them, and to identify anticipated impacts of the Project on the assertion of Indigenous rights and title governing traditional and cultural use of the environment. Trans Mountain stated it is aware of the Tsawwassen First Nation Final Agreement, and the resulting rights and obligations. Trans Mountain said its understanding of the Final Agreement is based on both reviewing the agreement and on discussions with Tsawwassen First Nation. Trans Mountain confirmed that, in engaging with Tsawwassen First Nation regarding the Trans Mountain Expansion Project, it took the Final Agreement into consideration.

Trans Mountain said it is committed to continued engagement to discuss the Project, mitigation measures, Project-related issues and the potential Project-related effects on Indigenous groups.

5.1.3 The Government of Canada's consultation process with Indigenous groups

The Government of Canada said it would rely on the Board's review process, to the extent possible, to identify, consider and address any adverse impacts on potential or established Indigenous and treaty rights resulting from the Project. The Government of Canada said federal authorities work together to ensure the legal duty to consult Indigenous groups is fulfilled and performed in a coordinated manner that is integrated with the environmental assessment and regulatory review process for the Project. In the Government's correspondence to Indigenous groups, Indigenous groups were informed of the Crown's reliance on the Board's process, to the extent possible, to meet the Crown's duty to consult and encouraged to participate in the Board's process to express Project-related concerns.

The Government of Canada outlined its approach to consultation with Indigenous groups for the Project, which occurs in four phases:

- Phase I: Initial engagement, from submission of project description to the start of NEB review process;
- Phase II: NEB hearings, from the start of the NEB review process to the close of the hearing record;
- Phase III: Post-NEB hearings, from the close of the hearing record to the Governor in Council (GIC) decision on the project; and
- Phase IV: Regulatory permitting, from the GIC decision on the project to issuance of departmental regulatory approvals (if required).

The Government of Canada said that commencing at the close of the NEB hearing record and ending with a GIC decision on the Project, the MPMO will coordinate consultation meetings between the Government and Indigenous groups for which the depth of consultation has been determined to be moderate or high. The purpose of these consultations is to conduct a

meaningful two-way dialogue to determine if there are any concerns related to the Project that have not been fully addressed by the NEB's draft conditions or the proponent's commitments to that point in the process, and to consider proposals from Indigenous groups for accommodation measures to further address outstanding issues or concerns that could be considered by the Crown.

A number of Indigenous groups expressed concerns about the limitations of the Government of Canada's approach to discharging its duty to consult with Indigenous groups, including its reliance on the NEB process. Some said that direct government-to-government consultation with the federal government is required to address their concerns, or as part of their decision-making about whether the Project may proceed in their territory.

5.1.4 Participation of Indigenous groups in the Board's hearing process

The Board's Enhanced Indigenous Engagement (EAE) initiative aims to provide proactive contact with Indigenous groups that may be affected by a proposed project, and to help Indigenous groups understand the Board's regulatory process and how to participate in that process. The Board reviews the completeness of the list of potentially affected Indigenous groups identified in the proponent's Project Description filed with the MPMO and the Board. The Board may suggest to the applicant any necessary revisions. The Board then sends letters to each potentially impacted Indigenous group on the revised list, informing them of the project as well as the Board's regulatory role in respect of the project, and offers to provide further information on the hearing process. Following issuance of these letters, Board staff follow up, respond to questions or conduct information meetings, where requested.

As committed to in the Project Agreement with the MPMO for the Project, the Board carried out its EAE activities for the Project from the time the Project Description was received on 23 May 2013 until February 2014. In August 2013, the Board sent a letter to 131 potentially affected Indigenous groups and organizations. The letter discussed the Board's hearing process and its Participant Funding Program. It also included a summary of the Project, information on how to obtain further information and an offer for NEB staff to attend a community meeting. Between November 2013 and February 2014, NEB staff presented information in person at nine community meetings attended by 22 different Indigenous groups and organizations.

Seventy-three Indigenous groups participated as intervenors in the OH-001-2014 hearing and provided their comments, views and evidence through written submissions and oral evidence to the Panel. Appendix 8 refers to information sources provided by Indigenous groups who participated in the review process and where this information can be located on the public record.

A total of 35 Indigenous groups and individuals provided oral traditional evidence (OTE) to the Board during the hearing. The Board received OTE at five locations (Edmonton, Chilliwack, Kamloops, Victoria, and Calgary). The Board received traditional evidence from the Horse Lake First Nation by telephone. The Board also made the audio recordings of OTE sessions available free of charge from the audio recording service provider.

5.1.5 Potential impacts on Indigenous groups

5.1.5.1 Trans Mountain's assessment of impacts on Indigenous groups

Trans Mountain said that through its Indigenous Engagement Program, it worked with Indigenous groups to identify anticipated impacts of the Project on the assertion of Indigenous rights and title governing traditional and cultural use of the land and marine environment. Trans Mountain said it endeavored to gather Indigenous perspectives on rights and asserted rights, identify issues and concerns relating to those rights and the Project, and reach understandings or agreements that address potential infringement of Indigenous rights affected by the Project.

Trans Mountain said its understanding that existing Indigenous and treaty rights of the Indigenous peoples of Canada are recognized and affirmed through section 35 of the *Constitution Act, 1982*.

Trans Mountain said it acknowledges the importance of the environment and the resources within it to Indigenous communities, and understands that the ability to participate in traditional land use activities is an important component of the exercise of their rights. Trans Mountain said its assessment of potential adverse effects of the Project considered the following value components that support Indigenous rights and interests:

- economy;
- employment;
- community services and infrastructure;
- individual, family and community well-being;

- human health;
- traditional culture;
- section 35 rights to fish, hunt and gather;
- Governance;
- visual and aesthetic resources; and
- species and habitats required to maintain a traditional lifestyle.

Trans Mountain said the methodology used to assess potential adverse effects of the Project on valued components supporting the exercise of Indigenous rights and interests considers: the potential environmental and socio-economic effects of the Project; ways in which these effects can be minimized or avoided altogether; and key mitigation strategies in place that would further reduce these effects. Trans Mountain said that it included Indigenous participation in its environmental field program to incorporate Indigenous views and additional traditional knowledge of the land into the consideration of potential Project-related environmental effects, and to provide Indigenous community members with the opportunity to provide TEK information to the ESA. Trans Mountain said its approach for collecting TEK tried to ensure a free, informed and ongoing process that meets Canadian ethical research standards. Translators were made available in the field upon the request of a given community, as warranted. Trans Mountain said that during field surveys, over 200 participants reviewed, collected and discussed TEK and potential Project-related effects and mitigation strategies.

Trans Mountain said it considered the potential effects of spills on elements of the environment that support Indigenous rights and interests. It said it acknowledges that salmon are vital to First Nations people in B.C.

Trans Mountain said TLU studies were completed on Crown land to obtain information regarding the TLU activities that participating Indigenous communities engage in on the land. The aim of the TLU studies was to assess and mitigate effects of the Project on current use of Crown lands for traditional activities and on identified TLU sites. Trans Mountain said this is achieved by meeting the following objectives:

- determine the extent and general nature of each community's current use of lands for traditional activities relative to the Project;
- identify existing concerns and potential effects of the Project on traditional land and resource use for baseline scoping and selection of social or environmental indicators for the effects assessment;
- provide traditional knowledge information, where appropriate, for the assessment of potential Project-related effects on traditional land and resource use; and
- establish appropriate site-specific mitigation measures to address traditional land and resource use concerns raised relative to the Project.

As discussed in detail in Chapters 11 and 14 of this report, Trans Mountain said it based the assessment of TLRU and TMRU on biophysical and human environments.

For the pipeline and associated facilities, Trans Mountain said that subsistence activities may be temporarily disrupted by construction or operations of the Project and the disruptions could mean that the traditional resource users miss the opportunity to harvest wild foods (e.g., wildlife, fish, plants) or that their participation is curtailed. Trans Mountain said that, despite these disruptions, the construction and routine operations would not result in significant adverse effects on the ability of Indigenous communities to continue to use land, waters or resources for traditional purposes, and thus the Project's contribution to potential broader cultural impacts related to access and use of natural resources is also considered not significant.

For the WMT, Trans Mountain said the expanded dock complex would become a permanent feature of the inlet and long-term traditional resource use patterns will likely adapt over time. Trans Mountain concluded there are no situations for TLRU that would result in a significant residual socio-economic effect, and that residual socio-economic effects of construction and operations activities of the WMT on TLRU indicators would be not significant.

With respect to the effects of Project-related marine vessel traffic, Trans Mountain said that a disruption of subsistence activities may occur due to increased transit of Project-related marine vessel traffic by restricting access to traditional use areas particularly if the resource users' travel occurs at the same time and in the same location as the Project vessel's transit. The company said that this could result in limiting the ability to harvest in certain areas, missed harvesting opportunities, or an increase in travel time to reach a destination. Trans Mountain said the Project-related disruption would only be temporary and activities are likely to be resumed in most cases once the vessel has passed. Trans Mountain said the effects associated with Project-related marine vessel traffic on TMRU are considered not significant, with the exception of

the expected residual effects on the traditional use associated with Southern resident killer whale population, which are considered to be significant.

Trans Mountain also said that its assessment of total cumulative effects for the Project concluded that there would be no significant Project contribution to adverse cumulative effects to the biophysical resources in the environment used for TLRU or TMRU by Indigenous groups. Trans Mountain concluded that overall there would be no significant adverse effects on the biophysical resources or the ecosystems that support TLU activities, with the exception of the Project's effects on the Southern resident killer whale.

With respect to human environment considerations, Trans Mountain concluded that there are no situations where social and cultural well-being, infrastructure and services, and community health indicators would result in a significant residual socio-economic effect with respect to Indigenous groups, including with respect to increased stress and anxiety related to perceived contamination that Indigenous groups may feel could result from the Project. Trans Mountain said that the assessment of effects on TLU patterns is based on alterations to the biophysical resources that TLU practices are based on and on consideration of the human environment, and concluded that the effects of the Project on TLU are not significant. Therefore, according to Trans Mountain, the residual socio-economic effects of Project construction and operations would be not significant.

5.1.5.2 Impacts raised by Indigenous groups

Indigenous groups have raised concerns throughout their written and oral evidence in this proceeding, and information about their concerns and interests has also been provided directly to Trans Mountain, which has filed evidence summarizing the concerns presented to them. Indigenous groups have characterized their concerns and interests in ways specific to each of them and, while information regarding key concerns and interests are summarized here, anyone wanting to understand the full context of the concerns and interests expressed by Indigenous groups should familiarize themselves with all of the relevant evidence on the record.

Indigenous groups provided information on impacts through their consultation activities with Trans Mountain as well as through their participation in the NEB hearing process. This evidence included completed TLRU and TMRU studies, OTE, responses to information requests, written evidence and final argument.

A number of Indigenous groups raised overarching concerns about impacts on their Indigenous and treaty rights. Within both written and oral evidence, Indigenous groups provided information on how, where, and when they exercise their asserted and established Indigenous and treaty rights, and they expressed their concerns as to how these rights might be impacted.

Groups described their established rights in the Project area, including those established through Treaty No. 6, Treaty No. 8, the Douglas Treaties, the Tsawwassen First Nation Final Agreement and court cases, including *R. v. Sparrow* and *R. v. Van der Peet*. Groups also described their rights in areas that would be traversed by Project-related marine vessel traffic. Indigenous groups referred to, and provided evidence on, their rights to hunt, trap, fish and gather and noted their rights related to the establishment of reserves.

In addition, a number of Indigenous groups provided information about their asserted rights. Details were provided as to claims to Indigenous title in areas potentially impacted. Descriptions were provided of stewardship and governance rights. Indigenous groups described their rights to fish for food, social, ceremonial and commercial purposes, and specific reference was made to fishing and harvesting sites, including those for salmon, crabs, prawns, shellfish and waterfowl. A number of Indigenous groups noted the importance of the Fraser River for the exercise of rights. Indigenous groups also noted the importance of marine areas for exercising their rights, including Burrard Inlet, Howe Sound, Swiftsure Bank and the Strait of Georgia. Details were provided regarding rights to gather plants for food and medicine as well as rights to engage in hunting and trapping activities, including harvesting of ungulates, waterfowl, fish, and shellfish. Travel and access was often referred to in the descriptions of their Indigenous rights. Many Indigenous groups noted rights related to ceremonial and spiritual practices and places. Rights related to archaeological and cultural heritage sites were also described. Much emphasis was placed on the importance of the exercise of their Indigenous rights to their culture.

Indigenous groups expressed significant concern as to how the exercise of these rights would be impacted. A number of Indigenous groups noted the importance of protecting the land and water for future generations, and indicated that the Project would introduce too much risk and additional impacts to their territories, rights, and identities. Indigenous groups also said that they must be part of all part decisions regarding access to their lands, waters and resources.

INAC said First Nations involved in the review of the proposed Project are at various stages of the British Columbia treaty process. INAC described in its evidence the ongoing status of negotiations within the British Columbia treaty process.

In addition to these overarching concerns related to their asserted and established Indigenous rights and title, key concerns raised by Indigenous groups about the Project relate to its potential impacts on:

- traditional land and marine resource uses, practices and activities;
- cultural heritage resources;
- community health;
- cultural practices;
- effects of cumulative development; and
- employment.

Many of the topics of concern raised by Indigenous groups are addressed in the chapters throughout this Report. The potential impacts on biophysical components, including fish and fish habitat, wildlife, vegetation, soils, and water quality and quantity, are discussed in Chapters 10 and 14. The potential effects on TLRU and TMRU are addressed in Chapters 11 and 14 respectively. Navigation, navigation safety and potential effects on recreational and commercial fishing are discussed in Chapter 11. Potential effects on human health, including the health of Indigenous people, are discussed in Chapters 11 and 14. Emergency management and spill response is discussed in Chapters 9 and 14. The concerns raised by Indigenous groups that relate specifically to these elements are discussed in detail in each of these respective chapters.

5.1.2.1.1 Impacts on traditional land and marine resource uses, practices, and activities

Indigenous groups said that their people have lived, hunted, gathered and fished within their traditional territories since time immemorial, and their uses of the lands, waters and resources within their territories are the backbone of their cultures. Many groups said they felt that the construction and operation of the Project would adversely impact their uses and activities within their traditional territories.

Indigenous groups raised concerns about how the Project could negatively impact their ability to continue their traditional uses, practices and activities such as hunting, fishing, trapping, the gathering of plants for subsistence and medicinal purposes, as well as their ability to access the land and specific sites for these purposes. Groups expressed concerns about their ability to harvest traditional food resources, including fish, shellfish, birds, and wild game as well as the impacts any reductions in their ability to harvest these resources would have on cultural and ceremonial activities as well as cultural transmission. Groups said that the harvesting and preparing of food is the primary context for many aspects of cultural transmission.

Many groups were concerned about their ability to continue to harvest plants for traditional uses, including medicinal plants. Some Indigenous groups said that they had concerns with the clearing of vegetation and with contamination of plants and loss or alteration of traditional use subsistence sites for plant gathering.

With respect to the WMT and marine shipping, a number of groups expressed concern these would negatively impact fish and fish habitat and would impact the reliance on fish for food and sustenance, and for economic purposes and spiritual practices and ceremonies, including harvesting at and around the WMT.

Concerns about specific marine resource harvesting locations, such as Swiftsure Bank, were also raised.

Several Indigenous groups expressed concern that accessing marine harvesting sites will be further restricted as a result of increased Project-related marine traffic.

Indigenous groups contend that a spill would have a catastrophic effect on the resources that they traditionally harvest and that the fact that the probability of a spill is small is not sufficient reason to determine the effects of a spill are not significant. They fear that a substantial spill or series of smaller spills could push resources past the tipping point and dramatically pollute and reduce stocks and habitat for many years.

5.1.2.1.2 Impacts on cultural heritage resources

A number of Indigenous groups raised concerns about the potential effects on their cultural heritage resources, including potential impacts to specific sites as well as effects on their continued ability to access sites in areas of cultural significance such as spiritual sites and gathering places. Groups said the Project would have impacts on their lands, resources and cultural practices including potential contamination of ancient village sites and cemeteries. Groups said their cultural rights and interests include sacred sites like villages, cemeteries, burning and ritual bathing sites, pit houses, and travel routes. Some groups expressed concern about their most sacred sites, including house pits and burial grounds.

Some groups expressed concern that specific information relating to their particular cultural heritage and spiritual sites were not fully accounted for in Trans Mountain's assessment of the project or its mitigation measures. The Stó:lō Collective raised specific concerns about potential impacts of the Project on the Lightning Rock site.

5.1.2.1.3 Impacts on community health

Several Indigenous groups expressed concerns about potential direct or indirect effects on community health, particularly in the event of a spill, through impacts on cultural activities, traditional food resources, or through increased anxiety and perception of contamination. Groups raised concerns about how the ability to continue traditional land use activities has resulting effects on the physical and psychological health of community members.

Some Indigenous group expressed concern about predicted impacts on physical and community health including stress, and reduced pre-natal health and youth development.

5.1.2.1.4 Impacts on cultural practices

Many Indigenous groups expressed concerns that the Project would impact opportunities to transmit knowledge from one generation to the next. Indigenous groups said that being on the land connects the present to the past, and traditional and cultural activities, such as harvesting, fishing and ceremonies bind families together. A number of groups were concerned that the Project would accelerate the process of loss of the spiritual connection to the land being experienced by youth and successive generations.

Indigenous groups said that their sense of place, privacy and quiet enjoyment are all-essential to their cultural and sacred practices, and that they will suffer sensory disturbance to these from tanker noise, light and vibration. Groups noted specific cultural practices they undertake, such as bathing in the waters of Burrard Inlet and associated creeks. Groups said continuing to engage in their ceremonial practices is a very important part of their culture.

Many Indigenous groups described how a disruption or reduction to traditional travelways would represent a loss of cultural expression and identity, as well as a loss of teaching opportunities for youth.

5.1.2.1.5 Effects of cumulative development

Many Indigenous groups discussed cumulative effects in their written and oral evidence. Indigenous groups said that their traditional territories have already been subject to change and continued encroachment. Groups said that the cumulative effects of development activities, including large-scale residential, industrial and commercial development, highways, railways and other infrastructure, and agricultural development have severely impacted their ability to exercise their Indigenous and treaty rights. Indigenous groups are concerned about the effects of existing development on the health of the ecosystems and resources harvested, and on their cultural and spiritual well-being, and the potential effects of the Project in addition to these existing effects.

Groups said that hunting activities continue to be impacted by development, and expressed concerns about the fragmentation of lands, loss of access to hunting and trapping areas, encroachment of developments, and loss of natural habitat.

A number of Indigenous groups had concerns with increased access to traditional areas. They were concerned that this would threaten wildlife, increase fishing pressure, and increase competition for resources used for traditional purposes.

A number of groups expressed concerns about Tran Mountain's cumulative effects assessment. Some groups said it did not accurately characterize or reflect the implications of incremental impacts on their use and occupancy of their territory, their interests, or their Indigenous rights and title.

5.1.2.1.6 Employment

In addition to the concerns noted above, numerous Indigenous groups also expressed an interest in employment and procurement opportunities as well as assistance with training to provide required skills. Many Indigenous groups said they wanted to participate in monitoring activities, and that community members or Elders should be present during construction and involved in reclamation work to ensure mitigation measures are completed. Samson Cree First Nation expressed concerns with monitoring by third parties and said ongoing traditional land use and environmental monitoring should be part of prevention and protection mechanisms.

5.1.2.1.7 Mitigation for potential impacts on Indigenous groups

Trans Mountain said it developed mitigation measures in accordance with Trans Mountain standards, industry and provincial regulatory guidelines, current industry-accepted best practices, engagement with Indigenous communities, experience gained from other pipeline projects with similar environmental and socio-economic conditions, and professional judgment. Mitigation measures, Management Plans and Contingency Plans are included in the Pipeline, Facilities and Westridge Marine Terminal EPPs. Trans Mountain said the EPPs and Environmental Alignment Sheets would be used to

guide inspection and monitoring of the Project during construction. Details of the mitigation measures Trans Mountain committed to for specific impacts are outlined throughout this Report.

Trans Mountain said that, in response to concerns and requests from Indigenous groups, it made a number of changes to the Project, including:

- reconfiguring the pipeline design in the Upper Fraser River and Upper North Thompson River Valley as a result of concerns raised during Indigenous engagement activities;
- revising a proposed route as a result of engagement with Peters First Nation on routing options across the Peters Indian Reserve No. 1A;
- implementing mitigation to ensure Project personnel are prohibited from fishing on Jacko Lake during construction activities, and working to provide continuous access to Jacko Lake for Stk'emlupsemc te Secwepemc members; and
- in response to concerns from the Katzie First Nation about Surrey Bend Regional Park, confirming that no land would be taken or removed from Surrey Bend Regional Park, and acquiring an easement for the pipeline that ensures ownership of the land will remain with the Park authority.

To mitigate the effects and concerns regarding traditional marine harvesting and cultural activities, Trans Mountain committed to, among other measures, provide regular updated information on Project-related marine vessel traffic to Indigenous communities. It also committed to initiate a public outreach program prior to the Project operations phase to communicate information on Project-related timing and scheduling with Transport Canada, the Canadian Coast Guard, the Chamber of Shipping for British Columbia, commercial and tourism associations, and potentially affected Indigenous groups.

Trans Mountain said that Project-related marine vessels would be fully compliant with all applicable navigational, communications and safety regulations, including those of Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority (PPA) and Port Metro Vancouver.

Trans Mountain said that, during engagement activities, Indigenous groups expressed an interest in participation in ERPs. Trans Mountain said that ERPs will be developed with the participating Indigenous group(s) and Indigenous groups will be invited to participate in regional workshops regarding emergency response planning. Trans Mountain committed to file a consultation plan related to its EMP, including its ERPs.

In response to the high level of interest in monitoring activities, Trans Mountain said Indigenous Monitors would be part of the onsite Environmental Inspection Teams to provide traditional knowledge to the construction program to ensure protection of the environment, and to ensure the successful protection, mitigation and monitoring requirements set out in the EPPs. Trans Mountain also committed to manage access along portions of its right-of-way by implementing mitigation measures during the pre-construction, construction and post-construction phases.

Trans Mountain said it is committed to continued engagement with Indigenous groups when reclamation management plans are being finalized.

Trans Mountain said that site-specific mitigation and enhancement measures will be implemented to ensure that the potential adverse social effects are eliminated or reduced and potential positive effects are enhanced during Project activities.

Trans Mountain said it will support employment and economic opportunities for Indigenous groups for the Project and that it has developed a Training Policy for Indigenous peoples to create initiatives that increase the long-term capability for Indigenous people to participate in the economy and to share in the success of the Project. Trans Mountain also said it will work with Indigenous communities to promote economic development through the identification of opportunities that offer Indigenous communities and businesses the ability to participate in the procurement of goods and services in support of the Project.

5.1.6 Submissions related to section 35, *Constitution Act, 1982*

Indigenous groups noted that the Board is required to act in a manner that is consistent with the *Constitution Act, 1982*. They said that federal action cannot unjustifiably infringe treaty and Indigenous rights and that the Crown is always subject to the limits imposed by the honour of the Crown, including the obligation to engage in proper consultation.

Indigenous groups argued that, in accordance with the Supreme Court of Canada's decision in *Rio Tinto Alcan Inc. v. Carrier Sekani Tribal Council*, 2010 SCC 43 ("*Carrier Sekani*"), the Board must assess the adequacy of Crown consultation as it has the power to decide questions of law, and Parliament has not excluded the ability to decide constitutional questions from the Board's jurisdiction under either the *National Energy Board Act* (NEB Act) or the CEAA 2012. They argued that if the Board is to exercise its jurisdiction under section 52, it must first address and decide all necessary questions of fact and law,

including whether the Crown has discharged the duty to consult and accommodate. They said that the Board cannot make a recommendation in the public interest until it is satisfied that the duty to consult has been discharged. Groups argued that, because the Crown participated in the process, this case was different from the facts considered in *Chippewas of the Thames First Nation v. Enbridge Pipelines Inc.*, 2015 FCA 222. It was argued that the Board's recommendation was not simply one of many decisions in relation to the Project but rather was the key regulatory decision to be made in relation to the Project. Indigenous groups characterized the Board's recommendation as a strategic higher-level decision or recommendation.

Indigenous groups said that the controlling question in all situations is what is required to maintain the honour of the Crown and to effect reconciliation between the Crown and the Indigenous peoples with respect to the interests at stake. Reference was made to what was described as the two primary purposes of the duty to consult and accommodate: balancing interests and preserving the honour of the Crown. Indigenous groups noted that the duty to consult is intended to advance reconciliation between Indigenous people and the Crown by ensuring Indigenous concerns are heard and considered and that Indigenous rights are accounted for in decision-making, protected and accommodated. Consultation must involve a dialogue with a genuine intention of understanding the rights and concerns of Indigenous groups, and with an openness towards changing course if required. They noted that there must be an intention to substantially address Indigenous concerns.

Indigenous groups argued that the Crown has not discharged its duty to consult and accommodate and therefore the Board must recommend that the Project not be approved. Some Indigenous groups argued that there had been no Crown consultation to date and that a decision-maker who proceeds on the basis of inadequate consultation errs in law. Indigenous groups argued that while the Board does not have an independent duty to consult and accommodate, it does have an obligation to exercise its decision-making function in accordance with section 35 but that because of procedural flaws in the hearing process, the Board did not have sufficient evidence to recommend the Project. Several groups argued that the Board's process was inadequate and that their participation in that process was hampered by a variety of issues, including funding. Some argued that they were not provided with complete information, that their rights were not appropriately scoped and that the Project impacts on their rights were not appropriately assessed, as there was too much reliance on biophysical indicators as proxies for Indigenous rights rather than on evidence dealing directly with impacts to Indigenous rights A number of Indigenous groups noted that consultation must occur early in the process and cannot be put off to later stages; they argued that such early consultation had not occurred in this case. Several groups argued that the Board's process was ill-suited for the intended purpose of consultation.

Indigenous groups argued that the Government of Canada's commitment to consultation after the Board has issued its decision cannot have any bearing on the Board's determination of whether the duty to consult and accommodate has been discharged as it is impossible to know whether it would be meaningful or effective. They argued that consultation that occurs after the Board issues its Report cannot be meaningful as the conditions of approval will have already been set. Indigenous groups pointed to Natural Resources Canada's list of potentially outstanding issues as evidence that the Crown is of the view that Crown consultation has not been adequate. Indigenous groups suggested that the Crown does not rely on Trans Mountain to discharge its duty to consult and, therefore, Trans Mountain's regulatory filings regarding engagement with Indigenous groups are not relevant. Some Indigenous groups argued that the Crown has not put any evidence before the NEB that would allow the Board to find that consultation has been fulfilled.

While most Indigenous groups were of the view that the Board had to make a finding on Crown consultation, the Stó:lō Collective said during oral argument that the Board did not have a role as far as commenting on the Crown's consultation because Crown consultation was not complete. The Stó:lō Collective said the Board should make a finding on whether Trans Mountain has done an adequate job of consultation such that the Crown could rely on it in some way. Additionally, the Stó:lō Collective submitted that since the Crown has made filings with the Board, the Board could comment on them. However, in the Stó:lō Collective's view, the final determination about adequacy of Crown consultation rests with the GIC.

Several groups argued that the Board's constitutional role includes determining whether they had proven their Indigenous rights for the purposes of the application and whether issuing the Certificate would infringe those rights. Groups also argued that a justification analysis must be performed to determine whether, absent consent of the Indigenous groups, infringements of proven rights are justified such that the government action is consistent with subsection 35(1). A number of Indigenous groups argued that the infringements to its rights could not be justified, with one group noting that a "public interest" justification was too vague to be a valid legislative objective. Indigenous groups argued that the Crown must fully discharge its constitutional obligation to justify the infringement prior to permitting the Project to proceed and that the NEB regulatory process was not designed to justify the infringement. They argued that the Board should recommend dismissal of the application on the grounds that the Crown has to date failed to justify the infringement of proven Indigenous rights.

Trans Mountain said that the Board must exercise its decision-making function in accordance with both the NEB Act and subsection 35(1) of the *Constitution Act, 1982*. It said the Board does this through broad consultation requirements it imposed on the proponent and by providing Indigenous groups with an opportunity to participate in a robust and accessible regulatory process in a meaningful way.

Trans Mountain said the Federal Court of Appeal was clear in *Standing Buffalo First Nation v. Enbridge Pipelines Inc.*, 2009 FCA 308 that the Board is not the Crown nor its agent when considering a section 52 application. This case was said to be directly analogous to the current Project because here the NEB process also ensures that the proponent has due regard for Indigenous rights. Trans Mountain argued that the Board's process also provides a practical and efficient framework within which the Indigenous group can request assurances regarding project impacts.

Trans Mountain said that the Crown has indicated that the feedback it receives in the NEB's Report will refine the Crown's understanding of potential Project impacts on Indigenous interests. While acknowledging that the NEB Act gives the Board full jurisdiction to hear and determine all matters, whether of law or of fact, Trans Mountain submitted that in Carrier Sekani, the Court rejected the argument that every tribunal with jurisdiction to consider questions of law has a constitutional duty to consider whether adequate consultation has occurred and if not to fulfill that requirement itself. In Trans Mountain's view, given the evidence on the Board's record that the Crown consultation process with Indigenous groups is not over, an adequacy determination by the Board at the NEB recommendation stage would effectively usurp the Crown's role in the consultation process that will follow the NEB's regulatory process. Phase III and Phase IV of the Crown's consultation will occur after the close of the public record. Therefore, according to Trans Mountain, it would be premature for the NEB to assess the adequacy of Crown consultation prior to issuing this report. In any event, the Crown is the final decision-maker of whether a Project certificate will be issued.

Regarding requested justification for infringement by Indigenous intervenors, Trans Mountain was of the view that there is no legal basis for a justification test to be applied by the Board at this stage of the process when the GIC will be considering the process and its own consultation with Indigenous groups in entirety.

5.1.7 Views of the Board

The Board interprets its responsibilities in a manner consistent with the *Constitution Act, 1982*, including subsection 35(1), which recognizes and affirms the existing Indigenous and treaty rights of Indigenous peoples. In order to ensure that its recommendations and decisions with respect to this application are consistent with both subsection 35(1) and procedural fairness requirements, the Board has adopted the following assessment process. The Board is of the view that this process is appropriate, recognizing the complexity of this application, the importance of the constitutionally protected rights of Indigenous peoples, and the many and varied societal interests that must be considered in its assessment.

The Government of Canada and the NEB hearing process

The Board notes that the Government of Canada indicated in letters to potentially affected Indigenous groups that it is relying on the NEB process to the extent possible to meet the Crown's duty to consult Indigenous groups. While the Board itself does not owe the duty to consult, the Board is of the view that this reliance is appropriate given the Board's robust and inclusive process, its technical expertise, and broad remedial powers with respect to Project-related matters. The Board notes that a number of judicial decisions, including *Taku River Tlignit First Nation v. British Columbia (Project Assessment Director)* 2004 SCC 74, have acknowledged the Crown's ability to rely on opportunities for Indigenous consultation that are available within existing processes for regulatory or environmental review. This is a means by which the Crown may be satisfied that Indigenous concerns have been heard and, where appropriate, accommodated. The evidence of the Government of Canada also indicates that following the issuance of this Report, the Government of Canada will continue consulting with certain Indigenous groups.

Requirements of Trans Mountain

The Board's process was designed to obtain as much relevant evidence as possible on Indigenous concerns about the Project, potential impacts on Indigenous interests and possible mitigation measures to minimize adverse impacts on Indigenous interests. In addition to providing technical information addressing Project-related impacts on, among other things, fisheries, wildlife, vegetation, and heritage resources, Trans Mountain was required to make all reasonable efforts to consult with potentially affected Indigenous groups and to provide information about those consultations to the Board. This included evidence on the nature of the interests potentially affected, the concerns that were raised and the manner and degree to which those concerns have been addressed. Trans Mountain was expected to report to the Board on all Indigenous concerns that were expressed to it, even if it was unable or unwilling to address those concerns. Therefore, even if an Indigenous group chose not to participate in the subsequent hearing process, any concerns could be brought to the attention of the Board through the applicant's evidence.

This early consultation was guided by the Board's Filing Manual Requirements, direction given by the Board during the Project Description phase, as well as information the applicant received from other government departments and agencies that it consulted in relation to the Project. The requirements reflect the fact that an applicant is often in the best position to respond to Indigenous concerns about a project before an application is filed and while a project is still in the early stages of development.

The Board expects an applicant to design and implement its consultation activities with regard to the nature and magnitude of a project's potential impacts. Where there is a greater risk of more serious impacts on Indigenous interests (which would, in part, depend on the nature of that interest), the Board has greater expectations in terms of the applicant's consultation with the potentially impacted Indigenous group. In contrast, where there is a remote possibility of an impact on Indigenous interests, or the impacts are minor in nature, the applicant's consultation will generally not be expected to be as extensive. An evaluation of Trans Mountain's consultation is outlined below.

Indigenous groups and the NEB hearing process

In addition to the mandated one-on-one consultation that is to occur between an applicant and potentially impacted Indigenous groups, it should also be understood that the Board's hearing process itself, including this report, is part of the overall consultative process. While much of the early consultation was performed by Trans Mountain, the Board process acted as a necessary and important check on that consultation and gave Indigenous groups an additional avenue to explain their concerns about the Project and have those concerns carefully considered by the Board.

Indigenous groups who are concerned with potential Project-related impacts on their interests had opportunities to present their views directly to the Board. While the Board required the applicant to implement a consultation program and perform an impact assessment, the Board also took steps to facilitate the direct participation of Indigenous groups in its proceedings. The Board entered into a Project Agreement with the MPMO for the Project, which described the Board's commitments related to its Enhanced Indigenous Engagement activities. The Board sent letters to each potentially impacted Indigenous group informing them of the Project, as well as the Board's role in respect of the Project. The letters provided information regarding the Board's participant funding program and offered to provide further information on the hearing process. Board staff followed up on these letters, responded to questions regarding the Board's process and conducted information meetings where requested.

Independent of the Panel and regulatory process, the Board administered a participant funding program, which allotted funding to assist intervenors with their participation. A total of approximately $3 million was made available for participant funding for this hearing. This amount was offered to 72 eligible intervenors, with 79 per cent of the funding offered to Indigenous groups.

In addition, potentially affected Indigenous groups were provided with a choice of a number of methods of participating in the hearing. Indigenous intervenors had the option of participating in the Board's proceeding in writing or orally, remotely or in person. The Board understands that Indigenous peoples have an oral tradition for sharing information and knowledge from generation to generation. Since this information cannot always be shared adequately in writing, the Board provided Indigenous groups with the opportunity to present oral traditional evidence (OTE). The Board finds OTE provided by Indigenous groups valuable for the Board's consideration of a project. The opportunity to provide OTE was unique to Indigenous participants. A total of 35 Indigenous groups and individuals provided OTE to the Board during the hearing.

Given the sensitivity of some of the information that was provided by Indigenous groups in their evidence, the Board also ordered that certain information be treated confidentially.

To further facilitate Indigenous groups' participation, the Board generally held oral portions of its hearing in locations near those interested in the Project, and accommodated requests to incorporate traditional ceremonies into its proceeding. When advised of a potential conflict with certain traditional activities, the Board revised, to the extent practical, its schedule to accommodate those timing concerns. The Board also provided both audio and video online broadcasts, as well as transcripts of its proceedings and audio recordings of OTE sessions, so that interested parties who were not in attendance could be aware of what was occurring during the hearing.

Many Indigenous groups took the opportunity to participate in the Board's hearing process and make submissions directly to the Board. Many of those submissions are reflected throughout this Report. Such submissions by Indigenous groups included, among other things, descriptions of the nature and extent of their interests in the Project area, views on the potential Project-related impacts, and discussion of appropriate mitigation measures, including their views on the draft conditions the NEB released for comment. The Board thanks each community for providing their traditional and cultural knowledge at the oral traditional evidence hearings.

Government departments and the NEB hearing process

Given the comprehensiveness of the Board's process, the Board's technical expertise and its broad remedial powers that are generally not within the purview of other government departments, it was important that concerns related to the Project be brought to the Board's attention through consultation with the applicant and participation in the hearing process. To the extent that other government departments had information to provide to the Board, they had the opportunity to participate in the Board's process and file relevant information on the Board's record. Several government departments participated in the Board's proceeding, including Natural Resources Canada, Transport Canada, Environment and Climate Change Canada, Port Metro Vancouver, and Fisheries and Oceans Canada and Canadian Coast Guard. These government participants filed expert information on the Board's hearing record and were available (and required) to answer questions asked by both the Board and intervenors, including Indigenous groups. These authorities also had the opportunity to comment and provide information on appropriate mitigation measures.

There were concerns identified by Indigenous groups during the Board proceeding that are generally unrelated to the application under consideration. The Board recognizes that Indigenous people have a broad range of matters and concerns that they wish to raise, discuss and resolve with the Government of Canada. While the Board recognizes the importance of these issues, the Board does not have the ability within its proceedings, to properly address issues that are unrelated to the application. Nevertheless, the Board carefully considered all of the submissions of Indigenous groups so that it could have a greater understanding of the context for Indigenous concerns with the Project.

Consideration of potential impacts and mitigation

Before making its decisions and recommendation on the Project, the Board considered all of the relevant information before it, including information regarding the consultation undertaken with Indigenous groups, the views of Indigenous groups, the potential impacts on Indigenous interests, and proposed mitigation measures. While the Board considered the nature of the interests potentially impacted, its consideration of claimed interests is not tantamount to the process undertaken to determine the definitive scope of a right through a claims process or a court proceeding aimed at confirming the existence and parameters of an asserted Indigenous right. In the Board's view, the Board is not required to make a declaration that a claimed right has or has not been proven.

The Board looked at the claimed or established interest in the context of how it may be impacted, what measures can be employed to mitigate that impact and how any impact should be considered in light of other interests related to the Project. The Board then considered all of the benefits and burdens associated with the Project, balancing Indigenous concerns with other interests and factors (such as the need for the Project), before determining whether, in its opinion, the Project is in the public interest.

In carrying out this part of its mandate, the Board's objective was to reconcile Indigenous interests and concerns with other public interest considerations. The Board's process is designed to be thorough and accessible to Indigenous groups so that they may make their concerns known to the Board and have those concerns considered and addressed as appropriate. Further, the open nature of the Board's process allowed all participants interested in the application to be fully aware of the evidence that the Board considered in making its recommendations and decisions on the Project, which is consistent with principles of procedural fairness.

Consultation through the Project lifecycle

It is important to understand that there is a need for consultation to occur early in the planning stages of a project. However, information about a project is necessarily refined as project planning progresses, including in response to information provided by Indigenous groups through consultation, and therefore, it is important that consultation is ongoing. The Board has set out broad expectations for all regulated companies that consultation will continue throughout the life of a project and the Board routinely imposes binding obligations on the applicant to ensure that such consultation is occurring in an appropriate manner throughout the lifecycle of a pipeline. As the regulator of a project throughout its lifecycle, the Board also has a number of processes and tools at its disposal to execute its oversight of a project, including ensuring compliance with any conditions imposed by the Board.

If a certificate is issued for this Project, consultation will be ongoing throughout the life of the Project as conditions are met and additional permits are obtained. Notwithstanding this additional consultation, the Board is satisfied that the initial certificate process described above serves an important role in reconciling the various interests involved in such applications and ensuring that *Constitution Act, 1982*, subsection 35(1) obligations associated with the Project are met.

Trans Mountain's consultation

In assessing the consultation undertaken by Trans Mountain with Indigenous groups, the Board evaluated the design and implementation of Trans Mountain's consultation activities. The Board considered the company's activities to engage Indigenous groups and to learn about their concerns and interests. It also considered how Indigenous groups responded to opportunities for consultation and how Trans Mountain sought to understand, consider and address the concerns of potentially affected groups. The Board considered how this input influenced the Project's proposed design and operation. The Board also considered the concerns and views expressed by Indigenous groups.

A company's early consultation with Indigenous groups is a critical part of the development of proposed project, and a key matter for consideration within the regulatory review process. Timely, accessible and inclusive consultation facilitates the effective exchange of information, and provides opportunities for the company to learn about the concerns of potentially affected Indigenous groups, to discuss how those concerns can be addressed through project design and operational considerations, and to develop and discuss measures to reduce and mitigate the effects a project may have on the interests of Indigenous groups. Timely and effective consultation can help establish productive relationships that can carry on throughout the life of the project. It also informs the Board of the concerns Indigenous groups may have about a project's impacts.

With respect to Trans Mountain's consultation with Indigenous groups, the Board finds that Trans Mountain met the expectations of the National Energy Board, including those set out in the Board's Filing Manual. Since 2012, as part of the initial phases of the consultation process, the company provided Project information to Indigenous groups. This included information about the Project's design, operations, as well as its potential environmental, social and economic effects, including potential economic benefits through employment and training opportunities. The Board notes that Trans Mountain continued to provide opportunities to raise and discuss concerns with the company to those Indigenous groups that were identified as being potentially affected, and those that identified themselves to Trans Mountain as wishing to be engaged in consultation, throughout the early Project design phase and the regulatory review process.

The Board finds that the criteria used by Trans Mountain to identify potentially affected Indigenous groups were appropriate. The Board notes that Trans Mountain's consultation with Indigenous groups took into consideration the Project's proximity to areas of traditional use along the proposed right-of-way, and in proximity to the WMT. Trans Mountain also considered input from relevant federal and provincial departments and ministries. Once groups identified to Trans Mountain their interest in engaging in consultation, Trans Mountain was responsive to these requests, including Michel First Nation. The Board also notes that Trans Mountain included Indigenous groups along the shipping route that would be used by tankers associated with marine transportation activities. This included Indigenous groups on Vancouver Island and the Gulf Islands along established marine shipping corridors transited by tanker traffic, as well as communities in and around Port Metro Vancouver. The Board finds these aspects of Trans Mountain's consultation program design and implementation to be inclusive and appropriate for the Project's location and scope.

The Board finds that Trans Mountain offered all potentially affected Indigenous groups adequate opportunities to raise any concerns they had with the company, and to provide information about their concerns and interests in the Project area and within their traditional territories. The Board notes that this included the opportunity for each potentially affected Indigenous group: to complete or participate in traditional land and resource use (TLRU) studies and traditional marine use (TMRU) studies; to provide traditional ecological knowledge (TEK); and to identify potential effects on the current use of lands and waters and resources for traditional purposes. The Board also finds Trans Mountain provided appropriate opportunities to identify and discuss measures to reduce or avoid potential adverse effects. The Board notes the variety of information provided by Trans Mountain to Indigenous groups, as well as the numerous opportunities and offers to engage in consultation. These included providing Indigenous groups with notices of field study work, Project updates, and invitations to meet with the company to discuss concerns. The Board also notes Trans Mountain's offers to provide capacity funding to Indigenous groups, which Trans Mountain said were facilitated through the signing of 94 agreements for capacity funding and assessment studies with an aggregate value of $36 million.

The Board notes that some Indigenous groups were critical of Trans Mountain's approach to consultation. A number of Indigenous groups raised concerns about the adequacy of Trans Mountain's consultation activities and efforts. Some groups said they were not provided adequate opportunities to raise their concerns with the company, or to discuss or participate in the development of mitigation measures for the Project. Other groups felt that the time allowed to review Project information was inadequate. The Stó:lō Collective felt some of its information was not fully considered by Trans Mountain.

The Board finds that Trans Mountain provided numerous opportunities and venues for Indigenous groups to provide information about their interests to the company, and that Trans Mountain considered the information that it received

from those Indigenous groups that chose to provide it. The Board notes that many Indigenous groups chose not to participate in TLRU and TMRU studies for the Project.

The Board is of the view that Trans Mountain considered the information that was provided by Indigenous groups about their use of the lands, waters, and resources, and made a number of changes to the design and planned operation of the Project as a result of this information. These changes include reconfiguring the pipeline design in the Upper Fraser River and Upper North Thompson River Valley, and revising a proposed route across the Peters Indian Reserve No. 1A. As the Board discusses in Chapter 11, the majority of the pipeline route for the Project parallels existing disturbance, including the right-of-way for Trans Mountain's existing pipeline. The Board finds this appropriate, as this reduces the requirements for new right-of-way disturbance, minimizes the potential impacts of construction, and reduces effects on nearby residents and communities. The Board is of the view that Trans Mountain appropriately responded in its design and routing to the concerns and recommendations made by Indigenous groups, to the extent that was possible while maintaining minimal disturbance by paralleling existing disturbance.

Trans Mountain committed to ongoing consultation with affected Indigenous groups throughout the life of the Project. The Board views consultation as an iterative and ongoing process of discussion and dialogue. The Board expects companies to continue to learn about the concerns that groups may have about a project, and to discuss ways to address those concerns to the extent possible. Trans Mountain's approach to its ongoing consultation with potentially affected Indigenous groups meets the Board's expectations. Trans Mountain has committed to implement its ongoing consultation efforts in order to further develop and finalize those measures that will be used to mitigate and reduce the potential effects on the Indigenous groups in the Project area. The Board finds this approach acceptable, and encourages Indigenous groups to continue to engage with Trans Mountain in order to provide input into the final plans and mitigation measures for the Project. In order to apprise the Board and all potentially affected Indigenous groups about Trans Mountain's ongoing consultation efforts, including how it has addressed any concerns raised by Indigenous groups, the Board would impose Condition 96 requiring Trans Mountain to file with the Board reports on its ongoing consultation with potentially affected Indigenous groups during construction, and through the first five years of operations (Condition 146).

Some groups were critical of this approach to ongoing consultation, and felt that Trans Mountain had not yet adequately completed or fulfilled its consultation with Indigenous groups. For example, Kwantlen First Nation, Cheam First Nation and Chawathil First Nation felt that Trans Mountain did not adequately provide opportunities to discuss or finalize emergency response plans for the Project. The Board finds that, for this phase of the Project, Trans Mountain provided appropriate and adequate opportunities to discuss elements of the Project such as emergency response plans. Trans Mountain has committed to engaging directly with potentially affected groups on the development of emergency response plans. The Board finds this appropriate. In order to apprise the Board and potentially affected Indigenous groups about its consultations, and to ensure that Indigenous groups are provided with opportunities to provide input into the final plans and measures, the Board would require Trans Mountain to file with the Board its plan for consultation on the development of its Emergency Management Program (Condition 90). Trans Mountain would also be required to incorporate the results of consultation into its Emergency Management Program, including tactical plans for high consequence areas (Condition 124). The Board finds that Trans Mountain provided Indigenous groups appropriate and adequate opportunities to discuss the measures and plans that would protect communities and the environment, and that these opportunities will continue as part of ongoing planning for the Project.

The Board acknowledges that Trans Mountain and a number of Indigenous groups entered into agreements and letters of understanding for the Project. The Board also notes the letters from certain Indigenous groups expressing their support for the Project, some of which note they do not object to the Project, or are satisfied by the mitigation measures and consultation provided with respect to the Project. Several of the letters from Indigenous groups also expressed their opinion that the Project would result in positive economic effects. The Board is supportive of the aims of such agreements, which clarify the nature of the relationship between the parties, outline any support necessary to aid in discussion about the Project, and facilitate cooperation. The Board views the expressions of support offered by Indigenous groups to reflect the outcomes of effective consultations and discussions between the company and those Indigenous groups that have chosen to enter into arrangements with Trans Mountain. The Board also notes the concerns expressed by Indigenous groups regarding opportunities to participate in the Project through employment, training, and contracting or procurement. As discussed in Chapter 11, in order to facilitate the economic participation of Indigenous groups in the Project, the Board would impose Condition 12 requiring Trans Mountain to file with the Board a plan for monitoring the implementation of training and education opportunities, and to file a local, regional and Indigenous skills and business inventory (Condition 11).

The Board finds that Trans Mountain has designed and implemented an appropriate and effective consultation program, that meets the requirements and expectations set out in the Board's Filing Manual. The Board also finds that, with Trans Mountain's commitments and the Board's recommended conditions, Trans Mountain can effectively continue to consult with Indigenous groups, to learn more about their interests and concerns, and address issues raised by Indigenous groups throughout the Project's operational life.

Project-related impacts

In assessing potential impacts on Indigenous interests, the Board considered all of the evidence provided. The Board assessed how Trans Mountain identified and evaluated the potential impacts, the concerns raised by Indigenous groups, and the measures Trans Mountain has proposed to minimize or eliminate the Project's potential impacts on the interests of Indigenous groups.

Through the review process, Indigenous groups had the opportunity to make their views and concerns about the Project, including what effects it might have on their potential or established interests, known to both Trans Mountain and the Board. Indigenous groups expressed their views and concerns about how the Project might affect their Indigenous and treaty rights relating to hunting, fishing, trapping, the gathering of plant resources for subsistence and medicinal purposes, and the continued cultural and ceremonial practices and activities that are intimately interwoven with and dependent on their access to lands, waters, and resources within their traditional territories. The Board acknowledges the importance that Indigenous groups place on being able to exercise their Indigenous and treaty rights, and continue their traditional activities, uses and practices within the entire area of their traditional territories, including access to resources and areas and sites of cultural importance and significance.

Trans Mountain outlined its approach for assessing the potential impacts on the rights and interests of Indigenous groups. Its approach relied on an assessment of the effects on biophysical and human environments. This incorporated information provided by Indigenous groups through consultation, traditional land and marine use studies, and their participation in biophysical field studies.

The Board considered the evidence provided by Trans Mountain, Indigenous groups, and other participants about the nature and extent of the activities, uses, and practices that are carried out by Indigenous groups in the Project area, and the concerns expressed regarding the impacts of spills on traditional use and activities. The Board considered the potential impacts on those activities, uses, and practices. The Board also considered all the measures committed to by Trans Mountain to minimize or avoid such impacts.

As described in detail in Chapters 10, 11, and 14, Trans Mountain has described its specific and broad mitigation measures that would be implemented to address potential effects on biophysical elements, including fish and fish habitat, wildlife, vegetation, and water quality and quantity, as well as measures to address specifically the potential effects on TLRU, TMRU and socio-economic components, including cultural heritage resources. Trans Mountain concluded that with the application of its mitigation measures, adverse effects on TLRU, TMRU and the biophysical elements that support such use, as well as on socio-economic components, including cultural heritage resources, are not likely to be significant, with the exception of effects on the Southern resident killer whale, including traditional uses associated with the Southern resident killer whale.

Some Indigenous groups did not agree with the approach taken by Trans Mountain. Some groups expressed concern that Trans Mountain did not undertake group-specific assessments of the potential effects, or did not assess the potential impacts to established or asserted rights. The Board finds Trans Mountain's approach to assessing the potential effects on Indigenous interests is acceptable. Trans Mountain has assessed the effects related to construction, operations, and potential accidents and malfunctions including spills that may impact biophysical resources and socio-economic components within the Project area, and the Indigenous uses, practices and activities associated with those resources.

The Board recognizes that there would be impacts associated with this Project, and that these would be experienced by some Indigenous groups. Reduced or interrupted access to lands, waters, or resources used by Indigenous groups, including for traditional land and marine uses, and for cultural and ceremonial purposes, may result in disruptions in the ability of Indigenous groups to practice their traditional activities. The Board has fully considered all the evidence in relation to these matters, which are described in detail in Chapters 11 and 14, and the Board finds that, during construction and routine operations, these impacts would be temporary and are not likely to be significant. With respect to TMRU activities directly affected by the WMT, the Board finds that these effects would persist for the operational life of the Project, as TMRU activities would not occur within the expanded water lease boundaries for the WMT. The Board finds that while the effects would be long-term in duration, these would be reversible in the long term, and that adverse effects are not likely to be significant.

With respect to the potential effects of Project-related vessel traffic on Indigenous marine vessels and users, the Board finds, as described in Chapter 14, that these effects would be limited to the time during which the Project-related vessels are in transit and therefore, these effects would be temporary and Indigenous marine vessels will be able to continue their movements and to access areas outside of those brief periods of interruption. As outlined in Chapter 14 of this Report, the Board finds that with the exception of effects on the traditional uses associated with the Southern resident killer whale, adverse effects of Project-related marine vessel traffic on traditional marine resource uses, activities and sites are not likely to be significant.

With respect to the potential impacts of a worst-case spill from the pipeline or from Project-related vessels on the ability of Indigenous groups to continue their traditional uses, practices and activities, the Board finds, as described in Chapters 11 and 14, that depending on the size, location and conditions of a spill and the effectiveness of response measures, there could be significant adverse effects on these traditional uses, practices and activities. As noted in its views on these matters in the respective chapters, the Board finds that the probability of such events is very low. The Board has incorporated the potential consequences of a spill outlined above into its discussion on spill risks in Chapter 1 and considered them in its overall weighing of the benefits and burdens of the Project in Chapter 2.

The review and final design of a proposed project is, in the Board's view, an iterative process. Should the Project proceed, Trans Mountain would be required to continue its consultation with potentially affected Indigenous groups, and to finalize the development of its plans and measures to reduce and mitigate the potential effects and to protect the environment and the resources that are of importance to and utilized by Indigenous groups. The Board would impose a number of conditions requiring Trans Mountain to report to the Board on its consultation with Indigenous groups during construction, through the first five years of operations, and to report to the Board on its consultations regarding the development of a number of its plans related to, among other things, environmental protection and emergency response programs.

Viewing all of these factors together, and as the Board has concluded within Chapters 10, 11, and 14, the Board is satisfied that with Trans Mountain's commitments, its proposed mitigation measures, and with the Board's proposed conditions, that the effects on the interests of potentially affected Indigenous groups can be effectively minimized, and that there would not be significant adverse effects on the ability of Indigenous people to continue to use lands, waters and resources for traditional purposes, with the noted exception of traditional uses associated with the Southern resident killer whale.

Summary of views on subsection 35(1), Constitution Act, 1982

The Board heard a number of arguments regarding requirements related to subsection 35(1) of the *Constitution Act, 1982*, including the need for the Board to assess the adequacy of Crown consultation. The Board recognizes that the law with respect to such matters is regularly being clarified. Nevertheless, the Board understands that the duty to consult with Indigenous groups, triggered when government decisions have the potential to adversely affect Indigenous and treaty rights, is a constitutional duty invoking the honour of the Crown and it must be met. While the Board does not itself owe the duty, its process is relied upon, to the extent possible, to discharge the duty to consult.

Having considered all the evidence submitted in this proceeding, the consultation undertaken with Indigenous groups, the impacts on Indigenous interests, the proposed mitigation measures, including conditions, to minimize adverse impacts on Indigenous interests and the commitments to and Board imposed requirements for ongoing consultation, the Board is satisfied that the Board's recommendation and decisions with respect to the Project are consistent with subsection 35(1) of the *Constitution Act, 1982*. The Board is of the view that this assessment is consistent with what is required for the purposes of the Board's Report.

The Government of Canada has stated that there will be additional consultation following the issuance of this Report, and the GIC will be making a determination as to whether it will direct the Board to issue a certificate for the Project pursuant to section 54 of the NEB Act.

5.2 Indigenous matters – MH-052-2018 hearing

5.2.1 Overview

The Board has considered all of the evidence provided in the MH-052-2018 hearing by Indigenous communities and others, including Trans Mountain and the Federal Authorities about the potential impacts of Project-related marine shipping on Indigenous interests, including rights; Trans Mountain and the Federal Authorities' proposed mitigation of the potential effects of marine shipping; requirements in the regulatory framework; and the Conditions listed in Appendix 3 and the recommendations in Chapter 2.

The Board interprets its responsibilities in a manner consistent with the *Constitution Act, 1982*, including subsection 35(1), which recognizes and affirms the existing Indigenous and Treaty Rights of Indigenous peoples. Further discussion of the Board's role in upholding section 35 of the *Constitution Act, 1982* is available in Section 5.2.6 of this chapter. The Board is of the view that there has been adequate consultation and accommodation for the purpose of the Board's reconsideration and recommendations in respect of Project-related marine shipping. The Board is of the view that any potential impacts from marine shipping on the interests, including rights, of affected Indigenous peoples are not likely to be significant and can be effectively addressed, with the exception of the impacts on the traditional use of Southern resident killer whales by Indigenous peoples.

In addition to the summaries of evidence in this section, Appendix 14 provides a summary of the general and specific concerns and issues about the potential impacts of Project-related marine shipping, raised by Indigenous communities through the MH-052-2018 hearing, as well as summaries of the responses to these concerns provided by Trans Mountain, the Federal Authorities, the Board (including conditions and recommendations), and applicable requirements provided through regulation and/or legislation. As noted in Section 5.1, this chapter of the Report should not be considered in isolation from the recommendation as a whole and anyone wishing to fully understand the context of the information and evidence provided by Indigenous communities should familiarize themselves with the entire record of the MH-052-2018 hearing.

The sections below are organized as follows. Section 5.2.2 summarizes the submissions regarding Trans Mountain's engagement program and the Government of Canada's consultation to date. Section 5.2.3 describes the participation of Indigenous communities in the Board's process for this Reconsideration, Section 5.2.4 summarizes the submissions on asserted rights, and Section 5.2.5 summarizes the submissions on potential impacts to the interests, including rights of Indigenous communities. The views of the Board are provided in Section 5.2.6, detailing the Board's findings on Trans Mountain's engagement, the Government's consultation, and the potential impacts, including the Crown's consultation obligations.

5.2.2 Consultation with Indigenous peoples

5.2.2.1 Trans Mountain's engagement with Indigenous peoples

The Board considered evidence related to Trans Mountains' Indigenous Engagement Program in its OH-001-2014 hearing, as described in Section 5.1.2.

In its updated evidence filing for the Reconsideration, Trans Mountain confirmed that it continues to engage Indigenous communities affected by the Project and will continue to update the Board through compliance with Condition 96.

With regards to marine shipping specifically, Trans Mountain stated that since 2012, Trans Mountain has engaged with 27 marine and inlet Indigenous communities, 21 of which have indicated an interest in the Project or interests potentially affected by Project-related marine vessel traffic.

Throughout 2015 to the present, Trans Mountain said that it had facilitated introductions and meetings of marine Indigenous communities with the Western Canada Marine Response Corporation (WCMRC). The purpose of these meetings was to inform Indigenous communities of WCMRC's state of preparedness and current plans in place should a marine spill occur and to mitigate the impacts thereof. This includes protection of wildlife, economic and environmental sensitivities.

Trans Mountain also said that, in accordance with its Consultation Plan for its Emergency Management Plan (Condition 90 of the original Certificate), it has engaged with Indigenous communities regarding the development of several aspects of its Emergency Management Program. Trans Mountain said that the consultation is an extensive, multi-step, ongoing process in which local and traditional knowledge from affected Indigenous communities is sought out through various engagement opportunities, including face to face meetings, workshops and field visits.

Trans Mountain also said that it is advancing the concept of a Salish Sea Initiative as part of an existing commitment with marine Indigenous communities to enhance their stewardship over the Salish Sea. While conceptual at this time, the Salish Sea Initiative has been introduced to marine Indigenous communities with a focus on where there is an already existing commitment, and the intention is for the Initiative to be Indigenous-led and developed in partnership with Trans Mountain. Due to Project-uncertainty the long-term initiative was suspended, but pending the resumption of the Project, Trans Mountain said that it would re-engage with interested Indigenous marine communities in the design and scope of the initiative, together with, as appropriate, other marine organizations and authorities.

Trans Mountain said that it continues to foster and develop working relationships with Indigenous communities to receive Indigenous knowledge. Trans Mountain said that where appropriate, it has established formal relationships with Indigenous communities that includes opportunities to incorporate Indigenous knowledge into Project plans. Trans Mountain said that it continues to review and identify opportunities to facilitate and support Indigenous participation in activities related to Trans Mountain's areas of responsibility.

Finally, Trans Mountain said that it is committed to ongoing and meaningful consultation with Indigenous communities throughout the lifecycle of the Project. Trans Mountain said that it intends to engage directly with Indigenous communities to understand issues, and where appropriate implement avoidance, mitigation and accommodation measures, and agreements.

5.2.2.2 Concerns raised by Indigenous peoples about Trans Mountain's consultation

Some Indigenous communities raised concerns in their evidence about Trans Mountain's consultation related to marine shipping impacts. The concerns raised in relation to Trans Mountain's ongoing consultation regarding marine shipping included the lack of capacity funding and limited opportunity to provide input into condition filings and other management plans.

Lyackson First Nation (Lyackson) stated that none of the concerns it has brought to the attention of Trans Mountain during ongoing engagement have been addressed. Lyackson further noted that Trans Mountain has provided insufficient funding for review of compliance filings or to ensure that it can be meaningfully engaged in the development of programs or mitigation measures to address Lyackson's concerns.

Musqueam Indian Band (Musqueam) characterized Trans Mountain's ongoing engagement activities with Indigenous communities, in particular as they related to condition compliance, as an empty record keeping process with no substance. Neskonlith Indian Band (Neskonlith) stated that Trans Mountain's consultation regarding the Project continues to be poor and does not meet the standard of meaningful consultation. Neskonlith also raised concerns about how Trans Mountain's future engagement would take place given the change in ownership.

During its oral traditional evidence, Stó:lō Tribal Council noted that Trans Mountain had limited its engagement regarding marine issues, and that it would only discuss the pipeline corridor and the Westridge Terminal.

The Indigenous Caucus for the IAMC (IAMC Caucus) raised concerns with the limited detail of engagement information provided by Trans Mountain in its condition compliance filings with the Board. It noted that Trans Mountain did not provide sufficient details regarding the recommendations or results of consultation with various Indigenous communities, including any outcomes or follow up activities to address Indigenous concerns.

BC Métis Federation submitted that meaningful, timely, transparent, and cultural sensitive consultation was not carried out for the Project, and that Trans Mountain has not engaged in discussion with members about how they may be impacted by the Project, nor about the role that they and their community might play in addressing those impacts.

Blood Tribe, Driftpile Cree Nation, Louis Bull Tribe, Papaschase First Nation #136, Tsuut'ina Nation and Whitefish Lake First Nation #459 all indicated that they had not been engaged by Trans Mountain as part of the Project and said that Trans Mountain should be engaging with each of them to discuss accommodation and mitigation measures to be implemented for the lifecycle of the Project.

5.2.2.3 Trans Mountain's reply to consultation concerns

Trans Mountain noted that it continues to dialogue with Lyackson regarding marine transportation activities and Lyackson's concerns over potential Project and regional marine transportation effects on the Southern resident killer whale (SRKW) population. It noted that it is working with provincial and federal maritime agencies with the goal of identifying effective, actionable mitigation measures that balance environmental and marine shipping industry needs. Trans Mountain committed to continue to provide Lyackson with updates and further details on research results and recommendations for possible mitigation measures to reduce potential effects of marine transportation effects on SRKW. More information regarding these measures are found in Chapter 14.

In reply to concerns raised by the BC Métis Federation, Trans Mountain said that it has been engaging with the BC Métis Federation on all facets of the Project since 2012 and that is has entered into a contractual arrangement in relation to the Project with BC Métis Federation and, based on that agreement, Trans Mountain is committed to continued engagement with BC Métis Federation in a meaningful way to address the questions and concerns of its members, including the recommendations brought forth in their direct evidence.

In response to Stó:lō Tribal Council's statement that Trans Mountain had placed restrictions on topics for engagement, Trans Mountain noted that it has engaged Stó:lō governance organizations on all aspects of the Project. While Trans Mountain has clearly stated that its operational control ends at the Westridge Marine Terminal (WMT), this was never intended to and has not precluded engagement on marine issues that extended beyond the WMT, including marine shipping. For example, it noted that Stó:lō Tribal Council was invited to the last two full-scale emergency response exercises at WMT in 2015 and 2018.

In response to questions about how Trans Mountain's engagement activities may change as a result of the change in ownership, Trans Mountain stated that it continues to be the proponent of the Project and as such, it will continue to engage with Indigenous communities and comply with any and all NEB conditions in respect of the Project. Trans Mountain noted that from a constitutional perspective, the ultimate responsibility for ensuring that the duty is adequately fulfilled remains with the Crown under the leadership of the Minister of Natural Resources. Trans Mountain said that it has started collaboration activities with the Federal Government in relation to the resumption of Phase III consultation, and will

participate as appropriate in subsequent consultations with Indigenous groups, to provide proponent and project specific information. Trans Mountain said that it is committed to participating in meaningful dialogue and consultation with Indigenous communities across the Project.

Finally, in response to overarching concerns raised about its engagement program, including the consultation it is doing with communities as part of condition compliance, Trans Mountain said that consultation and engagement with all Indigenous communities is ongoing, and there are no Project-related topics that are considered closed for discussion. Trans Mountain confirmed that it is open to hearing and discussing all issues with Indigenous communities and incorporating feedback into Project plans and development at every opportunity. Further, Trans Mountain said that it welcomes the involvement of Indigenous communities in the development and implementation of key marine conditions. Trans Mountain said that engagement on these conditions will occur through workshops, ongoing one-on-one meetings and Indigenous Engagement Roundtables planned for 2019.

5.2.2.4 The Government of Canada's consultation process with Indigenous peoples

The Board considered evidence related to the Government of Canada's consultation process with Indigenous communities in its OH-001-2014 hearing, as described in Section 5.1.3.

As part of the MH-052-2018 hearing, Natural Resources Canada (NRCan) filed information related to Crown consultation and engagement with Indigenous communities potentially impacted by the Project, outlining the initiatives that Canada has undertaken to identify Indigenous communities' substantive issues and to develop and implement mitigation or accommodation measures where appropriate.

NRCan filed the Joint Federal/Provincial Consultation and Accommodation Report (2016 CAR) for the Trans Mountain Expansion Project which summarizes the procedural and substantive aspect of consultation with Indigenous communities of the Project as part of the Original Phase III consultations on the OH-001-2014 Report. The 2016 CAR describes:

- Indigenous consultation undertaken in respect of the Project;
- View of Indigenous communities on how the Project may impact Indigenous interests;
- Measures proposed to address potential impacts of the Project on Indigenous interests raised by Indigenous communities;
- The Crown's conclusions regarding the potential impacts of the Project on Indigenous interests; and
- Conclusions regarding the adequacy of consultation.

The 2016 CAR also included appendices specific to consultation with the 40 Indigenous communities on the Crown list who had raised issues related to marine transportation during the Original Phase III consultations. NRCan said that the 2016 CAR's appendices summarize the Crown's understanding of concerns raised by Indigenous communities, governments, or nations, including the Crown's conclusion of the impacts of the Project to rights and title, and the depth of consultation owed to each Indigenous community, government or nation. NRCan noted that the key concerns raised by Indigenous communities related to marine shipping activities outlined in the 2016 CAR included impacts on marine fishing and harvesting, impacts on other traditional and cultural practices, and impacts of a spill.

NRCan noted that much of the collaboration and conversation with Indigenous groups on the Project after the Original Phase III consultation process occurred through the co-development and implementation of the Indigenous Advisory and Monitoring Committee (IAMC or Committee) on the Trans Mountain Expansion Project and existing pipeline. This measure was to supplement the proponent's commitments to Indigenous communities, the NEB conditions on the project, and the commitments made by the Government of Canada in the Oceans Protection Plan (OPP). NRCan highlighted Section 23 of the Terms of Reference for the IAMC, which refers to marine issues, noting that Indigenous communities indicated that they had not been meaningfully involved in the oversight of these activities in the past and that there was no clear alternative process for them to participate in the monitoring of those activities.

NRCan also described its West Coast Energy Infrastructure Initiative (WCEI), which was launched in 2014 to facilitate a coordinated federal presence in B.C. and ensure that federal engagement with Indigenous communities was translated into concrete actions and investments. With respect to Indigenous communities potentially impacted by the Project, it said that the WCEI work was undertaken outside of the formal Crown consultation and accommodation process, both prior to the release of the NEB report, as well as after, spanning a period from June 2014 to present. NRCan noted that WCEI work informed the federal response to Indigenous concerns through project funding, or other initiatives with respect to marine shipping, marine safety, marine pollution response, and marine stewardship.

The Federal Authorities said that the engagement outcomes outlined in the 2016 CAR, IAMC, and WCEI were carefully considered in developing the OPP. It said that the OPP aims to build strong relationships and partnerships with Indigenous

coastal communities and organizations. The third pillar of the OPP prioritizes launching co-management practices with Indigenous coastal communities, by building local emergency response capacity, marine training, and governance strategies for northern shipping. The Federal Authorities noted that formal regional partnerships with Indigenous communities will establish long-term relationships and partnerships that will provide opportunities for Indigenous communities to play a meaningful role in marine safety, including decision-making, and environmental protection. It noted that partnerships and agreements will be jointly developed, reflect the priorities and interests of Indigenous communities and Canada, advance common issues and achieve tangible outcomes that meaningfully contribute to reconciliation. More information regarding the Federal Authorities' consultation with Indigenous communities, including Indigenous participation in OPP initiatives is found in Section 5.2.5 of this chapter.

Finally, NRCan said that the Crown has decided to follow the guidance from the Federal Court of Appeal to engage in a specific and focused dialogue with Indigenous communities on the Project. As a result, NRCan stated that the government will re-engage consultations with all 117 Indigenous communities potentially impacted by the Project. On 5 October 2018, the Minister of Natural Resources sent a letter to Indigenous communities outlining the Government's intentions to engage in a specific and focused dialogue with Indigenous groups on the Trans Mountain Expansion Project. It stated that the next round of consultations will lead to an updated CAR that will outline the potential impacts to rights and interests of Indigenous communities in relation to the Project, and how these impacts have been mitigated and, where appropriate, accommodated. NRCan stated that consultation will be guided by four core objectives:

1. Consult with all Indigenous communities that are potentially impacted by the Project;
2. Tailor consultations to reflect the potential impacts, preferences and capacities of each group and outstanding concerns with the Project from the existing Phase III consultations;
3. Consult meaningfully through a substantive two-way dialogue and reasonable accommodations; and
4. Consult in a way that is fully consistent with meeting Canada's obligations under the s. 35 of the *Constitution Act, 1982*, and the Government's commitments to advance reconciliation with Indigenous peoples, including its pledge to implement the United Nations Declaration on the Rights of Indigenous peoples.

NRCan stated that it is committed to respecting the duty to consult and recognizes that consultation is an ongoing process. NRCan also indicated that the Government will rely on the NEB public hearing process to the extent possible to fulfill the legal duty to consult related to the Reconsideration of Project-related marine shipping. It noted that the re-engagement of Phase III consultation on the Project will see Canada engage in meaningful, two-way dialogue with First Nations and Métis communities impacted by the Project to validate and discuss marine shipping (and other) concerns and accommodation measures to address those concerns. As such, it noted that existing measures to address marine shipping concerns may continue to develop and new initiatives will be introduced in response to issues raised.

5.2.2.5 Concerns raised by Indigenous peoples about the Government of Canada's consultation

Indigenous intervenors raised concerns with Canada's consultation efforts at various stages of the Project, including consultation regarding the MH-052-2018 hearing, the ability of the Crown to rely on the NEB's Reconsideration process as part of its consultation obligations, the information filed by Canada as a result of the Original Phase III consultation process, and plans going forward for the re-engagement on Phase III Consultation. Indigenous communities also raised concerns with Canada's consultation around the OPP and its various initiatives, which is discussed further in Section 5.2.5.2 of this chapter.

2016 CAR

Multiple Indigenous intervenors raised concerns regarding the accuracy of the information in the 2016 CAR filed by NRCan, noting where errors and generalities were made, as well as questioning how the Crown came to its determination of impacts on individual First Nation's rights and interests and the depth of consultation owed to their respective communities.

Squamish Nation (Squamish) stated that the 2016 CAR does not accurately represent Squamish's rights, impacts to those rights from the Project and Squamish's outstanding concerns with the Project. Tsawout First Nation (Tsawout) noted that there was incorrect information in the CAR that the Crown relied on in their assessment of Tsawout's rights and interests, leading to an incomplete determination of impacts of the marine shipping component of the Project on Tsawout's rights and interests, as well as the depth of consultation owed.

Musqueam noted that the CAR has numerous errors and omissions regarding the information it provided both to the NEB in the OH-001-2014 hearing and the Crown during its Original Phase III consultations. Musqueam said that the Board should not rely upon it as information regarding Musqueam's concerns with the Project and the potential impacts of the Project on Musqueam's rights. Tsleil-Waututh Nation (TWN) also raised concerns with the CAR, stating that it was unilaterally developed without TWN's involvement, does not capture issues of concern that have been raised in the MH-052-2018

hearing, and that there are many outstanding issues of concern that were not resolved in the previous Phase III consultation process.

Consultation on the scope and process for the MH-052-2018 hearing

Numerous Indigenous intervenors raised concerns with the MH-052-2018 hearing process, including the scope of the Order in Council (OIC) referring aspects of the OH-001-2014 Report back to the NEB for reconsideration, the length of time given for the hearing, as well the scope of the hearing itself.

Squamish, Stz'uminus First Nation (Stz'uminus), Snuneymuxw First Nation (Snuneymuxw) and TWN all submitted that Canada should have consulted with them on the scope of the OIC, as well as procedural aspects related to the MH-052-2018 hearing.

Multiple Indigenous intervenors also noted that the Governor in Council (GIC) time line of 155 days for the Reconsideration was set without consulting impacted First Nations. Indigenous communities noted that the overall timeline was too short and that deadlines for hearing steps were too short to participate meaningfully or provide in-depth studies, or allow for an appropriate level of meaningful consultation. Indigenous intervenors noted that the short timeline for the Board to complete its assessment is especially problematic given the Government of Canada's position that it will be relying on the MH-052-2018 hearing to the extent possible to fulfill its constitutional duty to consult with Indigenous peoples. Indigenous intervenors noted that, since the Reconsideration is considered to be part of the consultation process, it must be conducted in a manner that upholds the honour of the Crown and the process must provide Indigenous communities with a meaningful opportunity to put forward their concerns and have them addressed.

For example, Squamish maintained that the overall time period for the Reconsideration was inadequate and unfair. It noted that since the Reconsideration is considered to be part of the consultation process, it must be conducted in a manner that upholds the honour of the Crown and should not be unduly rushed at the expense of First Nations' ability to lead the evidence they consider necessary for the process.

TWN said that for Canada to be able to rely on the MH-052-2018 hearing to discharge its duty to consult, the process must provide TWN, and other Indigenous intervenors, with a meaningful opportunity, and sufficient time, to put forward its concerns and have them addressed by the Board, so that in turn, the GIC can properly assess the environmental effects and the impacts to, and infringements of, TWN's Indigenous title and rights as a result of the Project.

Stó:lō Collective raised concerns with the length of the MH-052-2018 hearing, noting that the time limits did not allow for procedural fairness or the ability to fully canvas and consider the potentially significant adverse impacts of Project-related marine shipping on, inter alia, Indigenous rights and title, the environment, and species at risk. It also noted that the 155 day timeline imposed by GIC limited its ability to participate substantively in the MH-052-2018 hearing, including the inability to engage with specialists, adequately review and respond to additional evidence filed by Canada and Trans Mountain, or prepare additional assessments on the potential impacts of Project-related marine shipping.

Nooaitch Indian Band stated that it considered the Reconsideration process to be inadequate, stating that there has not been sufficient time for it to review the significant volume of new evidence filed by the Federal Authorities and Trans Mountain, nor to gather its own evidence. Tsartlip First Nation stated that the time limit is woefully inadequate to consider and respond to the serious issues in question, many of which are of a scientific or technical nature. Tsawout stated that the evidence it was able to submit was limited in scope and content due to the timelines imposed upon the hearing.

Stz'uminus said that it did not feel that a meaningful two-way dialogue can be achieved within the compressed timeline of the reconsideration process, and further was of the view that findings of fact generated through the process will be very unlikely to form a sufficient foundation for meaningful consultation between First Nations and the Crown.

Stk'emlúpsemc te Secwépemc of the Secwépemc Nation (SSN) noted that consultation must take place early in the decision-making process for it to be meaningful. SSN said that it was concerned with the late start to the Phase III consultation process and the inadequacy of consultation in the Reconsideration process. It noted that the timelines for the Reconsideration process have not been sufficient to allow for fulsome participation by SSN and other intervenors and so SSN does not accept this process as an appropriate method for Canada to use to discharge its duty to consult and accommodate SSN's Indigenous rights and interests.

Driftpile Cree Nation said that the format, process and timelines for the Reconsideration will prevent the Crown from relying upon the Reconsideration process to fulfill the duty to consult, whether it be in whole or in part. Adam Olsen said that it was disrespectful to Indigenous cultures and societies to put a limit of 22 weeks on consultation with Indigenous peoples.

Shxw'ōwhámel First Nation said that the MH-052-2018 hearing process as structured could not consider the potentially significant adverse impacts of Project-related marine shipping on, inter alia, Indigenous rights and title, the environment and species at risk, as it does not, in substance, provide for an appropriate level of meaningful consultation, and particularly

given that Project-related marine shipping could have significant adverse impacts on Shxw'ōwhámel First Nation's Indigenous rights.

Malahat First Nation raised concerns about fairness and adequacy of the Reconsideration process itself, taking issue both with the scope of the Reconsideration and with the abbreviated timeline imposed on the Board by the GIC. Other Indigenous intervenors also noted that scope of the MH-052-2018 hearing should be broader than just Project-related marine shipping. Stz'uminus for example, submitted that it is not reasonable to consider the environmental impacts of marine shipping without also reconsidering whether the Project is necessary. Squamish noted that it is deeply connected to and dependent on its lands, waters and resources that stand to be impacted by the Project, and it is artificial and not in keeping with how Squamish uses its Territory to consider certain Project effects on Squamish's Indigenous rights and title in isolation from the broader Project impacts.

Indigenous intervenors who are located along the pipeline route also raised concerns with the scope of the Reconsideration, suggesting that Project-related marine shipping should not be considered in isolation. Louis Bull Tribe, for example, said that the Board should give serious consideration to evidence of environmental, socio-economic and socio-cultural impacts of this Project both upstream and downstream before making its recommendation. Little Shuswap Lake Indian Band (LSLIB) submitted that it is an error to consider only the interests of the immediate and adjacent nations and not to consider the interests of those whose lands may not be bisected by the Project or whose lands or waters do not directly flank the Project. LSLIB said that as part of the MH-052-2018 hearing, the Board should consider the Indigenous interests of every Indigenous nation that may be affected by the Project and specifically by the increased marine shipping that will result of the Project, as pollution, spills and marine life are not fixed to the land, but are mobile.

Phase III consultation

Multiple Indigenous intervenors raised concerns with the Government of Canada's Phase III consultation activities, both what has occurred to date, as well as plans going forward. Neskonlith stated that Canada's consultation with Neskonlith regarding the Project continues to be poor and does not meet the standard of meaningful consultation.

Squamish stated that Canada has yet to engage substantively in a reinitiated Phase III consultation process and that Squamish is still waiting to hear about how Canada proposes to discharge its constitutional obligations. Squamish further stated that Canada's duty to consult and accommodate Squamish must be discharged prior to Project approval.

Lyackson stated that, to date, the Crown has not engaged meaningfully to ensure that the issues and concerns raised by the First Nation will be adequately addressed. It said that the Crown has not committed to providing sufficient funding to Lyackson to ensure that it can be meaningfully engaged in the development of initiatives and measures to mitigate Lyackson's vast outstanding concerns.

Blood Tribe, Driftpile Cree Nation, Louis Bull Tribe, Papaschase First Nation #136, and Tsuut'ina Nation, Whitefish Lake First Nation #459, and Stoney Nakoda Nations all indicated that they had not been meaningfully engaged by Canada as part of the original Project or the Reconsideration. The Alberta-based communities said that Canada should be consulting with each of them, including providing capacity funding for this consultation to take place, so that their views regarding mitigation and accommodation measures can be considered.

5.2.2.6 NRCan reply to concerns regarding Government of Canada consultation

2016 CAR

In response to concerns raised about the accuracy of the information in the appendices for individual First Nations that are part of the 2016 CAR that was filed on the NEB's record, NRCan said that the Crown's depth of consultation assessment is iterative and is expected to evolve as the NEB MH-052-2018 hearing unfolds and as Indigenous communities, governments and nations engage in re-initiated consultations with the Crown.

NRCan noted that when it sent letters to Indigenous communities in November 2018 as part of its re-engagement in Phase III consultations, it attached that community's Appendix from the 2016 CAR, as a starting point, and invited communities to identify where information needs to be changed or updated. NRCan said that the Crown will re-engage in Phase III consultations, outside of the MH-052-2018 hearing, with all impacted Indigenous communities, governments and nations, to meaningfully fulfill its duty to consult through understanding, and identifying measures to avoid, mitigate or accommodate, where appropriate, impacts of the Project to Indigenous and Treaty rights. Through this process, the Crown's interpretation of the depth of consultation owed and potential impacts on rights of the Project will continue to be updated in collaboration with each Indigenous community, government or nation, to ensure a thorough understanding of potential or established rights, and any potential impacts of the Project on those rights.

NRCan further stated that the next round of consultations will lead to an updated CAR that outlines the potential impacts to rights and interests of Indigenous communities in relation to the Project, and how these impacts have been mitigated, and

where appropriate, accommodated. The updated CAR resulting from the new process will inform the final decision with respect to the Project.

Consultation on the scope and process for the MH-052-2018 hearing

In response to concerns regarding Canada's consultation with Indigenous communities on the scope of the OIC to the Board for the MH-052-2018 hearing, NRCan noted that the Crown was following the guidance from the Federal Court of Appeal and that the Crown recognizes that the MH-052-2018 hearing is operating within the broader context of the re-initiated Phase III consultation process.

NRCan said that the NEB MH-052-2018 hearing provides a mechanism for Indigenous communities, government and nations to express their concerns regarding how Project-related marine shipping might adversely impacts potential or established Indigenous and Treaty rights, and related avoidance, mitigation and other accommodation measures.

NRCan said that the Crown will rely on the NEB Reconsideration Process, to the extent possible, to consider all forms of mitigation to Project-related marine shipping and assess the residual effects. The Crown will then assess the potential seriousness of any residual effects of the Project on Indigenous and Treaty rights, taking into account proposed mitigation and/or accommodation measures.

Phase III consultation

NRCan said that the Crown will re-engage in Phase III consultations, outside of the MH-052-2018 hearing, with all impacted Indigenous communities, governments and nations to meaningfully fulfill its duty to consult through understanding, and identifying measures to avoid, mitigate or accommodate, where appropriate, impacts of the project to Indigenous and Treaty rights. NRCan said that the NEB recommendations will inform the Crown's Phase III consultation. NRCan also stated that a recommendation on whether to approve the Project will only be considered by the GIC once it is satisfied that the Crown's obligation to consult and accommodate has been fulfilled.

NRCan also said that timely and accessible support for participant funding is part of the approach to Crown consultation activities. NRCan said that it offered participant funding to impacted Indigenous communities, governments and nations in November 2018, to support participation in consultation activities with the Crown. It said that this funding is available to cover: preparing input and reports to inform the Crown's record on the Project; building community capacity to engage in and benefit from major project reviews; and other activities, upon approval, considered necessary to ensure meaningful participation in Crown consultations. NRCan further stated that the Consultation Team has been mandated to engage in meaningful two-way dialogue and discuss the concerns of Indigenous communities, government and nations, including agreeing to accommodation measures, where appropriate (following Cabinet approval where required) to address those concerns. This will be an ongoing back and forth conversation between representatives of the Indigenous community, government or nation, and the Crown.

NRCan said that the re-initiated Phase III consultation process will build on existing relationships, the information submitted by Indigenous communities, governments, and nations to date, and the existing consultation record, while making improvements to ensure the duty to consult is appropriately fulfilled. This new process will result in an updated CAR that will be presented to the GIC prior to a decision being made in accordance with section 54 of the *National Energy Board Act*, which includes provisions allowing the Crown to seek an extension beyond the mandated three month review period. Prior to completion, Indigenous communities, governments and nations' views and comments on this document will further inform the Crown's assessment, which will then be reflected in the report.

NRCan also confirmed that Canada has not delegated the procedural aspects of its duty to consult to Trans Mountain. However, it noted that representatives of Trans Mountain will be part of the consultation and accommodation process and participate in meetings with representatives of Indigenous communities, government and nations, where appropriate, although the ultimate responsibility for ensuring that the duty is adequately fulfilled remains with the Crown under the leadership of the Minister of Natural Resources.

In addition, NRCan noted that the NEB process requires the proponent to work with, and potentially accommodate, Indigenous communities, governments and nations impacted by the Project. NRCan noted that while the NEB Filing Manual provides information to the proponent on the requirement to engage with potentially affected Indigenous communities, governments and nations, this does not constitute delegation of the duty to consult.

5.2.3 Participation of Indigenous communities in the Board's MH-052-2018 hearing

A description of the participation of Indigenous communities in the OH-001-2014 hearing process can be found in Section 5.1.4.

The Board's MH-052-2018 hearing process was designed to obtain as much relevant evidence as possible on concerns related to the issues to be considered as part of the Reconsideration, including the potential impacts of Project-related marine shipping on Indigenous interests (as noted in the Board's List of Issues), and possible mitigation measures to minimize those impacts, including on traditional Indigenous use associated with the Southern resident killer whale (SRKW).

The Board received and considered information about concerns related to Project-related marine shipping and the measures that would be required to address those concerns, as brought forward through engagement undertaken by Trans Mountain and the Government of Canada, and through the participation of potentially affected Indigenous communities and other participants in the hearing process.

As described in Section 1.3.4 of this Report, the Participant Funding Program offered a total of $4,981,760 to 69 recipients, of which 82 per cent was offered to Indigenous intervenors.

The Order in Council P.C. 2018-1177, which referred aspects of the Board's recommendation for the Project back to the Board for Reconsideration, was issued on 20 September 2018. As described further in Section 1.3.2 of this Report, the Board sought comments on the scope and design of the Reconsideration process:

- On 26 September 2018, a letter providing an overview of the Reconsideration and seeking comments was sent to all Indigenous intervenors in the OH-001-2014 hearing for the Trans Mountain Expansion, as well as all Indigenous peoples and groups on the Crown Consultation List in the OH-001-2014 hearing.
- On 5 October 2018, additional, focused comments on the definition of the "designated project" were sought from the Parties.

On 12 October 2018, the Board issued Hearing Order MH-02-2018, which outlined the process to be followed in the Board's adjudication of the Reconsideration. 52 Indigenous intervenors participated as intervenors in the MH-052-2018 hearing and provided their comments, views and evidence through written submissions and oral evidence to the Panel.

During the proceeding, Indigenous intervenors had opportunities to obtain further information about issues and mitigation measures related to Project-related marine shipping and present their views to the Board through the following steps:

- Written evidence submissions
- Oral Traditional Evidence (OTE)
- Written questions (information requests) of Trans Mountain, the Federal Authorities and other intervenors
- Responses to any written questions
- Comments on draft conditions and recommendations
- Written final argument

The Board carefully considered comments from Indigenous intervenors on the Board's draft conditions and recommendations and included a requirement for consultation with Indigenous peoples in the recommendations to the GIC.

The Board understands that Indigenous peoples have an oral tradition for sharing information and knowledge from generation to generation and that this information cannot always be shared adequately in writing. The Board considers it valuable to hear OTE which assists the Board in understanding how the Project may impact Indigenous interests, including rights. A total of 28 Indigenous intervenors provided OTE during the MH-052-2018 hearing. The Board received OTE at three locations (Calgary, Victoria and Nanaimo) and also received traditional evidence by two Indigenous communities via teleconference/video.

Appendix 8 lists and provides references to submissions made by Indigenous communities that participated in the review process. Appendix 14 provides a summary of the general and specific concerns, relevant to the List of Issues, raised by Indigenous communities through the proceeding, as well as summaries of the responses to these concerns provided by Trans Mountain, Canada, the Board (including conditions) and applicable requirements provided through regulation and/or legislation.

5.2.4 Submissions on asserted or established rights

In the MH-052-2018 hearing, Indigenous communities asserted a number of rights potentially impacted by Project-related marine shipping. These rights are summarized below, and the potential impacts of Project-related marine shipping to the interests, including rights, of Indigenous communities are considered in Section 5.2.5. The Board has, for the purposes of this Reconsideration, accepted asserted rights without assessing whether each of these rights has been proven. The descriptions below are summaries and anyone wishing to fully understand the information and evidence provided by Indigenous communities should review the entire record of the hearing.

- Tsleil-Waututh Nation (TWN) provided a table entitled "Summary of Tsleil-Waututh Title, Rights and Interests and of Proposal Effects and Consequences," which included rights such as harvesting and stewardship rights, which includes the right to determine how its lands, waters, and resources are used, and to manage them, based on its values and aspirations. TWN also shared its defining cultural relationship with the SRKW and the importance of maintaining, and enhancing that relationship as part of TWN's cultural obligations and revitalization.
- Lyackson First Nation (Lyackson) described how its members rely on the waters and resources within the marine area to continue their traditional way of life and noted their strong cultural connection with the SRKW. It also asserted a strong *prima facie* claim to Indigenous rights and title to *Le'eyqsun* Island, along with other traditional sites at Tl'qutinus on the south bank of the Fraser River south of Vancouver and in and around the waters of the Salish Sea.
- Squamish Nation (Squamish) described how its members rely heavily on the marine and freshwater resources throughout its territory, including within Burrard Inlet, the Fraser River, Howe Sound and the Salish Sea, to practice their rights to harvest resources for food, social and ceremonial purposes. Squamish also asserted title and self-governance within its traditional territory and noted its cultural connection with the SRKW.
- Stz'uminus First Nation (Stz'uminus) noted that the tanker route passes through its marine territory where its members exercise their fishing and harvesting rights. Stz'uminus also described the importance the SRKW play in its cultural and spiritual identity.
- Cowichan Tribes noted that it holds licenses for both commercial and food, social and ceremonial fishing, and explained that its members also practice other forms of marine harvest in accordance with their rights throughout their traditional territories.
- Ditidaht and Pacheedaht described their right to harvest a diverse array of marine resources in their traditional marine areas, in particular within Swiftsure Bank, which is both an area of transit for Project-related vessels and has also been designated as critical habitat for the SRKW.
- Esquimalt Nation, Pauquachin First Nation, and Scia'new First Nation noted that they have constitutionally protected Douglas treaty rights and Indigenous rights, including title, within the marine area.
- Malahat First Nation described its Indigenous and Douglas Treaty rights to fish within the Salish Sea and the lower Fraser River.
- Snuneymuxw First Nation described its Indigenous and Douglas Treaty rights to fish, which it said also includes the right to travel to and from its fishing grounds and the continued existence of an ecological system suitable to sustain those fish. Snuneymuxw also noted that it conducts fisheries for sockeye and halibut under food, social, and ceremonial licences. Snuneymuxw also described how the SRKW that inhabit the Salish Sea have a special place in Snuneymuxw culture.
- Tsartlip First Nation described how its members continue to access cultural and spiritual sites of significance within their traditional territory, and how they actively practice their Indigenous and Douglas Treaty rights to hunt and fish adjacent to or near the Project shipping lanes. Tsartlip also described their cultural use of the SRKW.
- Tsawout First Nation described its established Douglas Treaty right to fish, which includes incidental rights such as being able to travel to and from the preferred fishing areas, as well as an established Treaty right to hunt. Tsawout also claimed Indigenous rights, including title, in the areas of their territory impacted by Project-related marine shipping, and noted that the Tsawout and W̱SÁNEĆ Indigenous title includes the ability to decide how the land will be used and the right to proactively manage the land.
- T'Sou-ke First Nation provided information about its Indigenous and Douglas Treaty rights to fish, its coastal reserve lands, its traditional marine-based activities as well as its role as stewards for its territory. T'Sou-ke also described how the SRKW is integral to T'Sou-ke's spirituality and connection with its marine waters.
- Adams Lake Indian Band noted that the salmon is a keystone species and described their cultural use of the salmon and their right to fish within their traditional territory in the vicinity of the Adams and Fraser Rivers.
- Coldwater Indian Band described their right to fish, particularly the salmon and the Steelhead that migrate from the Salish Sea to the Coldwater River and are integral to their way of life.
- Little Shuswap Lake Indian Band (LSILIB) described its right to fish and harvest within its ancestral lands and waters, noting that the Secwepemc – which includes the LSLIB – are known as the "salmon people" because of their close cultural ties with the salmon. LSLIB also said that its people have a claim of Indigenous title to lands beyond its reserves.

- Neskonlith Indian Band (Neskonlith) described how salmon are a keystone species in its culture and traditional way of life and that, as a core food source, Neskonlith fishing rights are maintained under Secwepemc law, which guarantees the right to resources on Secwepemc territory.
- Simpcw First Nation also described its rights and practices related to salmon.
- Nooaitch Indian Band (Nooaitch) described its right to fish, especially the Chinook and Thompson River Steelhead, which it said that it relies on for sustenance, as well as for ceremonial and socio-economic reasons.
- Stk'emlupsemc te Secwepemc (SSN) also described these fish as keystone species, noting that its members exercise their rights to fish, hunt, gather, and trap and exercise cultural and spiritual practices on the lands and waters within SSN territory.
- Chawathil First Nation, Cheam First Nation, Kwantlen First Nation, Seabird Island Band, and Stó:lō Tribal Council described their fishing and harvesting rights within the Fraser River and explained how the salmon fishery is vital to the cultural identity of the Stó:lō people, who are also known as "People of the River."
- The Stó:lō Collective described how its members have inhabited, controlled and relied on S'ólh Téméxw, their traditional territory in the lower Fraser River watershed and that they exercise rights throughout the territory, including hunting, gathering, trapping and their established (non-treaty) right to fish.
- Shxw'ōwhámel First Nation asserted title to the land and waters of *S'ólh Téméxw* and also described its fishing, hunting and gathering rights within its traditional territory and waterways.
- Heiltsuk Nation (Heiltsuk) asserted Indigenous rights and title to their lands and waters, including the right to steward marine resources. Heiltsuk also noted that it has a proven Indigenous right to harvest herring spawn-on-kelp for commercial, as well as food, social and ceremonial purposes.
- Musqueam Indian Band (Musqueam) noted that it has an established right to fish for food, social and ceremonial purposes. Musqueam also described its reliance on other marine, aquatic, foreshore and estuarine resources and the integral role they play in Musqueam's culture.
- Shishalh Nation described their right to fish and harvest within their marine territories and noted that this requires access to a healthy marine environment and asserted their collective right to live as a distinct people. Shishalh also described their close cultural ties with the SRKW which it said is found in the legends, myths, teachings, dances, songs, carvings and regalia of the shisall.
- Driftpile Cree Nation, Louis Bull Tribe, Tsuut'ina Nation, and Whitefish Lake First Nation #459 described their Indigenous and Treaty rights to hunt, trap, harvest and fish throughout their traditional territories and these activities remain central to the distinctive cultures of each of the First Nations and their members' traditional way of life.
- Papaschase First Nation described how it was seeking recognition of its Indigenous rights as First Nation under Treaty 6 and the settlement of its claims and wrongful surrender of Indian Reserve #136, which is along the pipeline route.
- Blood Tribe explained that its members exercise their Indigenous and Treaty rights to hunt, fish, trap and gather across the Blackfoot Confederacy Traditional Territory (and beyond) and have a duty as stewards to protect the environment and cultural heritage of these lands.
- Ermineskin Cree Nation and Whitefish (Goodfish) Lake First Nation #128 explained that their members have historically used and occupied, and continue to use and occupy their traditional territory to exercise their Treaty rights, including trapping, hunting, fishing and gathering, as well as practices that are incidental to these rights.
- The three distinct Nations of Stoney Nakoda Nations, Chiniki, Wesley and Bearspaw First Nation, said they hold Indigenous rights and title recognized by Treaty No. 7.
- Métis Nation British Columbia (MNBC) noted that its citizens depend on the marine environment and its resources for food, social, and ceremonial purposes.
- The BC Métis Federation noted Métis people have been closely connected to the diverse social, cultural and economic fabric of the area known today as British Columbia since the early 19th century and have a diverse range of traditional and non-traditional lifeways within this territory.
- Both Indigenous intervenors from the United States noted that their use of the marine areas is not limited by the international boundary between Canada and the United States. The U.S. Tribes (Swinomish, Tulalip, Suquamish and Lummi Indian Nations) noted that they are sovereign nations recognized by the United States government. As

sovereign nations, and as Indigenous peoples who have lived on the Salish Sea since time immemorial, the U.S. Tribes said they have rights reserved by Treaties to fish in their "usual and accustomed grounds," and have inherent rights to culture. The Makah Tribal Council also noted that it is a sovereign tribal government with Treaty rights assured in the 1855 Treaty of Neah Bay, which includes the role of resource trustee with legal ownership of natural resources within the Treaty area.

Two of the intervenors have modern treaties, which recognize their rights:

- The First Nations of the Maa-nulth Treaty Society described how Project-related tankers will pass through its Southern Domestic Fishing Area, an area in which it has constitutionally protected treaty harvesting rights, as part of the Maa-nulth First Nations Final Agreement.
- Tsawwassen First Nation (Tsawwassen) described its relationship with the Salish Sea and the manner in which its members practice their Indigenous and Treaty fishing rights, as set out in the Tsawwassen First Nation Final Agreement, including Tsawwassen's ability to harvest traditional foods and carry out traditional cultural practices on the lands and waters within its traditional territory. Tsawwassen also noted its strong cultural ties to the SRKW.

In addition to the above, Alexander First Nation, Kwikwetlem First Nation, Saddle Lake Cree Nation, Samson Cree Nation, and Shackan Indian Band, indicated that there may be impacts on their rights, but these intervenors did not provide a description of asserted rights. The potential impacts raised are, however, included in the next section.

5.2.5 Potential impacts on Indigenous communities

The Order in Council P.C. 2018-1177 directed the Board to consider the environmental effects of Project-related marine shipping, noting the requirements of the CEAA 2012 and the SARA. As described in the List of Issues (issue no. 6), the Board also considered the potential impacts of Project-related marine shipping on Indigenous interests, including rights. The consideration of issue no.6 is not limited to the environmental effects of Project-related marine shipping, but also includes consideration of the potential impact on the interest or right itself. Potential impacts were raised by Trans Mountain, the Federal Authorities, and Indigenous intervenors, as described below.

5.2.5.1 Trans Mountain's assessment of potential impacts on Indigenous communities

The Board considered evidence related to Trans Mountains' assessment of impacts on Indigenous communities in its OH-001-2014 hearing, as described in Section 5.1.5.1.

In the MH-052-2018 hearing, Trans Mountain pointed to its previous environmental and socio-economic assessment and risk assessment of Project-related marine transportation in its original Project application and subsequent submissions during the OH-001-2014 hearing. It noted that the effects of Project-related shipping on the environment and Indigenous interests were fully considered by the Board in the OH-001-2014 hearing.

In its updated filing for the MH-052-2018 hearing, Trans Mountain indicated that it is aware that Indigenous communities continue to have concerns related to the impacts of Project-related marine shipping on their traditional Indigenous marine use, the traditional use associated with the Southern resident killer whale (SRKW), as well as concerns related to a marine spill and the involvement of Indigenous peoples in emergency planning and response. More information regarding Trans Mountain's assessment of these impacts is found in Chapter 14.

Trans Mountain noted that it continues to engage potentially affected Indigenous communities and welcomes their input into project design and the development and implementation of key marine conditions. Trans Mountain said that ongoing engagement will take place through workshops, one-on-one meetings, and Indigenous Engagement Roundtables planned for 2019.

5.2.5.2 Government of Canada's assessment of potential impacts on Indigenous communities and proposed mitigations

As previously noted, the 2016 CAR filed by the Federal Authorities included appendices specific to consultation with the 40 Indigenous communities on the Crown list who had raised issues with marine transportation during the Original Phase III consultations. NRCan noted that the key concerns raised by Indigenous communities related to marine shipping outlined in the 2016 CAR included:

- Impacts on marine fishing and harvesting
- Impacts on other traditional and cultural practices

- Impacts of a spill

NRCan also noted that, since the completion of the 2016 CAR and federal decision on the Project in November 2016, it received correspondence from Indigenous communities who raised the following concerns related to marine shipping:

- Concerns about increased acoustic disturbance arising from increased vessel traffic, and the need to fill a gap in knowledge;
- Questions about how the federal government will protect Indigenous fishing rights in relation to the impacts of marine shipping;
- The view that the IAMC does not accommodate concerns related to tanker vessel traffic;
- A desire to conduct community-based monitoring on the effects of vessel traffic in the Salish Sea, including on the impact of the vessel traffic on Indigenous communities' ability to hunt, gather, and "fish as formerly," safeguard the Salish Sea's sacred locations and burial places, and protect salmon and orca;
- A desire to move shipping lanes to avoid a key harvesting area at Swiftsure Bank;
- A desire to establish emergency response centres in or near Indigenous communities;
- A desire to discuss or participate in the Oceans Protection Plan; and
- A desire to have community members participate in pollution response, including through the Canadian Coast Guard, and Coast Guard Auxiliary.

The Federal Authorities outlined various programs and initiatives, such as the Oceans Protection Plan (OPP), the Whales Initiative, the IAMC, the West Coast Energy Infrastructure (WCEI) Initiative and others, all of which include federal responses to mitigate impacts to Indigenous interests and rights. The Federal Authorities noted that Pillar 3 of the OPP is to strengthen partnerships and launch co-management practices with Indigenous communities, by building local emergency response capacity, marine training and governance strategies for northern shipping.

The Federal Authorities said that they understood that Indigenous coastal communities are seeking to play an active and meaningful role in marine safety. Canada noted that the majority of the feedback from Indigenous coastal communities that it is working with to build partnerships have identified the lack of capacity – both funding and resources and time – to effectively participate in the Oceans Protection Plan initiatives. Transport Canada said that it is developing a long-term Grant and Contribution program designed to build Indigenous capacity and facilitate their participation in the marine safety system. The program is expected to be launched by December 2018, with funding to flow in April 2019.

The Federal Authorities also said that they understand that the Southern resident killer whale (SRKW) holds cultural significance for Indigenous peoples in B.C. They said that they are committed to protecting the SRKW and that the OPP includes funding for research and engagement to inform the development of a strategy on how to address underwater noise from vessels affecting SRKW.

In its evidence, the Federal Authorities described a variety of measures and initiatives that include consultation and partnerships with Indigenous communities, including the incorporation of Indigenous traditional knowledge where applicable. These measures and initiatives are aimed at providing opportunities for Indigenous communities to play a meaningful role in marine safety, including decision-making, environmental protection, and strategies to address the recovery of the SRKW. The Federal Authorities said that partnerships and agreements will be jointly developed; reflect the priorities and interests of Indigenous communities and Canada; advance common issues; and achieve tangible outcomes that meaningfully contribute to reconciliation. Some of the initiatives that were highlighted by the Federal Authorities include the following:

- *Cumulative Effects of Marine Shipping*: Transport Canada explained that this initiative is aimed at understanding the cumulative effects from marine shipping at six pilot sites across Canada, including on the south coast of B.C.
- *Coastal Environmental Baseline Program*: Fisheries and Oceans Canada and Transport Canada are working with Indigenous partners, coastal communities and local stakeholders to determine key concerns and help collect coastal environmental baseline information that can be used to inform ecosystem assessments, including the cumulative effects of marine shipping.
- *Enhanced Maritime Awareness Information System*: Led by Transport Canada and the Canadian Coast Guard, this pilot initiative aims to inform better decision-making and increased awareness with regards to culturally important areas and resources.

- *Collaborative Situational Awareness Portal*: Developed by the Canadian Coast Guard (CCG), the Portal will provide web-based platform for Indigenous and Coastal communities to access information on local marine traffic.
- *Indigenous Community Response Training*: Led by CCG, this initiative is aimed at enhancing Canada's community-based marine emergency preparedness and response capacity by providing training to individuals who are frequently the first responders to a marine emergency in B.C., including formal training for search and rescue, environmental response, and incident management.
- *SRKW Symposium*: Led by Fisheries and Oceans Canada, Indigenous communities that participated provided a review of the linkages between threats, and expressed that the complexity and importance of killer whales and their relationship to First Nations is fundamental to cultural traditions and teachings.
- *SRKW Indigenous and Multi-Stakeholder Advisory Group*: This groups brings together Indigenous communities, non-Governmental organizations, the shipping and marine transportation, fishing, and whale watching sectors, the Government of British Columbia, and Metro Vancouver Regional District to facilitate communication and coordination of activities to recover SRKW.

5.2.5.3 Issues and concerns raised by Indigenous peoples

The Board considered evidence provided by Indigenous peoples related to potential impacts of the Project in its OH-001-2014 hearing, as described in Section 5.1.5.2.

Indigenous communities filed information in this MH-052-2018 hearing regarding their concerns and interests in ways specific to each of them and while information regarding key concerns and interests is summarized here, anyone wanting to understand the full context of the concerns and interests expressed by Indigenous peoples should familiarize themselves with all of the relevant evidence on the record. Appendix 14 provides an additional summary of concerns raised by Indigenous communities throughout the MH-052-2018 hearing regarding Project-related marine shipping. Indigenous communities also raised concerns regarding the Project beyond marine-shipping related impacts. As these were beyond the scope of the issues being considered in this MH-052-2018 hearing, they are not captured in this chapter or elsewhere in the Report. Instead they have been tracked in a separate document which will be shared publicly with the Government of Canada, on the Major Projects Management Office website, who will use the information to inform its Phase III Consultation process.

As in the OH-001-2014 Hearing, Indigenous intervenors continued to raise concerns regarding the impacts of Project-related marine shipping on their Indigenous and Treaty rights. Some Indigenous communities filed new information, while others indicated that they were relying on the information filed in as part of the OH-001-2014 hearing. As part of both their oral and written evidence, Indigenous communities provided information on how, where, and when they exercise their asserted and established Indigenous and Treaty rights, and they expressed their concerns as to how these rights may be impacted and how the potential impacts would be mitigated and accommodated by both Trans Mountain and Canada.

In addition to the overarching concerns related to their asserted and established Indigenous and Treaty rights, Indigenous communities raised the following concerns about Project-related marine shipping.

Environmental effects of Project-related marine shipping

A number of Indigenous communities raised concerns about the environmental effects of Project-related marine shipping, including concerns about air quality, marine mammals, marine birds, marine fish and fish habitat. A full discussion of these matters, including the views of the Board, is provided in Sections 14.7 and 14.9.

Socio-economic effects of Project-related marine shipping

A number of Indigenous communities raised concerns about the socio-economic effects of Project-related marine shipping, including concerns about heritage resources, human health, traditional marine resource uses, cultural practices and activities. A full discussion of these matters, including the views of the Board, is provided in Sections 14.8 and 14.10

Spill prevention, emergency preparedness, and response

A number of Indigenous communities raised concerns about spill prevention, emergency preparedness and response. A full discussion of these matters, including the views of the Board, is provided in Section 14.11.

Indigenous governance and stewardship

Indigenous intervenors described their established rights in marine areas along the shipping route, including those established through the Douglas Treaties, the Tsawwassen First Nation Final Agreement, the Maa-nulth Final Agreement, and court cases including *R. v. Sparrow* and R. *v. Van der Peet*.

Indigenous intervenors described their rights to harvest marine resources, including to fish for food, social and ceremonial and commercial purposes. Indigenous intervenors described how they rely on the marine resources of the Salish Sea to maintain their way of life, exercising their Indigenous rights throughout the marine shipping area. Indigenous communities noted the importance of the marine areas for exercising their rights, including Burrard Inlet, Howe Sound, Swiftsure Bank and the Strait of Georgia. Indigenous intervenors described their spiritual connection with SRKW, including concerns that increased Project-related marine traffic could adversely impact the SRKW population, as well as their traditional use associated with the SRKW.

Indigenous intervenors also noted that inherent in these rights is the legal responsibility to care for the marine environment and everything within it. Indigenous intervenors spoke about their roles as stewards and protectors for the marine resources and animals. Tsawout referred to the W̱SÁNEĆ laws and governance, which it said includes the legal responsibility to care for relatives such as the marine waters and lands. Tsawout spoke to the inter-connectedness between W̱SÁNEĆ identity, the lands and waters in its territory, its ancestors, all of which are part of W̱SÁNEĆ laws. Therefore, Tsawout said, impacts to its lands, waters and various plants, animals, birds and fish species are also impacts to the exercise of its laws and governance. TWN explained that it has laws, protocols and sacred responsibilities that require it to rehabilitate and restore the ecosystem of Burrard Inlet.

LSLIB spoke of its Indigenous laws respecting salmon, including that every member of LSLIB is responsible for the preservation and protection of their traditional territories, their waters and the creatures contained within. LSLIB also said that its Indigenous laws should be considered and applied when governmental actors are consulting LSLIB and seeking to accommodate LSLIB's Indigenous rights and interests. Neskonlith noted that the Secwepmc People of the Lakes are working together as stewards and caretakers. It said that any impact on the health of the resources in its territory will significantly impact Neskonlith's way of life, Secwepmc laws, customs and traditions.

SSN noted that one of the flaws of the Reconsideration process is that it does not respect SSN's own Project assessment based on its laws and customs. Shxw'ōwhámel explained the importance of the law which dictated that Shxw'ōwhámel members have to take care of things once they start using those places. It was explained by Mr. Albert McHalsie of Shxw'ōwhámel that when chiefs would meet, they would start off with the statement:

> "S'olh Temexw Ikw'elo. Xolhmet Te Mekw'stam It Kwelat," meaning, "This is our land, we have to take care of everything that belongs to us."

Anchorages

Indigenous communities as part of the MH-052-2018 hearing raised concerns related to the impacts of anchorages in the Southern Gulf Islands. Cowichan Tribes, Lyackson, Snuneymuxw and Stz'uminus brought forward concerns about whether Project-related tankers would result in an increased use of existing anchorages in marine areas of importance to them or if increased Project-related tankers would result in additional anchorage sites being established. Snuneymuxw and Stz'uminus noted that Trans Mountain had not provided any information about the use of anchorages for Project vessels outside of the First Narrows. Indigenous intervenors also raised concerns about a lack of consultation when it came to the establishment of the existing anchorages in their marine territories, as well as consultation for any new anchorages being established. They also said that the increased use of these anchorages will have a serious impact on their ability to exercise their Treaty and Indigenous fishing rights, on their ability to use the marine resources in their territory, and that the presence of these vessels is accompanied by environmental risks and inherent social-cultural impacts, including noise and light pollution.

Trans Mountain reply regarding: Anchorages

Trans Mountain said it expected that tankers will anchor at the three anchorages east of Second Narrows, and pressure on anchorages will be reduced by holding tankers at the dock whenever a berth is available. Trans Mountain said that vessels destined to the Westridge Marine Terminal (WMT) do not currently anchor and will not anchor in the future, in the areas of concern raised by Indigenous intervenors. It also stated that it intends to manage arriving vessels to minimize the use of anchorages.

PPA reply regarding: Anchorages

The Pacific Pilotage Authority confirmed that there were no WMT bound or departing vessels that anchored in the Southern Gulf islands in the last five years.

Federal Authorities reply regarding: Anchorages

Transport Canada noted that through the National Anchorages Initiative it is conducting research studies to inform the creation of a National Anchorages Framework, which are expected to be completed in 2019. Transport Canada said that it is consulting with the marine industry, Indigenous communities, community organizations, and stakeholders as it works to develop an approach to identify anchorage sites, and traditional knowledge from First Nations will be collected during this process. Finally, Transport Canada said that it will also be undertaking a review and evaluation of the need for possible regulatory changes for oversight and management of anchorage sites. It said that these activities will allow for the development of a national anchorage framework and best practice guide for ships at anchor.

Government of Canada programs and initiatives as mitigation measures

Indigenous intervenors raised concerns about some of the Federal Authorities programs and initiatives as described in Section 5.2.5.2 of this chapter, that have been established since the OH-001-2014 hearing to address the potential impacts of Project-related marine shipping. Multiple communities indicated that engagement on the OPP and Whales Initiative have not been meaningful and that the IAMC is not an appropriate mechanism to address their concerns regarding Project-related marine shipping. Indigenous intervenors also raised concerns with the adequacy of the Federal Authorities plans and programs, including Indigenous involvement in emergency response efforts. Finally, they raised concerns regarding the implications of the initiatives to address impacts to SRKW, which may impact certain communities' Indigenous fishing rights.

Squamish and Lyackson noted that the IAMC does not address their concerns with the lack of proper risk assessment for the Project, and the potentially catastrophic consequences of accidents and malfunctions associated with the Project. Lyackson noted that based on its participation with the IAMC to date, it has received no assurance of any emergency response measures that would effectively mitigate catastrophic effects to the marine ecosystem and First Nations' rights and interests in the case of a spill.]

Squamish also said that the government's overarching initiatives such as the OPP and the IAMC do not address its specific concerns with the Project. Squamish further noted that any participation in the government's general initiatives is outside the consultation and accommodation process for the Project, and should not be considered as engagement on the Project.

Musqueam said that the Terms of Reference for the IAMC are clear that Indigenous Nations do not consider the IAMC nor funding provided through it to be an accommodation for the Trans Mountain Project.

The IAMC Caucus noted that while NRCan has characterized the IAMC as a "governance body," the IAMC neither governs any Indigenous nations' section 35 rights, nor has the Committee been provided decision-making authority with which to govern any aspect of the Project or of Project-related marine shipping. The IAMC Caucus said that it is constrained to monitoring and providing advice. The IAMC Caucus further noted that it is not a forum for consultation with Indigenous nations. It said the IAMC does not replace nor does it reduce the Crown's duty to consult Indigenous nations and that is not a window by which the government can come and consult all of the nations affected by the Project.

Lyackson, Heiltsuk Nation, and the IAMC Caucus also raised concerns regarding the Federal Authorities' engagement with regards to the OPP. Indigenous communities stated that to date, engagement sessions as part of the OPP have been limited in scope to information gathering or overview presentations, the format of which has not been conducive to dialogue, engagement or meaningful input in the planning and implementation of OPP programs. These intervenors noted that this type of engagement does not represent the "partnership" that is used to describe the goal of the OPP initiatives when it comes to Indigenous participation.

Adams Lake Indian Band (Adams Lake) said that it has not been engaged with Canada regarding any of the initiatives that are part of the OPP. It noted that while it is not a marine-side First Nation, the lifecycle of the salmon species upon which Adams Lake relies is dependent upon survival of the marine environment. Adams Lake said that it considers it to be a failure of the OPP to not engage with Indigenous communities who are so interconnected with species from the marine environment.

Indigenous communities also raised concerns with the content of the OPP programs regarding marine protection and emergency response. Heiltsuk stated that it did not agree with Canada's assertion that the Oceans Protections Plan initiatives represent "world-class" marine protections. Heiltsuk said that the initiatives under the Oceans Protection Plan, which was announced over two years ago, have failed to live up to their objectives.

Musqueam said that the OPP initiatives identified by the Federal Authorities in their evidence do not currently amount to substantial commitments and actions that could mitigate impacts from the Project to Musqueam. Cowichan Tribes said that while many of the OPP initiatives are a positive step towards enhanced coastal protection and management from major shipping, which is long overdue, it also said that the initiatives will have marginal benefit – if any – to actually prevent or mitigate an oil spill from a Project tanker.

Ditidaht First Nation (Ditidaht) said while the OPP contains a number of broad commitments, it is not clear what the specific action plan is to address its oil-spill response concerns within Ditidaht territory. Ditidaht noted that Canada must consider Indigenous knowledge, and include a specific commitment to create local spill response and emergency preparedness plans and the infrastructure and training required to implement it.

Pacheedaht First Nation (Pacheedaht) noted that recognition needs to be given to the jurisdiction of Pacheedaht and other Indigenous communities along the Project tanker route. It said that initiatives must be jointly developed and implemented with Indigenous Nations to meet the specific needs in the areas in question, based on the recognition of Indigenous rights and jurisdiction. Pacheedaht said that it needs to be fully involved in marine safety, spill preparedness and emergency response initiatives in its marine waters, and noted the OPP may be a vehicle for this approach to be taken, but while various ideas and proposals have been discussed, to date, few changes have been implemented and few timelines for implementing changes have been set.

The IAMC Caucus said that Coastal Indigenous nations are uniquely well positioned to contribute to effective emergency response by virtue of their locations along the coast line, their marine experience, their knowledge of critical marine areas and shorelines that require priority protection, and their special motivation to protect the lands and waters on which their people demand. The IAMC Caucus said that far more must be done to include Indigenous nations in emergency preparedness and response on the south coast.

The First Nations of the Maa-nulth Treaty Society, Ditidaht and Pacheedaht also raised concerns that the initiatives that form part of the OPP and the Whales initiative may have negative impacts on their fishing rights. In particular they noted that recovery measures for the SRKW including new critical habitat, may impact their ability to fish within their traditional territory.

Pacheedaht First Nation said that any potential conditions relating to fisheries closures intended to help address impacts to SRKW, must be considered in the context of Indigenous fishing rights. It noted that the critical habitat area for SRKW being proposed at Swiftsure Bank means that the entire marine area of Pacheedaht's Territory will be critical habitat. Pacheedaht said that it would like to collaboratively manage any conservation or protected areas in its Territory through a shared decision-making structure.

Ditidaht said that Fisheries and Oceans Canada has not meaningfully consulted Ditidaht on these issues and has not considered the potential adverse impacts of its proposed SRKW strategies on Ditidaht's fishing rights.

The First Nations of the Maa-Nulth Treaty Society also said that the proposed critical habitat at Swiftsure Bank would designate a significant portion of their domestic fishing area as critical habitat, which would have the potential to significantly impact their Treaty rights. It also noted that Canada is moving ahead with these measures without adequate consultation and without providing science to back the measures.

Federal Authorities reply regarding: mitigation measures

Transport Canada stated that Canada has a dedicated OPP engagement team that continues to support ongoing dialogue with South Coast First Nations. Transport Canada noted that while these discussions are still at an early stage, it is ready to work with interested Nations to explore shared goals and interests in more depth. In the course of these discussions, the parties would determine the purpose of potential agreements and the appropriate forums for carrying out this work, establish terms of reference and begin the work planning process. Transport Canada pointed to the recently launched Indigenous and Local Communities Engagement and Partnerships Program (ILCEPP) as a measure to support any future agreements on the South Coast. Transport Canada said that the objective of the ILCEPP is to support relationship building and encourage participation in longer-term engagement work on one or more OPP initiatives. This includes implementing federal-Indigenous or multilateral (e.g., federal, provincial, Indigenous) plans and agreements to facilitate collaborative management and/or partnerships in marine safety and environmental protection.

To assist Indigenous communities in participating in the OPP, the Federal Authorities noted that over $13 million is being made available to eligible Indigenous and local communities to be engaged and participate in the OPP. It said that this funding gives recipients the opportunity to take part in developing and improving Canada's marine transportation system and contribute their knowledge towards tailoring marine transportation systems to local conditions and the environment.

The Federal Authorities said that it understood that Indigenous peoples are interested in being informed about the OPP as a whole and understanding how it will strengthen marine safety in Canada and the benefits to their communities, including capacity building and the protection of Indigenous coastal communities' way of life, culture, environment, food sources, and commerce. It also noted that Indigenous coastal communities are asking how the OPP will advance reconciliation and rights recognition, and want to move quickly to advance OPP initiatives and see tangible results.

Transport Canada said that because the OPP is not project-specific, engagement is being led through a broader process than the MH-052-2018 hearing and Phase III consultation of the Project. Transport Canada further noted that if Canada contemplates further actions related to OPP initiatives, and these actions have the potential to impact Indigenous rights,

Canada will consult with potentially affected Indigenous communities. Transport Canada noted that while the OPP was not designed to address Project-specific impacts, OPP initiatives directly respond to the marine safety concerns which have been raised through previous consultation, including those done as part of the Trans Mountain Project.

Transport Canada noted that it continued to engage Indigenous communities to establish partnerships and to advance a co-development approach, to identify shared interests and develop solutions. These activities are ongoing and the results will vary based on the specifics of each OPP initiative and the outcomes of the co-development process.

In response to concerns related to the involvement of Indigenous communities in OPP initiatives related to marine safety, Transport Canada noted that Indigenous communities will continue to be engaged on various OPP initiatives to: inform, enhance transparency, establish partnerships, and work towards inclusion in the marine safety system. Transport Canada said that through co-development, the OPP aims to identify shared issues and develop solutions for relevant initiatives. It further noted that these activities are ongoing and the outcomes will vary based on each initiative and the results of the co-development process.]

The Canadian Coast Guard said that through the Indigenous Community Response Training initiative under the OPP, the Coast Guard has provided training to First Nations in the following courses: Coastal Nation Search and Rescue, Marine Advanced First Aid, Small Vessel Operators' Proficiency, and Incident Command System. It said that this training is then applied in joint operational exercises that incorporate all on-water first response partners, such as the Coast Guard Auxiliary, First Nations communities, Parks Canada, other federal, provincial and municipal partners and any other implicated organizations. The Canadian Coast Guard sad that it coordinates over 20 such exercises each year along the B.C. coast and that the exercises integrate search and rescue, environmental response, and first aid to ensure an integrated and comprehensive response.

The Canadian Coast Guard also said that regional training workshops are available to all coastal Indigenous communities. Invitations to participate in training depend on the nature of the training that is being offered. For example, Incident Command System courses are offered on a regional basis, the Coastal Nations Search and Rescue program is offered on a rotational basis between northern and southern communities, and environmental response training is location specific. It also said that Indigenous communities may also request in-community training for specific training programs, such as environmental response and incident management.

In response to concerns regarding the new critical habitat for SRKW off southwest Vancouver Island, DFO it explained that the identification of these areas is based on scientific advice stemming from research carried out over the last 40 years. It also noted that there is no immediate plan to add new closures or change the fisheries closures that protect the key SRKW foraging areas. DFO also said that it will be reviewing its fishery closure approach with Indigenous communities going forward and through these discussions, DFO can address questions such as understanding the information used to inform management measures, considering how other threats interact with the threat of lack of available prey for SRKW, and understanding how best to include and incorporate Indigenous and local knowledge to adaptively manage the mitigation of these threats.

Trans Mountain reply to concerns regarding: mitigation measures

Trans Mountain said that as a pipeline operator with no direct control over Project-related marine shipping, it believes that multi-party solutions with active collaboration between industry and government are required to ensure continued maintenance and advancement of the marine safety regime, and Trans Mountain supports the approach proposed under the OPP, whether or not the Project proceeds.

Involvement of Indigenous peoples in monitoring Project-related marine shipping

Many Indigenous communities expressed an interest in having a more active role in monitoring and oversight of Project-related marine shipping. Some Indigenous intervenors argued that the draft conditions released by the Board do not provide for sufficient involvement in Project monitoring and oversight. Shackan Indian Band said that the conditions and recommendations proposed by the Board must ensure that an ongoing role in monitoring and stewardship is provided to First Nations. Malahat First Nation said that it is participating in a number of initiatives relating to environmental stewardship activities in its territory and that it is prepared to play a much larger role in Project-related environmental monitoring and oversight. Tsawout said that an ongoing monitoring program of the Salish Sea must be carried out and include Tsawout in the crafting of the monitoring program.

The IAMC Caucus explained that the IAMC was established in 2017 to provide a collaborative forum supported by the technical resources of Indigenous nations, the Government of Canada and regulators. It said that the committee's purpose is to enhance environmental protections and the safety of the existing pipeline and the proposed expansion and to support Indigenous communities' meaningful participation in monitoring the pipelines and marine shipping. The IAMC Caucus said that the IAMC is comprised of: five members representing various federal departments (Natural Resources Canada, Transport Canada, Fisheries and Oceans Canada, Canadian Coast Guard, and Environment and Climate Change Canada);

one member representing the NEB; and the Indigenous Caucus, which is comprised of up to 13 members who strive to represent the interests of the potentially impacted Indigenous communities along the pipeline and marine shipping routes.

The Terms of Reference (TOR) for the IAMC set out the purposes and guiding principles of the IAMC, stating that the Committee is intended to form the basis of a new relationship between Indigenous communities, the Government of Canada and the NEB in respect of the Trans Mountain project activities. The IAMC Caucus noted that central to the Committee's work is the integration of Indigenous knowledge, values and perspectives into the monitoring, regulation and performance of the Trans Mountain project activities. It was noted that Section 9 of the TOR states that, in working towards that objective, the Committee is guided by s.35 of the *Constitution Act, 1982*, the principles of UNDRIP, and the Committee works to support reconciliation. Section 44 of the TOR states that in their participation on the Committee, government and NEB committee members seek to understand Indigenous perspectives, exchange information and build understanding regarding the work of the relevant regulators and collaborate on solutions to matters of concerns.

The IAMC noted that much of the work of the Committee takes place through subcommittees, including the Indigenous Monitoring and Marine Shipping Subcommittees. It noted that the Monitoring Subcommittee's goal is to work towards meaningful Indigenous inclusion in project monitoring. Section 19(c) of the TOR describes the monitoring activities that may be undertaken, including:

- Identifying monitors to accompany and advise NEB Inspection Officers and other staff from the NEB;
- Engaging with NEB Inspection Officers as described on corrective actions to be taken when non-compliance is identified; and or
- Providing or arranging for training and educational materials to Indigenous communities to improve their knowledge and capacity surrounding the Trans Mountain Project activities, including their ability to detect and respond to any spills or other hazards or emergencies.

The IAMC Caucus noted that the Monitoring Subcommittee has to date participated in twelve inspections, four emergency management exercises and one marine exercise.

The IAMC Caucus indicated that it hopes for an expanded role for the IAMC. It said that Indigenous peoples and interests need to be fully integrated into the oversight of the Project, if it proceeds, and into broader planning and stewardship process in respect of the use of marine areas off the south coast. It said that the IAMC is well positioned to play an expanded role in monitoring and oversight with the aim of increasing the safety of the Project-related marine shipping and reducing its impacts on Indigenous use of the lands and waters. During oral traditional evidence, members of the IAMC Caucus explained that the involvement of the IAMC in inspections along the pipeline route and at WMT has shown to add value to the process and it would be something positive to see other regulators starting to adopt this process, to have greater collaboration and participation by Indigenous communities in marine exercises, in inspections, and working with other regulators.

Chawathil First Nation, Cheam First Nation, Kwantlen First Nation, Seabird Island Band, and Stó:lō Collective all indicated that they wished to see the IAMC take on an expanded role in spill response, monitoring, oversight and compliance activities. Ditidaht also said that it supported the expansion of the IAMC's role, but noted that the IAMC activities should be in addition to the specific consultation and accommodation work that must be carried out with each First Nation that has the potential to be adversely affected by the Project.

Lyackson noted while it does have a seat on the IAMC marine shipping sub-committee, to date no concrete plans exist that effectively include First Nations in Indigenous-led monitoring that adequately address their concerns about Project-related marine shipping. The First Nations of the Maa-Nulth Treaty Society and the Métis Nation of BC noted that they had concerns regarding the membership of the IAMC, indicating that they had not been invited to participate as members of the IAMC.

Federal Authorities reply regarding: monitoring

NRCan said that the IAMC participation in the monitoring and oversight of Project-related marine shipping and its potential impacts to the marine environment is pursued primarily by the Marine Shipping subcommittee (the Subcommittee). Between October 2018 and March 2019, it said that the Subcommittee will be engaging with Indigenous communities with interests related to the marine corridor to validate and advance the following objectives:

- Explore and develop an Indigenous marine stewardship program: explore the idea of an Indigenous Pilotage Partnership through information gathering and engagement with communities, marine regulators and other relevant organizations. This priority work would include development of cultural training for pilots and support for building Indigenous capacity, coordinating efforts, and integrating Traditional Knowledge in marine monitoring.

- Provide advice on Indigenous inclusion in spill response: engage with relevant agencies; review the proponent and government's spill notification system, response and crisis communications plans; and provide advice to improve those plans.
- Provide advice on marine-related conditions: examine the marine-shipping related project conditions. The Indigenous members may assess the proponents' fulfillment of those Project conditions and provide advice on improvements to the conditions or proponents' plans.
- Enhance Indigenous capacity: support community member training with the Canadian Coast Guard (in coordination with OPP Marine Training), and review programs targeted at Indigenous marine training and related capacity needs such as equipment, in order to recommend areas for potential IAMC support.

Canada noted that it has committed $64.7 million to support the IAMC for the Project. It noted that so far, the Committee is reviewing or supporting 13 community projects related to the effects of Project-related marine shipping, including projects that analyze vessel traffic associated with the Project, the enhancement of emergency planning, the development of environmental management, and the hiring of emergency response personnel in individual First Nations, among others.

Trans Mountain reply regarding: monitoring

Trans Mountain noted that it is not a member of the IAMC nor does it provide funding to the IAMC. Trans Mountain stated that it understands that the IAMC is an Indigenous-led committee, established with a goal to form the basis of a new relationship between Indigenous communities, the government and the NEB in respect of Trans Mountain's activities. Trans Mountain's understanding is that the IAMC is already advancing Indigenous interests with respect to guardianship and stewardship over land and water operations during the lifecycle of the Project. Trans Mountain noted that the IAMC provides for collaborative, inclusive and meaningful Indigenous involvement in the review and monitoring of environmental, safety and socio-economic issues, and Trans Mountain is supportive of the IAMC's role as it pertains to the Project.

Crown's duty to consult and accommodate

As described in more detail in Section 5.2.2.4 of this chapter, Indigenous communities raised concerns regarding the Government of Canada's consultation to date. Intervenors argued that the 2016 CAR was inaccurate, that the Crown did not consult on the scope and process for the Board's MH-052-2018 hearing, and that no meaningful dialogue has occurred, neither through Phase III consultation nor otherwise.

Indigenous intervenors and commentors argued that the Crown continues to fall short on its consultation obligations. They pointed to a lack of meaningful two-way dialogue with the Government of Canada with respect to both the Project and the Reconsideration process. They argued that Canada should engage in consent based and collaborative Nation-to-Nation decision-making as required by the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

With respect to the MH-052-2018 hearing, Indigenous communities noted that the Board is required to act consistently with the *Constitution Act, 1982*, but argued that the Board's process is not properly set up to meet the requirements of the honour of the Crown. They said that the Board cannot find that the Project is in the public interest if their rights are infringed and if the Crown has not meaningfully consulted. Indigenous communities argued that the Government of Canada's commitment to the re-engagement of Phase III consultations cannot have any bearing on the Board's determination of whether the duty to consult and accommodate has been discharged as it is impossible to know whether the consultation will be meaningful and effective. They note the "inadequacies of [Canada's] consultation process" found by the FCA in *Tsleil-Waututh Nation*[44].

Indigenous intervenors said that Indigenous and Treaty rights will be seriously harmed by marine traffic associated with the Project and the Crown has corresponding obligations to justify this infringement. Indigenous intervenors noted that marine resources, including salmon and Southern resident killer whales are integral to their way of life and that the Crown has an obligation to consult and accommodate to ensure their rights are not unjustifiably infringed.

Stó:lō Collective and Shxw'ōwhámel First Nation also argued that the Crown is in a conflict of interest as the owner of the Project. They argue that the Crown will be held to the highest standard in meeting its legal obligations to Indigenous peoples, with whom a fiduciary relationship exists.

Trans Mountain reply regarding: consultation and accommodation

Trans Mountain submitted that, as a starting point, the Board's OH-001-2014 Report extensively considered the potential impacts from Project-related shipping on Indigenous interests. The FCA in *Tsleil-Waututh Nation* considered the adequacy of

[44] *Tsleil-Waututh Nation* at para. 760.

the OH-001-2014 hearing process and stated that it was satisfied that the Board's process was adequate for fulfilling its consultation obligations.

Trans Mountain said that in the MH-052-2018 hearing, the Board has invited new or updated evidence on, among other things, the potential impacts of Project-related marine shipping on Indigenous interests and mitigation measures to avoid, reduce, or offset potential adverse effects. Trans Mountain argued that the information filed in this hearing was generally consistent with the information filed in the OH-001-2014 hearing and no new or updated information has been filed that should cause any of the Board's conclusions in the OH-001-2014 Report to change.

Trans Mountain submitted that it has continued to engage with all potentially affected Indigenous communities in relation to Project-related marine shipping since the conclusion of the OH-001-2014 hearing. Further, it noted that the MH-052-2018 hearing provided opportunities for potentially affected Indigenous communities to learn more about Project-related marine shipping, ask information requests of Trans Mountain and federal government agencies, file written evidence and present oral traditional evidence. Taken together, Trans Mountain argued that Indigenous communities have been provided with extensive opportunities to engage on all aspects of Project-related marine shipping.

Trans Mountain further argued that notwithstanding this, the Board's task is not to assess the adequacy of Crown consultation in its Reconsideration Report. Trans Mountain noted that the Government of Canada has indicated that it intends to carry out additional consultation beyond and outside the NEB process. Trans Mountain submitted that the adequacy of Crown consultation can only be assessed once all consultation has been completed and at such time when the Crown (in this case, Cabinet) renders its final decision on the Project. As such, while the Board can assess the adequacy of Trans Mountains' consultation for the purposes of this Reconsideration, Trans Mountain argued that the Board need not and cannot at this time assess the adequacy of Crown consultation overall. Trans Mountain argued that such an assessment would be premature and beyond the purview of the Board.]

Federal Authorities reply regarding: consultation and accommodation

In response to concerns raised about the Crown relying on the Board's Reconsideration Process to meet its duty to consult, NRCan noted that the Crown can rely on existing regulatory processes, to the extent possible, to fulfill the duty to consult. As such, it said that the Crown may rely on the NEB MH-052-2018 hearing, to the extent possible, to identify, consider and address how the Crown's conduct in relation to Project-related marine shipping might adversely impact potential or established Indigenous and Treaty rights. NRCan said that this approach avoids duplication and ensures that the NEB, which has broad powers to set conditions for the Project, has full access to relevant information on potential adverse Project-related marine shipping impacts on Indigenous and Treaty rights. NRCan noted that the Crown will also consult on Project-related marine shipping impacts in its re-initiated Phase III of the consultation process.

Following the FCA decision in *Tsleil-Waututh Nation*, the Federal Authorities noted that NRCan wrote to Indigenous communities, governments and nations potentially impacted by Project-related marine shipping, encouraging them to participate in the NEB process. NRCan said that officials advised Indigenous communities that the Crown intended to rely on the NEB Reconsideration process, to the extent possible, to fulfill the legal duty to consult related to Project-related marine shipping.

NRCan also submitted that the Minister of Natural Resources wrote to potentially impacted Indigenous communities, governments and nations following the announcement that it would re-initiate Phase III consultations on the Project, outlining the Crown's intentions to engage in a specific and focused dialogue on the Project. NRCan said that the Crown's Phase III consultation and accommodation process will work with Indigenous communities, governments and nations in a manner that aligns with the Crown's commitment to strengthen and renew its relationships with Indigenous peoples while respecting and upholding the rights of Indigenous peoples in Canada.

The Federal Authorities noted argued that in re-initiating Phase III consultation, the Crown said it has been clear that this consultation and accommodation process is not about starting over. The Crown will build on existing relationships, the information submitted by Indigenous communities, governments and nations, and the existing consultation record, while making improvements to ensure the consultation is carried out in a meaningful way.

NRCan stated that the Crown consults in a way that is fully consistent with meeting Canada's obligations under s.35 of the *Constitution Act, 1982*, and the Crown's commitments to advance reconciliation with Indigenous peoples, including the pledge to implement UNDRIP. NRCan further stated that the Crown recognizes that meaningful engagement and consultation with Indigenous peoples aims to secure their free, prior and informed consent and this is especially true when Canada proposes to take actions, which impact them and their rights, including their lands, territories and resources. The Crown also recognizes the rights of Indigenous peoples to participate in decision-making in matters that affect them and their rights. NRCan said that this is what the overall consultation process for this Project is meant to achieve, including the renewed Phase III consultations.

Finally, the Federal Authorities said that a recommendation on whether to approve the Project will only be considered by the GIC once it is satisfied that: (1) the Crown has adequately fulfilled its duty to consult and that consultations with potentially impacted groups have been offered and/or carried out in a meaningful and responsive manner; and (2) accommodations have been considered, where appropriate, and responses have been provided to Indigenous communities, governments and nations.

Issues beyond the scope of the MH-052-2018 hearing

Indigenous intervenors also raised a variety concerns beyond the impacts of Project-related marine shipping. Indigenous communities along the pipeline route participated in the MH-052-2018 hearing and provided information related to the impacts of a marine spill on upstream activities, including on the Fraser River, an important location for the exercise of Indigenous rights. Indigenous intervenors also raised concerns regarding the Federal Authorities' consultation with Indigenous communities along the pipeline route regarding the management of fish and fish habitat in marine areas and the impacts of these upstream from marine areas. Indigenous intervenors in Alberta noted that pipeline construction and operation will impact their rights established through Treaty No.6, Treaty No. 7 and Treaty No.8. Indigenous intervenors along the Project route indicated that they would like to be involved in pipeline construction and operation monitoring and spill response along the pipeline route and communities also spoke about the cumulative effects of industrial development on the lands within their traditional territory.

Federal Authorities reply regarding: issues of concern beyond scope

NRCan stated that the government will re-engage consultations with all 117 Indigenous communities potentially impacted by the Project. On 5 October 2018, the Minister of Natural Resources communicated the Government's intentions to engage in a specific and focused dialogue with Indigenous communities on the Trans Mountain Expansion Project. It stated that the next round of consultations will lead to an updated CAR that will outline the potential impacts to rights and interests of Indigenous communities in relation to the Project, and how these impacts have been mitigated and, where appropriate, accommodated.

Trans Mountain reply regarding: issues of concern beyond scope

Trans Mountain noted that many intervenors raised issues and concerns that were fully canvassed and considered by the Board in the OH-001-2014 hearing. Trans Mountain submitted that these issues were adjudicated in the OH-001-2014 Hearing and as such it did not provide a reply to these concerns.

5.2.6 Views of the Reconsideration Panel

5.2.6.1 Trans Mountain's engagement with Indigenous peoples

In assessing the engagement undertaken by Trans Mountain with Indigenous peoples, the Board evaluated the implementation of Trans Mountain's ongoing engagement activities with regards to Project-related marine shipping. The Board considered the company's activities to engage Indigenous communities and to learn about their concerns and interests, as well as the concerns and views expressed by Indigenous communities within the MH-052-2018 hearing.

The Board notes Trans Mountain's ongoing commitment to: work with Indigenous communities along the marine shipping route to address marine-shipping related concerns; incorporate feedback into Project plans; involve Indigenous communities in the development and implementation of key marine conditions; and facilitate consultation with Indigenous communities and agencies responsible for marine-related safety, such as WCMRC. The Board notes Trans Mountain's plans for future engagement on marine-related Project conditions that will occur through workshops, ongoing one-on-one meetings and Indigenous Engagement Roundtables planned for 2019. The Board acknowledges that certain intervenors, such as the IAMC Caucus and Musqueam raised concerns regarding Trans Mountain's consultation on conditions attached to the CPCN but notes that it is not within the scope of the MH-052-2018 hearing to consider condition compliance. The Board is a lifecycle regulator and notes that there are other processes where these concerns are better addressed.

The Board notes that Trans Mountain has engaged with Indigenous communities since the close of the OH-001-2014 hearing, and has committed to continue to work with Indigenous communities. The Board expects Trans Mountain to continue to learn about the concerns that Indigenous communities may have about Project-related marine shipping and to discuss ways to address those concerns to the extent possible. The Board also encourages Indigenous communities with an interest in Project-related marine shipping to continue to engage with Trans Mountain.

The Board is satisfied that, with Trans Mountain's commitments and the Board's Conditions 96 and 146, Trans Mountain will continue to engage with Indigenous communities in order to learn more about their interests and concerns and address issues raised by Indigenous communities throughout the Project's operational life. The Board also notes that Indigenous communities filed evidence and raised issues of concerns that were beyond the scope of this MH-052-2018 hearing. The Board expects and encourages Trans Mountain to continue to engage with Indigenous communities on all aspects of the Project that are of concern to the communities themselves.

5.2.6.2 Potential impacts on Indigenous communities

In assessing potential impacts on Indigenous interests, including rights, the Board considered all of the evidence provided. The Board assessed how Trans Mountain and the Federal Authorities identified and evaluated the potential impacts of Project-related marine shipping in the OH-001-2014 hearing, the new concerns raised by Indigenous communities, and the accommodation measures proposed by Trans Mountain and the Federal Authorities to minimize or eliminate the Project's potential impacts on the interests of Indigenous communities.

With respect to the environmental and socio-economic effects of Project-related marine shipping, as well as spill prevention, emergency preparedness and response, the Board's views are detailed in Chapter 14. As described there, the Board finds a significant effect on the traditional use of SRKW by Indigenous peoples, and details the mitigation measures put in place to reduce this effect.

Some parties argued that the Board was required to determine whether they had proven title and rights. However, the Supreme Court of Canada, in *Clyde River*[45], stated:

> This does not mean, however, that the NEB is always required to review the adequacy of Crown consultation by applying a formulaic "*Haida* analysis," as the appellants suggest. Nor will explicit reasons be required in every case. The degree of consideration that is appropriate will depend on the circumstances of each case. But where deep consultation is required and the affected Indigenous peoples have made their concerns known, the honour of the Crown will usually oblige the NEB, where its approval process triggers the duty to consult, to explain how it considered and addressed these concerns.

The Board has looked at the potential impacts of the Project on the rights of Indigenous communities, but has not assessed whether those rights are proven.

Some parties also argued that the Board must then apply the test for justification of infringement on proven Indigenous rights. Although the Board is not deciding whether the asserted rights are proven, it notes that, in the *Tsilhqot'in* case[46], the Supreme Court of Canada reaffirmed that, when rights recognized under subsection 35(1) of the *Constitution Act, 1982* stand to be infringed, the Crown has several obligations.

> As discussed earlier, to justify an infringement, the Crown must demonstrate that: (1) it complied with its procedural duty to consult with the right holders and accommodate the right to an appropriate extent at the stage when infringement was contemplated; (2) the infringement is backed by a compelling and substantial legislative objective in the public interest; and (3) the benefit to the public is proportionate to any adverse effect on the Aboriginal interest. This framework permits a principled reconciliation of Aboriginal rights with the interests of all Canadians. (para.125)

The Crown's procedural duty to consult on the adverse effects and the related mitigations is discussed in more detail below. The Board finds that the Project is in the public interest, and this finding is described in Chapter 2 of this Report. The Board also finds that the benefits are proportionate to the adverse effects. This is because the route of the Project-related marine vessels currently has high levels of vessel traffic and the Project would lead to only a small fraction of the cumulative effects that are already impacting the SRKW. However, the mitigation measures that would be implemented in accordance with the recommendations and conditions in this MH-052-2018 Report may in fact serve to reduce the overall effects on the SRKW over time.

With regards to Indigenous governance and stewardship, the Board recognizes that Project-related marine shipping has the potential to affect the rights of Indigenous communities, including those rights established through the Douglas Treaties, the Tsawwassen First Nation Final Agreement, and the Maa-nulth Final Agreement. The Board acknowledges the responsibilities expressed by many Indigenous communities to look after the land and water located within their traditional territories: to be stewards, protectors, and follow their laws and sacred responsibilities. As a

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[45] Clyde River (Hamlet) v. Petroleum Geo-Services, 2017 SCC 40, para. 42.

[46] Tsilhqot'in Nation v. British Columbia, 2014 SCC 44; para 125

result, the Board has included Recommendation 1 which would require the GIC to develop and implement a regional cumulative effects management plan implemented in consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders.

With regards to anchorages, the Board is satisfied with the evidence of the PPA that no transiting tankers to WMT have used anchorages in the Southern Gulf Islands in recent years, as well as Trans Mountain's evidence that Project-related vessels do not currently anchor and will not anchor, in the areas of concern raised by Indigenous intervenors. The Board also notes that Transport Canada has initiatives underway to mitigate adverse effects due to the use of these anchorages and that these initiatives will include consultation with Indigenous peoples.

With regards to the Federal Authorities' proposed mitigation measures, the Board understands that Indigenous communities have concerns regarding the Government of Canada's programs and initiatives that have been established since the OH-001-2014 hearing to address Project-related marine shipping. The Board notes that Indigenous communities were critical of how Canada was engaging on the OPP and the Whales Initiative, that the OPP was too broad of a plan and that none of these programs were far along enough to be considered as mitigation measures for Project-related marine shipping.

The Board understands that while the Federal Authorities have indicated that the OPP is not Project-specific, components of the OPP directly respond to marine safety concerns raised through previous public consultation, including those on the Trans Mountain Expansion Project, and that certain OPP initiatives apply to the Project's marine shipping components. The Federal Authorities presented evidence describing how these components of the OPP include consultation and partnerships with Indigenous communities that will provide opportunities for Indigenous communities to play a meaningful role in marine safety, including decision-making, and environmental protection.

The Board acknowledges the concerns raised by Indigenous communities regarding the level and depth of consultation that is taking place regarding the many initiatives that form the OPP. It is not within the scope of this Reconsideration to assess the adequacy of Canada's consultation related to the OPP or other broad initiatives related to marine shipping. That said, the Board is of the view that the OPP is a positive step to addressing concerns related to marine shipping on the south coast of B.C., and is encouraged by Canada's commitment to strengthen partnerships with Indigenous communities. The Board notes that the Federal Authorities have said that if Canada contemplates further actions related to Oceans Protection Plan initiatives, and these actions have the potential to impact Indigenous rights, Canada will consult with potentially affected Indigenous communities.

The Board notes that the OPP is a large initiative with many programs and initiatives in various states of progression and encourages continued one-on-one discussions between the Federal Authorities and Indigenous communities so that they are able to understand all of the plans and programs, including how these may be appropriate to address community-specific concerns.

With regards to the involvement of Indigenous peoples in monitoring Project-related marine shipping, the Board understands that the Government of Canada established the IAMC as a measure that was to supplement Trans Mountain's commitments to Indigenous communities, the NEB conditions on the Project, and the commitments made by Canada in the Oceans Protection Plan. The Board notes that the Marine Shipping Subcommittee of the IAMC will be engaging with Indigenous communities with interests related to the marine corridor to validate and advance objectives related to marine stewardship, spill response, marine-related Project conditions and enhancing Indigenous capacity and marine training.

While some Indigenous communities expressed concerns with how the IAMC was operating as well as membership of the committee and who it represents, the Board also heard of the value of the IAMC from the IAMC Caucus itself, including descriptions of the activities of the Indigenous monitoring and marine shipping subcommittees, as well as its aspirations for the IAMC going forward. The Board notes that current IAMC activities include accompanying and advising NEB Inspection Officers, participating in emergency management and marine exercises, and providing or arranging for training and educational materials to Indigenous communities. The Board is of the view that this type of work is beneficial to the Project and that the IAMC is currently well-positioned to continue in these activities. The Board also notes that while the marine shipping aspect of IAMC activities may not be as advanced as the work being done along the pipeline route and within the WMT, it believes that the IAMC has a valuable role to play in sharing the capacity and knowledge of Indigenous communities in relation to spill preparedness and response, marine stewardship, planning and monitoring, including working with industry, regulators and other governmental bodies.

The Board recognizes that the IAMC is not a consultative body and does not take the place of one-on-one consultation between Trans Mountain or the Crown and individual First Nations. That said, the Board is of the view that the existence of the IAMC is a valuable measure to address concerns from Indigenous communities regarding marine shipping activities, including facilitating further Indigenous involvement in the marine safety, inspection and enforcement regime. The Board notes that the terms of reference for the IAMC explicitly states that the Committee is intended to form the basis of a new relationship between Indigenous communities, the Government and the NEB in

respect of Trans Mountain project activities. Thus the Board has included Recommendation 11 as part of this Report, which would require the GIC, in conjunction with Transport Canada and the Canadian Coast Guard, to facilitate opportunities, as appropriate, to engage and seek feedback from the Indigenous Advisory Monitoring Committee on the marine safety system, including on the marine inspections and enforcement regime, as well as on engagement opportunities for Project-related marine shipping activities that intersect with Canadian Coast Guard operational programs.

The Board notes that it received comments on this recommendation from a variety of Indigenous intervenors, including the IAMC Caucus itself, suggesting that the Board go further to empower the IAMC, including granting decision-making or broader oversight authority to the Committee. The Board heard expressions of support for the work the IAMC is doing from Indigenous intervenors, as well as their desire to see the role of the IAMC expanded. The Board does not have the statutory authority to delegate these types of powers to the IAMC. The establishment of the IAMC and its Terms of Reference were co-developed by IAMC members, including Indigenous communities, the NEB and the five government departments, and it would not be appropriate for this Panel to modify the IAMC's current operating model, as those discussions should occur amongst IAMC members themselves.

Finally, the Board acknowledges the concerns raised by Indigenous communities on the west coast of Vancouver Island who noted that the critical habitat area for SRKW being proposed at Swiftsure Bank may have an impact on their Indigenous fishing rights. The Board also notes that Federal Authorities have indicated that there is no immediate plan to add new closures or change the fisheries closures that protect the key SRKW foraging areas, and that Indigenous communities have been invited to participate in multi-sector Technical Working Groups (on prey availability and SRKW sanctuaries) convened by DFO to provide recommendations on management measures to support SRKW recovery for 2019 and the longer term. The Board also notes that the Federal Authorities have committed to continued consultation with those Indigenous communities who have raised these concerns. The Board does not have the ability within this proceeding to address the issue of the potential of future fisheries closures, but is of the view that the commitments from the Federal Authorities are appropriate and notes that this is an issue that can be further discussed as part of the Phase III consultation process.

The Board acknowledges that Indigenous communities raised a number of concerns that were beyond the narrow scope of the MH-052-2018 hearing. The Board recognizes that Indigenous communities have a broad range of matters and concerns that they wish to raise, discuss and resolve with both the federal and provincial governments. For example, the Board heard from communities in Alberta who are concerned about increased oil and gas development in their traditional territories, and communities in B.C. concerned about the pipeline's inland watercourse crossings. The Board is sharing the concerns it heard with NRCan in a separate document, that will be available on the Major Projects Management Office website and can be used to assist NRCan in its Phase III consultations with Indigenous peoples.

5.2.6.3 Crown's duty to consult and accommodate

The Board heard submissions during the MH-052-2018 hearing process from numerous Indigenous intervenors regarding the adequacy of consultation, in recognition of the rights recognized and affirmed in section 35 of the *Constitution Act, 1982*, and the need for assessment of adequacy of consultation.

The Board acknowledges the concerns raised by Indigenous intervenors regarding the Crown's overall consultation process, including the 2016 CAR being filed on the Board's record by the Federal Authorities, as well as assertions that the information does not accurately capture the concerns that were raised with the government during the Original Phase III consultations. The Board understands that this information was filed by the Federal Authorities in an effort to help make the Board aware of Indigenous interests and concerns related to the Project (and in particular to Project-related marine shipping) as they were understood by the Crown as of 2016. This MH-052-2018 hearing is not the appropriate venue to make a determination on the accuracy of the information in that document. The MH-052-2018 hearing was an opportunity for Indigenous communities to provide information directly to the Board regarding their concerns about Project-related marine shipping through their participation as intervenors and commenters, and the Board has considered all of this direct evidence.

The Board notes that as part of the re-initiated Phase III consultations on the Project, new information outlining the potential impacts to the rights and interests of Indigenous communities will be consolidated into an updated CAR, and prior to completion, comments on the CAR from Indigenous communities will be reflected in the document to further inform the Crown. Given that this Phase III Consultation Process is taking place outside the Board's MH-052-2018 hearing and will continue beyond the timelines of the MH-052-2018 hearing, the Board is not making a determination on the adequacy of the Phase III Consultation Process.

The Board's mandate, as indicated in Order in Council P.C. 2018-1177, is to reconsider its recommendation taking into account the effects of Project-related marine shipping. It is the GIC's role to make the final decision on the Project,

taking into account the Board's MH-052-2018 Report and the information to be provided by the Federal Authorities regarding the adequacy of the Crown's consultation and accommodation.

5.2.6.4 The Board's MH-052-2018 hearing

The Board's MH-052-2018 hearing gave Indigenous peoples an additional avenue to explain their concerns about Project-related marine shipping and have those concerns considered by the Board. The Board notes that the Crown advised all Indigenous communities whose established or potential Indigenous or Treaty rights could be affected by the Project that the Crown will be relying on the Board's MH-052-2018 hearing process to the extent possible.

Certain Parties argued that the principles of UNDRIP apply, in particular that the Project cannot proceed without the informed consent of Indigenous peoples. NRCan noted the Crown's commitment to advance reconciliation with Indigenous peoples, including the pledge to implement UNDRIP; however, Canadian courts have consistently held that the consultation process does not provide Indigenous groups with a veto over final Crown decisions.[47] Rather, what is required is a commitment to a meaningful process of consultation.

The Supreme Court of Canada (SCC) has held that the Board's process is capable of satisfying the Crown's duty to consult. In *Chippewas of the Thames First Nation,*[48] the SCC said:

> When deep consultation is required, the duty to consult may be satisfied if there is "the opportunity to make submissions for consideration, formal participation in the decision-making process, and provision of written reasons to show that Aboriginal concerns were considered and to reveal the impact they had on the decision" (*Haida*, at para. 44).

In *Tsleil-Waututh Nation*, the Federal Court of Appeal (FCA) considered whether the Board's process was adequate:[49]

> Applying these principles to the submissions before this Court, and bearing in mind that at this point I am only addressing submissions with respect to the adequacy of the design of the consultation process, the Board was required to provide a process that was impartial and fair and in accordance with its statutory framework and the Constitution.
>
> As explained above, section 8 of the *National Energy Board Act* authorizes the Board to make rules about the conduct of hearings before it, and the Board's rules allow the Board to determine whether public hearings held before it are oral or written. Section 52 of the *National Energy Board Act* requires the Board to render its report to the Minister within strict timelines. It follows that the Board could decide not to allow oral cross-examination, could determine how oral traditional evidence would be received and could schedule the hearing to comply with section 52 of the *National Energy Board Act* so long as, at the end of the hearing, it was satisfied that it had exercised its responsibilities in a manner that was fair and impartial and consistent with its governing legislation and section 35 of the *Constitution Act, 1982*.[50]

The FCA went on to conclude that "the Board's process was adequate for fulfilling its consultation obligations."[51]

During the Reconsideration, Indigenous intervenors had opportunities to obtain further information about issues and mitigation measures related to Project-related marine shipping and present their views to the Board through the following steps:

- Written evidence submissions
- Oral Traditional Evidence (OTE)
- Written questions (information requests) of Trans Mountain, the Federal Authorities and other intervenors
- Responses to any written questions
- Comments on draft conditions and recommendations

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[47] See, for example, *Haida* at para. 48, *Chippewas of the Thames First Nation* at para. 59, and *Tsleil-Waututh Nation* at para. 494.

[48] *Chippewas of the Thames First Nation v. Enbridge Pipelines Inc.,* 2017 SCC 41 at para. 47

[49] *Tsleil-Waututh Nation* at paras. 523, 531.

[50] *Tsleil-Waututh Nation* at paras. 523, 524.

[51] *Tsleil-Waututh Nation* at para. 531.

- Written final argument

In addition, participant funding was available for Indigenous intervenors.

The NEB Act provides the Board with broad powers and expansive remedial authority to deal with the impacts of federally-regulated pipeline projects. The Board is the federal statutory body that has the most direct involvement in the assessment of applications to construct and operate interprovincial and international pipelines. The Board also has the experience to understand a project, the likelihood of effects and the measures that can be implemented to minimize effects. In addition, the Board has the authority to elicit commitments from the proponent, impose conditions on an approval and ensure ongoing regulatory oversight of a project and a proponent's compliance. The Board also has been given the statutory mandate to impose and enforce mitigation measures to reduce negative project effects and hold a proponent to the commitments made in the Board's project assessment process to enhance benefits.

The framework within which the Board operates and under which decisions under the NEB Act are made, including the requirement that a project assessment process be conducted in a procedurally fair manner, can provide a practical, effective and efficient way within which Indigenous peoples can request and receive meaningful assurances from the proponent or the Board about project-related effects on Indigenous interests, including rights. Hearing directly and indirectly about Indigenous peoples' concerns about project-related impacts on their interests allows the Board to impose measures to mitigate the impacts and balance, as appropriate, any residual effects with the other societal interests at play when assessing a project.

Some Parties argued that the Crown is in a conflict of interest as the owner of the Project, in particular because of the Crown's fiduciary duties toward Indigenous peoples. In *Haida Nation v. British Columbia (Minister of Forests)*, 2004 SCC 73, the SCC said:

> The honour of the Crown gives rise to different duties in different circumstances. Where the Crown has assumed discretionary control over specific Aboriginal interests, the honour of the Crown gives rise to a fiduciary duty: *Wewaykum Indian Band v. Canada*, 2002 SCC 79, at para. 79. The content of the fiduciary duty may vary to take into account the Crown's other, broader obligations. However, the duty's fulfilment requires that the Crown act with reference to the Aboriginal group's best interest in exercising discretionary control over the specific Aboriginal interest at stake. As explained in *Wewaykum*, at para. 81, the term "fiduciary duty" does not connote a universal trust relationship encompassing all aspects of the relationship between the Crown and Aboriginal peoples:
>
> > . . . "fiduciary duty" as a source of plenary Crown liability covering all aspects of the Crown-Indian band relationship . . . overshoots the mark. The fiduciary duty imposed on the Crown does not exist at large but in relation to specific Indian interests.
>
> Here, Aboriginal rights and title have been asserted but have not been defined or proven. The Aboriginal interest in question is insufficiently specific for the honour of the Crown to mandate that the Crown act in the Aboriginal group's best interest, as a fiduciary, in exercising discretionary control over the subject of the right or title. (para. 18)

In the case cited, *Wewaykum*, the Court said (at para 96): "The Crown can be no ordinary fiduciary; it wears many hats and represents many interests, some of which cannot help but be conflicting." The SCC also noted, in *Chippewas of the Thames First Nation* (para. 59):

> In *Carrier Sekani*, this Court recognized that "[t]he constitutional dimension of the duty to consult gives rise to a special public interest" which surpasses economic concerns (para. 70). A decision to authorize a project cannot be in the public interest if the Crown's duty to consult has not been met (*Clyde River*, at para. 40; *Carrier Sekani*, at para. 70). Nevertheless, this does not mean that the interests of Indigenous groups cannot be balanced with other interests at the accommodation stage. Indeed, it is for this reason that the duty to consult does not provide Indigenous groups with a "veto" over final Crown decisions (*Haida*, at para. 48). Rather, proper accommodation "stress[es] the need to balance competing societal interests with Aboriginal and treaty rights" (*Haida*, at para. 50). [emphasis added]

The Board recognizes that the Crown has fiduciary duties toward Indigenous peoples, but also has broader obligations with respect to the public interest. These competing interests can be balanced, through the Crown's consultation and accommodation efforts, which include the Board's process.

Recognizing the role of the Board's hearing in the consultation process for this Project, as well as the Government of Canada's ongoing efforts relating to Phase III consultation, the Board is satisfied that its process was impartial and fair and is able to contribute, to the extent possible, to the Crown's obligation to consult and accommodate.

5.2.6.5 Board findings and conclusions

The Board is of the view that Trans Mountain's ongoing engagement activities with regards to Project-related marine shipping, including gathering input from Indigenous communities for marine-related conditions, continues to be appropriate and effective, and is also of the view that the Board process was appropriate for these circumstances.

The Board has considered the information submitted regarding the nature of potentially affected Indigenous interests, including information on constitutionally protected Indigenous and Treaty Rights. The Board has also considered the anticipated effects of the Project on those interests and the concerns expressed by Indigenous communities, as discussed in this chapter and this MH-052-2018 Report. In light of the nature of the interests and the anticipated effects, the Board has evaluated the consultation undertaken with respect to this Project, including the mandated engagement performed by Trans Mountain and the consultation undertaken through the Board's MH-052-2018 hearing process. The Board has also considered the mitigation measures proposed by Trans Mountain and the Government of Canada to address the various concerns and potential effects. The Board is of the view that there has been adequate consultation and accommodation for the purpose of the Board's recommendation on this Project. Any potential Project impacts on the interests, including rights, of affected Indigenous communities, after mitigation, are not likely to be significant and can be effectively addressed, with the exception of the impacts on the traditional use of Southern resident killer whales by Indigenous peoples. The Board is also of the view that the increased opportunities for Indigenous communities to provide input about their traditional knowledge, traditional marine resource use, activities, and cultural practices, into the Federal Authorities plans and initiatives such as the OPP could, in time, strengthen these mitigation measures. The Board is of the view that these multi-party initiatives are an important part of addressing the significant impacts of Project-related shipping on the traditional Indigenous use associated with the Southern resident killer whale.

The Crown intends to rely on the Board's process to the extent possible, and use this MH-052-2018 Report to assist with its ongoing Phase III consultation. The GIC must make its own determination and be satisfied that the Crown has adequately fulfilled its duty to consult and accommodate before it makes its decision on the Project.

As a result of the above, considering all of the findings in this Report, the Board is of the view that its recommendations with respect to this Project are consistent with section 35 of the *Constitution Act, 1982* and the honour of the Crown.

Pipeline and facility integrity

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.) and to replace "Aboriginal" with "Indigenous," the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report.

The Board makes and implements regulations and guidelines to promote the safety, security, and protection of people, the environment, and property throughout a pipeline project's lifecycle. Pipelines regulated under the *National Energy Board Act* (NEB Act) must be designed, constructed, and operated in accordance with the *National Energy Board Onshore Pipeline Regulations* (OPR) and the latest versions of relevant design codes, including Canadian Standards Association Z662 – Oil and Gas Pipeline Systems (CSA Z662).

In making its public interest determination, the Board is mindful of the direction provided by Parliament in section 52 of the NEB Act. It says in part that the Board must have regard to all considerations that appear to it to be directly related to the pipeline and to be relevant.

The Board may make its recommendation in the public interest before a company completes the final design for a project in cases where the company's preliminary design approach and methodology are found to be acceptable. The Board typically makes its recommendation subject to the fulfillment by the company of various certificate conditions and commitments prior to construction, operation, or other appropriate project milestone. The Board then verifies compliance with conditions and commitments through assessment of the information filed, inspections, and audits. Upon the completion of construction and when all relevant conditions and commitments have been fulfilled, the company may then apply to the Board for Leave to Open the subject pipeline sections and facilities. In accordance with the NEB Act, a company requires permission from the Board, by applying for Leave to Open, before opening a pipeline or a section of pipeline for the transmission of hydrocarbons or any other commodity. The Board may grant leave under section 47 of the NEB Act if satisfied that the pipeline can be safely opened for transmission.

6.1 New pipeline segments in Line 2

6.1.1 Design approach

Trans Mountain proposed to construct the following pipeline segments that will be part of the 1 180[52] km long Line 2 pipeline:

- approximately 339 km of new 914 mm (NPS 36) pipeline from Edmonton to Hinton, Alberta;
- approximately 121 km of new 1 067 mm (NPS 42) outside diameter pipeline from Hargreaves to Blue River B.C.;
- approximately 158 km of new 914 mm (NPS 36) pipeline from Blue River to Darfield, B.C.; and
- approximately 368 km of new 914 mm (NPS 36) pipeline from Black Pines to the Burnaby Terminal.

Trans Mountain said that the new pipeline will be designed, constructed, operated, maintained, and abandoned in accordance with the OPR and the latest version of CSA Z662. Trans Mountain submitted its application for the Project when the CSA Z662-11 standard was in effect. Trans Mountain subsequently committed to complying with CSA Z662-15 requirements when this standard came in to effect. In addition, Trans Mountain committed to complying with the requirements of the latest versions of various industry codes, standards, specifications, and recommended practices. Kinder Morgan Canada (KMC) standards, specifications, manuals, and recommended practices will be incorporated into the design, construction, operation, and maintenance of the expanded Trans Mountain Pipeline system, where applicable.

According to Trans Mountain, the engineering design information provided in its application was at a conceptual or preliminary engineering level. Detailed design for the Project is ongoing and will continue through the fall of 2017. Trans Mountain said that it is employing an iterative risk-based design approach as the basis of identifying optimal risk-mitigation measures and is incorporating these measures into the final design. See Section 6.1.3 for more information on the risk-based design process.

Trans Mountain said that there would be locations along the pipeline route where conditions or circumstances are not adequately addressed in CSA Z662 or the OPR, such as potential slope instability, scour, and erosion. Trans Mountain said that qualified engineering specialists will evaluate and prepare detailed engineered designs to meet the safety and integrity requirements of CSA Z662 and the OPR for those conditions or circumstances. Trans Mountain committed to using the best available technologies with respect to the engineering design, materials, and construction of the Project.

Views of the Board

The role of the Board in assessing the design of pipelines and facilities under its jurisdiction is primarily to ensure public safety and the integrity of the pipelines and facilities. The Board notes the concern of many participants that the information provided by Trans Mountain was at the preliminary design level, and that detailed engineering and design information was not available for them to examine during the hearing.

As discussed in Chapter 1, Section 1.6, pipeline projects generally follow a three-phase design process consisting of a conceptual phase, a preliminary engineering phase and a detailed engineering phase which would lead to the final design. Applications submitted to the Board for a Certificate of Public Convenience and Necessity (CPCN) typically contain information based on conceptual and preliminary engineering data. The detailed route for a project has typically not been determined at the application stage and, therefore, detailed designs cannot be completed for all aspects of the project.

The Board has examined the evidence and tested the assertions made by Trans Mountain and other hearing participants. Having done so, the Board has determined that the proposed design approach, in the form before the Board in this application, demonstrates that the conceptual and preliminary design of the Project complies with current and applicable regulations and standards. The Board proposes conditions to ensure that critical components of the final design and the Project once it is constructed will also comply with regulatory requirements.

[52] Line 2 will also include approximately 193 km of active pipeline segments transferring to Line 2 service.

6.1.2 Pipeline design

6.1.2.1 Hydraulic analyses

Trans Mountain said that single-phase steady state pipeline hydraulic analyses were undertaken to evaluate the hydraulic characteristics of the Project's pipelines. These analyses considered a wide range of pipeline diameters and design pressures to achieve the lowest combination of capital and operating costs per barrel of crude oil transported by optimizing the size of the pipeline segments, and the number, capacity and location of pump stations. Trans Mountain said that transient analyses will be performed during the detailed engineering phase to further evaluate the specific anticipated operational conditions.

Trans Mountain said that Line 2 has been designed to have a sustainable annual average pipeline capacity of approximately 85 850 m^3/d (540,000 bbl/day), based on an assumed slate of heavy crude oil batches, using a design flow rate of 90 370 m^3/d (568,400 bbl/day). Trans Mountain assumed an availability factor of 0.95 to establish the sustainable annual average capacity. The availability factor reflects the need for planned shutdowns for maintenance as well as unplanned shutdowns, operational flexibility, and hydraulic calculation uncertainties. Trans Mountain said that the capacities of the pipelines were governed by the viscosities of the crude oil. For Line 2, Trans Mountain's hydraulic analyses assumed that the crude shipped would be batches of diluted bitumen.

According to Trans Mountain, the hydraulic analyses indicated that 11 new pump stations will be required on Line 2 to achieve the necessary pumping capacity. Trans Mountain said that the availability factor of 0.95 for Line 2 has been selected for preliminary design purposes but may be revised during the detailed engineering phase, after considering a number of reliability and operating parameters.

During the hearing, Trans Mountain continued to refine its design and proposed several modifications to the initial design that would serve to reduce environmental impacts and reduce the scope of upgrades to the utility power infrastructure in the lower North Thompson River valley. This was achieved by changing the location of some pumping units and increasing the diameter of the pipeline from NPS 36 to NPS 42 for a distance of 121 km between Hargreaves, B.C., and the Blue River Pump Station. The proposed increase in diameter will result in reduced fluid friction losses in the pipeline, eliminating the need for the proposed Rearguard Pump Station and the associated B.C. Hydro upgrades to supply utility power. Trans Mountain said that one of the most significant results of the change was the elimination of two pipeline crossings of the Fraser River near the previously proposed Rearguard Pump Station. Trans Mountain said that the proposed reconfiguration resulted in a slight reduction in overall risk when compared to the same segment using an NPS 36 diameter pipeline.

As part of its hydraulic design, Trans Mountain said that it considered a theoretical future expansion scenario of 124 010 m^3/day (780,000 bbl/day) average annual sustainable capacity on Line 2. However, the expansion scenario will require installation of new pipeline segments, the addition of pumping units to several pump stations, and changes to the pump station design temperatures. Trans Mountain said that the purpose of considering a future expansion is to ensure that the pump station piping sizes and pump configurations selected for the current proposed expansion are appropriate for a higher capacity, and that physical space is available for additional pump units and other elements at the proposed pump stations. Trans Mountain said that there are many obstacles to the feasibility of this future expansion scenario, including the availability of power supply, the space available for tanks and terminal infrastructure at Edmonton, Sumas, and Burnaby, the capacity of the Puget Sound pipeline, and the capacity for increased vessel traffic through the Second Narrows in Burrard Inlet.

6.1.2.2 Design and operating pressure

Trans Mountain said that the new pipeline segments will be hydrostatically tested in accordance with CSA Z662 to provide a point-specific maximum operating pressure (MOP)[53] with the exception of some sections that would have a flat MOP. The point-specific MOP is expected to vary between 6,000 and 10,000 kPa. Trans Mountain said that it has extensive experience operating pipelines with point-specific MOPs and does not anticipate operational challenges as point- specific MOPs have been effectively applied on the existing Trans Mountain Pipeline (TMPL) system for many years. Trans Mountain said it is carrying out comprehensive hydraulic studies to identify safe limits for operating the pipeline and protective device settings to ensure the pipeline does not exceed allowable limits for transient pressures during abnormal operations. In addition, point-specific MOPs will be configured into the supervisory control and data acquisition (SCADA) system, which will provide a real-time pressure and point-specific MOP display to the Control Centre Operator (CCO) with MOP warning alarms. Figure 5 illustrates the anticipated maximum operating head profile[54] along the Line 2 pipeline.

6.1.2.3 Line pipe specifications

Trans Mountain said that line pipe will be made of low carbon, high strength, low alloy, Grade 483 steel with a minimum temperature rating of -5°C for below grade pipe and -45°C for above grade pipe. The maximum design temperature is 50°C. Trans Mountain also said that it will specify Category II pipe for the below ground pipe and Category III for the above ground pipe to maximize fracture initiation resistance and ensure premium product quality.

Trans Mountain said that the line pipe minimum wall thickness would be selected in accordance with CSA Z662. In addition, a risk assessment would be undertaken to identify the specific locations that require heavier wall pipes. In general, new 762 mm (NPS 30), 914 mm (NPS 36) and 1 067 mm (NPS 42) line pipe will have a minimum pipe wall thickness of 9.8 mm, 11.8 mm, and 13.8 mm respectively.

6.1.2.4 Slack line flow

Trans Mountain said that slack line flow[55] can have negative impacts on leak detection systems causing decreases in sensitivity, reliability and accuracy.

With regard to Line 2, Trans Mountain said that there was the potential for slack line flow downstream of the Coquihalla summit at the design flow rate and that back pressure control would be appropriate. As a result, the design would include increased pipe wall thickness for several kilometres upstream (the exact length to be determined), and for approximately two kilometres downstream of the relief station at Hope, as well as back pressure control valve(s) at the relief station. A pressure relief valve would be installed upstream of the back pressure control valve(s).

According to Trans Mountain, slack line flow will not occur at the design flow rates at other locations on Line 2. Trans Mountain said further study is required to assess atypical flow rate scenarios and shut-down and start-up conditions for Line 2. It may be necessary and/or desirable to allow slack line flow to develop in these transitional flow scenarios. Where it is possible and/or desirable to avoid slack line flow during pipeline shut down scenarios, mainline valves will be selectively closed to maintain line pack.

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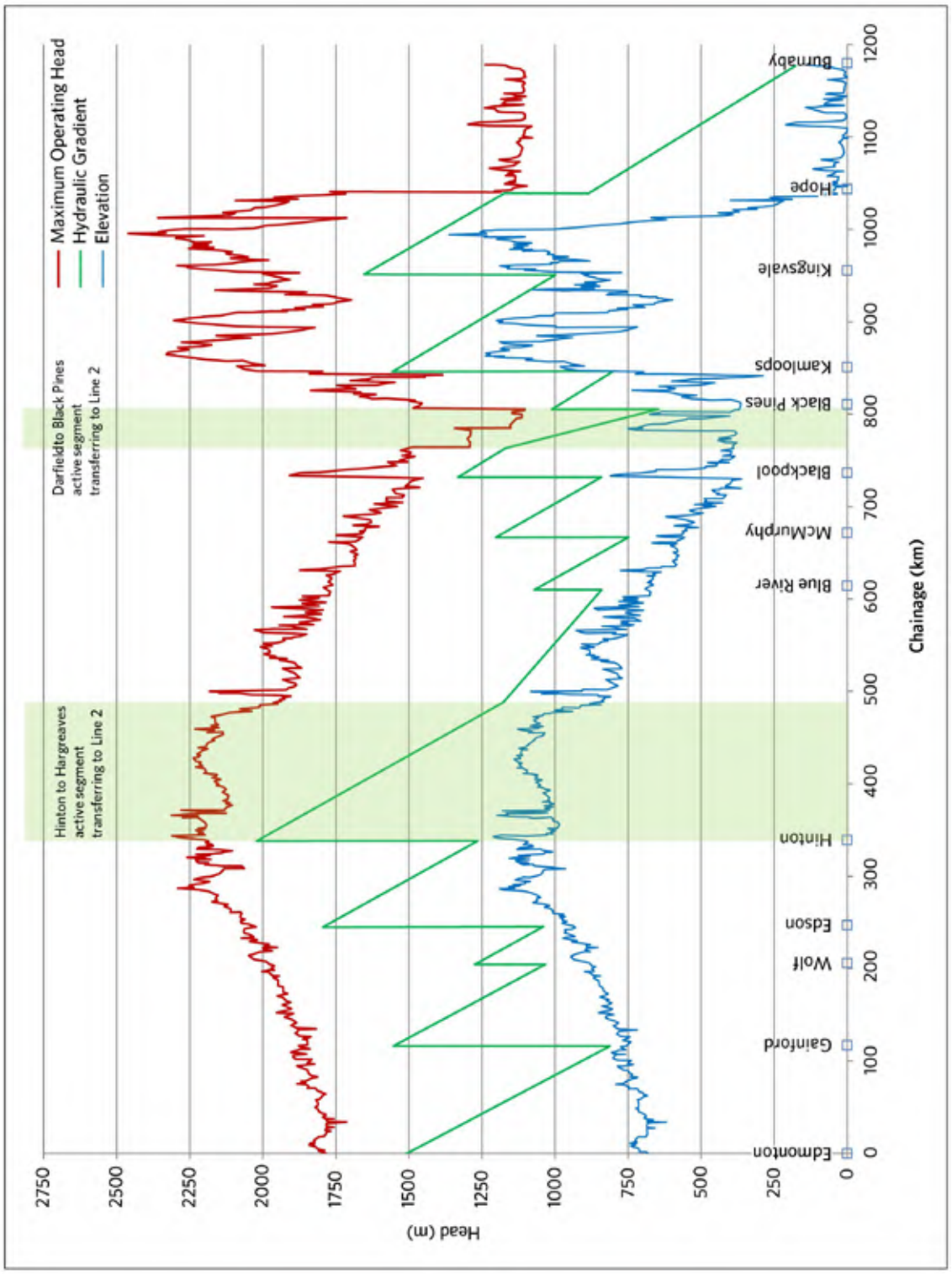
[53] A point-specific MOP will have a different MOP at each location of a pipeline segment. A flat MOP will have the same MOP for the entire segment of the pipeline.

[54] Maximum operating head expressed in units of metres or feet of crude compared to maximum operating pressure expressed in units of kilopascals or pounds per square inch.

[55] Slack line flow refers to a condition where a pipeline transporting a liquid product, such as oil, develops vapour bubbles at locations where the pipeline pressure falls below the vapour pressure of that liquid.

Figure 5: Anticipated maximum operating head profile



Edward Farquhar asked about specific control centre operating procedures for identifying slack line flow conditions. Trans Mountain said that KMC CCOs currently follow established procedures for considering deviations of pressure and flow when assessing slack line flow conditions. However, Trans Mountain was of the view that adding additional procedures to more specifically address slack line flow conditions would be a useful enhancement to the existing KMC procedures. Trans Mountain said this initiative was currently under development and that KMC will have these procedures completed and in use prior to the operation of the expanded pipeline system.

Views of the Board

The Board finds that Trans Mountain has followed accepted engineering practices during the conceptual and preliminary design stage, and that the proposed pipeline design meets or exceeds minimum requirements of the *National Energy Board Onshore Pipeline Regulations* and Canadian Standards Association Z662 (CSA Z662). Trans Mountain has considered a future capacity expansion scenario, which is reasonable for companies to consider during the project design stage. However, Trans Mountain would be required to file a separate application with the Board for the Board's consideration and approval, should it wish to increase the pipeline's design capacity in the future.

The Board notes that Trans Mountain is proposing to use point-specific maximum operating pressures (MOPs) for the new pipeline segments in mountainous areas, which is also permitted by CSA Z662. It is advantageous, or in some cases necessary, for liquid pipelines to operate with point-specific MOPs to account for variations in pressure due to elevation changes in such areas. Trans Mountain is required by CSA Z662 to install the necessary protective devices to ensure the pipeline does not exceed point-specific MOPs during normal or abnormal operating conditions.

The Board is satisfied with the proposed pipeline specifications for the new pipeline segments. In addition to minimum wall thickness requirements provided in CSA Z662, Trans Mountain will undertake a risk assessment to identify the locations where heavier walled pipe is required. Stress analyses will be carried out to calculate the stresses that would be experienced by the pipe to determine the required pipe wall thicknesses at proposed horizontal directional drilled crossings. The Board is of the view that these approaches will help in enhancing the integrity of the pipeline by reducing risk.

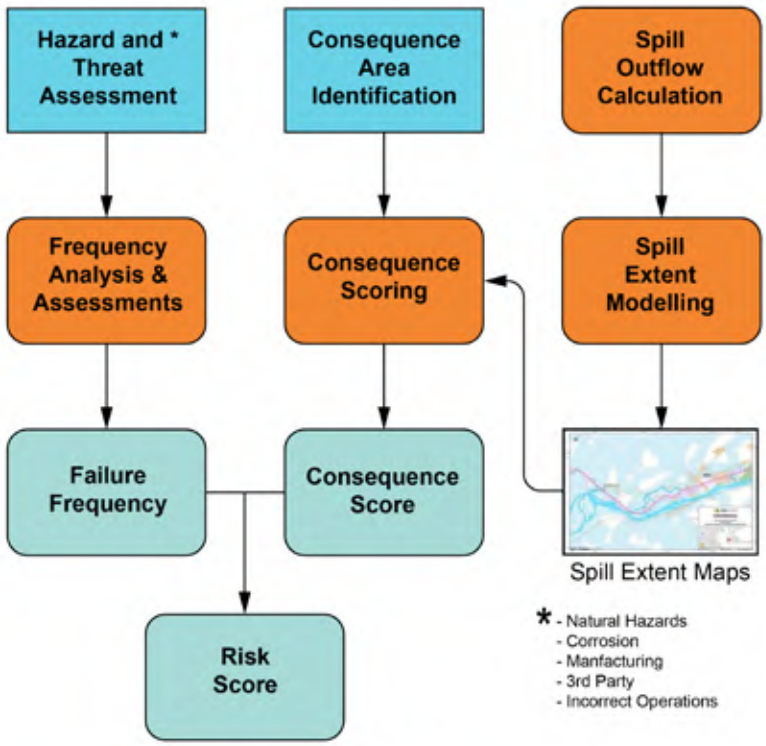
Slack line flow conditions can negatively affect the capabilities of the leak detection system and the Board is of the view that, where possible, slack line flow should be addressed during the detailed design stage of the pipeline. Therefore, the Board would impose Condition 135 requiring Trans Mountain to provide the design and operation measures it will implement for the detection and prevention of slack line flow conditions.

6.1.3 Risk-based design

Trans Mountain said that it was undertaking a risk-based design process that enables the pipeline design team to minimize risk in a cost effective manner and to demonstrate safe operations. The risk-based design would be primarily used to develop a basis for identifying and mitigating principal threats, such as natural hazards (e.g., geotechnical, hydrological and seismic) and external threats (e.g., third-party damage). It would also be used to develop strategies at the design stage to reduce risk resulting from identified threats and associated consequences. Trans Mountain said that risk-based design is a rigorous design approach that goes beyond the minimum requirements of CSA Z662. For the purposes of risk-based design, Trans Mountain considered the probability of full-bore ruptures and their potential consequences as representing the most credible worst-case hazard scenario.

Trans Mountain characterized its risk assessment method for the pipeline as being semi quantitative, resulting in a relative ranking of risk for all segments along the pipeline. Trans Mountain said that its risk-based design process is iterative and that, based on the results, additional measures could be implemented in the design to either reduce the probability (i.e., frequency) of failure or to reduce the consequences for areas of higher risk. The risk-based design is informed by risk scores derived by multiplying quantitative estimates of failure frequency and qualitative consequence score. Figure 6 provides an overview of Trans Mountain's Spill Risk Assessment Process.

Figure 6: Risk assessment process



In the risk-based design process, Trans Mountain segmented the proposed pipelines into individual similar segments called dynamic segments. A dynamic segment is a contiguous length of pipeline which has the same wall thickness, internal pressure, land use and depth of cover. Trans Mountain said this approach enabled the establishment of a failure frequency, consequence score and risk score for each segment. Line 2 has over 91,000 dynamic segments between Edmonton and Burnaby. Trans Mountain said this approach would enable pipeline designers to identify principal risk drivers and prioritize and select the most effective risk mitigation measures to arrive at a risk-optimized design.

6.1.3.1 Establishing the failure frequencies

Trans Mountain said that industry failure statistics are not directly applicable to new pipelines because they do not take into consideration modern pipeline designs, materials and operating practices that benefit new pipelines. Trans Mountain cited 20 technological advances that have addressed many of the issues affecting the older pipelines.

For some failure threats, Trans Mountain used reliability models that employ limit state functions[56] for the specific damage mechanism of interest. Trans Mountain said that these limit state functions exist for some of the most significant threats, such as third-party damage and corrosion (both internal and external). Trans Mountain said that reliability methods are not feasible for all threats, and that industry failure statistics must be relied upon in order to provide estimates of failure frequency for failure threats such as human error during operation, material defects and construction defects. The historical failure frequency estimates were evaluated by Trans Mountain and modified to account for the era of installation, use of current materials, design and operations technologies.

Trans Mountain said that geohazards could be evaluated by an expert assessment at discrete locations of potential susceptibility in order to characterize the magnitude and associated frequency of occurrence. Trans Mountain said that it evaluated the potential frequency of loss of containment (FLoC) for each type of geohazard at every location along the proposed pipeline. Trans Mountain evaluated 14 categories of geohazards under the broader categories of hydrotechnical

[56] A mathematical expression that determines whether the pipeline satisfies a design requirement (e.g., fails or does not fail during the period of time specified).

hazards, rock slope geohazards, soil slope geohazards, seismic geohazards, and snow slope geohazards. It provided examples of potential mitigation measures that could be applied to reduce the FLoC values, including the use of horizontal directional drilling (HDD) at a watercourse crossing to eliminate potential exposure due to scour, or relocating a valve outside of an avalanche path to remove the potential for impact. Trans Mountain said that such mitigation would be implemented as part of detailed design and engineering. Section 6.1.4 provides more information on geohazard assessment. The results of the Quantitative Geohazard Frequency Assessment, along with other hazards, were included in Trans Mountain's overall risk assessment in order to identify sites where additional investigation or mitigation may be required as part of Trans Mountain's risk-based design.

6.1.3.2 Qualitative consequence assessment

Trans Mountain said that the environmental and socio-economic consequences that are associated with a crude oil pipeline spill do not lend themselves to absolute quantification and expression in terms of a universally recognized unit of measure. Trans Mountain outlined a qualitative consequence methodology that it had developed to evaluate the environmental impacts associated with a low vapour pressure liquid spill on its new pipeline sections. This is an indexing method in which factors that influence consequence severity are assigned weighting factors and are then combined into a qualitative score. Trans Mountain said that since there are often no publications or other reference material available to support the relative weightings of these factors, the factors themselves were assigned on the basis of expert judgment, considering known effects from past incidents and known relative environmental sensitivities. Trans Mountain said that the qualitative estimates of consequence were based on the following assumptions:

- a maximum design throughput of 90 370 m^3/day (568,420 bbl/d) between Edmonton and Burnaby, and for Burnaby to Westridge, volumes of 111 290 m^3/day (700,000 bbl/day);
- a full-bore release as a most-credible worst-case scenario;
- the product was released through an opening in the bottom of the pipe equivalent to the internal diameter; and
- there was a time interval of ten minutes between release and pump shut-down.

In order to provide environmental consequence scores for its semi-quantitative risk analysis, Trans Mountain used two separate consequence scoring approaches; one for watercourse intersects (i.e., segments where the spill plume intersects watercourses) and the other for non-watercourse intersects (i.e., all other segments). Scoring tables were provided which gave input values associated with different outflow volumes, various watercourse sensitivities, the presence of drinking water sources and potential land use impacts.

6.1.3.3 Risk scores and acceptance

Trans Mountain provided tabulated risk results for the proposed Line 2 pipeline that contain unmitigated risk results reported for one-kilometre segments of the route. Unmitigated risks are the risk values prior to implementation of all risk mitigation measures. In ranking the unmitigated risk results from highest to lowest, Trans Mountain observed that natural hazards (geohazards) represent the largest contributor to failure frequency. The lowest threat contributors to total failure frequency were internal and external corrosion.

Trans Mountain said that all risk mitigation measures would be incorporated into the final design through the implementation of the risk-based design process. Once incorporated into the final design, these mitigation measures would reduce failure likelihood and/or consequence (and hence risk) by targeting risk mitigation strategies directed at the principal drivers of risk identified in the risk assessment.

With regard to risk acceptance criteria, Trans Mountain said that no environmental risk evaluation criteria have been established for pipelines in any jurisdiction, and those risk criteria that do exist relate to human life. Therefore, the types of risk mitigation measures that are being considered by Trans Mountain include both failure prevention and spill mitigation measures to ensure that risk is managed to levels that are As Low As Reasonably Practicable (ALARP). Trans Mountain said that the ALARP principle dictates that risk mitigation should be considered until a point of diminishing returns has been reached with respect to the expenditure of further resources. Once it has been established that risk reduction in one area is not sensitive to further implementation of risk-mitigation measures, resources are more appropriately directed at reducing risk in other areas. Trans Mountain is of the view that the risk mitigation decisions that are based on ALARP promote safe and reliable operation because the presumption is that an operator is bound by duty to implement the risk reduction measure. To avoid having to implement risk-mitigation measures, the operator, as duty-holder, must be able to show that it would be grossly disproportionate to the benefits of the risk reduction that would be achieved. Thus, according to Trans Mountain, the process is not one of balancing the costs and benefits of measures, but rather of adopting measures except

where they are ruled out because they involve resource allocations that are grossly disproportionate to the benefits achieved.

Trans Mountains said in its reply evidence that the misperception and mischaracterization of the purpose of the pipeline risk assessment was common in the evidence submitted by intervenors. According to Trans Mountain, many intervenors were of the opinion that the risk assessment described in Trans Mountain's pipeline risk assessment represented the risk associated with the final design of Line 2 and the new delivery lines, and that furthermore, it should serve as the basis for some form of evaluation of risk acceptability. Trans Mountain said that many intervenors also asserted that the expected frequency of full-bore ruptures along the entire length of the pipeline should be reported as a "return period." Trans Mountain said that reporting failure frequencies in this manner would not be meaningful since the results of the risk assessment are preliminary, and therefore would not be representative of the final design of Line 2 and the new delivery lines.

Tsleil-Waututh Nation, Tsawout First Nation, and Upper Nicola Indian Band submitted a report by Dr. Thomas Gunton and Dr. Sean Broadbent, dated May 2015, *entitled An Assessment of Oil Spill Risks for the Trans Mountain Expansion Project* (the Gunton Report). The Gunton Report evaluated, in part, the evidence of Trans Mountain respecting the risk of pipeline spills used in the risk-based design approach for the Project.

The Gunton Report estimated pipeline spill risks based on recent historical spill frequency data from the Board, Enbridge liquids pipeline system, and the Pipeline and Hazardous Materials Safety Administration (PHMSA). The Gunton Report said that spill risk estimates based on these data sources, as well as Trans Mountain's own analysis, show that spill likelihood is high, with the number of spills for the new Line 2 ranging from one to three spills every two years. The Gunton Report observed that a comparison of pipeline spill risk for the Project shows Trans Mountain's unmitigated pipeline spill frequency estimate is similar to an estimate based on data from the National Energy Board, but much lower than spill risk frequencies based on data they obtained from Enbridge and the PHMSA incident statistics. The Gunton Report stated that Enbridge and PHMSA data are based on pipelines that use mitigation measures similar to those proposed by Trans Mountain for the Project. The Gunton Report highlighted that in comparison to these actual spill rates, Trans Mountain's much lower forecasted spill frequency rates raise doubts about the reliability of the Project forecasts.

In Trans Mountain's reply evidence, it was noted that the Gunton Report stated that its assessment examined whether risk assessments for tanker, terminal, and pipeline spills adequately assess the likelihood of significant adverse environmental effects, as required in the CEAA 2012. Trans Mountain said that the Gunton Report confused Trans Mountain's pipeline risk assessment, which serves as the basis for the company's risk-based design, with an environmental assessment. Trans Mountain indicated that the pipeline risk assessment was completed for a different purpose and therefore, the analysis and findings in the Gunton Report were misdirected. Trans Mountain reiterated that it was its intention to identify potential risks along Line 2 and the new delivery lines, and to adopt mitigation measures to address those risks at the design phase pre-emptively. Once incorporated into the final design, Trans Mountain asserted that the mitigation measures would reduce failure likelihood and/or consequence.

Trans Mountain took issue with the incident data used in the Gunton Report to demonstrate a lack of conservativeness in Trans Mountain's full-bore rupture frequency estimates. Trans Mountain noted that the Gunton Report incident rates include both leaks and ruptures, and therefore, were not representative of the worst-case, full-bore rupture scenario considered in Trans Mountain's risk assessment. Consequently, Trans Mountain said that the authors overstated the incident rates relative to that hazard scenario.

Views of the Board

The Board is of the view that a risk-based methodology is a rational approach to the design of the proposed new pipeline segments. The Board finds that the nature and purpose of the failure statistics provided by Trans Mountain is to support the risk-based design of Line 2, and is not meant to establish a spill return period for the entire pipeline length. The evidence provided in the Gunton Report in relation to the probabilities of failure does not add value, and is not a basis for designing or assessing the design of a pipeline. Using historical pipeline failure statistics from other jurisdictions or other companies is relevant only if it can be determined that their design, construction, and operation are comparable. The type of product shipped, the specific regulatory requirements and oversight, the internal company inspection procedures and design standards, and the period of construction can all impact the failure frequencies observed. Extensive expertise in pipeline design, construction, operation, and an understanding of codes and regulations is required to assess these factors. Trans Mountain's limited use of historical data for construction and material defects is appropriate for risk-based design; however, there is no evidence that the mitigation proposed by Trans Mountain exceeds the mitigations applied in other similar projects. The Board has proposed conditions to address this issue by identifying, addressing and mitigating potential hazards (Conditions 9, 66, 111, 114, and 143).

There currently appears to be a lack of established quantifiable environmental risk evaluation criteria for pipelines. The Board notes Trans Mountain's commitment to implement both failure prevention and spill mitigation measures to ensure that risk is managed to levels that are As Low As Reasonably Practicable (ALARP). However, Trans Mountain

has not provided the Environmental Risk Score limits within which the ALARP criteria would apply, nor has Trans Mountain provided the methodology employed in establishing these limits. In addition, Trans Mountain has not provided its final Environmental Risk Score targets following the implementation of failure prevention and spill mitigation measures. The Board reminds Trans Mountain that section 9[57] of the OPR requires that pipeline designs provide for adequate and effective protection of property and the environment, security of the pipeline, and the safety of all persons. As a result, risk mitigation decisions based on ALARP criteria must fulfill the intent of the OPR as a priority over commercial considerations.

The Board notes that the detailed engineering and design will include finalization of the risk-based design process. Consequently, final risk mitigation methods, mitigated Environmental Risk Scores, and expected outflow volumes following mitigation will not be available prior to the completion of detailed engineering and design. The Board would impose Condition 15 requiring Trans Mountain to file with the Board results of the updated risk assessment for Line 2 and the new delivery pipelines, including mitigated Environmental Risk Scores, Environmental Risk Score acceptance criteria, and the rationale for criteria selection.

6.1.4 Geotechnical design considerations

6.1.4.1 Terrain mapping and geohazard inventory

Trans Mountain delineated areas referred to as terrain polygons along the route with similar features and characteristics in its Terrain Mapping and Geohazard[58] Inventory report. The terrain polygons were assigned geohazard stability ratings ranging from Class I (stable) to Class V (unstable) based on factors including slope angle, surficial material type, and evidence of ground movement. Natural hazards were identified for each polygon and assigned ratings of low, medium, or high depending on their likelihood of occurrence within the life of the Project.

Trans Mountain said that the geohazard inventory was developed using engineering judgment and experience, an understanding of the geology, landform and hazard types, and potential natural hazard triggers. Input to the geohazard inventory was from various sources including features identified from the terrain mapping, a review of aerial imagery, and observations undertaken during field verification of the terrain mapping.

6.1.4.2 Geohazard assessment

Trans Mountain assessed 14 different types of geohazards in the design of the Project, under the broader categories of hydrotechnical hazards, rock slope geohazards, soil slope geohazards, seismic geohazards, and snow slope geohazards. The results were presented in a report entitled *Quantitative Geohazard Frequency Assessment – Final*. Trans Mountain also assessed karst, acid rock drainage and metal leaching, and tsunamis.

Trans Mountain said that it had initially identified 4,281 potential geohazards along the alignment and that although many geohazards would have an effect on the right-of-way, only a small subset of these would have the potential to result in a loss of containment. Trans Mountain identified 628 potential geohazards with unmitigated frequency of loss of containment (FLoC) values greater than $1x10^{-5}$ events per year and committed to review all of these regardless of the ultimate risk ranking. Trans Mountain said it would prioritize, manage and mitigate these geohazards to reduce the overall risk to levels that are As Low As Reasonably Practicable (ALARP) (refer to Section 6.1.3).

Trans Mountain provided potential mitigation options to reduce the frequency of occurrence, the spatial impact and the vulnerability for each geohazard type where applicable. Trans Mountain also provided a table of the ten highest-ranked individual discrete geohazards to demonstrate how the unmitigated risk score could be reduced by potential mitigation measures, including relocation of pipelines or valve sites, horizontal directional drilling (HDD), deep burial, use of heavy-walled pipe and implementing surface water control.

Trans Mountain said that site-specific field assessments at geohazard sites along the proposed pipeline route would be initiated in 2015 and would continue through to construction. The results from the field assessments would be used to refine the estimated FLoC values for each potential geohazard presented in its Quantitative Geohazard Frequency Assessment.

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[57] Section 9 of the OPR requires companies to develop detailed designs of the pipeline and submit them to the Board when required to do so.

[58] A geohazard, as defined by Trans Mountain, is an event caused by geological features and processes that present severe threats to humans, property, and natural and built environments. Geohazards are a subset of natural hazards. Trans Mountain said that geohazards were reviewed with respect to their ability to impact the pipeline.

The results of the Quantitative Geohazard Frequency Assessment would be incorporated into the overall risk assessment, along with the other identified threats that could result in a loss of containment.

The Upper Nicola Band raised concerns regarding metal leaching and acid rock drainage. In response, Trans Mountain said that it has carried out a desktop[59] and field assessment of the proposed pipeline route to identify and characterize geologic units with an increased potential to leach metals or produce acidic drainage. Trans Mountain said that it would develop a metal leaching and acid rock drainage Mitigation Toolbox which would describe additional sampling and monitoring programs to assess site-specific geochemical characteristics, develop appropriate management strategies to be applied during construction, and confirm the effectiveness of the management strategies in minimizing the long-term potential for acidic and/or metal-rich runoff.

The Stó:lō Collective raised concerns about natural hazards, such as flooding, debris flows, mudslides and rock slides in the Fraser Valley, saying that these are regular occurrences, have been large in scale, and have caused massive damage. The Stó:lō Collective provided photographs of large-scale natural hazards, including the Hope Slide in 1965 and flooding of the Fraser River in 1972, 1977, and 2012. The Stó:lō Collective said that local knowledge holders feel there is a high likelihood that large scale events will occur in the future, creating concern regarding the ability of the pipeline to withstand such impacts. In response, Trans Mountain said the Project would be designed to avoid these hazards and that it would implement mitigation measures where avoidance was not possible.

The City of Surrey submitted a geotechnical review of the Thornton Yards and Fraserview Area in Surrey, which, it noted, Trans Mountain had identified as having high natural hazard potential. The report identified specific locations of concern and recommended that Trans Mountain conduct a further review of the proposed pipeline route due to high liquefaction susceptibility ratings at some locations and the potential for landslides that could impact the pipeline at other locations. The City of Surrey provided two alternate routing options that avoided Surrey Bend Region Park. In response, Trans Mountain committed to pursue and investigate options with the Ministry of Transport regarding sharing its right-of-way, as proposed by the City of Surrey.

Letters of comment were filed that said:

- Trans Mountain should demonstrate that the design will account for landslide risks under future climate conditions, noting that slopes could become increasingly unstable with weather extremes due to climate change; and
- Trans Mountain should consider the risk of spills due to multiple incidents happening at the same time, for example, weather conditions combined with associated floods and erosion.

Views of the Board

The Board is of the view that Trans Mountain's Quantitative Geohazard Frequency Assessment approach and methodology are acceptable for identifying and quantifying geohazards along the pipeline route. Trans Mountain has identified the location of specific geohazards, and geotechnical investigations in support of detailed engineering and design are ongoing.

Regarding Trans Mountain's commitment to reducing overall risk to As Low As Reasonably Practicable (ALARP), the Board seeks to verify that the most accurate values of frequency of loss of containment (FLoC) are input into the pipeline risk assessment, and any required mitigation takes place to reduce FLoC values to acceptable levels. Accordingly, the Board would impose Condition 16 requiring Trans Mountain to file an updated Quantitative Geohazard Frequency Assessment for the new Line 2 and delivery pipeline segments, containing a reassessment of the FLoC values based on site-specific field assessments and any required mitigation. The assessment must include a detailed explanation of how the ALARP level has been met for any location where the FLoC value is greater than 10^{-5} events per year.

Regarding the letters of comments received about the design for geohazards, the Board is of the view that Trans Mountain has demonstrated that the concerns expressed have been or will be adequately addressed in Trans Mountain's Quantitative Geohazard Frequency Assessment, pipeline risk assessment (Condition 15), and Natural Hazards Management Program (Condition 147) (refer to Section 6.10.2). This includes allowance for the effects of possible increased climatic variation (e.g., rainfall distribution and intensity, Mountain Pine Beetle migration), and consideration of multiple geohazards occurring simultaneously.

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[59] A desktop assessment is carried out using available information such as airphotos, LiDAR survey results, and existing geological and geotechnical data, whereas a field assessment would involve the acquisition of new data through field programs such as geotechnical drilling and sampling, geophysical surveys, and site reconnaissance.

The Board notes that Trans Mountain has committed to implementing an Acid Rock Drainage Management Plan as part of the Pipeline Environmental Protection Plan. The Board would impose Condition 72 that would require Trans Mountain to provide finalized management plans as part of its Pipeline Environmental Protection Plan. The Board would require Trans Mountain to provide a summary of its consultation with affected Indigenous groups, which would include Upper Nicola Band, and demonstrate how it has incorporated the results of its consultation into the plan.

6.1.5 Seismic design considerations

Trans Mountain said that the Project would traverse seismically active terrain in which there are three types of earthquakes: subduction-interface, in-slab, and crustal. Great earthquakes, up to magnitude 9[60], occur along the Cascadia subduction zone off the west coast of Vancouver Island every 500 years on average. Major in-slab earthquakes of up to magnitude 7.5 occur deep beneath southwestern B.C. and northwestern Washington. Crustal earthquakes of up to magnitude 7.5 may occur within, and west of the Coast and Cascade Mountains. There is some potential for moderate to strong earthquakes up to magnitude 6 around the Rocky Mountain Trench. Weak to moderate earthquakes of magnitude 5 or less have occurred across the central and southern interior of B.C. and in Alberta.

Trans Mountain said that there are currently no guidelines in Canada that prescribe a performance standard for the seismic design of pipelines and that it would develop performance standards for the new pipeline and related facilities during the detailed design phase. Seismic design of earthen, concrete and steel structures would be in accordance with the latest editions of the National Building Code of Canada (NBCC)[61], the Alberta Building Code, the British Columbia Building Code, and other recognized standards and practices, as applicable. The new pipeline and facilities would be designed for seismic loading corresponding to a 2 per cent probability of exceedance in 50 years, which is equivalent to a 1:2,475 annual probability of exceedance (APE). According to Trans Mountain, this means that the Line 2 pipeline and facilities would be designed to not lose containment for crustal and in-slab seismic events of magnitude 7.1 and Cascadia subduction-interface seismic events of approximate magnitude 9. Trans Mountain said that this is consistent with the design criteria in current provincial and national building code guidelines, and other utility agencies operating in B.C.

Trans Mountain said that detailed site-specific geotechnical investigations would be undertaken to support the seismic design of the proposed pipeline and related facilities where they may be exposed to strong ground motions or permanent ground displacement due to surface fault rupture, liquefaction, or seismically induced landsliding.

In the *Seismic Assessment Desktop Study* report, for the proposed new Line 2 and delivery pipeline segments, Trans Mountain's preliminary assessment focused on surface fault rupture hazard, ground motion predictions, liquefaction susceptibility and opportunity, and seismically induced landslide potential. These topics are discussed individually below.

6.1.5.1 Surface fault rupture

Trans Mountain said that the greatest seismic threat arises from the potential for active faults, with hazards related to strong ground motion and permanent ground displacement due to surface fault rupture. Trans Mountain considered a fault to be *active* if there is clear evidence of post glacial slip occurring within the Holocene epoch (approximately the past 11,600 years), and to be *potentially active* if evidence for post-glacial activity is uncertain or equivocal. Trans Mountain said that no confirmed active faults have been identified along the route. However, it identified four faults with suspected Quaternary (occurring approximately in the past 2.6 million years) or post-glacial activity that intersect or approach the proposed corridor (refer to Figure 7). These are:

- Sumas Fault, around RK[62] 1115;
- Vedder Mountain Fault, between RK 1075 and 1106;
- Fraser River-Straight Creek fault system, around RK 1045; and
- Rocky Mountain Trench, between KP 505 and 525.

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[60] Earthquake magnitude is measured using the moment magnitude (Mw) system, a logarithmic scale that measures the size of earthquakes in terms of the energy released.

[61] Trans Mountain's seismic hazard assessment uses values from the 2010 NBCC model for the model. Trans Mountain said that if the 2015 model comes into force before final design and construction, it may elect to adopt smaller design ground motions in southwestern B.C. where 2015 values are less than the 2010 values. In these instances, deterministic ground motions would govern the Project's seismic design.

[62] "RK" stands for reference kilometre and is used to identify locations along the applied-for route. "KP" stands for kilometre post and is used to identify locations along the existing Trans Mountain Pipeline system.

Figure 7: Location of faults

Abbreviations

Faults abbreviated as follows:
CSZ: Cascadia Subduction Zone
BRF: Beaufort Range
CLF: Cowichan Lake
SGF:Strait of Georgia
SWIF: Southern Whidbey Island
DMFZ: Devils Mountain
SBPF: Strawberry Point
UPF: Utsalady Point
SPF: Sandy Point
BBF: Birch Bay
DHF: Drayton Harbor
SF: Sumas
VMF: Vedder Mountain
BCF: Boulder Creek
FRSC: Fraser River-Straight Creek
RMT: Rocky Mountain Trench
Inset map area shown as red box.

Trans Mountain retained the Department of Earth Sciences at Simon Fraser University (SFU) to determine whether the Project corridor crosses Holocene faults within the Lower Mainland and Fraser Valley. The study concluded that, where LiDAR coverage was available, Holocene faults are unlikely to intersect the Project; however, Holocene faults were not precluded outside the zone of LiDAR[63] coverage. Trans Mountain responded that LiDAR has been acquired for: a 750-m-wide strip along the complete Line 2 corridor; the Burnaby Mountain area; all of Abbotsford; most of Chilliwack; most of the Fraser Valley between Chilliwack and Hope; and a strip approximately 4 km wide along the North Cascade Mountains bounded by the southern Fraser Valley.

Trans Mountain said that the collection and review of LiDAR digital terrain models for portions of the route passing near the four suspected Quaternary faults is underway as part of detailed design. Trans Mountain also said that, for locations where faults are suspected but cannot be identified through LiDAR, additional investigations, including the use of geophysics, would be considered.

Trans Mountain said that, if a specific fault was found to pose an unacceptable risk to the Project, it would develop a fault-specific crossing design to mitigate risk to an acceptable level.

Natural Resources Canada (NRCan) recommended that Trans Mountain provide the results from ongoing fault mapping, as well as the specific conclusions and final results on the four potentially active faults, (Sumas, Vedder Mountain, Fraser River-Straight Creek, Rocky Mountain Trench) to the Board on completion. NRCan recommended that Trans Mountain provide specific conclusions regarding whether the Vedder Mountain and Sumas faults have been active during the Holocene epoch. NRCan also recommended that Trans Mountain provide the Board with results of the Fault Lineament Study that will be used as part of the detailed design.

The City of New Westminster said that the existence of potentially active faults is not known, noting that the investigation of potentially active faults by SFU Department of Earth Sciences had not been completed.

6.1.5.2 Ground motion

Trans Mountain said that the performance of pipelines in response to seismically induced ground shaking and ground deformation depends on many factors, including proximity of the pipeline to the fault rupture site, ground motion characteristics, pipeline properties, and welding procedures.

Trans Mountain provided ground motions maps for a range of peak ground accelerations and spectral acceleration periods. Trans Mountain said that two approaches are commonly used to estimate earthquake ground-motion amplitudes: probabilistic and deterministic. A comparison of probabilistic and deterministic ground motion predictions was provided in the *Seismic Assessment Desktop Study*. Ground-motion hazard maps presenting probabilistic ground motions were provided as part of the desktop study. Trans Mountain said that the Project would be designed to withstand the larger of:

- ground motions with a 1:2,475 annual probability of exceedance, as provided by the National Building Code of Canada, modified to reflect site conditions; or
- deterministic ground-motion predictions for credible earthquake sources, modified to reflect site conditions.

Trans Mountain said that the Project would also be designed to withstand permanent ground displacement, transient ground displacement, and seismic wave propagation arising from earthquakes that produce design-level ground motions.

Trans Mountain said that the 1:2,475 APE hazard levels used in the seismic hazard update should yield larger displacements near the proposed facilities than a magnitude 9 subduction-interface event off the west coast of Vancouver Island. Therefore, ground displacement triggered by a magnitude 9 subduction-interface event would not affect infrastructure designed in accordance with the Project's seismic hazard update.

Trans Mountain said that an earthquake on a particular fault might damage the pipeline if the peak ground acceleration (PGA) caused by that earthquake exceeded that of the Project's design level along the pipeline corridor. However, based on its analysis, Trans Mountain concluded that there were no credible scenarios where the PGA would exceed the 1:2,475 APE for the Project.

Burnaby Residents Opposing Kinder Morgan Expansion (BROKE) filed a report on the seismic hazard assessment and mitigation strategies for the Project, focusing on the Burnaby area. The report looked at the earthquake hazard in terms of peak ground shaking, and documents other shaking hazards, including shaking duration and time dependent hazards such as

[63] LIDAR is a remote sensing technology that measures distance by illuminating a target with a laser and analysing the reflected light. According to Trans Mountain, LiDAR is the only remote-sensing tool that gives accurate, high-resolution images of the ground surface, and offers the best chance of characterizing lineaments and identifying suitable locations for site-specific investigation.

aftershocks. BROKE expressed the view that the proposed design for a 1:2,475 APE is a minimum life-safety standard guideline and that higher seismic design standards are often adopted for infrastructure of great importance to society, such as schools, hospitals, dams, nuclear plants. The BROKE report also examined the likelihood of peak ground motions exceeding the 1:2,475 APE for earthquakes from various sources.

In response to BROKE's concerns regarding long-duration shaking, long-period ground motions, and time-dependent shaking hazards, Trans Mountain said that it had considered each of these and determined that they were either very unlikely or not applicable to the design of the Project.

Metro Vancouver sought a commitment from Trans Mountain to design the Project more conservatively, including an evaluation of the impacts on the Project of a magnitude 9.0 or greater earthquake. Metro Vancouver also requested the rerouting of the pipeline around or beneath liquefiable deposits, including the Coquitlam land fill, the use of higher fabrication, welding and inspection standards prescribed by strain-based design, and the use of thicker walled pipe to withstand a worst-case scenario earthquake event.

6.1.5.3 Liquefaction and lateral spreading

Trans Mountain provided an assessment of liquefaction susceptibility for the various types of terrain encountered along the proposed pipeline route in accordance with a project-specific liquefaction susceptibility classification system. Liquefaction potential, described as a qualitative combination of susceptibility and opportunity, was found to be highest in the seismically active Fraser River floodplain, with some liquefaction potential existing into the Cascade Mountains.

The liquefaction hazard potential was classified for different areas along the corridor based on the findings from the desktop study as very high, high, moderate, low, or very low. Trans Mountain said that, as part of the Project's iterative design process, geotechnical investigations would be completed first at the very high potential sites, followed by the high and moderate potential sites, until Trans Mountain was satisfied that all sites with liquefaction-triggered ground displacement potential had been characterized. Geotechnical site investigation at sites with high and moderate liquefaction potential would be completed in 2015 and 2016.

Trans Mountain said that the outcome of the liquefaction assessment includes a determination of the displacement associated with lateral spreading. This would be compared against the acceptable displacement associated with the pipe's stress and strain capacity, and would determine whether the pipeline remains within the allowable design limits according to industry codes and standards.

Potential mitigation measures for liquefaction-related geohazards include pipe material specifications, pipe wall thickness, mechanical protection (such as concrete coating), reduced welding defect allowances, construction methodology (such as appropriate earthen backfill materials to limit restraint of the pipeline), and rerouting. Strain-based design would be considered at locations where other mitigation measures could not be relied on to protect the pipeline from large ground displacements. These locations would be identified during detailed engineering and design through ongoing geotechnical investigations at seismically susceptible sites.

The City of New Westminster said that the lower Brunette River watershed is subject to liquefaction in the event of a major earthquake and recommended that a complete risk assessment, including an inventory of seismic hazards, be completed before further review of pipeline design was carried out.

In a letter of comment, Ian Stephen questioned Trans Mountain's assertion that no historical earthquakes have occurred near Vedder Mountain Fault or Sumas Fault. He also recommended a route change due to the potential for compounding risks where the Vedder Mountain and Sumas Faults are in proximity to each other, based on the increased risk of liquefaction, flooding, and earthquake-triggered river bank activity.

6.1.5.4 Seismically induced landslides

Trans Mountain said that site-specific displacement estimates required consideration of several surface and subsurface characteristics, obtainable mostly thorough geological and geotechnical investigation. Future work includes site-specific field reconnaissance investigations of landslide-prone terrain. Where landslide-prone terrain is confirmed, Trans Mountain said it would evaluate the potential for earthquake triggering and ground displacement.

Views of the Board

The Board accepts Trans Mountain's approach to seismic design, including the design for the larger of ground motions with a 1:2,475 annual probability of exceedance, as provided by the National Building Code of Canada, or deterministic ground-motion predictions for credible earthquake sources. The Board finds that this approach is consistent with the

design of other major projects in similar circumstances and will result in a conservative design in keeping with relevant regulations, codes, and standards.

Regarding concerns expressed by BROKE, Metro Vancouver, and others on the selection of seismic design parameters and the design levels for predicted ground motions, the Board finds Trans Mountain's analysis to be acceptable. Trans Mountain has provided detailed responses to the concerns of intervenors and has demonstrated that the Project will be designed to withstand predicted ground motions and displacements for reasonably foreseeable seismic events, including in-slab, shallow-crustal and subduction-interface earthquakes.

To verify that Trans Mountain has adequately assessed the likelihood of recent or active faulting, (i.e., during the Holocene epoch), the Board would impose Condition 69 requiring Trans Mountain to provide the results of fault-mapping studies to the Board prior to the commencement of construction. The condition would also require Trans Mountain to provide the specific conclusions and final results, as recommended by Natural Resources Canada, on four potentially active faults (Sumas, Vedder Mountain, Fraser River-Straight Creek, Rocky Mountain Trench) along with potential hidden faults, including consideration of the potential for compounding risks due to the proximity of the Vedder Mountain and Sumas Faults.

To confirm that the potential for liquefaction-triggered ground movement is adequately assessed in detailed engineering and design, the Board would impose Condition 68 requiring Trans Mountain to identify sites with very high, high, and moderate liquefaction potential and describe how the potential for liquefaction-triggered ground movement will be mitigated at each site.

6.1.6 Strain-based design considerations

Pipelines are designed to withstand several types of loads. Some loads, such as the weight of the pipe and weight of the soil over the pipe, are permanent and remain constant over time. Other loads, such as internal pressure, are operational, and create stresses in the pipeline as long as loads are applied. Some loads are environmental and can impose stresses for short or long durations. Most pipelines in Canada are designed using stress-based design, whereby the pipe is designed to accommodate a maximum stress that is set below the level at which the pipe would permanently deform.

Strain is the deformation experienced by the pipe as a result of the applied stresses. Certain events, such as ground movement, can impose additional stresses and strains on the pipeline. In these circumstances, strain-based design may be required. As an alternative to stress-based design, strain-based design allows for limited deformation to occur in the pipe by controlling allowable strains to a safe level. Strain-based design typically requires more stringent control in terms of quality of welds, testing, handling procedures, and monitoring during operation.

Trans Mountain said it would consider using strain-based design where other mitigation measures cannot be relied on to protect the pipeline from large ground displacements caused by infrequent geohazards (i.e., slope movement and earthquake-triggered lateral spread displacements resulting from liquefaction). Strain-based design would be considered at seismically susceptible and other geohazard sites identified through ongoing geotechnical investigations.

Trans Mountain said that pipeline design and strain-based analysis would be completed in accordance with CSA Z662, with strain analysis and capacity completed in accordance with Z662 Annex K, *Standards of acceptability for circumferential pipe butt welds based upon fracture mechanics principles*.

Trans Mountain said that full-scale verification testing would be considered and undertaken where the weldment strain-based design parameters are not within the validation data range of the fracture mechanics model being considered. Trans Mountain submitted that it was premature to commit to a full-scale test verification program until strain capacity and strain demand were determined.

Views of the Board

Strain-based design allows for higher stresses and greater pipe deformation than the more conventional stress-based design. As such, strict attention to quality control during pipe manufacture, installation, maintenance, and operation will be required to ensure that specified strain limits are not exceeded. Strain-based design is useful where earth movements may occur, such as on unstable slopes or areas with higher liquefaction potential. The Board accepts Trans Mountain's proposed use of strain-based design, subject to the requirement that Trans Mountain provide the Board with more information on the intended application of strain-based design, including the locations, rationale, and adequacy of the strain-based design where applied (Condition 70).

6.1.7 Watercourse crossings

6.1.7.1 Hydrology

Trans Mountain filed a Route Physiography and Hydrology Report that focused on the physical geography of the proposed route including topography, surficial geology, bedrock geology, and watercourse crossings. The report identified notable (or hydraulically significant) watercourse crossings, defined by Trans Mountain as having watershed catchment areas greater than 50 km^2, which was used as a proxy for watercourse crossings where significant forming processes, such as bank erosion or scour, may occur. Trans Mountain said that additional investigation and hydrologic assessment would be carried out as part of detailed engineering and design.

Trans Mountain said that detailed engineering and design involves the determination of the preferred crossing method and crossing design for every crossing along the route, based on the quantification of the magnitude and frequency of occurrence of hydrotechnical hazards, such as scour, channel degradation, bank erosion, encroachment, and avulsion. Quantifying these hydrotechnical hazards relies on the analysis of remotely-sensed datasets, such as LiDAR and site-specific data collected during hydrotechnical field investigations and detailed surveys. Trans Mountain said that field investigations and bathymetric surveys were scheduled, and committed to providing revised flood frequency estimations to the Board upon completion.

6.1.7.2 Design

Watercourse crossing methods include open-cut, isolated and trenchless methods. Trans Mountain proposes two types of open-cut crossing techniques; mainline trenching and designed open-cut. It proposes two types of isolated crossing techniques; pumps with or without dams, and dams with flumes. Trenchless methods proposed for the Project include boring, HDD, micro-tunneling, and tunneling. Trans Mountain provided a description of its watercourse crossing review process and stated that crossing methods and timing would be finalized during the detailed engineering and design phase. Trans Mountain said that detailed engineering related to hydrotechnical design included two steps:

- the characterization of hydrotechnical hazards at watercourse crossings; and
- the provision of design recommendations in the form of minimum depth of cover and setback distances away from the banks of the watercourse.

Trans Mountain committed to adopting the 1:200 year flood event, as required by the Province of British Columbia, to determine the necessary depth of cover at all watercourses. Watercourse crossings would have a site-specific engineered crossing design, a generic watercourse crossing design or, where no hydrotechnical hazard was identified, a specified 1.2 m minimum depth of cover. Where the potential depth of scour exceeds 1.2 m, a depth of cover sufficient to prevent pipeline exposure during a 200-year flood event would be provided. Trans Mountain committed to the use of heavy-walled pipe at all major and most minor watercourse crossings.

Trans Mountain said that it would obtain real time flow measurements immediately prior to commencing any mid-sized and large open-cut crossing using the isolation method. If flow volumes exceed threshold limits for the isolation method, Trans Mountain would reschedule or implement contingency methodology. Trans Mountain said that it would use a refined version of *Pipeline Associated Watercourse Crossings Guidelines, 3rd Edition* by the Canadian Association of Petroleum Producers, Canadian Energy Pipeline Association, and Canadian Gas Association to assess, plan, construct, operate, and maintain the pipeline-associated watercourse crossings.

Trans Mountain identified 23 major watercourse crossings as being favourable for HDD and provided preliminary Geotechnical and HDD Feasibility and Design reports for most of these. Trans Mountain said that the information submitted in the HDD feasibility reports would be augmented with additional detailed engineering and design investigations and studies, and that HDD execution plans would be a construction deliverable by the eventual HDD contractors. Trans Mountain provided a draft HDD specification and said that the specification would be further refined during detailed engineering and design.

In response to questions regarding the feasibility of the proposed HDD crossing of the Fraser River, Trans Mountain said that the feasibility of the crossing had been comprehensively demonstrated on the basis of:

- the preliminary geotechnical assessment;
- previous similar HDD crossings successfully installed nearby; and
- the current state of practice in the HDD industry.

Trans Mountain said that a hydraulic fracture evaluation has been completed for the Fraser River crossing to evaluate the ability of the site soils to maintain a supporting fluid pressure column within the bore during drilling. Additionally, Trans Mountain expects that the HDD contractor will revisit the need for further geotechnical investigations and would conduct investigations as necessary prior to construction.

In response to concerns of participants including the Upper Nicola Band regarding the effects of climate change, Trans Mountain said that it is currently not possible to reliably predict how climate change will affect future flood events, but noted that the general tendency of a warmer climate with shifts in runoff-generating mechanisms is for an increase in hydro-meteorological extremes. This would likely lead to more frequent and more severe scouring events, such as debris flows. Trans Mountain said it would adaptively manage potential residual effects associated with changing climate through its Natural Hazard Management Program (refer to Section 6.10.3).

The Nooaitch Indian Band filed a hydrology report that stated it was reasonable for Trans Mountain's hydrologic studies to be at the general or screening level, on the understanding that further work is required in detailed design. The report commented on the use of estimated values for peak flows in ungauged catchment areas and cautioned that inaccurate seasonal flow estimates could result from not accounting for variability between watersheds. According to the Nooaitch Indian Band, this could result in underestimating scour depth and the required depth of cover, which could lead to increased risk of pipeline exposure, damage, or failure.

Nooaitch Indian Band recommended that further hydrologic analysis in detailed design should include site-specific estimates of peak and seasonal flows and that climate change should be accounted for. It recommended that a re-alignment of the HDD crossing of the Coldwater River at RK 958 should be considered to reduce the risk of pipeline exposure due to erosion and channel avulsion. It also recommended that the HDD crossing of the Thompson River at RK 847 should be reviewed to assess the risk of avulsion and lateral bank erosion on the south bank near the entry point.

The City of New Westminster said that the route along the north and east bank of Brunette River is within an area that experiences flash flood conditions. It said that Provincial guidelines recommend municipalities plan for a 0.5 m sea level rise by 2050 and a 1 m rise by 2100. The City of New Westminster recommended that Trans Mountain consider several mitigation strategies, including rerouting the pipeline, using thicker-walled pipe, relocating HDD exit and entrance points above flood levels, as well as placing paired automatic shut-off valves on either side of fish-bearing waterways. The City of New Westminster expressed concern that watercourse flood and scour analysis and bank mitigation for Brunette River and associated creeks was not available for review during the hearing.

Metro Vancouver sought commitments from Trans Mountain to use HDD techniques under waterways, and to place the entrance and exit points of the HDD more than 30 m from waterways. Metro Vancouver also sought a commitment that Trans Mountain use thicker walled pipe and casing in pipeline sections near or under waterways as protection from unanticipated scour.

The Board also received comments from participants regarding Trans Mountain's selection of a 1-in-200 year design flood for scour estimates at river crossings.

Views of the Board

The Board is of the view that Trans Mountain's approach to the design of watercourse crossings is in keeping with current industry standards and practices, and that Trans Mountain has adequately responded to the questions and concerns raised throughout the hearing regarding watercourse crossing design, including the effects of climate change, flash floods, scour depths, and sea level rise. The Board notes that the hydrologic information provided by Trans Mountain on watercourse crossings is preliminary, and that Trans Mountain committed to providing revised flood frequency estimations based on field investigations and bathymetric surveys that were ongoing during the hearing.

To verify that Trans Mountain is using representative hydrological data in calculating flood frequency estimates, the Board would impose Condition 65 requiring Trans Mountain to file updated flood frequency estimates for notable (i.e., hydrologically significant), watercourse crossings. The Board is satisfied that, with Trans Mountain's commitment and the fulfillment of this condition, the watercourse crossings will be designed, constructed and operated safely, and in accordance with appropriate codes and standards.

Trans Mountain committed to carry out additional geotechnical investigations and to reassess the feasibility for the horizontal directional drill (HDD) of six significant watercourse crossings. Also, Trans Mountain may propose the HDD of additional watercourse crossings, including the Salmon River, based on the outcome of its detailed engineering and design. In order to assess the feasibility of these crossings in accordance with the NEB's Filing Manual, the Board would impose Condition 67 requiring Trans Mountain to file outstanding HDD feasibility and design reports and drawings for the crossings identified in the condition, as well as any other river crossings where a trenchless crossing method is being considered.

6.1.8 Infrastructure crossings

According to Trans Mountain's preliminary list of crossings, there are more than 2,700 crossings of existing linear infrastructure along the proposed route. Trans Mountain said that crossings would be individually assessed to determine the most appropriate crossing method and design. Crossing of highways, high-use gravel roads and railways would be constructed using a bored crossing method, which would have a minimum effect on traffic or interruption to communication or utility services. Crossings of low-use gravel roads, minor roads and trails would be completed by conventional open-cut crossings.

Trans Mountain said that the depth of cover for the pipeline would be a minimum of 0.9 m in mineral soil and 0.6 m in rock. Additional cover would be required at road crossings, watercourse crossings, railway crossings, and at other locations as required. In these circumstances, the minimum depth of cover would be the greatest of CSA Z662 requirements, the depth specified in crossing agreements and applicable regulations of other authorities, or the additional cover which could be established during the detailed engineering phase. According to Trans Mountain, it would carefully assess each crossing during the detailed engineering phase to identify and mitigate potential hazards. Trans Mountain said it would also consider depth of cover in the risk-based design process as a mitigation measure for third party damage.

6.1.8.1 Clearance

Trans Mountain said that a minimum clearance of 0.3 m would apply to the crossing of existing buried facilities, such as foreign pipelines, buried electrical cables, fiber optic cables and utilities (i.e., water and sewer pipes), in accordance with CSA Z662. In urban areas, a minimum clearance of 0.7 m would apply, where practical, and a precast slab would be installed between the new pipeline and adjacent facilities. The clearance between the new pipeline and any other parallel pipeline, cable or other utility would not be less than 1.0 m.

6.1.8.2 High voltage current interference

B.C. Hydro operates an electrical transmission system which has a number of unshielded power lines in close proximity to the proposed Line 2 pipeline. B.C. Hydro identified over 100 locations where the proposed pipeline crosses, or is located within 30 m of existing B.C. Hydro electric transmission infrastructure. B.C. Hydro engineering practice requires that pipelines maintain a 30 m separation from its power lines. Trans Mountain said that it would observe B.C. Hydro's 30 m separation requirement where it is practical to do so. However, it said there are specific route locations where maintaining the 30 m separation would be impractical.

CSA-C22.3 No. 6-13 standard sets out the requirements for the coordinated operation of pipelines and power lines with line-to-line voltages greater than 60 kV. The CSA standard recommends a separation distance of at least 10 m between pipelines and power lines with shield wires. When the power lines are unshielded, the CSA standard states that a 10 m separation distance is not as effective in reducing the probability of damage to the pipeline during power line fault conditions and advises pipeline and power line companies to establish an agreement to avoid unsafe conditions.

Clause 5.3 of CSA-C22.3 standard states that it is difficult to quantify the safe distance between pipeline and power line with shield wires under fault conditions. It further states that, historically, a 10 m separation distance appears to be an acceptable conservative value. Trans Mountain does not agree with the third paragraph of Clause 5.3 of the CSA standard. Trans Mountain believes that, in many instances, a 10 m separation distance between power lines and pipelines is sufficient under fault conditions. However, Trans Mountain committed to complying with CSA C22.3 No. 6-M91, which is a previous version of the standard without the 10 m separation distance requirement.

Trans Mountain committed to an engineered solution agreeable to B.C. Hydro to mitigate any adverse effect on the pipeline resulting from an abnormal condition of the power system involving electrical ground faults. Trans Mountain also committed to reduce hazardous induced voltages on its pipelines to meet a maximum steady state voltage and to limit transient voltages to meet the requirements of IEEE Standard 80.[64]

View of the Board

Clause 5.3 of CSA-C22.3 No 6-13 states that it is difficult to quantify the safe distance between the pipeline and power line fault current discharging facilities. The Board notes from the standard that, historically, a 10 m distance between pipelines and power lines with shield wires appears to have been a conservative safe distance. When the power line

[64] The Institute of Electrical and Electronics Engineers (IEEE) Guide for Safety in AC Substation Grounding

does not have shield wires, the standard states that 10 m separation is not as effective in reducing the damage to the pipelines, and advises the pipeline and power line companies to establish an agreement in these circumstances.

CSA Z662-15 states, "where buried pipelines are close to high fault current-carrying grounding networks, remedial measures can be necessary to protect the pipeline from resulting potential gradients in the earth near the pipelines." Given that CSA C22.3 No. 6 13 does not categorically present a scope of an engineered solution for a separation distance of power lines from pipelines whereas CSA Z662-15 recommends "remedial measures," the Board is of the view that Trans Mountain's commitment of an engineered solution is consistent with the recommendations of CSA Z662-15. The Board would impose Condition 50 requiring Trans Mountain to demonstrate that it has developed an engineered solution in agreement with B.C. Hydro.

With respect to other infrastructure crossings, the Board notes that Trans Mountain has provided several commitments to address the concerns of participants related to crossing methods, traffic control during construction, crossing depths, future developments, and potential impact to existing infrastructure. The Board expects Trans Mountain to work with municipalities and utility companies during detailed engineering and construction to address these concerns.

6.1.9 Corrosion control

Trans Mountain said that external corrosion would be prevented by external pipe coating and a cathodic protection (CP) system. Approximately 90 per cent of the new pipeline segments will be externally coated with fusion bond epoxy (FBE). The external coating would be factory-applied in accordance with CSA Z245.20 and KMC's coating standards. The remaining pipe would be coated with factory-applied abrasion resistant overcoat, or three-layer polyethylene where additional protection from mechanical damage is required, such as at watercourse crossings, bored crossings and rocky terrain.

According to Trans Mountain, coating specifications for field girth welds would be developed during the detailed engineering phase. Trans Mountain said that its field-applied coating specifications would incorporate the requirements of the latest edition of the relevant CSA coating standards.

Trans Mountain said that the CP system would be used as a secondary corrosion control measure for the pipeline. CP would be applied by impressed current ground beds located along the pipeline. Trans Mountain said that test stations for monitoring the effectiveness of CP levels would be installed at appropriate locations.

According to Trans Mountain, the CP system would be common to both the Line 1 and Line 2 pipelines. Trans Mountain said the proposed common CP system concept is similar to the common CP system currently in operation between the recently constructed FBE-coated TMX Anchor Loop, and the older coal tar enamel-coated original pipeline. Trans Mountain submitted a report demonstrating the effectiveness of this common CP system. The report concluded that the protection of both pipeline systems is acceptable in accordance with CSA Z662 and other applicable standards.[65]

Trans Mountain said the selection of coatings that are compatible with a CP system is critical in preventing external corrosion. External corrosion is rarely found on a pipeline coated with FBE if adequate CP is available. With proper application of the external coating, degradation or disbondment of the coating is unlikely. However, if this was to occur and groundwater was to contact the pipe, the surface of the pipe would still be protected from corrosion by the CP system.

Trans Mountain said that the risk of internal corrosion for the Line 2 pipeline is not expected to be higher than for the existing pipeline. The product proposed to be transported in the Line 2 pipeline is similar to the products currently being transported in the existing pipeline, where internal corrosion is not experienced as a systemic issue. Trans Mountains said that the pipeline would not be coated internally. Trans Mountain said given the planned in-line inspection (ILI) reassessment interval of five years on the Line 2 pipeline, it is reasonable to expect that any internal corrosion features that may initiate will be detected before they can reach a critical flaw size. Any required maintenance can be developed and implemented as a pre-emptive measure. Therefore, according to Trans Mountain, the probability of a failure from internal corrosion is assessed as being negligible.

[65] Canadian Gas Association: OCC-1 – Recommended Practice for the Control of External Corrosion on Buried or Submerged Metallic Piping Systems and NACE SP0169 – Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

Views of the Board

The Board is of the view that the combination of external coating and cathodic protection, along with Trans Mountain's proposed monitoring, would help to identify and mitigate external corrosion. Following applicable standards and procedures during the coating application would help to achieve a high quality external coat to protect the pipeline. The Board is satisfied with Trans Mountain's proposed corrosion control measures.

Nevertheless, the Board expects Trans Mountain to monitor the pipeline for both external and internal corrosion during operation, and to include external and internal corrosion monitoring programs in the Integrity Management Plan. Should the Project be approved, the Board may use compliance activities, such as audits, to verify the implementation of these monitoring programs.

6.1.10 Mainline valves and valve locations

Trans Mountain said that the location and spacing of remote block valves (those not located at pump stations) on the Line 2 pipeline was initially determined in accordance with CSA Z662. Factors considered in choosing preliminary valve locations included the co-location of existing valve sites on adjacent pipelines, accessibility, and site suitability for construction and operations. Trans Mountain said that no threshold outflow volume was used in deciding the primary valve locations. To limit consequences associated with a pipeline leak or rupture, Trans Mountain would consider the following when selecting valve locations: topography; environmentally sensitive areas and terrain; population density; accessibility of electrical power; maintenance flexibility; release volume analyses; release volume dispersion modelling; and the risks to High Consequence Areas (HCAs). Trans Mountain said that the proposed valve locations may be adjusted slightly to optimize functionality and minimize aesthetic impacts.

Trans Mountain provided a list of preliminary valve locations for Line 2. Line 2 would have approximately 55 check valves[66] and 72 remote mainline block valves, of which 71 would be automated. In addition, there would be 12 mainline block valves and 11 associated check valves located at the new pump stations.

Metro Vancouver questioned Trans Mountain's commitment regarding the placement of automatic shut-off valves, particularly on either side of fish-bearing waterways. Trans Mountain said that it is proposing to use remote main line block valves with check valves on the downstream side of major watercourse crossings, and not automatic shut-off valves. Trans Mountain explained that valve operation should not be automatic because the automatic shutdown of the pipeline without initiation by a control room operator has the potential to damage the pipeline or exacerbate a spill.

Trans Mountain said that the locations of the final valve site would be established through an iterative risk-based design process. This would include investigating the potential benefit associated with moving valves closer and/or adding valves. Trans Mountain provided spill outflow modelling results for the Line 2 pipeline, including calculated spill volumes during a full-bore rupture. The volume calculation was based on the assumption that the mainline block valves located upstream and downstream of the failure site would be fully closed in 15 minutes of detecting a low pressure alarm. This includes 10 minutes to detect the alarm and shut down the pump, and five minutes for full valve closure. Trans Mountain said that the iterative risk-based design process utilizes outflow volume as the basis of a sensitivity analysis to investigate the benefit of placement of additional valves or the modification of valve placement. Trans Mountain said that the risk-based design process is a more rigorous approach than simply limiting outflow volumes to some fixed value. This is because a criterion based solely on outflow volume is not capable of evaluating other factors that would otherwise be relevant to a risk assessment, such as environmental sensitivity or likelihood of occurrence. For example, there are some circumstances where outflow volume is relatively insensitive to the addition of block valves due to the position within a pipe segment and its associated elevation profile. According to Trans Mountain, under such circumstances, there may be more effective measures available to mitigate risk, such as increasing wall thickness or increasing the depth of cover, where risk magnitude is governed principally by third party damage.

Trans Mountain said that valve locations would be finalized in detailed design and their locations would be submitted to the Board and communicated to relevant stakeholders through Technical Working Groups (TWGs). The proposed valve locations have been discussed with municipalities that have engaged with Trans Mountain and have initiated joint TWGs. As an example of this approach, Trans Mountain said that it was reviewing suggestions from the City of Abbotsford on a valve location within their city.

Trans Mountain said that the refinement of valve placement is only one approach to risk management. Trans Mountain said that, in the context of the valve placement optimization and incorporation into the risk assessment, certain risk-based

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[66] The general purpose of a check valve is to automatically open to allow forward flow, and automatically close to prevent reverse flow (i.e., back flow) when the pumps are stopped.

design criteria were important in evaluating the benefit of additional valves. The types of risk mitigation measures that will be considered in the risk-based design process include failure prevention and spill mitigation measures to ensure that risk is managed to levels that are ALARP. More information on Trans Mountain's proposed risk-based design criteria is provided in Section 6.1.3.

Views of the Board

The proper placement of mainline block valves helps minimize the consequences of a rupture by limiting the outflow volumes.[67] Valve placement is also important in isolating pipeline segments during maintenance activities. Trans Mountain has provided the preliminary mainline block valve locations for Line 2. The Board notes Trans Mountain is using a risk-based approach to optimize the preliminary valve locations. The Board would impose Condition 17 requiring Trans Mountain to demonstrate that the final valve locations will be able to minimize outflow volumes such that the level of risk is managed to As Low As Reasonably Practicable (ALARP). The condition would require Trans Mountain to demonstrate that the placement of additional valves has been implemented until a point of diminishing return has been achieved with respect to limiting outflow volumes.

The Board accepts the rationale provided in Trans Mountain's response to Metro Vancouver concerning the placement of automatic shut-off valves; however, the Board notes that Trans Mountain is planning to utilize a number of check valves. These are generally proposed at locations at the downstream end (in relation to the flow of oil) of major watercourse crossings, where oil would be flowing uphill under normal operating conditions. The Board is of the view that in an event of a pipeline failure, check valves could minimize the outflow volumes by automatically preventing backflow. Condition 17 would require Trans Mountain to confirm, with the use of transient analysis, that operation of check valves and main line block valves will not cause unsafe transient pressures on the Line 2 pipeline.

6.1.11 Control system and leak detection

6.1.11.1 Control system

Trans Mountain said that the expanded Trans Mountain system would be operated and monitored 24 hours per day, 365 days per year, by the CCOs at the Primary Control Centre (PCC) in Sherwood Park, Alberta, using a SCADA system. The Westridge Marine Terminal (WMT) would be operated and monitored from the WMT Control Centre, with continuous monitoring at the PCC. A Secondary Control Centre in south Edmonton, maintained as a hot standby site with the same functionality as the PCC, would be available when the PCC is unavailable. Pump stations and terminals in the expanded system will include Emergency Shut Down systems that would operate automatically under certain abnormal operating conditions and could also be activated remotely from the PCC or locally by field operations. The SCADA system would be used to collect information about fluid parameters, valves positions, pump status, and the status of other safety devices. It would also be used to transmit commands for the operation and control of the pipeline system.

6.1.11.2 Leak detection

Trans Mountain said that the leak detection systems for the expanded TMPL system would be in compliance with CSA Z662, Annex E: *Recommended practice for liquid hydrocarbon pipeline system leak detection*. Trans Mountain identified KMC's computational pipeline monitoring (CPM) system as being the primary leak detection method. The CPM method would be used in combination with complementary leak detection methods, which could include:

- monitoring by the CCO using the SCADA system;
- scheduled line balance calculations;
- aerial and ground surveillance patrols;
- in-line inspection tools that can detect small defects; and
- in-line inspection tools with acoustical microphones that can detect small leaks.

[67] Outflow volumes (i.e., spill volumes) from a pipeline failure comprise volumes expelled due to kinetic energy and potential energy. In liquid pipelines, the kinetic energy (flow of liquid) comes from pumps. Thus, the spill volumes due to kinetic energy can be stopped by stopping the pumps. The potential energy comes from gravity due to differences in elevation. The placement of mainline block valves, also called isolation valves or sectionalizing valves, can reduce spill volumes due to potential energy.

Trans Mountain said that it intends to implement a number of technology advancements and improvements in the expanded pipeline system, including a second CPM system that would operate in parallel with the existing system. Trans Mountain said that current Canadian regulations require only a single leak detection system, whereas regulations in Germany require two parallel systems. In recognition of this higher standard, and for continuous improvement, Trans Mountain said that it would be installing a second CPM system on the existing TMPL system. If successful, the second CPM system would also be implemented for the Project, thereby exceeding regulatory requirements and maximizing CPM leak detection capability. In addition, Trans Mountain said that it is currently participating in two joint industry projects to investigate the viability of commercially available external leak detection technologies and aerial surveillance systems. The external leak detection technologies include vapor-sensing tubes, fiber-optic distributed temperature sensing systems, hydrocarbon-sensing cables and distributed acoustic sensing systems. The aerial surveillance systems include volatile organic compound sensing and temperature sensing from a helicopter or fixed-wing aircraft.

Trans Mountain anticipates that in populated areas or along multi-use transportation corridors, unintended spills may be discovered and reported by external parties.

Trans Mountain said that the CPM system would be able to monitor pipeline performance continuously. The CPM system would not automatically shut down the pipeline but would generate an alarm notifying the CCO of a possible leak. The CCO would use prescribed procedures to determine if the alarm is a probable false alarm or a probable leak. If the evaluation leads to a determination of a probable leak, the CCO would use the SCADA system to shut down the pipeline and immediately dispatch field operations personnel to verify if there is a leak, or otherwise identify the cause of the alarm. A Simulation Specialist would be on call 24 hours a day, 365 days a year, to assist the CCO in the analysis of the leak alarm.

Upper Nicola Band and Edward Farquhar questioned Trans Mountain about the sensitivity[68] of the CPM system. Trans Mountain responded that, for the proposed Line 2, the sensitivity is anticipated to be in the range of 2 per cent to 5 per cent of the design flow rate. Trans Mountain said it will follow API 1149: *Pipeline Variable Uncertainties and Their Effects on Leak Detectability*, an accepted industry approach for estimating sensitivity thresholds, to calculate the sensitivity during the detailed engineering phase. The Province of British Columbia asked how Trans Mountain would verify the sensitivity and accuracy of the CPM system. Trans Mountain said that it conducts performance tests on the CPM system annually using historical SCADA system data in a pipeline simulator, where process variables are manipulated to simulate a leak. Trans Mountain also said that, while not a legislative requirement, it follows the API Recommended Practice 1130: *Computational Pipeline Monitoring for Liquids*, which includes testing on an annual basis to verify the sensitivity and accuracy of the leak detection system.

Views of the Board

Reliable and accurate pipeline control and leak detection systems are vital for the safe operation of a pipeline system. These systems also play an important role in reducing consequences of an accidental release. The Board recognizes that leak detection is an evolving technology. Trans Mountain has committed to implementing complementary leak detection technologies to enhance its leak detection capabilities and to continually improve its leak detection system. The Board is of the view that Trans Mountain's commitment will improve performance of the leak detection system. The Board would impose Condition 115 requiring Trans Mountain to provide an update on the status of complementary leak detection technologies that it is considering, and the timelines for their implementation. The condition would also require Trans Mountain to provide a plan to validate the performance (i.e., sensitivity, accuracy, reliability and robustness) of the leak detection system within the first year of Project operations.

Trans Mountain said it anticipates that external parties may recognize and report a spill. Condition 115 would require Trans Mountain to file a copy of its public awareness program, including spill recognition and reporting procedures.

Trans Mountain assumed a 10 minute interval to detect an alarm and shut down pumps in calculating spill outflow volumes from a full bore pipeline rupture. However, this time interval is not mentioned in Trans Mountain's leak detection procedures. Trans Mountain said that a trained Control Centre Operator (CCO) would recognize the indications of a large leak in much less than 10 minutes and would initiate an immediate shut down. Trans Mountain is currently reviewing its procedures to introduce a rule directing the CCO to perform a controlled shutdown of the pipeline when a leak cannot be ruled out in a given time period after initial indication. Condition 115 would require Trans Mountain to describe how this rule has been introduced into its procedures. Should the Project be approved, the Board may use compliance activities, such as audits, to verify the implementation of these procedures.

[68] CPM sensitivity is a measure of the size of a leak that a CPM system is capable of detecting.

6.1.12 Construction

6.1.12.1 Joining of line pipe

Trans Mountain said that the average pipe joint length will be 24 m in cross-country situations, while in some urban areas and other restricted access sections along the pipeline route, pipe lengths could be reduced to 18 m or 12 m. Production welding of the pipeline would be performed by a combination of manual and mechanized methods with Shielded Metal Arc Welding (SMAW) and Flux Core Arc Welding (FCAW) methods. For tie-in welds, a low hydrogen manual SMAW procedure and/or a semi-automatic FCAW procedure would be used. Welding specifications would be developed during the detailed engineering phase.

Trans Mountain said that as part of the process to tie the existing TMPL segments into the proposed Line 2 pipeline, welding would be necessary on the existing TMPL while it is liquid filled. The carbon equivalent of the existing TMPL is typically less than 0.50 per cent but may be greater at the tie-in location. Appropriate metallurgical tests would be conducted prior to initiating the tie-in to ensure the application of appropriate welding specifications and welding procedures.

6.1.12.2 Non-destructive testing (NDT) of welds

Trans Mountain said that every welded joint to be subjected to fluid pressure would be examined by appropriate non-destructive testing (NDT) methods to validate the integrity of the welds. Trans Mountain would have certified inspectors to monitor welding and NDT activities to ensure compliance to project specifications and procedures. Periodic audits would be performed by third party welding and NDT specialists employed by Trans Mountain. NDT specifications for the Project would be developed during the detailed engineering phase.

6.1.12.3 Quality management during construction

Trans Mountain said that it would develop construction specifications for the construction activities during the detailed engineering phase. The prime contractor for each mainline pipeline spread or pipeline facility would develop and implement a Contractor's Construction Quality Management Plan, subject to the approval of Trans Mountain.

According to Trans Mountain, an inspection team of qualified and experienced personnel would inspect all phases of pipeline construction activities to ensure compliance with legislative requirements, permit conditions, procedures, specifications and drawings. In addition, quality audits of the construction work would be undertaken to ensure that the work is being completed in accordance with the Trans Mountain Expansion Project Pipeline Construction Specification and Project Pipeline Quality Management Program (QMP). Trans Mountain's QMP for the engineering, procurement and construction of the Project will be developed during the detailed engineering phase.

6.1.12.4 Geohazard risk management during construction and operation

Trans Mountain provided a summary of potential constructability problems related to each type of geohazard along with a description of potential options for mitigation. Trans Mountain also provided example scenarios of how stability of the terrain may be affected by construction, including landslides, rock fall, rock slides, and erosion.

Trans Mountain said that the likelihood of landslides initiating due to pipeline construction activity can be reduced through careful construction practices, including the use of experienced grading foremen, the management of surface and subsurface drainage, avoiding the placement of fill on potentially unstable slopes and minimizing the height of cut slopes.

Trans Mountain said that during grading of the new right-of-way, the potential for localized instability and rock fall concerns would be identified. In these instances, qualified geotechnical engineers would review the location of concern and, where warranted, prepare site-specific mitigative designs.

Trans Mountain said that it would carry out a Terrain Stability Assessment for steeper or wetter slopes, or slopes potentially impacted by geohazards where warranted. Terrain Stability Assessment involves classification according to a system used by the British Columbia Ministry of Forests and Ministry of Environment[69] that rates the likelihood of slope failures initiating as a response to clearing and construction, but does not specifically identify existing natural geohazard processes. Trans Mountain said that slopes that are potentially subject to natural geohazards would be identified through its Natural Hazards Management Program (refer to Section 6.10.3). Trans Mountain committed to developing a management plan for terrain stability prior to start of construction that would be implemented during construction and would continue through operation.

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[69] Refer to Forest Practices Code, 1999. Mapping and Assessing Terrain Stability Guidebook. 2nd edition, British Columbia, Ministry of Forests and Ministry of Environment.

6.1.12.5 Pressure testing

Trans Mountain said that before being commissioned, every component of the pipeline would be pressure tested using water to verify integrity in compliance with CSA Z662 and the OPR. Before or after the pressure test, each pipeline section would be inspected using a caliper tool to check for anomalies such as ovality, dents and buckles. Any defects exceeding allowable limits of CSA Z662 would be cut out and replaced with pre-tested pipe.

Views of the Board

The Board notes that Trans Mountain would develop required welding specifications and procedures during the detailed engineering phase. The Board would impose Condition 111 requiring Trans Mountain to file its joining programs with the Board prior to commencing welding. The Board would use this information for compliance verification activities during the Project construction stage.

The OPR require companies to examine the entire circumference of each pipeline joint by radiographic or ultrasonic methods. The Board is of the view that delaying of radiographic or ultrasonic examination of the final tie-in welds (i.e., welds that are not subjected to a leak test during hydrostatic testing) is essential in identifying possible delayed hydrogen cracking in the weldments. It is the Board's view that the length of time required for delayed hydrogen cracks to initiate is not well understood. As a precautionary measure, the Board would impose Condition 114 requiring Trans Mountain to delay non-destructive examination of the final tie-in welds and any associated repair welds for at least 48 hours from completion of the weld.

The Board is of the view that there is an elevated risk of geohazards occurring during construction due to the rugged terrain and the potential for high levels of precipitation along portions of the pipeline route. To ensure that any geohazards encountered during construction are identified and addressed, the Board would impose Condition 66 requiring Trans Mountain to develop and file an updated Risk Management Plan to address the threats of geohazards, to be modified as geohazards are encountered during construction.

The Board is of the view that some flexibility will be required in addressing geohazards as they are encountered during construction. To allow field change decisions for geohazard mitigation in accordance with pre-approved criteria, the Board would impose Condition 51 requiring Trans Mountain to file, for approval, a field changes manual for geohazard mitigation.

6.2 New Westridge delivery pipelines

6.2.1 Overview

Following a geotechnical investigation in the fall of 2014, Trans Mountain proposed a tunnel through Burnaby Mountain (tunnel option) as the preferred option for the new Westridge delivery pipelines. Trans Mountain requested that the Board examine, as an alternative, the corridor via Burnaby streets that Trans Mountain had initially proposed in its Application (streets option). Trans Mountain estimated that the tunnel option would cost $64.6 million and would require 23 months to construct, with an additional 10 months required for early procurement. The streets option was estimated to cost $27 million and would require seven months to construct.

6.2.2 Tunnel option

6.2.2.1 Design approach

Trans Mountain said that the tunnel would be approximately 2.6 km long, at least 4 m in diameter, and would be constructed using a tunnel boring machine. The tunnel entry would be located within the Burnaby Terminal and the exit would be at the WMT. In addition to the two proposed NPS 30 delivery pipelines, Trans Mountain is considering the installation of a third pipeline in the tunnel to replace the existing NPS 24 Westridge Delivery Pipeline. According to Trans Mountain, the third pipeline would be part of a separate regulatory application. Figure 8, Figure 9 and Figure 10 provide options for the proposed orientation of the pipelines within the tunnel.

Trans Mountain said that following installation of the pipelines, the tunnel would be backfilled with impermeable concrete or grout to reduce the potential for pipe movement from fluctuations in temperature, and to prevent the tunnel from being a flow path for groundwater.

Figure 8: Orientation of the two NPS 30 delivery pipelines, if the pipe segments are welded outside the tunnel

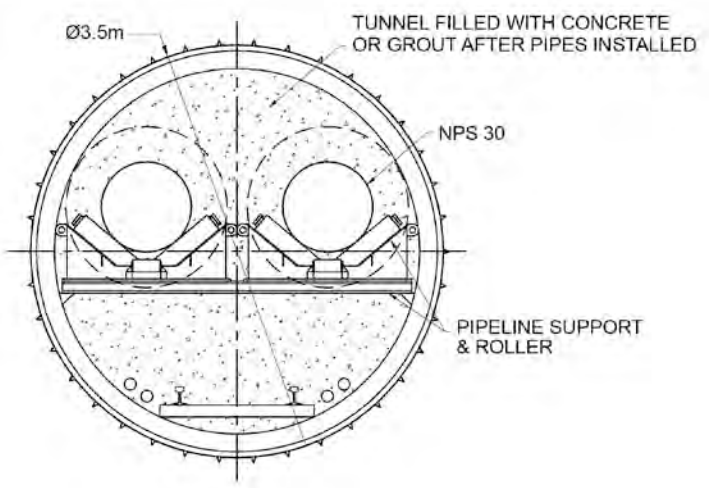


Figure 9: Orientation of the two NPS 30 delivery pipelines, if the pipe segments are welded inside the tunnel

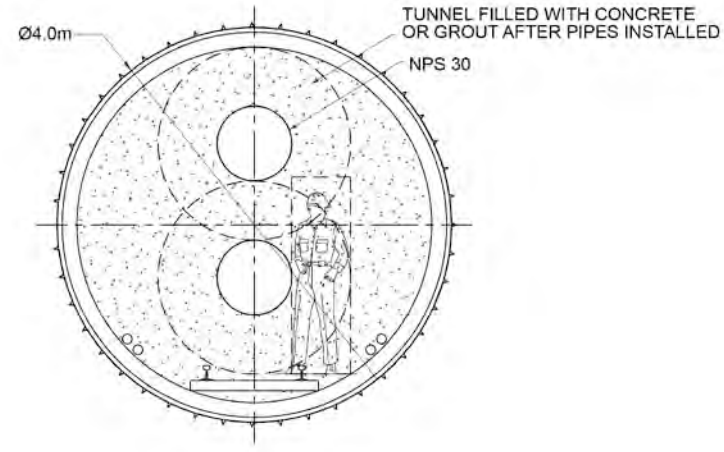
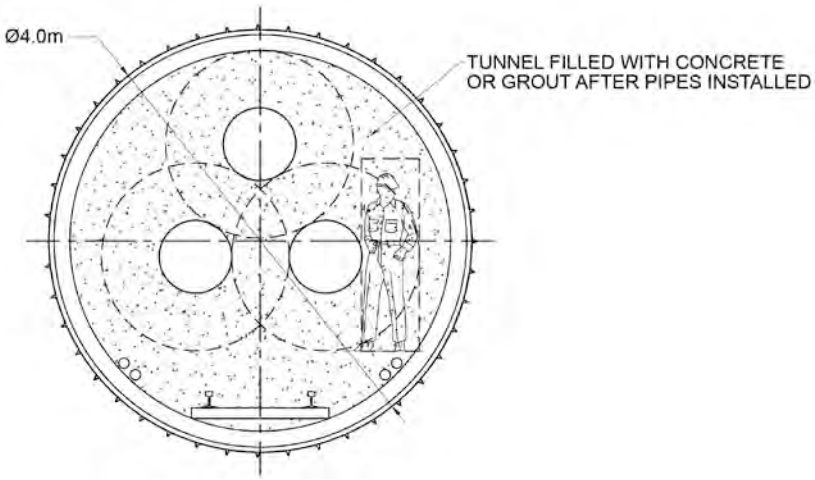


Figure 10: Orientation of the three NPS 30 delivery pipelines, if the pipe segments are welded inside the tunnel



Trans Mountain said that its tunnel design would incorporate design features and operating procedures that recognize the unique nature of the installation and the lack of accessibility for future maintenance and repair. The tunnel design would be included within the risk-based design of the pipeline segments, and risk mitigation would include the selection of an appropriate pipeline wall thickness that reflects the nature of the installation, a high integrity pipeline coating, and stringent quality assurance measures.

According to Trans Mountain, the impermeable concrete or grout backfill would provide a secondary containment system through the entire length of the tunnel. Trans Mountain said that, while concrete backfill represents an unconventional installation configuration for transmission pipelines, there is ample experience with down hole (production) applications that indicate the effectiveness of impermeable cement as a means of creating a seal in a casing in which the pressure membrane has been breached. Trans Mountain also provided a list of tunneled and backfilled hydrocarbon pipelines completed since 2010 that are operating internationally.

Trans Mountain provided a preliminary risk assessment comparing unmitigated risk profiles of the tunnel option and streets option. The assessment concludes that the tunnel option has a significantly lower risk profile than the streets option.

6.2.2.2 Geotechnical design

Trans Mountain filed a Westridge Delivery Pipelines routing update which contains the results of geotechnical and geophysical investigations from the drilling of four boreholes and geophysical surveys at the entrance and exit of the proposed tunnel. Trans Mountain said that it had adequate information to confirm the feasibility and detailed design of the Burnaby Mountain tunnel option. Moreover, based on its assessment, Trans Mountain determined that an HDD was not feasible.

Trans Mountain said that excess material from the tunnel would be disposed of at an approved location and that safe disposal would need to be considered due to the potential presence of acid generating rock. Regarding seismic activity and the effects of ground shaking on the buried pipeline, Trans Mountain said that ground shaking on its own would have little effect on the integrity of the pipeline. According to Trans Mountain, underground structures such as the delivery pipeline incur appreciably less damage than surface structures, and the reported damage decreases with increasing overburden depth. In addition, Trans Mountain expects that underground facilities constructed in soils would incur more damage compared to pipelines constructed in competent rock, and lined and grouted tunnels would be safer than unlined tunnels in rock.

Using the results from terrain mapping, field verification, air photo review, and an independent evaluation by SFU's Department of Earth Sciences, Trans Mountain concluded that there is no evidence of active faulting on Burnaby Mountain, and that the tunnel option had a lower hazards rating than the option of trenching in the streets of Burnaby.

The City of Burnaby filed a geotechnical report commenting on Trans Mountain's Burnaby Mountain geotechnical investigation, stating that the number of boreholes was insufficient to characterize the stability and rock mass characteristics for the proposed tunnel route. Trans Mountain agreed with the City of Burnaby's statement that the rock mass and ground conditions encountered in the boreholes is of variable quality and said that the selected tunnel boring machine would need to be capable of dealing with the expected range of ground conditions.

The Board received a letter of comment regarding the likelihood, magnitude and possible effects of a major earthquake on the pipeline, and stating that it would be difficult or impossible to monitor and repair the pipeline after the tunnel is backfilled with grout.

6.2.2.3 Tunnel operation

Trans Mountain said that operating procedures for the tunnel would include inspection, monitoring, and testing systems to provide an early indication of anomalies and allow for preventative measures to stop a potential leak from the pipeline. Possible repair techniques, given that the pipelines would be inaccessible after the tunnel is grouted, would include the installation of a smaller pipe, internal insert or slip lining, replacement of the pipeline through a new tunnel, or conventional overland routing.

Trans Mountain acknowledged that the avoidance of cracking in the concrete or grout backfill could not be guaranteed, and said that if a leak were to occur at an inaccessible location in the concrete-encased pipeline, it would consider:

- draining the delivery line segment upon detection of the leak;
- using cleaning pigs and nitrogen to remove any residual oil adhering to the pipe wall;
- assessing repair or replacement options; and

- completing a risk assessment to determine if any leaked oil has the potential to impact area receptors.

Trans Mountain committed to completing baseline ILI surveys for the Westridge Delivery Pipelines after entering into service.

6.2.3 Streets option

6.2.3.1 Design approach

Trans Mountain requested that the Board assess the Burnaby streets option as an alternative to the Burnaby tunnel.

Trans Mountain said that the alternate corridor was designed to accommodate two NPS 30 pipelines using conventional pipeline construction techniques for installation. However, due to restricted workspace, one of the NPS 30 pipelines would have to be constructed before the other, extending the duration of the impacts to local traffic flow and residences along the pipeline route.

Trans Mountain committed to using continuous heavy wall pipe for the delivery pipelines in excess of the minimum requirements of CSA Z662 for the streets option. Trans Mountain said that the risk-based design process would be used to select the pipe wall thickness, along with other mitigation measures during the detailed design and engineering phase.

Views of the Board

The tunnel option would take longer to construct and would be much more costly than the streets option. However, as noted by Trans Mountain, the tunnel option would reduce disruption during construction, minimize risk during operation, and would have a lower hazards rating than trenching twice through the streets of Burnaby.

Regarding the City of Burnaby's concern with Trans Mountain's geotechnical investigation, the Board is of the view that the level of detail of the geotechnical investigation for the tunnel option is sufficient for the purpose of assessing the feasibility of constructing the tunnel. The Board notes that a second phase of drilling is planned for the development of construction plans at the tunnel portals, and that additional surface boreholes or probe holes could be drilled from the tunnel face during construction. The Board is of the view that both the tunnel and street options are technically feasible, and accepts Trans Mountain's proposal that the streets option be considered as an alternative to the tunnel option.

The Board is not aware of the use of the concrete or grout-filled tunnel installation method for other hydrocarbon pipelines in Canada. The Board is concerned that damage to the pipe or coating may occur during installation of the pipelines or grouting, and that there will be limited accessibility for future maintenance and repairs. The Board is also concerned that there may be voids or that cracks could form in the grout. The Board would require Trans Mountain to address these and other matters, including excavation, pipe handing, backfilling, pressure testing, cathodic protection, and leak detection, through the fulfillment of Conditions 26, 27 and 28 on tunnel design, construction, and operation.

The Board would impose Condition 29 regarding the quality and quantity of waste rock from the tunnel and Trans Mountain's plans for its disposal.

The Board would also impose Condition 143 requiring Trans Mountain to conduct baseline inspections, including in-line inspection surveys, of the new delivery pipelines in accordance with the timelines and descriptions set out in the condition. The Board is of the view that these inspections would aid in mitigating any manufacturing and construction related defects, and in establishing re-inspection intervals.

Trans Mountain's possible installation of a third pipeline in the tunnel to replace the existing NPS 24 delivery pipeline, although not part of the Application, would have an effect on the design and construction of the tunnel and the proposed new delivery pipelines. The Board therefore requires Trans Mountain to provide further information with regard to this proposal prior to commencing construction of the tunnel (Condition 20).

6.3 New pump stations

6.3.1 Design approach

According to Trans Mountain, the pump stations are designed to ensure safe and efficient operation, incorporating a number of operational, safety and containment features. Trans Mountain said that the primary focus of the design process was to reduce the risk of a failure to the greatest extent practicable, with a secondary focus on limiting negative impacts in the event a failure does occur. To achieve this, Trans Mountain implemented a risk-based design process, integrated feedback from the consultation process, and relied on its operating experience with the existing Trans Mountain Pipeline.

Trans Mountain said that the safety of facilities would be assured through proper engineering design, material specification and selection, and consistent application of KMC's Facilities Integrity Management Program (FIMP).

Trans Mountain provided a preliminary pump station risk assessment, including prevention and consequence reduction measures, and said that the assessment would also be used to inform detailed design.

Trans Mountain has 23 active pump stations and 1 deactivated station (Niton, Alberta) on its current pipeline system. Following hydraulic analyses, Trans Mountain determined that the optimum configuration requires 11 new pump stations for Line 2. The new Line 2 pump stations would include one new site at Black Pines, B.C. while the ten remaining sites would be co-located at the existing pump station sites. Two sites would also replace the currently active Wolf, Alberta and Blue River, B.C. pump stations while utilizing their existing electrical infrastructure.

On Line 1, the results of the hydraulic analyses determined that the deactivated Niton Pump Station would need to be reactivated, and a new pump station would be required at Black Pines, B.C. The existing Jasper, Alberta Pump Station would be reconnected to Line 1 and fitted with a drag reducing agent injection system. New pump units would also be added to the Sumas Pump Station and the Kamloops Pump Station.

The existing pump stations at Albreda, Stump, Hope and Wahleach are not hydraulically required for Line 1 operation; however, Trans Mountain said that a study would be conducted to determine if their continued availability would improve system reliability.

Table 5 provides a summary of pumps and motors for Line 1 and Line 2 after the Project. On Line 1, the pump station MOPs would vary between 5,890 kPa and 9,930 kPa. The maximum operating pressures at all Line 2 pump stations would be 9,930 kPa. Trans Mountain confirmed that piping design, materials, welding, fabrication, non-destructive testing and pressure testing would comply with CSA Z662.

Trans Mountain carried out geotechnical site investigations at 11 proposed pump station locations and provided preliminary geotechnical reports for each (Black Pines, Blackpool, Blue River, Edmonton Terminal, Edson, Gainford, Hinton, Kamloops, Kingsvale, McMurphy, and Wolf). The reports included recommendations for site grading and compaction, foundation design, road construction and containment ponds, along with recommendations for further studies.

Infrared flame detectors would provide fire detection within the pump buildings. Combustible gas detection would also be installed within each pump building. Pump station discharge pressure transmitters would signal overpressure situations. Depending on the level of the detected overpressure condition, protection measures would range from an alarm requiring action of the operator to an automatic pipeline shutdown.

Each pump station would have emergency shutdown (ESD) systems designed in accordance with CSA Z662. Trans Mountain confirmed that initiation of an ESD would result in the immediate shutdown of all running pump units, and the closing of station suction and discharge valves.

Table 5: Summary of pump stations and motors for Line 1 and 2 after the Project

	Line 1 Pumps			Line 2 Pumps		
	Approximate KP from Edmonton	**Status**	**Number of pumps & Motor sizes**	**Approximate RK**	**Status**	**Number of pumps & Motor sizes**
Edmonton	0.0	Existing	4 @ 1,865 kW (2,500 HP)	0.0	New	5 @ 3,730 kW (5,000 HP)
Stony Plain	49.5	Existing	2 @ 3,730 kW (5,000 HP)			
Gainford	99.4	Existing	3 @ 1,492 kW (2,000 HP)	117.4	New	3 @ 3,730 kW (5,000 HP)
Chip	147.0	Existing	2 @ 3,730 kW (5,000 HP)			
Niton	173.4	To be Reactivated	2 @1,492 kW (2,000 HP)			
Wolf	188.0	To be Deactivated	2 @ 3,730 kW (5,000 HP)	206.1	New	2 @ 3,730 kW (5,000 HP)
Edson	228.8	Existing	3 @ 1,492 kW (2,000 HP)	247.2	New	3 @ 3,730 kW (5,000 HP)
Hinton	317.8	Existing	2 @ 3,730 kW (5,000 HP)	339.4	New	4 @ 3,730 kW (5,000 HP)
Jasper[1]	369.5	Existing	2 @ 1,865 kW (2,500 HP)			
Rearguard	476.8	Existing	2 @ 3,730 kW (5,000 HP)			
Albreda	519.1	Potential deactivation[2]	3 @ 1,492 kW (2,000 HP)			
Chappel	555.5	Existing	2 @ 3,730 kW (5,000 HP)			
Blue River	588.9	To be Deactivated	2 @ 3,730 kW (5,000 HP)	614.6	New	2 @ 3,730 kW (5,000 HP)
Finn Creek	612.5	Existing	2 @ 3,730 kW (5,000 HP)			
McMurphy	645.0	Existing	2 @ 1,492 kW (2,000 HP)	671.7	New	2 @ 3,730 kW (5,000 HP)
Blackpool	710.0	Existing	2 @ 3,730 kW (5,000 HP)	736.9	New	2 @ 3,730 kW (5,000 HP)
Darfield	742.0	Existing	2 @ 1,492 kW (2,000 HP)			
Black Pines	783.7	New	2 @1,865 kW (2,500 HP)	810.7	New	2 @ 3,730 kW (5,000 HP)

	Line 1 Pumps			Line 2 Pumps		
	Approximate KP from Edmonton	**Status**	**Number of pumps & Motor sizes**	**Approximate RK**	**Status**	**Number of pumps & Motor sizes**
Kamloops	823.0	Existing	1 @ 447.6 kW (600 HP) 2@ 1,865 kW (2,500 HP) 2 @ 3,730 kW (5,000 HP)	850.9	New	4 @ 3,730 kW (5,000 HP)
		New	1 @ 3,730 kW (5,000 HP)			
Stump	862.7	Potential deactivation[2]	2 @ 3,730 kW (5,000 HP)			
Kingsvale	924.9	Existing	3@ 1,865 kW (2,500 HP)	955.5	New	3 @ 3,730 kW (5,000 HP)
Hope	1011.8	Potential deactivation[2]	2 @ 3,730 kW (5,000 HP)			
Wahleach	1045.9	Potential deactivation[2]	2 @ 3,730 kW (5,000 HP)			
Sumas	1082.0	Existing	2@ 1,492 kW (2,000 HP)			
Sumas Puget Sound	1082.0	Existing	2@ 1,492 kW (2,000 HP)			
	1082.0	New	1 @1,865 kW (2,500 HP)			
Port Kells	1124.3	Existing	2@ 3,730 kW (5,000 HP)			

1 - Drag-reducing agent (DRA) injection capability to be added at Jasper Pump Station

2 - Deactivation subject to results of a reliability study

6.3.2 Leak detection and containment

Trans Mountain said that the existing SCADA system would be expanded to accommodate the new instrumentation and control signals from the pump stations. For new pump stations, Trans Mountain said it would install ultrasonic flow meters on the discharge side of all pump stations to improve leak detection sensitivity.

Trans Mountain said that pumps would have mechanical seal leak detection systems that would activate an alarm in the Control Centre in the event of a failure. Pump buildings would have floor sumps with level switches that would cause an alarm in the event of an accidental product release. The leak containment design at new pump station sites would employ a hydrocarbons containment area. Containment areas would have hydrocarbon detectors that would notify the SCADA system if a leak occurs. A concrete pad and/or liner system would be installed under the outdoor pump station piping, extending towards the containment area. The containment area would hold surface run-off until the contents could be examined and verified to be acceptable for release. Spill containment with hydrocarbon detection would also be located at in-line inspection sending and receiving traps.

Views of the Board

The Board is satisfied with Trans Mountain's approach to pump station design. Trans Mountain has committed to using appropriate standards for the design, including CSA Z662. In addition, Trans Mountain's risk-based design, including hazard identification and assessment, is incorporated into its pump station design process. The Board also recognizes that Trans Mountain benefits from its pump station operations experience on the existing Trans Mountain pipeline in the design process for new pump stations.

The *National Energy Board Onshore Pipeline Regulations* require that pump stations be designed to prevent soil, groundwater and surface water contamination. Accordingly, leak detection and spill containment are vital to the continued safe operation of pump stations. The Board accepts that Trans Mountain's proposed pump station leak detection and containment design complies with regulatory requirements.

6.3.3 Design temperature

Trans Mountain said that station piping would have a minimum design temperature of -29°C and a maximum design temperature of 38°C. The minimum design temperature was based on Trans Mountain's standard for facilities. Trans Mountain said that "low temperature" designated materials would be required to satisfy a minimum design temperature below -29°C, and that there is significant additional materials cost to acquire "low temperature" materials. Trans Mountain said that "low temperature" materials are not necessary for terminal and station piping because daily average temperatures are very rarely less than -29°C, even in Alberta. However, Trans Mountain acknowledged that over the last five years the average daily temperature has fallen below -29°C in Edmonton on a number of occasions. Trans Mountain also said that active terminal and station piping are kept warm by internal product flow, while idle piping systems would require time to cool to extreme low temperatures. Furthermore, Trans Mountain would electrically heat trace and insulate critical valves and drain piping wherever extreme low temperatures could occur.

Trans Mountain selected a maximum design temperature of 38°C for terminal and station piping based on Trans Mountain's tariff, which limits incoming commodities to 38°C. Trans Mountain said that it is extremely rare for temperatures to rise above 38°C anywhere along the Trans Mountain system; however, Trans Mountain acknowledged that ambient temperatures in Kamloops, B.C. rose above 38°C on three occasions over the last five years. Trans Mountain said that hydraulic modelling also confirmed that crude oil temperatures would not rise above 38°C anywhere along Line 2, considering a flow rate of up to approximately 131 160 m^3/day (825,000 bbl/day). Trans Mountain said that the selected maximum design temperature provides a reasonable margin for potential future expansion, while limiting the unnecessary cost of building facility piping to withstand the stresses of operating at temperatures higher than 38°C.

Views of the Board

The specification of suitable design temperatures is necessary to determine appropriate notch toughness[70] values for above ground piping at facilities. Materials with adequate notch toughness must be utilized so that the piping will be resistant to failure, particularly when subjected to low temperatures. According to CSA Z662, minimum design temperatures for above ground sections of facility piping must consider the lowest metal temperature attainable in service, which can be affected by internal fluid and ambient temperatures.

The Board is of the view that Trans Mountain has not demonstrated the appropriateness of its proposed minimum design temperature for above ground facility piping. Although Trans Mountain proposed -29°C as the minimum design temperature for facility piping, it has acknowledged that the ambient temperature has fallen below -29°C in the vicinity of the Project on numerous occasions over the last five years. Furthermore, Trans Mountain used average daily temperatures to justify their material temperature specifications, as opposed to daily temperature extremes. The Board is of the view that this is not a conservative approach. Although flowing oil could aid in sustaining greater than ambient metal temperatures, isolated piping segments would eventually reach ambient temperatures, given sufficient time.

The Board is also of the view that Trans Mountain has not demonstrated the suitability of the proposed maximum design temperature of 38°C for facility piping. Trans Mountain presented evidence indicating that the ambient temperature has risen above the proposed maximum design temperature in at least one location along their system. Furthermore, the reliance on tariff requirements alone does not preclude temperature excursions from occurring. Therefore, the Board would impose Condition 8 requiring Trans Mountain to demonstrate compliance with CSA Z662 in their above ground facility design temperature specifications, based, in part on location-specific maximum and minimum temperatures, as opposed to average temperatures.

6.3.4 Construction

Trans Mountain committed to constructing pump stations in accordance with the OPR and CSA Z662. Welding, fabrication and non-destructive examination of pump station piping would be completed in accordance with applicable industry and company standards and specifications. Trans Mountain said that comprehensive construction schedules for each pump station will be developed during the detailed engineering and design phase.

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[70] Notch toughness is an indication of the resistance of a steel to fracture under suddenly applied loads at a notch, or flaw.

Trans Mountain said that all piping would be hydrostatically pressure tested in accordance with applicable standards, including Trans Mountain's Station Hydrostatic Test Standard. Piping constructed in fabrication shops would be hydrostatically pressure tested prior to delivery to the site. Site fabrication pipe would be hydrostatically tested onsite.

Views of the Board

The Board finds that Trans Mountain's plan to develop a Project-specific joining program meets the requirements of the OPR. The Board would impose Condition 111 requiring Trans Mountain to file its joining program in order to assess the adequacy of Trans Mountain's internal specifications with respect to the welding and non-destructive examination of facilities, including pump stations.

The Board is of the view that Trans Mountain's plan to hydrostatically test all pump station piping is appropriate. The Board would impose a condition requiring Trans Mountain to submit their pressure testing program to the Board to evaluate, among other things, the acceptability of its Station Hydrostatic Test Standard with respect to regulatory requirements (Condition 112).

6.4 Terminal expansions

6.4.1 Design

Trans Mountain said that current crude and refined product capacity of the Trans Mountain system, including those tanks approved but not yet constructed, is 57 tanks with a combined shell capacity of 1 718 690 m³ (10,810,000 barrels).[71] Trans Mountain said that its preliminary engineering assessment indicated that with the expanded pipeline capacity, it would require 20 new tanks at Edmonton, Sumas, and Burnaby, ranging in size from 11 920 m³ (75,000 barrels) to 63 600 m³ (400,000 barrels), and having a combined total shell capacity of approximately 876 040 m³ (5,440,000 barrels). Trans Mountain said that these tanks would be constructed within the existing terminal property lines, requiring no additional new land. In addition, the existing Tank 9, in Edmonton, and Tank 74, in Burnaby, will be demolished to make room for the new tanks. Two of the new tanks will assume the numbering designations of the demolished tanks. With the addition of the new tanks, there will be 75 tanks at these locations, having a total shell capacity of approximately 2 558 130 m³ (16,090,000 barrels). The numbers and capacities of the new and existing tanks are provided in Table 6. Trans Mountain said that further studies were underway to verify that the numbers and sizes of the new tanks were optimal.

Table 6: Existing and new tank capacities

Location	Existing or under construction		New Tanks		Total	
	# of tanks	Capacity, m³ (barrels)	# of tanks	Capacity m³ (barrels)	# of tanks	Capacity, m³ (barrels)
Edmonton	35	1 274 310 (8,015,000)	5	209 070 (1,315,000)	39*	1 470 660 (9,250,000)
Sumas	6	113 680 (715,000)	1	27 820 (175,000)	7	141 500 (890,000)
Burnaby	13	267 900 (1,685,000)	14	627 990 (3,950,000)	26*	883 170 (5,555,000)
Westridge	3**	62 800 (395,000)	0	0	3	62 800 (395,000)
Total	57	1 718 690 (10,810,000)	20	864 880 (5,440,000)	75	2 558 130 (16,090,000)

* Total number of tanks account for tanks that will be demolished (one at Edmonton Terminal, and one at Burnaby Terminal)

** WMT currently has three jet fuel storage tanks. The jet fuel facility is not regulated by the NEB.

[71] Trans Mountain said that the shell capacities of each tank referred to in its Application were not the working capacities. The working capacity (the volume contained between the low working levels and the high working levels) varies for both existing and new tanks, and depends on tank design. This volume is about 85 to 90 per cent of the shell volumes.

6.4.1.1 Safety

Trans Mountain said that the tanks and their associated infrastructure would be designed to meet the Canadian Council of the Ministers of the Environment (CCME) Standard 1326, the Environmental Code of Practices for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products, API Standard 650 (API 650) Welded Steel Tanks for Oil Storage, and CSA Z662. Foundation design would be based on Provincial Building Code requirements using geotechnical information specific to the site.

Trans Mountain said that tank spacing will be in accordance with National Fire Protection Association (NFPA) Standard 30 and the National, Alberta and B.C. fire codes, with spacing between adjacent tanks equal to or greater than the sum of their respective diameters divided by four. Fire protection systems will be in accordance with NFPA Standard 30, other applicable NFPA standards, and the National, Alberta, and B.C. fire codes.

In order to prevent the overfilling of tanks, each tank will be equipped with a radar gauging system for liquid level measurement and overfill protection. Redundant instrumentation for overfill protection will be provided. Trans Mountain said that secondary containment would be designed in accordance with CSA Z662, NFPA Standard 30, and the National, Alberta and B.C. fire codes, where applicable.

Trans Mountain said that it intended to install water and foam fire protection systems on or nearby the proposed new tanks to address a number of fire scenarios at each terminal. The fire scenarios contemplated by Trans Mountain included tank floating roof rim seal fires, tank full surface fires, adjacent tank cooling, and releases to secondary containment. Trans Mountain said it would finalize the fire protection systems for each terminal during the detailed engineering and design phase, and committed to adhering to the applicable NFPA standards in their design and installation.

Trans Mountain said that all terminal piping will conform to the requirements of CSA Z662 for low vapour pressure liquids, and to the requirements of all applicable codes, standards, specifications and recommended practices that are incorporated by reference in CSA Z662. Component fabrication, construction and installation will be rigorously inspected to ensure that the prescribed designs are followed.

Trans Mountain said it would externally coat the tanks with a zinc primer/urethane top-coat system. The tank floor top and the interior 1 m (3.3 ft) of the lower shell would be coated with epoxy.

Trans Mountain said that all new tanks and associated piping will be hydrostatically tested.

6.4.2 Secondary containment

6.4.2.1 Edmonton Terminal

The Trans Mountain Terminal in Edmonton is divided into two terminal areas. Tanks added in the West Tank Area (WTA) require additional containment capacity, as specified in the regulations. Specifically, 100 per cent of the capacity of the largest tank, plus 10 per cent of the capacity of the other tanks that share the common impoundment area, is required. This containment capacity will be partially provided by the remote impoundment (RI) recently constructed to serve the East Tank Area (ETA). The remaining containment capacity will be provided within the WTA common impoundment (CI).

Trans Mountain said that it sized the RI, based on the requirements of NFPA 30, to have a capacity equal to the working volume[72] of the largest tank in the ETA (approximately 61 200 m^3, or 385,000 barrels). Since the RI is normally open to the ETA CI, the RI has additional capacity for all of the water that can collect in the RI from a 1-in-100 year, 24-hour precipitation event (approximately 31 800 m^3 or 200,000 barrels). Since the largest tank being added in the WTA is equivalent to the size of the largest tank in the ETA, the RI can also serve the WTA, in accordance with NFPA 30. However, the combination of the 1-in-100 year, 24-hour accumulated precipitation from the ETA and WTA will exceed the additional design capacity of the RI. Therefore, a new storm water retention area, the remote impoundment annex (RIA), would be constructed at the north end of the WTA to handle accumulated precipitation from the WTA.

Trans Mountain said that NFPA Code 30, the only applicable code that addresses remote impounding, does not specify or provide guidance on the design flow rate to a remote impoundment, thereby leaving the design to engineering judgment. Trans Mountain said it had never experienced a catastrophic failure of a storage tank and that the spill rates associated with

[72] Trans Mountain interprets the terminology for secondary containment capacity requirements in CSA Z662, NFPA 30, AFC, and BCFC to mean the capacity of a storage tank when the liquid level is at the high working level, rather than at the top of the shell (the nominal shell volume).

storage tanks were relatively low. Therefore, Trans Mountain believes that storm water flow should govern the design of the WTA drainage system. Figure 11 illustrates the proposed Edmonton Terminal plot plan, including the five new tanks in the WTA and the secondary containment system.

Strathcona County required Trans Mountain to conduct a risk assessment for the proposed Project, in line with the County's risk requirements for developments in their industrial areas. Because of Strathcona County's relationship with the City of Edmonton, the risk assessment points out the impact of this Project on the City of Edmonton and its acceptability. A 1.5 km distance from the City of Edmonton was used as a guideline for setting the boundary for a risk assessment conducted for Strathcona County who referred to the Major Industrial Accidents Council of Canada (MIACC) criteria as their guide for risk assessments for development proposals in their area. Within the 1.5 km radius of the west tank farm facility, there are other hazardous industries, including a refinery, oil product storage, pipeline operations, a railway, industrial trucking operations, a steel fabricator, and an industrial design products operation that would be impacted.

Trans Mountain commissioned a risk assessment report for the expansion of the Edmonton Terminal WTA. The proposed expansion of the WTA includes the addition of five new tanks and the demolition of an existing tank. The WTA will house 14 tanks located within a single CI. Trans Mountain said that the single CI would be designed to drain any spilled oil or water from firefighting through a series of channels to the RIA located remotely from the tanks in the northwest corner of the site. The RIA consists of one lagoon capable of holding 14 300 m^3 (90,000 barrels) and will overflow to the existing RI, if needed. The RI and the RIA form the basis of a fire scenario for the report.

The risk assessment report highlighted the need for prevention of releases and ignition sources to address risks associated with flammable liquid. The hazard and risk analysis focused on a fire related to a major tank spill and the radiant heat effect of the flames. The smoke plume from a fire and consideration of the sulphur component in the oil, which has been recognized as a health concern, was also analyzed. The report noted that the analysis focused on a single tank releasing its contents of up to 63 600 m^3 (400,000 barrels) and did not consider the "knock-on"[73] effect of that spill within the CI. The report noted that the probability of this happening was very low, and that this concern would need to be addressed by the design and emergency planning needs of the Project.

To determine the size of a potential oil fire scenario, the report considered the surface area of a spill that would be exposed to air. The report noted that if one of the tanks were to spill their contents, it would fill the RIA and possibly the CI. If the spill exceeded the capacity of the RIA, it would overflow into the RI, creating a larger surface area and fire scenario, having a radiant heat impact of 282 metres from the edge of the RI. This distance would include some other industrial businesses and therefore, these would need to be included in emergency planning.

The final scenario evaluated a major dike fire where a major release would not drain to the RIA and RI but would be contained within the CI. Following ignition, the radiant heat impact would be felt outwards from the CI centre for 824 m, or about 540 m from the dike walls. The report indicated that this scenario was less probable as it would require an additional blockage event to obstruct drainage to the RIA and RI. Consequently, the report concluded it was not a realistic worst-case scenario.

Trans Mountain believes that the credible worst-case release rate for the largest proposed storage tanks in the Edmonton Terminal West Tank Area (WTA) would be caused by a component failure located at the bottom of the tank. Based on the preliminary design, Trans Mountain anticipated that the piping configuration for the storage tanks would consist of an NPS 30 tank line between the terminal valve manifold and the tank. The tank will have two NPS 20 nozzles that would be used to connect the NPS 30 tank line. A credible worst-case scenario could involve the failure of an NPS 20 tank nozzle or a failure of a flange connection in the NPS 30 tank line. These could be the result of an earthquake exceeding the design earthquake, or mechanical damage (i.e., a vehicular strike). In either of these scenarios, Trans Mountain did not believe that the release rate would be equivalent to a full-bore failure (open-ended pipe), but would more likely involve a crack or tear in the nozzle or pipe, or a leaking flange connection. In Trans Mountain's view, a credible worst-case release rate is 50 per cent of the release rate from two NPS 20 nozzles or 14 400 m^3/hour (90,580 bbl/hour) in Edmonton.

[73] The release of neighbouring tank contents as a result of the initial tank release.

Figure 11: Edmonton Terminal plot plan

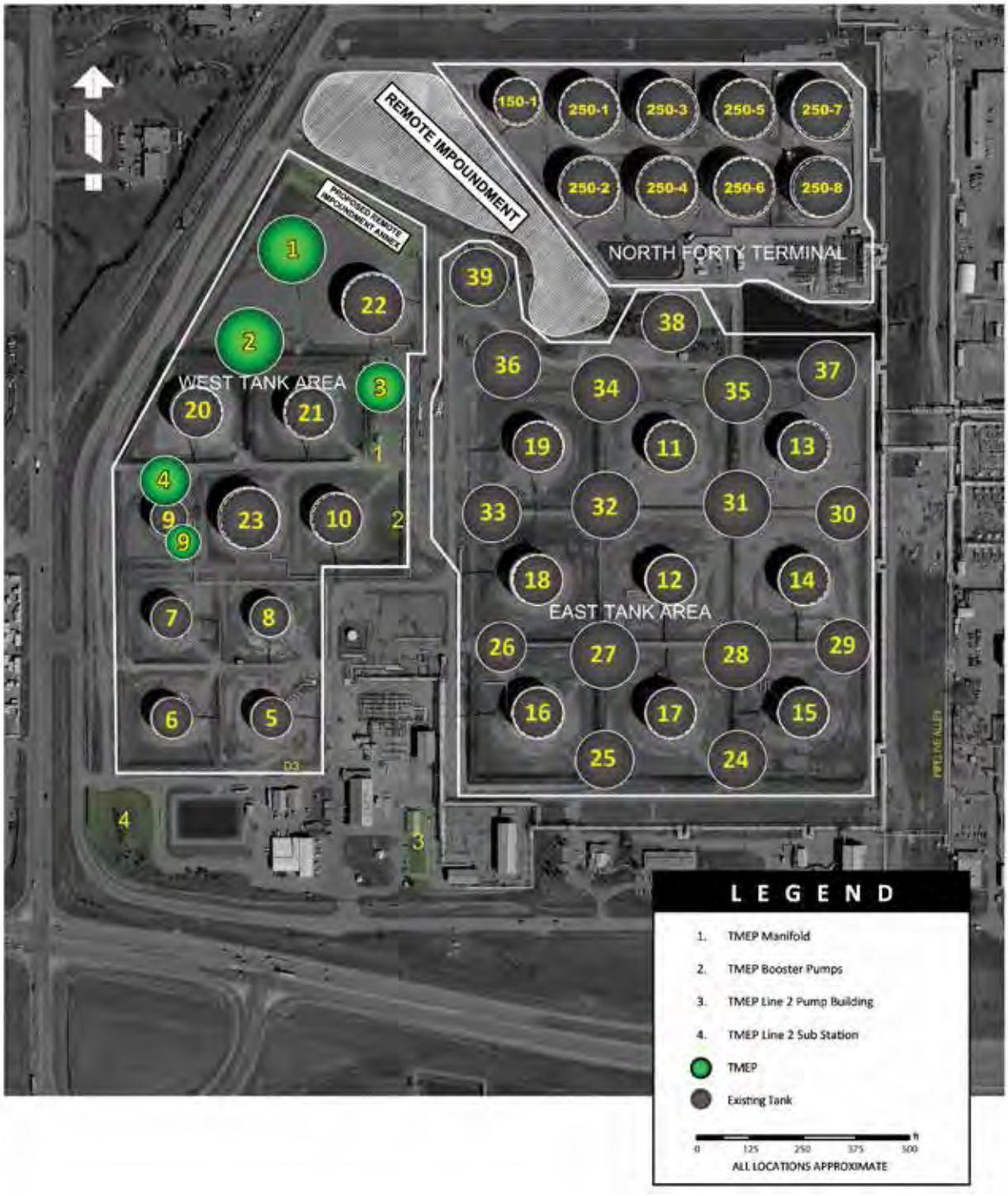
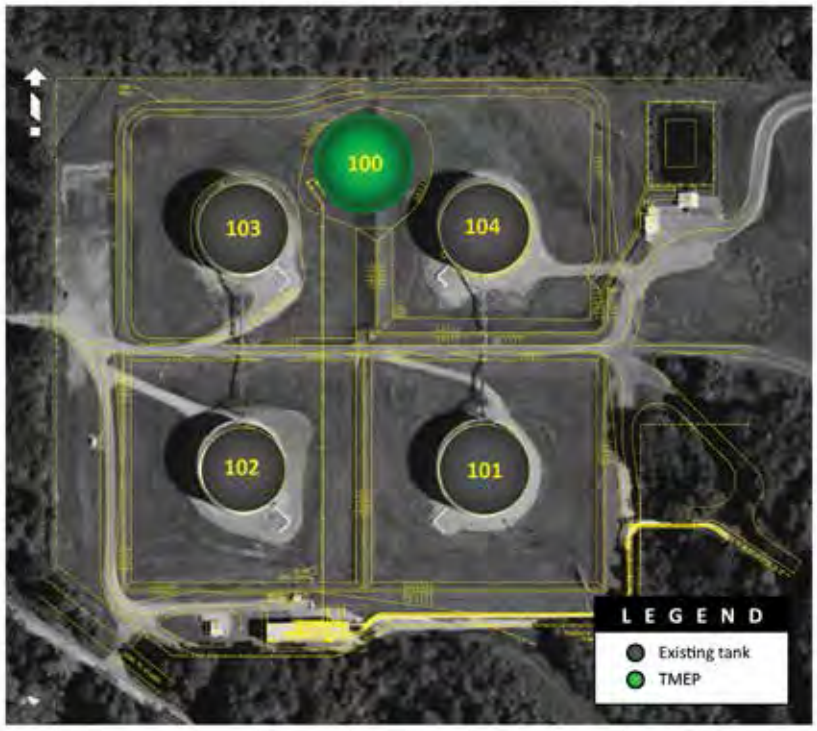


Figure 12: Sumas Terminal plot plan



Trans Mountain indicated that the design flow rate from the WTA to the RIA would be 3 240 m^3/hour (20,380 bbl/hour) based on storm water flow from a once in five years, one hour precipitation event. The design flow rate from the RIA to the RI would be marginally higher at 3 600 m^3/hour (22,640 bbl/hour). Trans Mountain concluded that it would take 19 hours for the entire contents of the largest tank to drain into the RI, and that in such an extreme case, the oil would not escape the CI area; however, a certain amount of pooling could occur. Trans Mountain said that the largest tanks in the proposed design are situated very near to the RIA and if deemed appropriate by emergency responders, the volume in the affected tank might be reduced during the spill event by pumping to other storage tanks within Edmonton Terminal, the capability for which would exist within the proposed infrastructure design.

6.4.2.2 Sumas Terminal

The tanks at Sumas are normally used to hold batches of crude oil to be shipped on the Puget Sound Pipeline to refineries in Washington State. One new tank with a shell capacity of 27 820 m^3 (175,100 barrels) was proposed by Trans Mountain. Trans Mountain said that the berm between Tank 103 and Tank 104 would be partially removed to allow space for the installation of the new tank (Tank 100), and replaced with a concrete wall. Figure 12 displays the proposed Sumas Terminal plot plan, including Tank 100. Trans Mountain said that the existing capacity of the Tank 104 containment area would be maintained, while Tank 100 would share containment with Tank 103. The realignment of the berm between Tank 103 and Tank 104, and the excavation for the Tank 100 foundation and associated perimeter space, would ensure that the shared containment capacity was in accordance with CSA Z662 and the B.C. Fire Code (BCFC). Trans Mountain said that the shared containment area would be lined with an impervious membrane liner. Storm water runoff would be collected in the lower part of the shared containment area for observation prior to release to the natural drainage course on the south side of the property. Trans Mountain said that as an additional precaution, discharging storm water would flow through an oil/water separator.

Similar to the Edmonton Terminal WTA, Trans Mountain commissioned a risk assessment report for the Sumas Terminal. The report examined scenarios involving a fire within the terminal's secondary containment areas, and the radiant heat impacts to the terminal, workers, and the public. The analysis did not consider the "knock-on" effect of neighboring tank releases resulting from the initial tank release, stating that the probability of such an event occurring was very low.

Referencing the MIACC criteria, the report concluded that the distance associated with an acceptable level of risk to personnel and the public ranged from 101 m to 198 m from the terminal's secondary containment walls.

6.4.2.3 Burnaby Terminal

The Burnaby Terminal, shown in Figure 13, is uphill of the neighborhood of Forest Grove, and a Metro Vancouver drinking water reservoir and pump station. Trans Mountain said that due to space limitations, some of the storage tanks at the Burnaby Terminal will share containment areas with other tanks, and that this containment capacity would be in accordance with CSA Z662 and the BCFC. CSA Z662 and the BCFC require containment of 100 per cent of the capacity of the largest tank plus 10 per cent of the capacity of the other tanks that share the common containment area. The containment for Tanks 96, 97, and 98 will be partially provided by RI adjacent to the tanks. For some tanks, secondary containment will be partially provided by RI, in accordance with the requirements of NFPA Code 30.

Based on preliminary design work completed to date, Trans Mountain estimated that the total secondary containment volume would be approximately 530 000 m³ (3,350,000 barrels), which is more than 60 per cent of the total proposed storage tank capacity at high working levels. Trans Mountain said that the volume of the existing tertiary containment, which will be retained in the expansion, is approximately 80 000 m³ (500,000 barrels). Trans Mountain said that this increases the total containment volume to more than 70 per cent of the total proposed product storage volume, and is nearly twelve times the capacity of the largest tank.

Trans Mountain submitted a risk assessment report for the Burnaby Terminal following the proposed expansion. The report analyzed scenarios involving pool fires within the terminal's secondary containment areas, and the radiant heat impacts to the terminal, workers, and the public. The report found that the risk of greatest concern was a pool fire. Referencing the MIACC criteria, the report concluded that the distance associated with an acceptable level of risk to personnel and the public ranged from 86 m to 224 m from the terminal's secondary containment walls. The report stated that the results were within the acceptable level of risk as recommended by the MIACC criteria. The report also concluded that although a boil-over would be a highly unlikely event, it should be considered in emergency response planning due to the potential for widespread damage.

Trans Mountain considers the worst-case release scenario at Burnaby Terminal to be the entire volume of proposed Tank 74, Tank 76, or Tank 78, which will be the largest tanks on site. These tanks share a common containment area. The estimated capacity of each tank, at high working level, is approximately 51 700 m³ (325,000 barrels) requiring a secondary containment capacity of approximately 62 040 m³ (390,000 barrels). Trans Mountain estimated the volume of storm water from a 1-in-100 year, 24-hour precipitation event to be approximately 2 950 m³ (18,560 barrels). The volume of water used to fight a full-surface fire and cool adjacent tanks was also estimated to be approximately 3 250 m³ (20,440 barrels), for a total volume of approximately 6 200 m³ (39,000 barrels). Trans Mountain concluded that the approximately 10 340 m³ (65,040 barrels) of excess secondary containment capacity would be more than sufficient to allow for accumulated precipitation and water used in firefighting.

Trans Mountain said that firefighting water and storm water were inherently considered in determining the secondary containment capacity in accordance with NFC and the BCFC. Trans Mountain pointed to Clause 4.3.7.3.3 of the NFC and BCFC, which it said implies that the 10 per cent marginal capacity for each additional tank is intended for accumulated precipitation and water used in firefighting.

Trans Mountain said that none of the codes and standards that cover containment volume at storage tank terminals, including CSA Z662, NFPA Code 30, the NFC, or the BCFC, contemplate simultaneous multiple-tank failure scenarios. Trans Mountain said that storage tanks are designed to the rigorous requirements of API 650, are spaced according to the applicable requirements of codes and standards, and that working tanks are only filled to capacity for part of the time they are in operation.

Trans Mountain said that multiple-tank failure scenarios are expected to have extremely low (near zero) probabilities. However, it noted that following the Project, the aggregate containment at Burnaby Terminal is adequate for a number of multiple-tank failure scenarios. With respect to shared containment areas, the rupture of three full tanks, specifically Tanks 74, 76 and 78, would be the hypothetical worst-case multiple tank failure scenario. In this scenario, containment would require the full use of secondary containment, and excess oil would flow into the tertiary containment area. Trans Mountain said the amount of space in tertiary containment depends on storm water management in the containment area and following significant storm events (i.e., 1-in-100 year, 24-hour precipitation event), the capacity could be exceeded. Trans Mountain advised that, based on detailed modelling of the operation of the expanded system, the total volume of oil in tanks 74, 76 and 78 is expected to average 54 400 m³ (342,000 barrels), which is about 57 per cent of the shared secondary containment. The total volume of oil in the three tanks is expected to exceed the available secondary containment less than seven per cent of the time; and the tanks are expected to be at their maximum capacities four per cent of the time. Trans Mountain was of the view that additional mitigation was not necessary because it was extremely unlikely that three tanks would fail from a seismic event exceeding the design seismic event immediately after a 1-in-100 year, 24-hour precipitation event.

Figure 13: Burnaby Terminal plot plan

The City of Burnaby and the Burnaby Fire Department expressed concern that a seismic event could lead to simultaneous tank failures and the release of product, overwhelming the facility retention provisions. Trans Mountain replied that to consider the likelihood of simultaneous multiple-tank failures and uncontained releases of oil properly, it was important to contemplate the levels of utilization of the Burnaby Terminal tanks. Trans Mountain said it had completed simulations of the anticipated onsite storage volumes at the Burnaby Terminal following the expansion. The associated tank utilization histograms indicated that 556 460 m^3 (3,500,000 barrels) would be expected 99.5 per cent of the time, while on average, a total volume of 233 870 m^3 (1,471,000 barrels) is anticipated. Trans Mountain highlighted that the combined total secondary and tertiary containment capacity at Burnaby Terminal, approximately 610 000 m^3 (3,850,000 barrels), is roughly 10 per cent greater than the amount of oil that would be at the terminal 99.5 per cent of the time.

Trans Mountain believed that the credible worst-case release rate for the largest proposed storage tanks at Burnaby Terminal would be associated with a component failure located at the bottom of the tank, similar to that described for the Edmonton Terminal.

Trans Mountain said that proposed design of the expanded Burnaby Terminal would also allow oil to be transferred simultaneously from new tanks to other new or existing tanks by gravity induced flow or by use of the WMT delivery line pumps. Trans Mountain anticipated that a transfer rate of up to 6 960 m^3/hour (43,800 bbl/hour) would be possible, using three sets of WMT pumps simultaneously. Trans Mountain said that in the extremely unlikely event of an uncontrolled fire in a single tank, or tank failure at the same time as a fire in the shared secondary containment area, the volume of oil in the other two tanks could be rapidly reduced to less than the capacity of the shared secondary containment.

The preliminary design flow rates from the secondary containment areas to the partial remote impoundment area are based on the theoretical maximum flow rates for two parallel NPS 36 diameter pipes for the Tank 96 and Tank 98 shared secondary containment area. Two parallel NPS 42 diameter pipes determine the theoretical maximum flow rates to the partial remote impoundment for the Tank 97 secondary containment area. Trans Mountain said that the pipe sizes were selected such that the flow rates would be close to the credible worst-case release value (i.e., the release rate through one NPS 20 tank nozzle, with the tank at high working level).

Trans Mountain said its assumption that the flow from the secondary containment areas to the partial RI should be close to the worst-case release rate was very conservative. In each case, the design is such that the secondary containment area must be nearly full before flow to the partial RI will take place. For the secondary containment area to be full, the majority of the contents of the tank from which the release is occurring must drain, which will reduce the head above the release point, slowing the release rate. In addition, the full secondary containment area will reduce the differential head, further slowing the release rate. The somewhat lower design flow rate for the Tank 96 and Tank 98 shared secondary containment area, as compared to the Tank 97 secondary containment area, reflects the earlier overflow of the Tank 97 secondary containment area and the higher residual head in Tank 97 when the overflow occurs.

The City of Burnaby and the Burnaby Fire Department submitted reports which questioned Trans Mountain's choice of worst-case scenario as a pool fire. Concerns were raised regarding fire and safety risks at the terminal, in particular those associated with boil-overs. The City of Burnaby said that boil-over occurs when water at the base of a tank of a crude oil turns to steam upon contact with heat descending through the oil from a full surface fire. The volume of steam may explosively eject the contents of the tank and immediately be ignited by the surface fire, generating a massive fireball supplemented by drops of burning fuel.

Trans Mountain said that the risk of boil-over has been overstated, and emphasized the design and operational measures which would minimize the potential for water accumulation within the tanks.

Trans Mountain said that all of the proposed new storage tanks would have water-draw piping, which could be used to remove water if deemed necessary. It also said that the proposed new storage tanks would have fixed external roofs to provide an additional barrier to rain-water ingress into the tanks. Trans Mountain said that the new tanks would have a cone-shaped bottom, sloping down towards a centre sump where the tank inlet / outlet line(s) would terminate. The anticipated high utilization of the tanks would ensure that any small amounts of settled water would be flushed out during the next delivery, preventing water accumulation. Trans Mountain identified further risk reduction measures, including the automated fire detection and suppression systems that would prevent and/or extinguish fires that could lead to a boil-over event. Lastly, Trans Mountain said that because boil-over can only occur following a burn period of many hours, emergency management measures, including evacuations, would be highly effective in reducing consequences to the public.

Views of the Board

Secondary containment is required by CSA Z662 and the provincial fire codes to accommodate the release of an entire tank of product, regardless of the low probability of occurrence. As noted by Trans Mountain, NFPA Code 30 is the only applicable code that explicitly references remote impounding. The requirements focus on the control of spills so that the spilled liquid does not collect around tanks. Some of these requirements include:

- the drainage route shall have a slope of not less than one per cent away from the tank for at least 15 m toward the impounding area;
- the drainage route shall be located so that if the liquid in the drainage system is ignited, the fire will not seriously expose tanks or adjoining property; and
- the impounding area shall be located so that when filled to capacity, the liquid will not be closer than 15 m from any property line that is or can be built upon, or from any tank.

Based on the evidence provided by Trans Mountain for the Edmonton Terminal West Tank Area (WTA), the time required to transfer the entire contents of the largest tank from the common impoundment (CI) to the remote impoundment annex (RIA), and then to the remote impoundment (RI), is 19 hours. In this scenario, there is the potential for oil to back up in the common impoundment and pool around the tanks. If ignited, tanks could be exposed to a pool fire. As currently described by Trans Mountain, the design of the WTA may not meet the requirements of NFPA Code 30. The Board would impose Condition 23 requiring Trans Mountain to submit the Edmonton WTA design, and to demonstrate that its design fully complies with NFPA 30.

The Burnaby Terminal is uphill of the neighborhood of Forest Grove. An issue of potential concern is the possibility, however remote, of a multiple-tank failure in a common impounding area exceeding the available secondary containment capacity under certain conditions. The Board would impose a condition requiring Trans Mountain to demonstrate that the secondary containment system would be capable of draining large spills away from Tank 96, 97 or 98 to the partial RI. Trans Mountain must also demonstrate that the secondary containment system has the capacity to contain a spill from a multiple-tank rupture scenario (Condition 24).

The City of Burnaby and the City of Burnaby Fire Department raised concerns about fire and safety risks at the Burnaby Terminal following, in particular, those associated with boil-overs. Trans Mountain claimed that boil-over events are unlikely, yet did not quantify the risks through rigorous analysis. The Board is of the view that a complete assessment of risk requires consideration of the cumulative risk from all tanks at a terminal. The Board would impose conditions requiring Trans Mountain to revise the terminal risk assessments, including the Burnaby Terminal, to demonstrate how the mitigation measures will reduce the risks to levels that are As Low As Reasonably Practicable (ALARP) while complying with the Major Industrial Accidents Council of Canada (MIACC) criteria considering all tanks in each respective terminal (Conditions 22 and 129).

6.4.3 Geotechnical design considerations

Trans Mountain said that seismic design of earthen, concrete, and steel structures, including foundations, containment berms, pipe racks, other support systems, and piping, would be in accordance with the latest editions of the National Building Code of Canada, the Alberta Building Code, the British Columbia Building Code, and other recognized standards and practices, as applicable to the structures and locations. Seismic design of storage tanks, including consideration of sloshing and other effects, would be in accordance with the latest edition of the American Petroleum Institute Standard 650 (API 650), Welded Tanks for Oil Storage, Annex E, which is the recognized North American standard. As with the pipelines, the tanks and other facilities would be designed for seismic loading corresponding to a 2 per cent probability of exceedance in 50 years, which is equivalent to a 1:2,475 annual probability of exceedance (APE).

Trans Mountain said that seismic design would be undertaken by experienced and competent professional engineers registered in the province where the facility is to be located. Geotechnical programs, which would include borehole and other investigative methods to obtain sub-surface data, would be conducted, and the results and recommendations of registered professional engineers and geologists would be used to inform the seismic designs.

6.4.3.1 Edmonton Terminal West Tank Area (WTA)

The proposed redevelopment of the WTA included the demolition of an existing tank, construction of new tanks and berms, construction of new utility buildings, site grading and construction of new ancillary facilities. Trans Mountain's Geotechnical Investigation Report Enhanced FEED[74] Stage (Final) for the WTA provided geotechnical recommendations to support the civil and structural design. The report recommended pile foundations for the support of proposed facilities. The report also included a list of recommendations for further geotechnical investigations and follow-up.

[74] Front End Engineering Design

6.4.3.2 Burnaby Terminal

The scope of Trans Mountain's geotechnical work included a review of available site and soils information, a geotechnical subsurface investigation, and preliminary analyses and engineering review based on initial design concepts. The review included the results of geotechnical investigations, which involved the drilling of 163 boreholes. Trans Mountain said that additional geotechnical investigation and analyses will be necessary for the final design stage of the project.

Trans Mountain said that the tanks would be installed on a flat surface and that the geology is well suited to support the new tanks. Trans Mountain said that the slope stability measures and foundation design details for the proposed expansion of the Burnaby Terminal would be finalized during the detailed engineering and design phase of the Project.

Trans Mountain said that the choice of materials is a recognized method of mitigation against the effects of permanent ground displacement that may occur as a result of seismic activity. This would include the selection of appropriate backfill materials to limit strain on the pipe and adjusting pipe wall thickness to increase the pipe's resistance to deformation. In accordance with API 650, storage tank materials would be specified to have certain properties, including thickness, chemical composition, and strength, as part of the seismic design process. Trans Mountain confirmed that it expected the proposed pipelines and the storage tanks at Burnaby Terminal to withstand a significant seismic event.

Trans Mountain said that it had not yet begun the detailed design for the storage tanks, but that it believed the new tanks proposed for Burnaby Terminal would meet the criteria of API 650, Welded Steel Tanks for Oil Storage, Annex E[75] to be assigned Seismic Use Group (SUG) I, which includes "storage tanks in a terminal or industrial area isolated from public access that has secondary spill prevention and control…"

The City of Burnaby filed a review of Trans Mountain's Preliminary Geotechnical Assessment Report for Burnaby Terminal, which identified several areas of concern or geotechnical deficiencies that it stated should be addressed before the Project progresses. The review stated that the foundation design of the tanks was not adequate for the stage of the study, that there was no mention of foundation anchoring, that there was no review of the historical geotechnical performance of the current tank farm facility, and that there was no overall slope hazard assessment.

Trans Mountain responded to each of the concerns identified by the City of Burnaby and asserted that its Preliminary Geotechnical Assessment Report for Burnaby Terminal was valid and complete for the stage of design for which it was prepared.

BROKE questioned the appropriateness of Trans Mountain's selection of a 1:2,475 annual probability of exceedance for the design of the Project, stating that higher earthquake design standards are often applied to dams and nuclear power plants. The report stated that all of B.C. Hydro's 41 hydroelectric dams are currently being re-built or retrofitted to withstand a severe earthquake, equivalent to a 1-in-10,000 year return period (1:10,000 APE).

6.4.3.3 Sumas Terminal

Trans Mountain proposes the construction of one new tank at the existing Sumas Terminal. The tank and its foundation would be designed in accordance with API 650 and CCME[76] guidelines. As with the Burnaby Terminal, Trans Mountain expects the new Sumas tank would meet the API 650 criteria for SUG I. Trans Mountain said that it had not yet completed a preliminary geotechnical report for the Sumas Terminal.

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[75] American Petroleum Institute (API) Standard 650, Welded Steel Tanks for Oil Storage, Annex E, defines the seismic use groups as:
SUG III tanks are those providing necessary service to facilities that are essential for post-earthquake recovery and essential to the life and health of the public; or, tanks containing substantial quantities of hazardous substances that do not have adequate control to prevent public exposure.

SUG II tanks are those storing material that may pose a substantial public hazard and lack secondary controls to prevent public exposure, or thosetanks providing direct service to major facilities.

SUG I tanks are those not assigned to SUGs III or II.

The commentary on API 650 Annex E states "For example, tanks serving the following types of applications may be assigned SUG I … 1) storage tanks in a terminal or industrial area isolated from public access that has secondary spill prevention and control…."

[76] Canadian Council of Ministers of the Environment (CCME) guidelines regarding water and soil quality, including Canada-wide standards for petroleum hydrocarbons in soil.

Views of the Board

The Board acknowledges the concerns of participants regarding the preliminary nature of the geotechnical design evidence provided. However, the Board is of the view that the design information and the level of detail provided by Trans Mountain with respect to the geotechnical design for the Edmonton Terminal West Tank Area and the Burnaby Terminal are sufficient for the Board at the application stage. The Board notes that more extensive geotechnical work will be completed for the detailed engineering and design phase of the Project.

With regard to the Sumas Terminal, the Board notes that the preliminary geotechnical report is outstanding. The Board would impose Condition 32 requiring Trans Mountain to file its preliminary geotechnical report for the Sumas Terminal prior to commencing construction.

With regard to the selection of Seismic Use Group (SUG) for the design of the tanks, the Board notes that Trans Mountain has not made a final determination. Nevertheless, should the Project be approved, the Board will verify that Trans Mountain's tanks have secondary controls to prevent public exposure, in accordance with SUG I design criteria, by way of Conditions 22, 24 and 129.

6.5 Westridge Marine Terminal Expansion

6.5.1 Design approach

The purpose of the WMT is to load various types of crude oil onto Aframax or Panamax class tankers or tank barges, and unload jet fuel from tankers and barges. The expanded WMT will receive crude oil batches from the Burnaby Terminal through two proposed 762 mm diameter (NPS 30) delivery pipelines, in addition to the existing delivery pipeline.[77]

Trans Mountain said it would expand the existing terminal by removing the existing dock[78] and replacing it with a new dock complex with three berths, each capable of loading Aframax class vessels. One of these berths will be capable of receiving jet fuel. A small utility dock with multiple berths for tugs, pilot boats, spill response vessels and equipment, and boom boats would also be constructed. Table 7 provides an overview of the proposed docks and berths.

Table 7: Dock and berth overview

Dock	Berth	Product	Pipe diameter
1	1	Crude oil export + jet fuel import	Crude: 762 mm (30") Jet Fuel: 305 mm (12")
2	2	Crude oil export	Crude 914 mm (36")
	3	Crude oil export	Crude 914 mm (36")
3	4	NA - Utility Dock	NA

Process piping at the WMT will be designed for a peak loading rate of 4 635 m^3/hour (700,000 bbl/d). The design flow rate is intended to allow an Aframax class vessel to load a cargo of 106 500 m^3 (670,000 bbl) in 24 hours, allowing for one hour of ramp up and one hour of ramp down.

[77] Trans Mountain is considering replacement of the existing delivery pipeline with a third 762 mm diameter (NPS 30) pipeline in the Burnaby Tunnel.

[78] WMT currently has one dock with one berth and has three jet fuel storage tanks. Batches of oil, destined for WMT for loading onto tankers or barges, are collected in the storage tanks at Burnaby Terminal and delivered to WMT's existing 610 mm (NPS 24) diameter pipeline. Trans Mountain intends to file a separate application for decommissioning of the existing dock pursuant to section 45.1 of the OPR. The jet fuel facility is not regulated by the NEB.

6.5.1.1 Dock layout

Trans Mountain said that the design of the dock complex is governed by the following primary criteria:

- provide the highest level of navigational safety;
- provide the capability for the simultaneous loading of three Aframax class vessels;
- allow the existing dock to remain in service while the new dock complex is under construction;
- minimize the overall footprint and impact to community views; and
- eliminate deep-water dredging and reduce the amount of dredging for the foreshore.

Trans Mountain said that the chosen dock design is considered to be optimal in meeting all of the above criteria. Trans Mountain also said that the Port Metro Vancouver (PMV), the Pacific Pilotage Authority (PPA) and the B.C. Coast Pilots (BCCP) were provided with the results of Trans Mountain's fast time simulation for the proposed dock layout for the WMT, which confirmed the safety of navigation and safe maneuvering in and around the dock layout. Trans Mountain said that, after reviewing the simulation results, these bodies confirmed that the proposed dock layout was the preferred layout.

Figure 14 illustrates the plot plan of the proposed WMT.

6.5.1.2 Loading arms and vapour recovery arms

Trans Mountain said that three 406 mm diameter (NPS 16) loading arms at each berth, one of which would be considered as an installed spare, and the two remaining arms would be used to load crude oil onto tankers. The maximum flow rate capacity of one 406 mm diameter (NPS 16) loading arm is 4 140 m^3/hr (26,000 bbl/hr). At Berth 1, there would also be a 305 mm (NPS 12) diameter unloading arm for receiving jet fuel.

Trans Mountain said that since vessel loading will not be permitted without a functioning vapour recovery system, it would consider the need for a spare system, either installed or ready for quick installation. The proposed vapour recovery arms would be 305 mm (NPS 12) in diameter.

In designing the loading arm, Trans Mountain said that it would use the Oil Companies International Marine Forum (OCIMF)'s Design and Construction Specification for Marine Loading Arms, which is the foremost international design specification for marine loading arms.

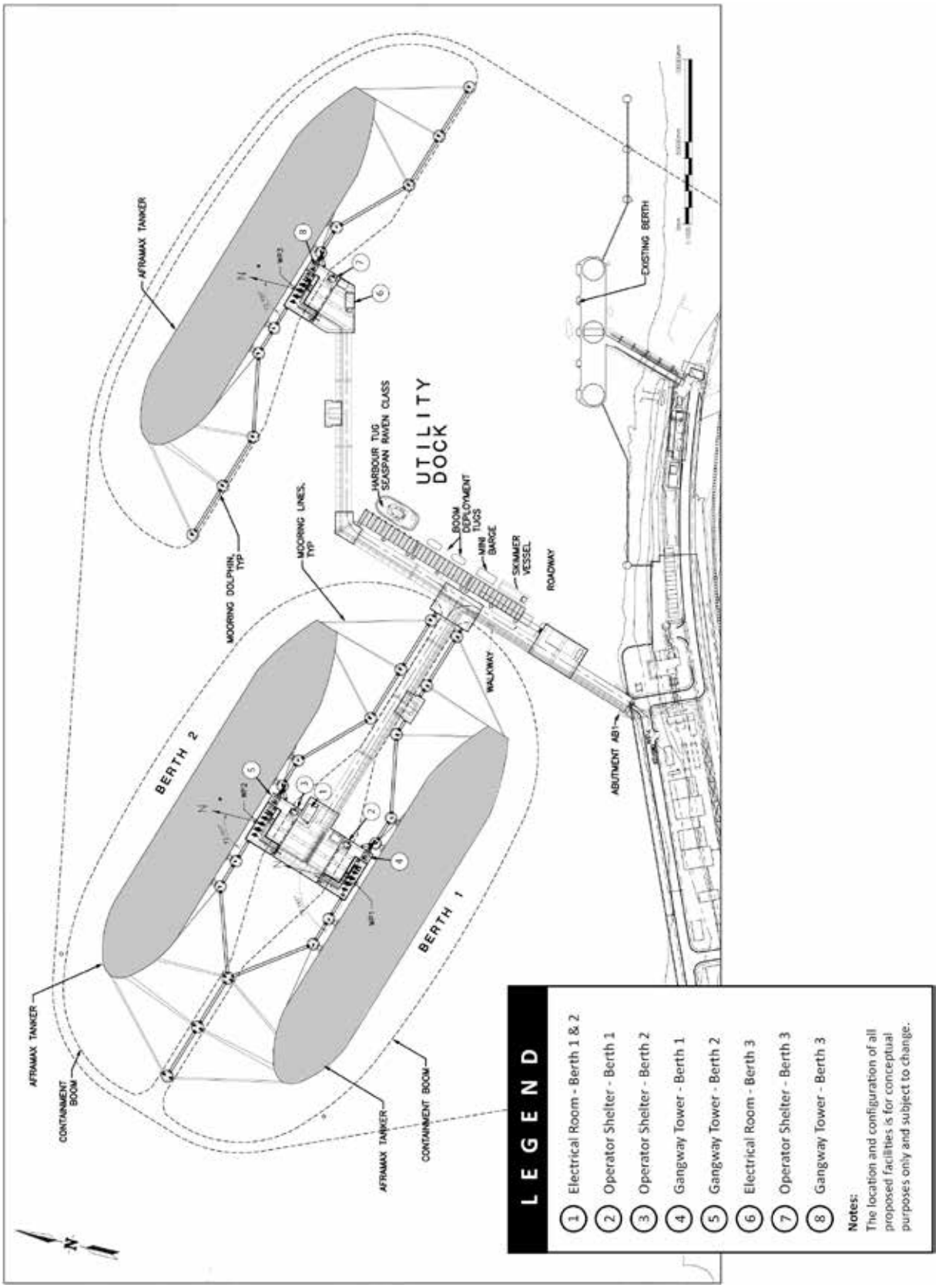
6.5.1.3 Emergency release couplers and systems

Trans Mountain said it is reviewing the advantages and disadvantages of including emergency release couplers (ERCs) and emergency release systems (ERS) for the proposed loading arms at the WMT. Trans Mountain said it is committed to the safety of the public and the protection of the environment during vessel loading operations but is not yet able to establish that the application of complex, automated ERC and ERS technology is appropriate for WMT. During the detailed engineering and design phase, Trans Mountain will assess the potential for tsunamis caused by seismic events and landslides to determine if the application of ERCs and ERSs at WMT is warranted. In response to a concern raised by the Squamish Nation, Trans Mountain said that a tsunami would be unlikely to cause significant damage to the WMT as the terminal would be designed and constructed to current design codes and standards, and industry best practices. Also, if the wave were to move the vessel beyond the allowable motion range of the cargo loading arm, an automatic shutdown device would be triggered to stop the flow of crude oil and, if needed, disconnect the loading arms.

6.5.1.4 Tanks

Trans Mountain said it eliminated two previously proposed vapor recovery tanks from the design. Trans Mountain said it also has a desire to eliminate the proposed relief tank if it is technically feasible to do so. This will be determined during detailed engineering, after the completion of transient hydraulic studies on the existing NPS 24 delivery line.

Figure 14: Westridge Marine Terminal layout



6.5.1.5 Control system and fire protection

The control system for the new facilities will be integrated with the existing WMT control system and will comply with existing control philosophies. All transitional vessel loading and unloading activities (start, ramp-up, ramp down and stop) will be controlled and monitored from the new WMT control building. Once a steady state operating condition has been reached primary control responsibility will be handed over to the Control Centre Operator (CCO) located in the Primary Control Centre (PCC). During this steady state stage, the WMT control centre will also have the ability to monitor various parameters associated with the loading operation. The specific design measures for the timely activation of the quick release mooring hooks at the mooring dolphins, to be incorporated into the control room systems, will also be developed during the detailed engineering and design phase.

According to Trans Mountain, a new fire protection system will consist of a firefighting water system and a foam system. The system design will be completed during the detailed engineering phase.

6.5.1.6 Shore-sourced oil spills

Trans Mountain said the safety of the operations at WMT will be assured through proper engineering design, material specification and selection, and consistent application of Kinder Morgan's Facility Integrity Management Program (FIMP). To mitigate shore-sourced oil spills caused by defective shore-based equipment such as piping, manifolds, valves, metering system and loading arms, the design and operations control measures will include:

- appropriate design and construction of the dock and mooring component;
- construction of containment devices surrounding potential shore sources such as the metering skid, onshore piping manifold and the loading arms area;
- placement of emergency stop buttons at several locations, including near the loading connection, with ability for the operators on the vessel to initiate immediate cessation of cargo loading; and
- implementation of detailed operating procedures for product loading and unloading.

Views of the Board

Trans Mountain has committed to design, construct, and operate the Westridge Marine Terminal (WMT) in accordance with applicable regulations, standards, codes and industry best practices. The Board accepts Trans Mountain's design approach, including Trans Mountain's effort to eliminate two vapour recovery tanks in the expanded WMT by modifying the vapour recovery technology. The Board considers this to be a good approach for eliminating potential spills and fire hazards. The Board would impose Condition 21 requiring Trans Mountain to provide its decision as well as its rationale to either retain or eliminate the proposed relief tank.

The Board would require Trans Mountain to consider all components on the docks carefully, in particular the loading arms, to eliminate potential spills. The Board requires Trans Mountain to conduct a study on the necessity of an emergency release system for the loading arms during both normal and abnormal operating conditions (Condition 84). The Board agrees with Trans Mountain that a tsunami would be unlikely to cause significant damage to the WMT for the reasons provided by Trans Mountain.

Trans Mountain said it will complete the design of the fire protection system for the WMT during the detailed engineering stage. The Board requires Trans Mountain to demonstrate the adequacy of the fire protection system to suppress fires for the scenarios identified in the final risk assessment (Condition 127). The Board also requires Trans Mountain to file its final risk assessment for the WMT, for approval, demonstrating the mitigation measures will reduce the risks to levels that are As Low As Reasonably Practicable (ALARP) while complying with the Major Industrial Accidents Council of Canada (MIACC) criteria for risk acceptability (Condition 129).

6.5.2 Geotechnical design

6.5.2.1 Westridge Marine Terminal offshore facilities

Trans Mountain's draft Preliminary Westridge Marine Terminal Offshore Geotechnical Investigation report provides information for input to the siting considerations and screening level evaluation of various pile foundation design options. The purpose of the investigation was to obtain subsurface soil information in the area of the proposed new berthing structure and, based on this information, to carry out geotechnical analyses as input to the overall marine structure design of the new terminal. Trans Mountain also undertook geophysical investigations to establish the bathymetry in the survey

area, including the accessible intertidal area, and to survey the sub-bottom and determine subsurface acoustic hard layer profiles. Trans Mountain said that it would determine the need for any additional geotechnical work after the preferred pile design option is selected.

Trans Mountain said that the specific details related to the numbers and sizes of piles were preliminary and would be finalized during the detailed engineering and design phase, and that all dock structures would be designed and constructed in accordance with applicable codes and standards.

Trans Mountain acknowledged that an earthquake could trigger a landslide in Burrard Inlet. Trans Mountain said that it was undertaking a study of the potential size of a landslide generated tsunami and its potential effect, which would be used to inform detailed design. Trans Mountain was of the view that, due to its sheltered location, there is an extremely low likelihood that a large tsunami created by an offshore earthquake could reach the WMT.

Trans Mountain said that the potential for sea level rise at WMT would be accounted for in the detailed design primarily by ensuring that the deck elevation of the structures is set high enough to avoid flooding or wave damage should the predicted sea level rise occur.

The City of Burnaby filed a geotechnical review of Trans Mountain's draft Preliminary WMT Offshore Geotechnical Investigation report. The review identified a number of concerns and deficiencies in the geotechnical investigation that, it stated, would need to be addressed at the current stage or the detailed design stage, and concluded that the report does not present a comprehensive geotechnical assessment of the site.

NRCan requested clarification of Trans Mountain's assumptions regarding existing seabed integrity and the proposed configuration of piles and trestles. NRCan said that it was satisfied that Trans Mountain will be undertaking a comprehensive geotechnical program prior to the detailed design phase.

Stephen Hardy noted that the WMT is in a seismically active location and said that the draft conditions regarding foundations and pile design for the WMT should explicitly include a specification for seismic hazard.

6.5.2.2 Westridge Marine Terminal onshore facilities

Trans Mountain has not completed a geotechnical report for the WMT onshore facilities and said it would commit to filing the report as a condition of approval.

Views of the Board

The Board acknowledges the City of Burnaby's concern regarding the level of detail of the geotechnical information provided in the hearing for the Westridge Marine Terminal (WMT) offshore facilities. However, the Board is of the view that Trans Mountain has demonstrated its awareness of the requirements for the geotechnical design of the offshore facilities and accepts Trans Mountain's geotechnical design approach.

To confirm that soil conditions have been adequately assessed for input to the final design of the WMT offshore facilities, the Board would impose conditions requiring Trans Mountain to file a final preliminary geotechnical report for the design of the offshore facilities, and the final design basis for the offshore pile foundation layout once Trans Mountain has selected the pile design (Conditions 34 and 83).

To verify the geotechnical design approach for the WMT onshore facilities the Board would impose Condition 33 requiring Trans Mountain to file a preliminary geotechnical report for the onshore facilities prior to the commencement of construction.

The Board would examine the geotechnical reports upon receipt and advise Trans Mountain of any further requirements for the fulfilment of the above conditions prior to the commencement of construction.

6.6 Transfer of active pipeline segments to Line 2 service

Trans Mountain proposes a change in the operation of two active pipeline segments that are currently part of the existing TMPL to heavy crude operation on the proposed Line 2:

- Hinton, Alberta to Hargreaves B.C. – a 150 km length of 914 mm outside diameter (NPS 36) pipeline constructed in 2008; and
- Darfield to Black Pines B.C. – a 43 km length of 762 mm outside diameter (NPS 30) pipeline constructed in 1957, deactivated in 1984 and subsequently reactivated in 2004.

Trans Mountain also provided a list of existing facility equipment and systems, including substation electrical and control infrastructure, mainline block valve power and control, and backup power that would be either moved to Line 2 service or shared with Line 2.

Trans Mountain provided an engineering assessment for the two active pipeline sections, which it said was prepared in accordance with CSA Z662 requirements. The engineering assessment included:

- a review of pipeline design, materials, construction and operation specifications;
- a review of integrity management and maintenance records; and
- Fitness for Service assessments of corrosion, cracking and mechanical damage.

Trans Mountain concluded that the engineering assessment demonstrates that the two active pipeline segments can safely operate in Line 2 heavy crude service. Trans Mountain committed to providing an updated engineering assessment following the completion of crack baseline inspections and prior to the active pipeline segments being placed into Line 2 service.

Views of the Board

The active pipeline segments transferring to Line 2 service are currently under Board jurisdiction, and managed through Trans Mountain's existing Integrity Management Plan. Therefore, within the context of the Project's conceptual design, the Board finds that the information provided in Trans Mountain's engineering assessment is sufficient to evaluate the feasibility of transferring the active pipeline segments to Line 2 service. The Board is of the view that Trans Mountain's engineering assessment does not include a comprehensive evaluation of imperfection growth, or a rationale for the proposed in-line inspection schedule. Trans Mountain committed to providing an updated engineering assessment addressing these concerns. The Board would impose a condition requiring Trans Mountain to submit the updated engineering assessment of the two active pipeline segments transferring to Line 2 service. The Board also requires Trans Mountain to acquire a certificate with a supporting report from an independent certification body confirming the fitness for service, under the operating conditions of Line 2, of the Darfield to Black Pines segment (Condition 122). The Board requires this segment to meet the same level of operational safety as newly constructed pipe in Line 2 service.

6.7 Reactivations

6.7.1 Pipeline reactivations

Trans Mountain proposes to reactivate two segments of 609.6 mm (NPS 24) outside diameter pipeline, constructed in 1953:

- A 150 km long pipeline segment from Hinton, Alberta to Hargreaves, B.C., deactivated in 2008; and
- A 43 km long pipeline segment from Darfield to Black Pines, B.C., deactivated in 2004.

These two pipeline segments would become part of Line 1, while the pipeline segments currently in operation at these locations would become part of the new Line 2. The deactivated segments are currently filled with nitrogen, capped, cathodically protected, and surveillance has been maintained. Trans Mountain committed to reactivating the pipeline segments in accordance with the OPR and CSA Z662.

Trans Mountain completed a preliminary engineering assessment, including a threat-based assessment, as a first step toward satisfying the requirements of the OPR for reactivation. Trans Mountain said that the purpose of the preliminary engineering assessment is to document the integrity management status of the pipeline segments to be reactivated, and the measures that Trans Mountain would employ to verify the integrity of the two pipeline segments prior to reactivation. The threat-based engineering assessment was conducted as an alternative to a quantitative engineering assessment because the required in-line inspections were not completed at the time of the submission. Trans Mountain committed to filing a final engineering assessment incorporating the results of the hydrostatic testing and the in-line inspection and repair program prior to the reactivation of the pipeline segments.

6.7.1.1 Reactivation steps

Trans Mountain said that prior to reactivation, it would inspect the two pipeline segments using in-line inspection tools to identify and locate metal loss, mechanical damage, and axially oriented cracks. Trans Mountain would then conduct digs to verify in-line inspection tool sizing accuracy and to complete any required repairs. The final step prior to reactivation would involve hydrostatic testing in accordance with CSA Z662 to qualify the pipeline segments at a minimum to their former maximum operating pressures.

Trans Mountain also committed to inspecting the reactivated segments with a specialized high-resolution ultrasonic tool within the first two years of operation, to locate any defects that were not identified during previous reactivation steps. All identified defects would be assessed and repaired as required.

Upper Nicola Band expressed concern regarding the current and future condition of the reactivation segments, and the impacts of a rupture or an undetected leak.

Parks Canada Agency (Parks Canada) said that it understands that details regarding the extent of the mitigation work would only be known following the completion of in-line inspections. Parks Canada recommended that Trans Mountain file a quantitative risk assessment for the portion of the Project within Jasper National Park prior to the planned commencement of reactivation. Trans Mountain explained that it could not file a quantitative risk assessment because there is no universally recognized means of quantifying the environmental and socio-economic consequences associated with a crude oil spill. While failure frequencies are quantifiable, consequences are expressed as qualitative index scores. As a result, the risk assessment would become semi-quantitative; therefore, Trans Mountain committed to completing a semi-quantitative risk assessment once the integrity verification activities and analysis have been completed.

Views of the Board

In accordance with section 45 of the OPR, companies under the Board's jurisdiction are required to apply to the Board for the reactivation of pipelines deactivated for 12 months or longer. The reactivation application must include the reasons and procedures to be used for the reactivation. The Board requires companies to include in their application, an engineering assessment complying with CSA Z662 that demonstrates the integrity of the pipeline system and its suitability for its intended service.

Typical reactivation applications assess the current integrity status of the pipeline through, among other techniques, an analysis of in-line inspections, excavation and repair data, corrosion and crack growth, and fatigue modelling. Trans Mountain's reactivation engineering assessment describes a plan to determine fitness for service; however, it does not evaluate the current integrity status of the reactivation segments based on the actual results of the proposed activities, as the activities have not been completed. The Board acknowledges the concerns raised by Upper Nicola Band and Parks Canada. The Board would impose Conditions 19 and 152 requiring Trans Mountain to file, following the completion of all reactivation activities, and prior to commencing construction of the Project, a final engineering assessment confirming the current integrity status of the two reactivation segments. In addition, an independent certification body must provide an assessment of the fitness for service of the segments prior to commencing construction of the Project, and continued assurance of the fitness for service of the segments beyond the initial certification period.

6.7.2 Facility reactivations

Trans Mountain intends to reactivate two station isolation valves on the existing 609.6 mm outside diameter (NPS 24) pipeline at Jasper Pump Station. Trans Mountain said that it would complete an engineering assessment for these valves to ascertain their fitness for service.

The Niton Pump Station, which has been deactivated since 2006, will also be reactivated for service on Line 1 as part of the scope of the Project. Trans Mountain said that, among other things, reactivation would generally include:

- inspection of pumps, motors, and large diameter valves, and completion of any maintenance requirements identified during the inspections;
- hydrostatic testing of station piping;
- reactivation of the SCADA system; and
- recommissioning of existing mechanical, electrical, instrumentation, and control systems.

Trans Mountain committed to completing an engineering assessment of the Niton Pump Station in accordance with CSA Z662 requirements to demonstrate that the pump station is suitable for its intended operation on Line 1.

Views of the Board

Trans Mountain has not provided an engineering assessment demonstrating the fitness for service of the Niton Pump Station for its intended operation on Line 1. Therefore, the Board would impose Condition 31 requiring Trans Mountain to submit, prior to commencing pump station construction, an engineering assessment demonstrating that the Niton Pump Station is suitable for its intended operation.

6.8 Line 1 operational changes

6.8.1 Capacity

Trans Mountain said that in response to growing demand and the changing needs of shippers, it had made various modifications to add throughput capacity and facilities to the existing pipeline system constructed in 1953. As a result, between 1957 and 2013, the capacity of the system gradually increased from 23 845 m^3/day (150,000 bbls/day) to 47 690 m^3/day (300,000 bbl/day).

The existing TMPL system carries a variety of crude oil batches in a single line between Edmonton and the Burnaby area, shipping 20 per cent heavy crude oil and 80 per cent light crude oil and refined products. As part of the Project, Trans Mountain would increase the Line 1 operating capacity to 55 640 m^3/day (350,000 bbl/day), delivering refined products and light crude oil in batches. While Trans Mountain said that it does not intend to transport significant amounts of heavy crude oil on Line 1, it would have the capacity to transport small amounts of batched heavy crude oil at a capacity of less than the 55 640 m^3/day (350,000 bbl/day) capacity for light crude. Trans Mountain said that experience with the existing Trans Mountain Pipeline system has shown that impacts to capacity occur with the introduction of less than 10 per cent heavy crude oil in batches. Moreover, the transportation of approximately 30 per cent heavy crude oil in batches has the same impact on capacity as if the system were transporting 100 per cent heavy crude oil.

Trans Mountain performed a hydraulic analysis on Line 1 based on the proposed capacity increase, and determined that: the Niton Pump Station would need to be reactivated; that a drag reducing agent (DRA) injection facility would be required at Jasper; and that a new pump station would be required at a new site at Black Pines. Trans Mountain also determined that the existing Albreda, Stump, Hope, and Wahleach Pump Stations would not be required for regular operation of Line 1. These stations would be deactivated unless reliability studies undertaken during the detailed engineering and design phase indicate that their continued availability would be beneficial.

Trans Mountain said that the relief station at Hope currently protects the existing pipeline downstream of the Coquihalla summit from overpressures due to valve closures and pipeline shut down events, and will continue to protect Line 1 in the future. A pressure relief valve will be installed upstream of the back pressure control valve(s) on Line 2 and will share the facility. Trans Mountain said that the design basis for both the pressure control and pressure relief systems will be determined during the detailed design and engineering phase.

Trans Mountain submitted an engineering assessment of the existing TMPL pipeline segments to demonstrate their suitability for operation under the proposed Line 1 operating conditions. The engineering assessment concluded that the existing TMPL could safely operate in Line 1 service based on regular in-line inspection monitoring, an effective integrity management program, an assessment of the remaining defects in the pipeline, and a comprehensive third party damage prevention program.

Lisa Craig said that plans to determine the state of the existing pipeline and its ability to accommodate the increased flow were not outlined, and expressed concern that this put the safety of her family and community at risk. Trans Mountain replied that it has provided information relevant to these concerns in an engineering assessment of the active TMPL segments that would be incorporated into Line 1 service. Trans Mountain said that the assessment indicates that the segments are safe to operate under the operating pressures and volumes proposed by the Project.

The City of Surrey filed an engineering report concluding that the TMPL is nearing the end of its useful life, and that the pipeline through the City of Surrey should be abandoned and replaced with a larger diameter pipeline to increase the hydraulic capacity of the Project. Trans Mountain replied that information placed on the record confirms that the existing TMPL is managed and monitored as required by CSA Z662 and the OPR, and that there is no evidence that the pipeline is nearing its end of life. Likewise, Trans Mountain said there is no evidence suggesting that the pipeline should be replaced.

Shxw'ōwhámel First Nation submitted a report prepared by Accufacts Inc. (Accufacts) that found Trans Mountain is proposing major changes to Line 1 which have not been adequately addressed in the Project application. Accufacts believes that Line 1 is at a much greater risk of rupture than what Trans Mountain has indicated in its submissions to the Board.

Trans Mountain replied that the Accufacts report implies that operating pressures would be increased with the increase in throughput. However, Trans Mountain said that the increase in throughput would be achieved primarily through the reduced viscosity of the proposed line fill as opposed to increased operating pressures. Trans Mountain said that the new operation

would result in certain segments of the pipeline experiencing slightly higher normal operating pressures, while others would experience slightly lower normal operating pressures. Trans Mountain said that their assessment of the active TMPL segments that would be incorporated into Line 1 service shows that the changes are minor in nature, and would not exceed current maximum operating pressures.

6.8.2 Leak detection and slack line flow

Trans Mountain said that the existing SCADA system would be thoroughly assessed and upgraded as necessary to ensure that it can be used successfully to monitor and control the expanded TMPL system. Trans Mountain confirmed that under steady-state conditions, Line 1 would not be in slack line flow downstream of the Coquihalla summit at the design flow rate, and with the selected discharge pressure at Kingsvale Pump Station and the selected suction pressure at Sumas Pump Station. However, Trans Mountain said that it is likely that slack line flow will continue to be a feature of operations in this segment as it is today. Trans Mountain will consider the application of back pressure control, but it may not be feasible due to the existing pipe configuration and specifications. Trans Mountain said that slack line flow conditions have a negative impact on real-time transient models because the number of uncertainties increases compared to packed line flow. In slack line flow conditions, the reliability, sensitivity, and accuracy of the CPM system would decrease, resulting in an increase in estimated detectable leak thresholds.

Trans Mountain said that the slack line flow section of the existing pipeline has been inspected multiple times with state of the art in-line inspection (ILI) technology in recent years, and a hydrostatic test on the section was performed successfully in late 2013. In the event that the CPM system calculates that slack line flow may occur elsewhere in the existing pipeline, a warning message is sent to the CCO who then takes appropriate measures to adjust pressure set points to prevent the pipeline from reaching slack line flow conditions. The CCO continues to monitor the pipeline to ensure that it is properly packed.

Shxw'ōwhámel First Nation filed an engineering report that found that Trans Mountain would operate at least one of the pipelines in the Project in slack line flow. The report noted that slack line flow operation could limit the effectiveness of leak detection systems, and recommended that Trans Mountain demonstrate the efficacy of its leak detection system.

Trans Mountain replied that Line 1 would not be in slack line flow at its full design flow rate; however, Line 1 would experience slack line flow in the segment downstream of the Coquihalla summit at 50 per cent and 75 per cent of its design flow rate. Mitigation measures to eliminate slack line flow in this flow regime, such as back-pressure control, would not be possible as the pressures necessary to ensure operation without slack line flow would exceed the maximum operating pressures in this segment. Trans Mountain said that slack line flow conditions are difficult for CPM systems to model, and that the CPM system would decrease sensitivity levels for segments with column separation in order to model line conditions to the best of the system's ability. However, Trans Mountain highlighted that as part of a systematic approach to leak detection, it relies on complementary leak detection approaches in addition to the CPM system to detect leaks, as set out in Section 6.1.11.

6.8.3 Risk assessment

Trans Mountain said it performs annual risk assessments of the existing TMPL using a semi quantitative approach. Quantitative failure frequencies (in failures per year) and qualitative consequence values (i.e., index-based) are used to express semi-quantitative risk scores for any pipeline segment relative to the risk scores for other pipeline segments along the TMPL. The risk results are in turn, used to prioritize and select the most effective risk mitigation measures for the pipeline. Trans Mountain said that because the risk scores are semi-quantitative, they have no physical relevance outside the scope of the risk analysis. However, the risk results are useful for highlighting locations of high risk relative to other locations along the pipeline.

Trans Mountain said that the objective of the risk assessment is to support an integrity management program of an existing pipeline by guiding assessment and mitigation activities. This differs from the objective of the Line 2 risk assessment, which is to support the risk-based design of a new pipeline. Furthermore, the two risk assessments use different data sets. As a result, the risk assessments are not directly comparable to one another.

6.8.4 Mainline valves

Trans Mountain said that the results of the risk assessment provide input to the prioritization of system improvements to reduce the operational risk for the pipeline. This process has resulted in the requirement for new valves and the automation of existing valves to mitigate potential spill volumes and the associated consequences.

Trans Mountain said that it has an established and ongoing process for assessment and upgrades of remotely operable valves to isolate the pipeline in the event of an incident, and to mitigate the potential consequences from a pipeline spill. This process includes annual updates to the risk assessment of Line 1, outflow modelling, and overland flow modelling.

Trans Mountain committed to undertaking a reassessment of potential outflow volumes using the increased average post-expansion throughput volumes expected on Line 1. The results will be assessed to determine the need for additional remotely operable valves, or the need to convert existing manual valves to remote operation.

Trans Mountain said that valves being upgraded to automated valves on the existing TMPL, which would become part of Line 1, tend to require more than five minutes to close. Recently automated sites require approximately eight minutes to close in order to minimize shutdown volumes while avoiding transient overpressure events. Trans Mountain did not provide an assumed time for field personnel to access pipeline block valves that cannot be operated remotely following a release event. It said that the time for field staff to access particular manual remote block valves would depend on a number of factors, including the time of day, weather conditions, and the conditions of the access route to the particular block valve. For the purpose of outflow volume calculations, Trans Mountain assumes that access occurs after the total gravity drain has completed.

Trans Mountain said that the remainder of the manual block valves on the sections of Line 1 that are not being modified by the Project would continue to be evaluated in accordance with the established process for considering improvements to reduce the consequences of potential releases on the operating TMPL. It said that a multi-year plan for the automation of existing valves, installation of new automated valves and installation of new check valves has been established.

Trans Mountain said that based on its preliminary plan, it would automate some of the manual block valves on the reactivation segments to close in five minutes. Other valve sites are not planned for automation because check valves would prevent backflow in the event of a release. Trans Mountain said that a number of valve sites within Jasper National Park and Mount Robson Provincial Park are not planned to be automated, based on the principle of minimizing new disturbances in these areas. In addition, Trans Mountain said that it based its valve automation decisions on whether a significant reduction in outflow volumes would be realized. Following detailed design, Trans Mountain committed to finalizing its plan for automating existing valves, or installing new valves within the reactivation segments.

Trans Mountain listed a number of Line 1 main line block valves located at pump stations and terminals which would be modified to have a closure time of five minutes, or the shortest time possible as determined by a Line 1 surge analysis. Other pump station and terminal valves are included in Trans Mountain's long-term modification program.

Views of the Board

The active TMPL is currently under Board jurisdiction and is being regulated accordingly through ongoing compliance activities. Regarding the existing TMPL and its suitability for operation with increased capacity in Line 1 service, the Board finds the pipeline's condition to be acceptable. The Board has examined the predicted operating pressures along Line 1 and finds that they would not exceed the current maximum operating pressures of TMPL. Likewise, the proposed service fluids have properties within the range of those currently being transported. The Board is of the view that a combined larger diameter single pipeline through Surrey would be feasible for a single product pipeline system. However, because Line 1 would operate in batched service, combining streams from Line 1 and Line 2 into a single pipeline would involve significant operational difficulties.

The Board agrees with Shxw'ōwhámel First Nation's concern that slack line flow conditions can negatively impact the capabilities of leak detection systems, and therefore must be controlled or eliminated to the extent practicable. The Board would impose Condition 135 requiring Trans Mountain to identify locations along Line 1 where slack line flow may occur under various operating pressure scenarios, and to provide operational measures for its detection and prevention.

The Board finds that Trans Mountain's multiple system approach to leak detection is acceptable, and recognizes Trans Mountain's commitment to evaluate and upgrade the existing SCADA system. Prompt leak detection is essential in minimizing the consequences of a release, particularly when considering the increase in capacity proposed for Line 1, and the potential for greater release volumes. Therefore, the Board would impose Condition 115 requiring Trans Mountain to provide a plan for improving the performance of the existing leak detection system.

The Board acknowledges Trans Mountain's process of annual risk assessment, outflow volume modelling, and the determination of valve upgrades and additions on the proposed Line 1. Because Trans Mountain said it would finalize its valve automation and installation plan following detailed design, the Board would impose Condition 18 requiring Trans Mountain to provide the supporting risk assessment on Line 1, including outflow volume modelling results following mitigation. This information will assist the Board in determining the adequacy of Trans Mountain's proposed valve upgrades on Line 1 with respect to minimizing the consequences of a release.

The evidence shows the majority of the Line 1 remote block valves will be manually operable, and that Trans Mountain does not have an assumed time to access manually operable remote block valves following a release. The Board finds that in certain scenarios, the use of automated main line valves in place of manual valves could minimize release volumes in the event of a rupture. The Board is of the view that valve type, location, and closure time are vital in

limiting release volumes on Line 1. Trans Mountain confirmed that it has a multi-year plan for valve upgrades along Line 1, yet did not provide the details of this plan. Therefore the Board finds that Trans Mountain has not adequately demonstrated how release volumes would be minimized. To address this, the Board would impose Condition 18 requiring that Trans Mountain provide its multi-year plan for valve upgrades and additions on Line 1, and demonstrate that risks are managed to levels that are as low as practicable. Should the Project be approved, the Board may use compliance activities, such as audits and inspections, to verify the implementation of the Line 1 valve upgrade plan.

6.9 Electrical matters

6.9.1 Power system and motor protection for facilities

The electrical protection system protects power systems and pump motors in the pump stations and terminals. Trans Mountain said that it would use integrated digital protection and motor management relays for protecting the pump motors. For the overcurrent/overload and ground fault protection of pump motors and facilities, Trans Mountain said that it would use:

- a fuse/vacuum contactor/relay combination for protection against electrical faults and overloads;
- 400 A and 720 A vacuum contactors (with interrupting capacities of 7000 A and 7200 A, respectively); and
- neutral grounding resistors to all stations and terminals, for limiting the ground fault currents to a low magnitude.

Trans Mountain expected that the above protection system would clear a severe electrical fault within 8.33 milliseconds (msec) and said that it would not be considering three-phase circuit breaker and relay combinations for motor protection. Trans Mountain said that additional measures would be implemented if scenarios were identified during the detailed engineering phase that indicated a vacuum contactor was unable to clear a specific fault.

Trans Mountain said that it would incorporate arcing faults mitigation in its design. This would involve upgrading the relay settings and could include relays with fiber optic arc sensor capabilities or arc resistant switchgear. Final configurations for each location would be determined during the detailed engineering phase.

Views of the Board

The Board observes that a number of incidents have occurred with regard to electrical power systems in pipeline facilities due to ground faults and arcing faults. When designing a protection system to prevent equipment damage from all types of fault current, it is desirable to minimize the magnitude of the fault current. The Board notes that Trans Mountain has committed to installing neutral grounding resistors at all of its facilities to limit the ground fault current to a low level.

The Board observes that due to abnormal conditions in power systems in pipeline facilities, ground fault current can exceed the design limit. If such a fault is not cleared quickly, it can gain energy and escalate into an arcing fault. The Board is aware that, in some cases, arcing faults in pipeline facilities have triggered fires. As arcing faults have the potential to cause safety and integrity issues, the Board issued Safety Advisory SA 2015-03 on 4 May 2015 which recommended the clearance of ground faults before the faults escalate to arcing faults. Trans Mountain said that it would use a fuse/vacuum contactor/relay combination that will be suitable to clear a severe fault within 8.33 msec. While it is desirable to clear severe faults as quickly as possible, the Board is of the view that Trans Mountain has not demonstrated, using time-current characteristics, under what conditions a fault would be cleared in 8.33 msec. The Board would impose Condition 30 requiring Trans Mountain to confirm that it has implemented settings to clear ground faults that can override any pre-set time delays that may be used for coordination between various protective devices.

Another challenge faced during a severe ground fault is that stored energy from other running motors may feed ground faults. This results in an increase to the total fault current. SA-2015-03 addresses this issue, recommending that companies take measures to prevent the reverse flow of stored energy from other electrical equipment. It is the Board's view that Trans Mountain has not provided a satisfactory solution to this concern. The Board would impose Condition 30 requiring Trans Mountain to implement measures in its final design to prevent reverse flow of energy from other equipment during an electrical fault.

6.9.2 Battery system for uninterruptible power supply (UPS)

Trans Mountain said that UPS systems would provide emergency power to the critical loads, such as SCADA systems, communications systems at all pump stations, terminals, and station isolation valves at stations, without sending or receiving traps. Emergency power would be supplied from the batteries connected with the UPS systems. The batteries would be charged during the time when the utility power is available. In the event of power failure, a transfer switch would transfer the input of the UPS systems from the utility power to the standby generators. The stored energy would be used to maintain power to the critical loads until standby generation comes on line.

Trans Mountain said that the types and sizes of the battery systems would be determined during the detailed engineering phase. The battery types would be determined based on the service conditions, the UPS manufacturer recommendations, and best engineering practices identified during detail engineering design.

Views of the Board

Uninterrupted Power Supply (UPS) systems are critical to pipeline operations. Emergency power will be required to a number of critical loads throughout the Project. It is essential that the batteries have adequate capacity and rating so that emergency power can be supplied to the critical load.

The Board is of the view that the storage and ventilation of batteries require special attention for safe and reliable operation of batteries. Rule 26-546 of the CSA 22.1 No. 15, Canadian Electrical Code Part-1 (CEC) states that:

> "Storage battery rooms or areas shall be adequately ventilated; storage batteries shall not be subjected to ambient temperatures greater than 45°C or less than the freezing point of the electrolyte."

The Board observes that Trans Mountain has not yet committed to any specific standard for the design of the UPS systems where battery banks are an integral part of the UPS systems. Therefore, the Board would impose Condition 101 requiring Trans Mountain to file a list of the code(s) it would follow during UPS system design and operation.

6.10 Safety and Loss Management System

6.10.1 Overview

The National Energy Board's OPR requires that all pipeline companies under its jurisdiction have a management system approach that enables companies to meet their obligations for safety, security and protection of the environment. Companies must establish, implement and maintain the management system to effectively manage and reduce risk, and promote continual improvement.

Trans Mountain said that it will continue to operate the expanded TMPL system in accordance with KMC's current Integrated Safety and Loss Management System (ISLMS). Trans Mountain said that the ISLMS was developed in response to the 2013 amendments to the OPR, and that it applies to all activities involving the design, construction, operation and abandonment of the TMPL system.

Trans Mountain said that systems integrity management involves structured risk identification and assessment. Integrity risk assessment results are used to prioritize maintenance activities and in-line inspection programs.

Trans Mountain said that these activities and programs are formalized in its Pipeline Integrity Management Program (IMP) and the Facilities Integrity Management Program (FIMP). Each Integrity Management Program includes the elements outlined in Annex N of CSA Z662 and confirms the operational reliability of all system components, including pump stations, terminals, remote mainline block valves and other facilities.

6.10.2 Pipeline Integrity Management Program

Trans Mountain said that the primary focus of the IMP is on the prevention of releases through the identification, assessment and management of hazards. The IMP also addresses the mitigation of the impacts of releases on people and the environment should they occur. Trans Mountain said that a baseline risk assessment would be conducted during the technical development of the expansion pipeline. The risk assessment will consider all major pipeline threats, including external corrosion, internal corrosion, cracking, third party damage, material defects, outside forces (geotechnical) and operational error. Following start-up of the expanded system, Trans Mountain would undertake annual risk assessments, with risk management activities directed toward a fundamental goal of continual improvement.

Trans Mountain said that in-line inspection (ILI) tool runs would be scheduled in accordance with Kinder Morgan's Integrity Management Program. Trans Mountain described the ILI programs as continual assessment processes with standard

intervals of five years between ILI inspections. Any anomalies detected that may grow to become an integrity threat before the next scheduled ILI inspection are either repaired or scheduled to be reassessed with an earlier ILI inspection.

Trans Mountain said that post-construction ILI inspections would be performed in addition to hydrostatic testing of the new Line 2 pipeline segments to identify any construction damage that would require repair. This would also provide baseline geometry data. It said that within a year of the new pipeline segments entering into service, a baseline ILI survey of pipeline geometry and metal loss would be undertaken with a high-resolution tool, and that a high-resolution USCD tool would be run in each of the new Line 2 pipeline segments within the first five years of operation.

Trans Mountain said that, in addition to the ILI program, other major prevention programs used on the existing Trans Mountain system include a Damage Prevention Program and a Natural Hazards Management Program. These programs would be enhanced to include the expanded TMPL system pipelines. Specifically, these programs include:

- a CP system monitoring program that consists of close interval pipe-to-soil surveys completed on a five year rotating cycle, monthly verification of the proper functioning of rectifiers and ground-beds, and annual test lead surveys (a baseline close interval survey will also be completed during the first years of operation of the expanded TMPL system);
- a slope stability monitoring and assessment program that consists of monitoring identified slopes for potential ground movement using instrumentation, visual inspection, comparisons of successive ILI runs, or a combination of these, and evaluating the potential impacts on pipeline integrity;
- a stream crossing monitoring program to ensure that erosion does not compromise the depth of cover that is required to protect the pipeline against coating damage or unacceptable stresses; and
- general depth of cover monitoring surveys conducted on a five year rotating cycle.

6.10.3 Natural Hazard Management Program

Trans Mountain said that the purpose of the Natural Hazard Management Program is to develop and maintain an inventory of hydrotechnical and geotechnical sites, and to implement a schedule of site inspections, detailed investigations, maintenance and mitigation to manage the likelihood of pipeline exposure and impact from geohazards. Trans Mountain said that its approach follows the framework of a risk management program as outlined in CSA Z662, and also the CEPA Pipeline Watercourse Management Recommended Practice.

Trans Mountain said that, following construction, the list of geohazards identified along the Project route would be incorporated into KMC's Natural Hazard Management Program, which has been systematically implemented on its existing pipeline system since 1998. Trans Mountain said that this would allow it to adaptively manage geohazards and respond to changing conditions, such as climate change. Trans Mountain would monitor slopes for potential rock fall, slope instability, and slope erosion through regular patrol of the pipeline right-of-way during operations and would mitigate where required.

Trans Mountain committed to carrying out a baseline natural hazard assessment within the first year of operation, and to update the Natural Hazard Management Program no less frequently than every five years thereafter.

6.10.4 Facility Integrity Management Program

Trans Mountain said that the safety of the facilities in the expanded TMPL system would be assured through the enhancement and application of the existing Facilities Integrity Management Plan (FIMP). Like the IMP, the FIMP has processes for the identification of all integrity hazards that could affect the safe operation of facilities, the assessment of these hazards, and the management of the hazards to prevent and mitigate the impact of petroleum releases and petroleum fires. The FIMP includes a continual assessment process that will ensure the completion of all maintenance and testing activities required for the effective operation of all preventative and consequence reduction systems.

Trans Mountain said that the FIMP uses a qualitative risk assessment process which will be applied to the development of the Project facilities early in the design process to ensure that appropriate preventive measures and consequence reduction measures are incorporated. The FIMP risk assessments will be complementary to the hazard and operability study reviews (HAZOP) conducted as part of the design process for all facilities. Trans Mountain said that the FIMP requires that risk assessments be completed on three year intervals, and will also require the periodic monitoring and assessment of facility piping under a formalized risk-based inspection program.

Trans Mountain said that inspections of all pump station and terminal piping would be included as part of scheduled maintenance activities. Aboveground piping will be visually inspected to confirm that there is no external corrosion, evidence of leakage, or other conditions that would indicate the pipe is not fit for service. Underground piping will be monitored by a combination of ILI, where feasible, and other condition monitoring technologies. Trans Mountain said that mechanical equipment, including pumps and valves, electrical equipment such as transformers and motors, and

instrumentation equipment such as meters and transmitters, are inspected at prescribed intervals. In some cases, equipment will have alarms to indicate certain operating parameters are not within specifications. Safety systems will be inspected and tested on a regular basis to confirm their correct functioning.

Trans Mountain said that equipment and systems at all facilities in the expanded TMPL system will undergo preventative maintenance to ensure the facilities meet all applicable legislative and company standards, and operate safely and with the highest levels of reliability. The frequency of inspections will be determined by legislative requirements, risk assessments, operating experience and manufacturers' recommendations. Trans Mountain said that the preventative maintenance program would be refined through the comprehensive tracking and analysis of incidents, including leaks, security incidents, near misses, significant equipment malfunctions and process upset conditions.

Trans Mountain said that monitoring programs for the facilities in the expanded TMPL system will include:

- scheduled pump station and terminal surveillance rounds and visual inspections;
- a site water handling systems and oil detection systems inspection program;
- a tank inspection program, in accordance with American Petroleum Institute (API) 653;[79]
- a valve inspection and testing program;
- a pressure vessel inspection program;
- an aboveground pipe inspection program;
- a piping integrity program;
- a flange integrity program;
- a coating inspection program;
- a marine structures inspection program;
- an electrical substation breaker thermal inspections program;
- a cathodic protection system inspection and testing program;
- a fire-suppression system inspection and testing program;
- a protective devices and alarms inspection and testing program; and
- an air quality monitoring program at the terminals.

Trans Mountain said that integrity issues identified during daily, monthly or annual inspections, or other scheduled inspections are entered into the Computerized Maintenance Management System (CMMS) and prioritized for corrective maintenance.

[79] API Standard 653- Tank Inspection, Repair, Alteration, and Reconstruction

Views of the Board

As described in this chapter and in Chapter 7, the Board is of the view that a management systems approach provides a consistent framework for the design, development and implementation of a company's protection programs. It also provides the basis for the cyclical planning, implementation, review, and adjustment of operational activities, which is essential for a company to effectively address risks, manage its resources appropriately, and achieve the desired outcomes.

The OPR requires companies to develop, implement and maintain, among other programs, an integrity management program that anticipates, prevents, manages and mitigates conditions that could adversely affect safety or the environment during the design, construction, operation, maintenance and abandonment of a pipeline. The Board is of the view that obtaining initial baseline information regarding the position and condition for the new Line 2 and new delivery pipeline segments is beneficial in identifying potentially injurious manufacturing and construction defects at an early stage, and is helpful for planning future integrity management activities. While Trans Mountain has committed to carry out some of the in-line inspections, the Board is of the view that, in some cases, the inspections should be initiated sooner after commencing operations than proposed by Trans Mountain, and that additional inspections should be conducted. Therefore, the Board would impose Condition 143 requiring Trans Mountain to conduct baseline inspections in accordance with the timelines and descriptions set out in the condition. In some cases, the inspections must be conducted within six months of commencing operations, and in no case will they be conducted more than two years after commencing operations.

The Board would also impose Condition 148 requiring Trans Mountain to file Geographic Information System (GIS) data for the Project within one year after commencing operations. The Board expect Tran Mountain provide the GIS data to local governments and Indigenous groups upon request.

To verify that input to the Natural Hazard Management Program is current and accurate, the Board would impose Condition 147 requiring Trans Mountain to file with the Board the results of its baseline natural hazard assessment within one year of commencing operations, to update it at intervals not exceeding every five years, and to integrate it into the Natural Hazard Management Program.

7.0

Construction and operations

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.) and to replace "Aboriginal" with "Indigenous," the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report.

The *National Energy Board Onshore Pipeline Regulations* (OPR) require a regulated company to design, construct, operate and abandon a pipeline in a manner that ensures the safety and security of the public and the company's employees, the safety and security of the pipeline, and the protection of property and the environment. In order to meet these obligations, the company must establish, implement, and maintain a systematic, explicit, comprehensive and proactive management system which integrates emergency management, integrity management, safety management, security management, and environmental protection programs.

Management system elements and related requirements are detailed in the OPR, sections 6.1 through 6.6, and fulfill the cycle of "plan, do, check, act." Across all program areas and throughout the lifecycle of the pipeline, a company must identify all hazards and potential hazards, and evaluate and manage the associated risks. This includes developing and implementing controls to prevent, manage and mitigate the identified hazards and risks, and communicating these controls to anyone who is exposed to the risks.

Throughout the lifecycle of a pipeline, from approval, through construction and subsequent operation and maintenance to abandonment, the Board employs the compliance verification approach outlined in Chapter 3 of this report to hold the pipeline company accountable for meeting its regulatory requirements. Regulatory requirements include:

- conditions of National Energy Board (NEB) Orders and Certificates;
- the NEB Act and regulations, including the OPR which references standards and applicable codes; and
- companies' own policies, plans, systems and commitments (including commitments made in the course of a hearing) which become regulatory requirements under provisions of applicable conditions and regulations.

NEB technical staff track and assess condition compliance, and conditions requiring approval of the Board must obtain that approval before the company can proceed with the next phase of the project. Through compliance verification activities, such as audits, inspections, meetings, and review of condition filings, and other manuals and reports, the Board verifies a company's regulatory compliance and assesses the adequacy and effectiveness of a company's management system and programs.

This chapter addresses the plans and programs which Trans Mountain said it would develop to manage safety, security and emergencies during and pertaining to Project construction. These plans and programs would be consistent with, and complementary to, existing measures that apply to Trans Mountain's current facilities and operations. Trans Mountain said it would update all existing plans and programs to include the Trans Mountain Expansion Project prior to commencing

operations, as outlined later in this chapter. For further information regarding Trans Mountain's Emergency Management Program during operation, refer to Chapter 9.

This chapter also discusses:

- Trans Mountain's proposed measures to ensure compliance with regulatory requirements during construction and subsequent operation of the Project; and
- conditions the Board would impose to make Trans Mountain's commitments and plans regulatory requirements, and to assist the Board and public in tracking Project progress and verifying regulatory compliance.

7.1 Safety, security, and emergency management during construction

Trans Mountain said that it would develop plans pertaining to construction safety, security and emergency management during the detailed design phase of the Project and submit them to the Board prior to construction.

7.1.1 Construction safety

Trans Mountain said that it would develop a Health and Safety Management Plan (HSMP) during the detailed engineering and design phase to reduce risk, and protect the health and safety of workers and the public during construction. The HSMP would conform to and incorporate OPR requirements, federal occupational health and safety requirements, applicable provincial requirements, industry standards, and Kinder Morgan Canada Inc.'s policies, standards and manuals. The HSMP would set requirements for Trans Mountain's prime contractors and allow for continuous improvement during construction.

While Trans Mountain would be the prime contractor for "pump stations, terminals and other facilities," Trans Mountain said that an external prime contractor would be assigned to each mainline pipeline spread. Each prime contractor would be required to:

- conduct a risk assessment for construction of the assigned Project component;
- develop and implement a Project Specific Safety Plan (PSSP) to meet the requirements of the HSMP; and
- submit its PSSP to Trans Mountain for approval at least 60 days prior to commencing construction.

Trans Mountain referenced numerous health and safety requirements that would be included under the HSMP, including the development of additional plans by itself or its prime contractors and the implementation of these plans during construction. Plans to be developed that directly affect public safety during construction include Traffic and Access Control Management Plans (TACMPs) and detailed contractor-developed Traffic Control Plans (TCPs). As well, a blasting management plan, fire prevention and fire contingency planning to reduce the risk of wildfires, and a noise control plan to minimize the effects of construction-related noise on the public and worker health would be developed.

Safety considerations particular to the proposed Project include construction in close proximity to the existing operating Trans Mountain Pipeline (TMPL) system and construction within the confined space of the proposed Burnaby Mountain tunnel.

With regard to construction activities in the vicinity of existing operational storage tanks, Trans Mountain committed to develop site-specific safe work procedures and mitigation measures for Edmonton, Sumas and Burnaby.

With regard to the Burnaby Mountain tunnel, Trans Mountain determined that the preferred option for the Westridge Delivery Pipelines would be a tunnel approximately 2.6 km long and at least 4 m in diameter, as described in Chapter 6, Section 6.2. Trans Mountain said that the final configuration of tunnel diameter and pipe installation would depend on the selected contractor's means and methods. However, the final tunnel diameter would be sized to provide a clearance envelope around each pipe to carry out all necessary pipeline related work in accordance with worker health and safety regulations.

Several participants expressed concerns regarding public health and safety issues, such as traffic, emergency access, noise and dust. Specific concerns are described and addressed in Chapter 11.

Trans Mountain said that controls to ensure public safety during construction would be determined through detailed construction planning and consultation with municipal authorities and stakeholders.

These controls would be integrated into the HSMP and PSSPs. Trans Mountain said that it would implement a communications program to ensure local businesses and the public were made aware of potential construction impacts, including general safety requirements, lane restrictions, road closures and alternate access plans.

Trans Mountain said that access for emergency services would be a critical component of the TACMPs and local TCPs. TACMPs would include Incident Plan and Public Information Plan sections that would consider potential impacts to

emergency vehicle access and service to communities, and ensure that municipalities, emergency response providers, and the general public were made aware of any potential traffic impacts or disruptions by the Project. TCPs would be developed in consultation with provincial and municipal representatives, and would take into account emergency vehicle traffic continuity.

Views of the Board

Sections 18 to 20 of the *National Energy Board Onshore Pipeline Regulations* require companies to take various measures to ensure the safety of employees, contractors, the public and the environment during pipeline construction, including developing a construction safety manual and submitting it to the Board. Construction safety manuals for the Project would consist of the overarching Health and Safety Management Plan, as well as individual contractor Project Specific Safety Plans, which would be developed prior to construction.

The Board would impose Condition 64 requiring submission of these manuals in advance of construction to ensure that regulatory requirements are met and safety risks pertaining to the Project are addressed, including tunnel construction and construction in close proximity to operating pipelines and facilities. The Board requires more information following detailed design of the proposed tunnel to ensure that any work conducted by workers within the tunnel can be completed safely. Therefore, the Board would impose Condition 26 requiring that confined space entry procedures for the Burnaby Mountain tunnel be submitted to the Board for approval.

The Board is of the view that additional public safety concerns will be addressed by implementation of Traffic Control Plans, Access Management Plans, Noise Management Plans, and Environmental Protection Plans, to be submitted in response to the conditions found in Chapters 10 and 11 (Conditions 47, 72, 73, 74, 78, 80, 81 and 86).

7.1.2 Construction security

Trans Mountain said that prior to commencing construction, it would conduct security risk assessments for all construction areas and implement appropriate controls, which could include physical barriers and signage, security personnel, and daily inspections during construction. A construction security management program would be developed in compliance with the OPR and would be complementary to the existing security management program for Trans Mountain operations.

Many participants expressed concern over potential vandalism or terrorism affecting the pipeline and facilities during construction and operations.

Trans Mountain said that security threats, such as vandalism or terrorism, would be addressed through the security risk assessments, development of the construction security management program, and updates to the existing operations security management program. Additionally, Trans Mountain said that it requires situations including trespass and sabotage to be addressed by the site-specific emergency response plans that would be developed by each prime contractor. Trans Mountain said that Kinder Morgan Canada (KMC) has a comprehensive security program that was developed over many years in consultation with security experts and the RCMP, but in order to maintain the effectiveness of the programs, details of the current program, proposed security program changes and the construction security program were confidential.

Views of the Board

Section 47.1 of the *National Energy Board Onshore Pipeline Regulations* requires companies to develop, implement and maintain a security management program. Guidance notes further indicate that pipelines must be designed, constructed, operated or abandoned in accordance with the applicable provisions of Canadian Standards Association Z246.1: Security management for petroleum and natural gas industry systems.

The Board would impose Condition 63 requiring Trans Mountain to confirm, prior to construction, the development of the security management program for Project construction. Due to the sensitive nature of security matters, Trans Mountain would not be required to file a copy of this program with the Board. Trans Mountain would maintain the program in its own offices and establish protocols to prevent the inadvertent release of sensitive security information (such as security risk assessments and controls) which could put the public, property and environment at risk. Once Trans Mountain has filed confirmation that the security management program for Project construction has been developed, NEB security management specialists would follow up with Trans Mountain to assess the program and verify that it is adequate and effective to address security conditions that could adversely affect people, property or the environment during Project construction.

7.1.3 Emergency preparedness and response during construction

To manage potential emergencies during Project construction, Trans Mountain said that it would develop and implement an Emergency Response Plan (ERP) separate from, and complementary to, Trans Mountain's ERPs for operations, which are

discussed in Chapter 9. Trans Mountain said that its construction ERP would be designed to ensure timely and appropriate emergency response in compliance with regulatory requirements and industry standards, and would guide the prime contractors' development of detailed site-specific ERPs. The site-specific ERPs would address personal injury or health incidents, environmental damage, fires, floods, earthquakes, rock slides, avalanches, sabotage, trespass and other emergency situations that could occur during construction. Contingency plans for potential emergencies and other events during construction are compiled in the Project Environmental Protection Plans.

Several municipalities said that the construction ERPs should be developed in consultation with applicable federal and provincial agencies, local government authorities and emergency first responders. Trans Mountain replied that it would continue to consult with stakeholders, including municipalities and their emergency responders, during the development of site-specific construction ERPs prior to the start of Project work.

Views of the Board

Section 32 of the *National Energy Board's Onshore Pipeline Regulations* requires companies to develop, review and update emergency procedures manuals, and submit manuals and updates to the Board. The Board would impose Condition 89 requiring submission of the construction Emergency Response Plans (ERPs) in advance of construction to ensure that regulatory requirements are met and that potential emergencies during construction are addressed. The Board notes Trans Mountain's commitment to continued consultation with stakeholders, including municipalities and their emergency responders, during development of its construction ERPs.

7.2 Safety, security, and emergency management during operations and maintenance

Trans Mountain said that, if approved, the completed Project would be integrated into Trans Mountain's existing programs and management system, which would be updated accordingly. Given the prominence of concerns expressed during this hearing relating to emergency management during operation of the Project, KMC's emergency management program for operating pipelines is discussed separately in Chapter 9. The safety and security management aspects of the Project during operation are discussed below.

Trans Mountain said that it would continue to operate the expanded TMPL system in accordance with KMC's current Integrated Safety and Loss Management System (ISLMS). The ISLMS was developed in response to the 2013 amendments to the OPR and applies to all activities involving the design, construction, operation, and abandonment of the TMPL system. Trans Mountain said that the ISLMS is the basis for ensuring a strong safety culture with an emphasis on continuous improvement. It outlines KMC's commitment to establishing, implementing, monitoring and continuously improving processes and controls to ensure that KMC is conducting business in a safe, environmentally responsible and sustainable manner. KMC's Environment, Health and Safety (EHS) management system is imbedded within the ISLMS.

Trans Mountain said that KMC implemented the EHS management system to ensure that risk to employees, contractors, the public, and the environment is minimized. The EHS management system integrates emergency management, security, health and safety, and environment programs, and emphasizes EHS impact prevention and continuous improvement.

Trans Mountain said that KMC's Operations Facility Security Plan identifies security measures that are required at different types of facilities at differing threat levels. The security plan is based on NEB and other national, provincial and international security standards. As for existing Trans Mountain facilities, security systems would be selected and installed at new Project facilities in accordance with considerations such as threat monitoring and analysis, tracking and trending of security incidents, and assessment of overall system and individual facility vulnerabilities.

The B.C. Wildlife Federation commented that security programs and/or systems should extend to any parts of the pipeline that have unburied pipe, including expansion joints or pigging stations, as any unburied pipe could be a target for vandalism. Trans Mountain responded that security programs and/or systems will extend to all parts of the Project during construction and operations, including parts of the pipeline that are unburied. Other participants' concerns and Trans Mountain's responses regarding security management during Project operation are discussed in Section 7.1 in combination with construction security concerns.

Many participants expressed health and safety concerns about the pipeline expansion through their communities. Some expressed specific concerns about air emissions; impacts of potential spills, ruptures or tank fires; appropriateness of pipeline routing or facility location in proximity to residences and schools; and marine safety. These concerns are discussed in Chapters 9, 10, 11 and 14. Other participants expressed general concern or lack of trust regarding Trans Mountain's safety record and commitment, as well as the general safety of the Project and the overall TMPL system. The Georgia Strait Alliance said that one of the reasons most frequently cited in a web based survey of its supporters regarding opposition to the proposed Project, was a lack of trust in the Project proponent in general and its safety record in particular. One respondent to the survey said that Kinder Morgan's safety record was abominable and the company could not be relied on to operate safely.

Some participants supported Trans Mountain's attention to safety or pipeline safety in general. While most comments collected by the Simon Fraser Student Society and The Graduate Student Society at Simon Fraser University were opposed to the pipeline, the societies said that the infrequency of serious incidents, the current need for oil, and the relative safety of pipeline transport versus rail were themes in student feedback that was supportive of the proposed Project.

Views of the Board

Section 47 of the *National Energy Board's Onshore Pipeline Regulations* (OPR) requires companies to develop, implement and maintain a safety management program that anticipates, prevents, manages and mitigates potentially dangerous conditions and exposure to those conditions. The Board acknowledges public concern regarding Trans Mountain's commitment to safety, and notes that Trans Mountain has an established Health and Safety Management System, which is subject to continuous improvement and ongoing NEB compliance verification activities.

Section 47.1 of the OPR requires companies to develop, implement and maintain a security management program, and associated guidance notes indicate that pipelines must be designed, constructed, operated and decommissioned or abandoned in accordance with the applicable provisions of Canadian Standards Association Z246.1. The Board would impose Condition 63 requiring Trans Mountain to confirm, prior to commencing operations, that it updated its existing operations security management program to incorporate the Project. Due to the sensitive nature of security matters, Trans Mountain would not be required to file a copy of this program with the Board.

Trans Mountain would maintain the program in its own offices and establish protocols to prevent the inadvertent release of sensitive security information (such as system and facility vulnerability assessments, threat monitoring, and identification of critical infrastructure) which could put the public, property and environment at risk. Under the OPR, the security management program would then be subject to assessment and ongoing NEB lifecycle compliance verification to confirm adequacy and effectiveness to address security conditions that could adversely affect people, property or the environment during Project operation.

7.3 Compliance verification

Trans Mountain described plans, programs, and management systems, including the Project Environmental Compliance Program, Project HSMP, and corporate ISLMS which it would develop or update and implement to ensure compliance with regulatory requirements, encourage continuous improvement, and reduce risk during construction and subsequent operation of the Project. Furthermore, Trans Mountain said that an inspection team of qualified and experienced personnel would inspect all phases of construction activities to ensure:

- compliance with procedures, specifications, and drawings;
- compliance with all applicable legislative requirements, approved permit conditions, and undertakings; and
- conformance with Project health, safety, security, and environmental plans and procedures. Many commenters expressed concerns regarding how the NEB would enforce the Project's conditions.

They expressed a perception that the conditions were self-reporting checklists for the company with no regulatory status or associated monitoring, enforcement or penalties. Lovel Pratt said that it was imperative that if the NEB chooses to permit the Project, all of the conditions be legally binding and transparently verifiable by all directly affected stakeholders and concerned Canadian, United States, First Nation and Tribal citizens.

Other commenters expressed concern that no conditions could prevent human error, mitigate the overall environmental effects of the Project, or prevent or effectively remediate oil spills and the resulting damage to the environment.

In comments on draft conditions associated with general Project compliance, some participants expressed concerns that the phrase "unless the NEB otherwise directs" gives the Board excessive power to alter the conditions or release Trans Mountain from the need for compliance. Participants also expressed concerns regarding condition and commitments tracking and compliance verification, and listed commitments which they said were not adequate or adequately captured in the latest update to the commitments tracking table filed by Trans Mountain during the hearing. Trans Mountain replied that it is conducting a comprehensive quality assurance/quality review process to ensure it has documented all commitments that are not confidential and that are on the NEB's record, and invited parties to direct any noted errors or omissions from the commitments tracking table to Trans Mountain for resolution. A number of participants also expressed a desire to be consulted with regard to construction scheduling, and notified of schedule updates and construction progress.

Views of the Board

The Board notes that Trans Mountain has committed to inspect all phases of construction activities to ensure that all requirements are met, and has taken a management system approach to reduce risk and facilitate continuous

improvement during construction and operations. The Board agrees that Trans Mountain must be held accountable for complying with regulatory requirements, including conditions and commitments outlined in the hearing.

The Board would impose several overarching conditions (Conditions 1, 2, 3, 4 and 5), the effect of which would be to make all commitments, plans or programs, included, referenced or agreed to on the hearing record, regulatory requirements of the Board. Furthermore, to assist the Board and all stakeholders in tracking construction progress and compliance (and to assist the Board in planning appropriate compliance verification activities), the Board would impose conditions requiring Trans Mountain to file commitments tracking tables, phased filing information, a list of temporary infrastructure sites, construction schedules, construction progress reports, and a signed confirmation of Project completion and compliance (Conditions 6, 10, 61, 62, 106 and 139).

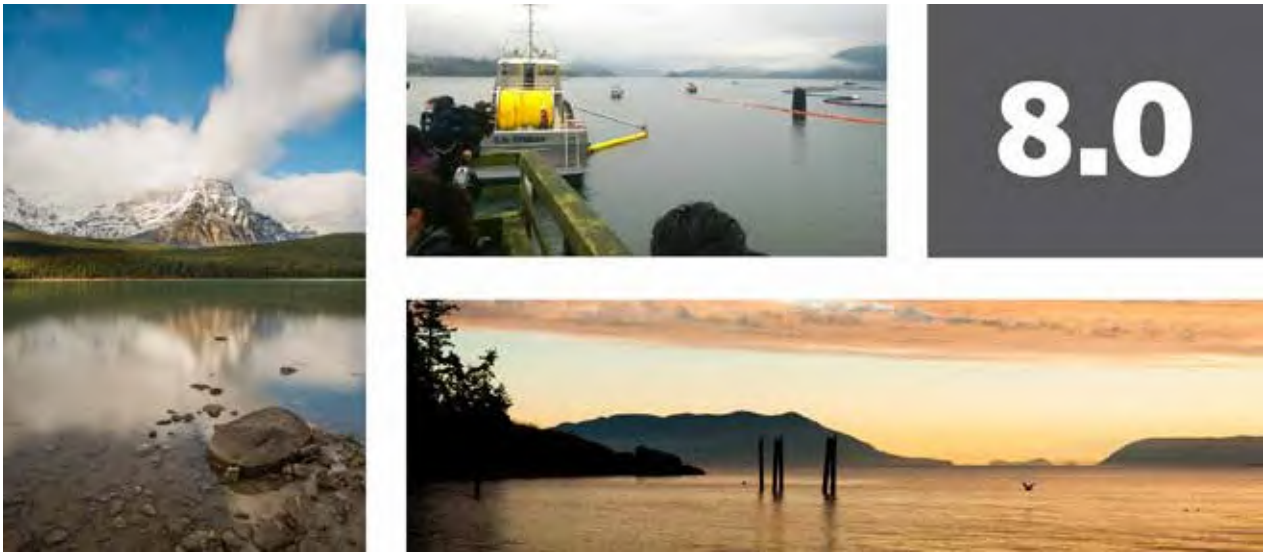
The intent of the phrase "unless the NEB otherwise directs" in Condition 1 is to provide the Board with some flexibility to vary conditions in a timely manner, if needed, without requiring the Governor in Council (GIC) approval. Changes would be considered by the Board on a case-by-case basis, within the context of the conceptual design presented by Trans Mountain in its application and the hearing, the associated level of safety and environmental protection, and the recommendation and decisions of the Board and the GIC. More substantial changes to the Project would require a variance pursuant to section 21 of the NEB Act, and variance of a Certificate would not be effective until approved by the GIC.

Some potential changes were already contemplated in the hearing process, subject to overall approval of the Project, and, if required, would be implemented by Trans Mountain in compliance with the relevant conditions (for example, Condition 108 related to contingency watercourse crossings and Condition 51 related to field changes for geohazard mitigation). If Trans Mountain wishes to make other changes to the approved Project pursuant to Condition 1 or section 21 of the NEB Act, the company would be required to submit an application to the Board, and the change could not be implemented until and unless it was assessed by NEB technical staff and approved by the Board.

The intent of Condition 6 is not to duplicate commitments made in other plans, programs or manuals which are filed with the Board. Instead, the intent is to capture commitments scattered throughout the hearing record, such as in responses to information requests or in reply argument, and compile them in a format that is readily accessible to the public, Trans Mountain personnel and NEB staff, such that commitments are tracked and implemented. The Board acknowledges Trans Mountain's ongoing review of its commitments tracking table (including the quality assurance/quality review process referenced in its reply to comments on draft conditions) and invitation for parties to direct any errors or omissions to Trans Mountain for resolution.

The Board notes the numerous mechanisms and commitments in place for coordination and consultation between Trans Mountain, and municipalities and landowners during construction planning. The Board does not require such consultation to be incorporated into Condition 62. The intent of construction schedule filings under this condition is not to consult on construction schedule development but to keep parties informed and updated with regard to the Project schedule, and thus assist the Board and those interested in tracking construction progress and compliance with other conditions and commitments.

If the Project is approved, the Board would employ its established lifecycle compliance verification and enforcement approach, as described in Chapter 3, to hold Trans Mountain accountable during construction and the subsequent operation and maintenance of the Project. Additionally, condition filings are publicly posted on the NEB's Regulatory Document Index, and condition compliance status, inspection reports, audit reports, Inspection Officer Orders, Board Orders and Administrative Monetary Penalty Notices of Violation are all publicly posted on the NEB's Compliance and Enforcement webpage.



Environmental behavior of spilled oil

The environmental behavior of spilled oil was relevant to the List of Issues for the Reconsideration. The content of this chapter has been updated since the Board's May 2016 OH-001-2014 Report to reflect the Reconsideration.

Section 8.1 is unchanged from the OH-001-2014 Report, as the Reconsideration Panel found that these views of the parties from the OH-001-2014 hearing were still applicable.

New views of the Parties from the MH-052-2018 hearing are set out in Section 8.2, followed by the Views of the Reconsideration Panel. In order for the Reconsideration Panel to reach its views, it reviewed all relevant evidence from both the OH-001-2014 hearing and MH-052-2018 hearing.

8.1 Environmental behavior of spilled oil — OH-001-2014 hearing

Trans Mountain said that the expanded Trans Mountain Pipeline (TMPL) system would have the capability to transport light and heavy crude oils, including diluted bitumen. Trans Mountain said that oil properties provide information about their potential behaviour and fate in the environment, and the potential environmental effects if a release were to occur.

Trans Mountain and a number of other participants provided information on the fate and behaviour of spilled oil. As part of its public interest mandate under the NEB Act, the Board has used this information to inform its assessment of potential environmental and socio-economic effects of oil spills, and response planning regarding the Project and related marine shipping[80]. The information and Board views within this chapter are particularly relevant to Chapters 9, 10, 11 and 14 and should be considered when reading those chapters.

The majority of concerns raised by participants about the fate and behaviour of spilled oil in relation to the Project and related marine shipping focused on spills in marine and freshwater aquatic environments. Therefore, although this chapter does discuss spills on land, it focuses predominantly on spills in aquatic environments and not on terrestrial spills. Spills on land are also discussed in Chapter 9.

[80] In its 10 September 2013 letter, the Board determined that although the increased marine shipping to and from the Westridge Marine Terminal is not part of the Project proposed by Trans Mountain, by way of Issue #5 in the Board's List of Issues, the potential environmental and socio-economic effects of those marine shipping activities, including the potential effects of accidents or malfunctions that may occur, are relevant to the Board's consideration of the application under the *National Energy Board Act*.

8.1.1 Weathering processes and the fate and behaviour of spilled oil

8.1.1.1 Land

Trans Mountain said that an oil spill on land would tend to move downslope, sink downward under gravity, and spread horizontally on the surface and in the subsurface. When the mobile oil encounters an impermeable soil structure, such as bedrock or the water table, downward movement stops and the oil spreads laterally or down the slope of the more impermeable layer. Eventually oil stops moving and is trapped in the soil or natural depressions. However, even when immobilized, the oil continues to lose mass through water (dissolution) and vapour (evaporation) phases and through biodegradation. The natural rate of depletion through these processes becomes progressively slower with time as the remaining hydrocarbons include increasingly more complex components that resist weathering. The rate and extent of movement is influenced by various factors, including properties of the hydrocarbon such as density and viscosity; type and properties of the receiving substrate; temperature; and soil saturation. Trans Mountain said that fresh diluted bitumen has a higher potential to penetrate substrate but as the oil weathers, the penetration potential would resemble that of bunker oil.

8.1.1.2 Aquatic environments

Trans Mountain said that weathering processes are similar for hydrocarbons in freshwater and marine environments, with some differences in the rate and extent at which the processes occur, due to differences in physical, chemical and hydrodynamic conditions of the receiving environments. A spill can be expected to initially float except in cases where the hydrodynamics of the receiving water are such that the oil becomes entrained through turbulent flow.

Trans Mountain said that spilled hydrocarbons undergo changes in physical and chemical properties due to the natural weathering processes of evaporation, emulsification, natural dispersion, dissolution, oxidation, interaction with particulates, and biodegradation. Physical and chemical changes occur immediately and rapidly upon release. Trans Mountain said that although these processes usually act simultaneously, their relative importance varies with time and determines the hydrocarbon fate and behaviour. The rate of change in oil properties due to weathering is dependent on a number of factors, including spreading (or containment) and environmental variables, such as temperature, currents, turbulence, winds, and sediments. Trans Mountain said that spreading, evaporation, emulsification, and dispersion and, to a lesser degree, dissolution, are initially the most important processes in oil weathering that affect the mass balance of the oil. Interactions with particulates, photo-oxidation, and biodegradation are slower, longer-term processes that determine the ultimate fate of the hydrocarbons.

Trans Mountain described the weathering processes associated with an oil spill at sea (Figure 15). Similar processes would occur for an oil spill in fresh water.

Trans Mountain said that typically, once released into the marine environment, oil begins to weather and after a period of time, it can submerge or begin to sink. When released into water, lighter components of hydrocarbons would begin to evaporate; some would dissolve into the water column, and the remainder would float as long as the density of the remaining oil is less than the density of the water into which it was released. Wave action can cause water-in-oil emulsions, which would drive the mixture towards neutral buoyancy. Adhesion to bottom sediment (e.g., beaches, riverbeds) or other sinking material can cause the oil to be submerged.

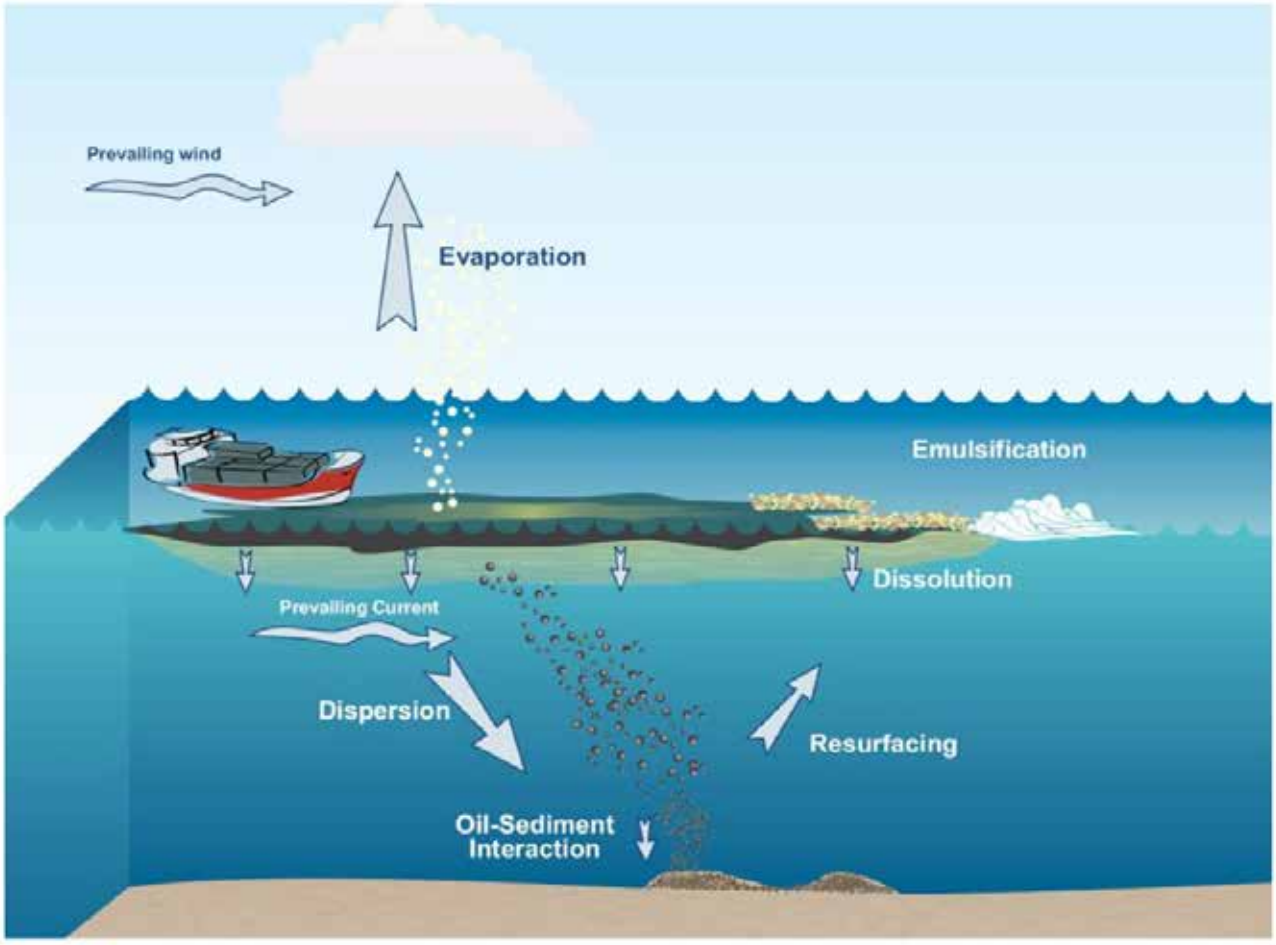
Trans Mountain said that to understand how different oils change over time while at sea, it is important to understand how weathering processes interact. Wind speed, wave heights, water temperature, salinity levels and sediment levels affect the fate and behaviour of oil in the marine environment. The speed by which weathering occurs depends on the buoyancy and viscosity of the oil. Trans Mountain said that oil slicks quickly spread to cover extensive areas of the sea surface, and variations in the thickness of the oil are typical. The rate at which the oil spreads is affected by the viscosity of the oil, as well as prevailing environmental conditions, such as temperature, water currents, tidal streams and wind speeds. The more severe the conditions, the more rapidly the oil would spread and break up.

Trans Mountain said that oil released to fresh water would be transported by the water, and that the factors influencing transport could include current speeds, size and form of the freshwater body, and wind. As oils are transported within the water body, portions may adhere to substrates or vegetation and become stranded along shorelines. To a limited degree, some residue may be retained within coarse stream or river bed substrates. Changes in water level within freshwater or tidal systems may flood or inundate areas where hydrocarbons are stranded, and refloat a portion of that material. Alternatively, falling water levels or tides may strand hydrocarbons along higher water lines or in overbank areas following flood events.

Trans Mountain said that as oils are transported, normal weathering processes continue to change the character of the oil. The rate of spreading, dissolution and dispersion of oil would be less in the low turbulence environments of ponds and lakes compared to the Burrard Inlet or an estuary setting, but higher in highly turbulent rivers where the oil would also move downstream and spread laterally. Ice formation in freshwater bodies would affect how the oil is partitioned and would have

implications for cleanup strategies and persistence of the oil. For example, diluted bitumen spilled under ice would be expected to have lower evaporation and weathering rates.

Figure 15: Oil weathering processes at sea (similar processes occur in a freshwater environment)



8.1.2 The potential fate and behaviour of oil transported by the Project

8.1.2.1 The products

Trans Mountain said that the expanded TMPL system could transport light and heavy crude oils, including diluted bitumen, which would form a large proportion of the crude oil shipped from the Westridge Marine Terminal (WMT). Trans Mountain said that the tariff on its pipeline system limits the maximum density of oil shipped to 940 kg/m³ and a maximum viscosity of 350 centistokes.

Trans Mountain said that to enable transport through the pipeline, bitumen is mixed with diluent. Typical diluents are natural gas condensate (light oil recovered from natural gas production) and synthetic crude oil (partially refined bitumen). Trans Mountain said that, in effect, the diluent is added to replace the light hydrocarbons lost from microbial degradation of the oil sands. Diluted bitumen is a stable, homogenous mixture that behaves similar to other natural crude oils when exposed to similar conditions and undergoes a weathering process. Trans Mountain said that diluted bitumen is not a bitumen in suspension, in emulsion, or a two-phase liquid.

Trans Mountain said that the shipping, oil spill response and insurance industries use the terms persistent and non-persistent oils for transportation and oil spill response planning purposes. Less persistent oils that are spilled are expected to remain in the environment for lesser time than higher persistence oils. Trans Mountain said that some simple grouping of oil types has been developed based on oil density. These oil groups range from I to V with Group I oils being the least persistent and Group V being the most persistent. Generally, oils with a lower density would be less persistent.

Trans Mountain said that Group I oils tend to dissipate completely through evaporation within a few hours and do not normally form emulsions. Group II and III oils can lose up to 40 per cent by volume through evaporation but, because of their tendency to form viscous emulsions, there is an initial volume increase as well as a curtailment of natural dispersion, particularly in the case of Group III oils. Group IV oils are very persistent due to their lack of volatile material and high viscosity, which preclude both evaporation and dispersion. Trans Mountain said that sometimes a Group V classification is used to collectively classify oils whose density is higher than that of water and would likely sink when spilled in water.

For oil spill response planning purposes, Trans Mountain said that diluted bitumen is a Group III hydrocarbon with a specific gravity equal to or greater than 0.85 and less than 0.95. Trans Mountain said that diluted bitumen, while typically rated as a Group III product, displays heavier oil behaviour when weathered. It said that the densities for the weathered oils that it tested show that they would fall under the Group IV category (specific gravity equal to, or greater than, 0.95 and less than 1.0) within the first 24 hours following a spill. This is due to initial evaporation of the lighter ends.

Numerous participants expressed concerns that diluted bitumen is likely to sink when spilled in water. Ms. Michelle Baudais said that diluted bitumen can separate in water and the bitumen component would then sink. Similarly, the Pender Islands Conservancy Association and Musqueum Indian Band said that, in the event of a spill, the solvent component of the diluted bitumen could evaporate to the point where the residual bitumen sinks.

Ms. Carol MacLeod and several other participants said that diluted bitumen is substantially different from "crude oil" and that diluted bitumen contains diluents that are highly carcinogenic.

Trans Mountain said that diluted bitumen and other crude and fuel oils with similar physical properties are transported throughout the world. It said that the general behaviour of these oils is similar with respect to fate and weathering, and spill countermeasures. Trans Mountain said that shortly after most of the evaporative loss through weathering, the remaining diluted bitumen behaves similarly in many physical respects to other heavy crude oil and common heavy fuel oils, such as Bunker C.

8.1.2.2 Weathering and aggregate formation

As discussed in Section 8.1.1, oils undergo a weathering process when exposed to the environment. Trans Mountain said that the key difference between diluted bitumen and a medium crude oil is a shorter weathering timeframe for diluted bitumen. It would generally take many days or weeks for the medium crude to weather and/or emulsify to achieve the characteristics of heavy oil, whereas a diluted bitumen may weather to a heavy oil state within one or a few days, depending on its original formulation and the active weathering processes.

Trans Mountain said that diluted bitumen products do not sink upon spilling on water. However, diluted bitumen, similar to other heavy crude and refined oils may achieve densities greater than 1000 kg/m^3 only after extensive weathering and/or sediment and water uptake. Trans Mountain said that there are multiple factors that lead to potential oil submergence or sinking. Oil viscosity can affect spreading which in turn can affect evaporation and dispersion rates. Differences in oil viscosity also contribute to changes in water and sediment uptake. Trans Mountain said that it is a well-established fact that sediment interaction with medium to heavy crude oils or fuel oils may result in submergence or sinking, as may occur with weathered diluted bitumen.

Trans Mountain said that oil-sediment interaction is not simply a function of sediment availability for the process of aggregate formation, but that the natural dispersion of oil droplets, oil viscosity, and other factors contribute to the process. A high level of energy is required to form stable aggregates. Trans Mountain said that when sediment concentrations and wave energy levels are high enough, the formation of aggregates can occur.

Trans Mountain referred to recent research conducted by NRCan and Alberta Innovates in which the authors concluded that low viscosity oils that readily disperse form oil mineral aggregates while higher viscosity oils do not disperse easily and so form less oil mineral aggregates. Consequently, increased interaction of conventional crude with sediment occurred due to its low viscosity. A diluted bitumen with higher viscosity did not disperse into the water column and a lower quantity of oil mineral aggregates formed.

8.1.2.3 Biodegradation

Trans Mountain said that the main difference between oil sands deposits and those from the rest of the Western Canadian Sedimentary Basin is that oil sands formed nearer to the surface. This resulted in oil sands deposits being subject to more microbial activity. Microbes digested most of the lighter fractions in these deposits. What remains are the heavier fractions that result in the denser, more viscous crude oil known as bitumen.

Trans Mountain said that bacterial decay of diluted bitumen in the marine environment occurs as bacteria degrade the constituent hydrocarbons in the slick. It said that the resident population of bacteria along the tanker route is clearly small

due to the general absence of a food source, as the Strait of Georgia is generally free of oil slicks. Trans Mountain said that after a spill incident, the resident population would initially multiply, as it consumed the newly available food source. At some point, the population would reach a maximum and ultimately, after a period of perhaps months, the population would return to near its initial size.

Trans Mountain said that for spills in freshwater environments, such as the Fraser River watershed, Thompson River watershed, Lower Nicola watershed, and the Upper Nicola watershed, river flow and limited industrial human activities on water in these watershed, would likely limit the size of the background oil-degrading bacterial population. Hence, the biodegradation process would take a longer time to evolve compared to areas where a natural oil degrading population may exist, such as in some harbors or downstream areas where background oil from runoff or boats is more prevalent. Trans Mountain said that inland waters along the pipeline route tend to contain higher nutrient levels compared with seawater, which may enhance the rate of microbial degradation of hydrocarbon.

The degree of biodegradation that may occur after a spill of oil sands products would be dependent on the extent to which the bitumen deposit was (naturally) degraded prior to extraction and the inherent biodegradability of the diluent. Therefore, Trans Mountain said that source bitumen that originally underwent a high degree of biodegradation would likely experience little further degradation after a release and weathering of the lighter diluent components. Trans Mountain said there has been little research done on oil sands products with respect to biodegradation and that this is an area for recommended research.

Trans Mountain said that a diluted bitumen spill to freshwater would not entirely be left to biodegrade. Only after all spill response cleanup and treatment had reached approved regulatory endpoints, and in consideration of net environmental benefit, could some portion of oil be left to biodegrade and this would typically involve a monitoring program to gauge progress.

The City of Vancouver said that, after initial evaporation, the biodegradation of remaining polycyclic aromatic hydrocarbon compounds depends on numerous factors, including the availability of microbes capable of degrading polycyclic aromatic hydrocarbons, oxygen, and inorganic nutrients to support microbial metabolism and growth, as well as the temperature, viscosity, and relative surface area of the oil. The City said that, as biodegradation and photo-oxidation proceed, the residual bitumen eventually hardens into an asphalt-like material that has low bioavailability of any remaining toxic compounds. Should diluted bitumen find its way into hypoxic subsurface sediments, there may only be modest changes in composition for decades or even a century.

Natural Resources Canada (NRCan) said that biodegradation of the largest components of all crudes and heavy fuel oils in the environment is relatively slow. With time, natural processes like photo-oxidation can break down the oil into smaller molecules allowing biodegradation of the oil. NRCan said that it was studying new spill treatment agents aimed to enhance rates of photo-oxidation of petroleum spilled on water and if successful, these treatment agents would become another tool for use during spill response.

The Squamish Nation said that heavier hydrocarbon compounds, such as those found in high proportions in diluted bitumen, are the most resistant to microbial degradation.

8.1.2.4 Submerged and sunken oil

Trans Mountain said that all heavy oils, including heavy crudes and fuels such as Bunker C, have the potential to become submerged or sunken when exposed to the right combination of conditions, such as weathering, overwash, sediment load and mixing energy. Exposure to a single condition is unlikely to cause heavy oils to become submerged or to sink.

Trans Mountain said that the Joint Review Panel for the Enbridge Northern Gateway Project found that although there is some uncertainty regarding the behavior of diluted bitumen spilled in water, the weight of evidence indicated diluted bitumen is no more likely to sink to the bottom than other heavier oils with similar physical and chemical properties. The Panel found that diluted bitumen is unlikely to sink due to natural weathering processes alone, within the timeframe in which initial, on-water response may occur, or in the absence of sediment or other particulate matter interactions.

The Shxw'ōwhámel First Nation (Shxw'ōwhámel) raised concerns about submerged and sunken oil[81]. Shxw'ōwhámel said that for all oil spills, every incident of submerged oil presents a unique set of conditions based on the type of oil, the environment in which it is spilled, and other physical processes. The Shxw'ōwhámel said that several main processes have been identified which could cause oil to sink or become submerged. For example, where the oil's density is greater than the

[81] Sunken oil is spilled oil which has negative buoyancy and will sink to the sea/riverbed. Submerged oil is spilled oil that has near-neutral buoyancy and has been submerged below the surface.

water in which it is spilled, the oil would sink to the sea/riverbed. Should the oil then move to an area with higher water densities, it may rise again.

The Shxw'ōwhámel said that, where the oil has a density close to the water in which it is spilled, wave action and currents can cause it to become submerged for periods and even trapped in the water column. This emulsification and weathering can also cause lighter oils to increase in density and become closer to that of the water. There must also be sufficient wave energy to push fragments of oil below the water's surface. The Shxw'ōwhámel also noted the potential for floating oil to interact with high concentrations of suspended sediment and submerge or sink.

The Shxw'ōwhámel said that large masses of oil that have a density close to that of water may be submerged for periods from surface turbulence. This phenomenon is called over-washing. Over washing time increases with oil density and wave size. High-viscosity, high-density oils do not spread as a coherent slick but can form "rafts" or "blobs" under the effect of waves. These blobs can be pushed rather deep into the water and take a long time to resurface.

The City of Vancouver said that under near worst-case ambient conditions of warm summer temperatures and moderate winds, spilled diluted bitumen may begin to submerge in the surface layer of the Fraser River plume and Burrard Inlet about 24 hours following initial release. The City of Vancouver said that this possibility must be addressed in oil spill risk assessments. The City of Vancouver said that the surface waters of Burrard Inlet and the Fraser River estuary are often brackish, within the Fraser River discharge plume, and approach the density of freshwater. It said that diluted bitumen is more likely to submerge as water salinity decreases. The City of Vancouver referred to studies indicating that volatility losses alone may increase the density of diluted bitumen enough to cause it to submerge in fresh or brackish water.

Environment and Climate Change Canada (ECCC) said that salinity stratification (i.e., differing layers of salinity) in the Fraser River mouth has been documented in the scientific literature. Based on the behaviours and properties of oil sands products reported in ECCC publications and in the literature, ECCC said that it expects that mixed-salinity conditions could affect the behaviour and fate of oil spilled in this type of environment.

Living Oceans Society said that, similar to the Nestucca barge spill, a spill of diluted bitumen would likely be entrained and submerged in the water column and transported to various areas along the west coast. It said that higher sea states typical of the more exposed waters along the Strait of Juan de Fuca and the west coast of Vancouver Island would promote entrainment of diluted bitumen into the water column, making the oil difficult to track.

8.1.2.5 The Gainford Study

Trans Mountain conducted research on the fate and behaviour of diluted bitumen in sea water (the Gainford Study). Trans Mountain said that this research complemented other laboratory and bench-scale tests on the fate and behavior of heavy crude oil made from Alberta oil sands. The research included a weathering test of diluted bitumen spilled in a marine environment over a 10 day period. The tests were tank tests intended to simulate wave and current conditions within Burrard Inlet, with water temperature averaging about 15°C. Two types of diluted bitumen likely shipped on the Trans Mountain system, Cold Lake Winter Blend (CLWB) and Access Western Winter Blend (AWWB), were tested.

Trans Mountain said that the Gainford Study and other tests have shown that, like other crude oils, the density of the oil increases as the lighter components evaporate. The rate at which this occurs lessens as the density and viscosity of the oil increases. The relative density of the diluted bitumen observed in the Gainford Study reached that of fresh water in eight to ten days. Trans Mountain said that no evidence of sunken or submerged diluted bitumen was observed during the Gainford Study. There was little evidence of small droplets (natural dispersion) into the water column. Instead, the oil tended to form relatively continuous floating patches on the tank surface.

Trans Mountain said that weathering through evaporative loss alone is not expected to cause the diluted bitumens it tested to submerge or sink in marine conditions, even at 0 ° C water temperature, and that Government of Canada research also acknowledged this. Trans Mountain said that diluted bitumen could sink in fresh water at colder water temperatures but only after weathering for many days. The Gainford tests showed potential sinking of weathered diluted bitumen in freshwater after approximately eight days.

Trans Mountain concluded that the behaviour of both CLWB and AWWB proved to be no different from what might be expected of other conventional heavy crudes when exposed to similar conditions. It said that the potential for oil submergence or sinking is not unique to diluted bitumen and has been documented for a number of spills.

The Squamish Nation said that the Gainford Study and other research used unrealistically thick oil slicks which reduced evaporation rates. It said that had a more natural slick thickness been used, it is likely that weathering losses, and hence density increases and submergence and sinking would be substantially faster.

Trans Mountain said that diluted bitumens, like all oils, will spread if unconfined. It said that research indicates that weathered diluted bitumens exhibit strong tendencies to form a more continuous thick mat, rather than a thin sheen, on water.

Trans Mountain concluded that based on the Gainford Study and other research, regardless of the evaporation rates assumed, the weathered diluted bitumens tested remained floating at least for the duration of each of the study periods: 13 days and 5 days on freshwater flume studies and for 10 days on brackish water.

8.1.2.6 Spill response methods in the Gainford Study

Trans Mountain said that the Gainford Study assessed the effectiveness of mechanical skimming equipment, dispersants, beach cleaning agents, and in-situ burning on CLWB. Overall, Trans Mountain concluded that alternate oil spill response methods, such as the use of dispersants and in-situ burning, were not as effective as mechanical means. Trans Mountain said that all of the mechanical skimmers tested were effective in recovering product, whether fresh, emulsified, or naturally weathered, after a 10-day exposure to ambient element conditions. Trans Mountain said that weathered CLWB did ignite in in-situ burn tests for up to 24 hours. It said that the study showed that fresh to very weathered CLWB could be effectively removed from a hard substrate through a combination of shoreline cleaner (Corexit 9580) and low to moderate water pressure flushing. Trans Mountain said that these techniques may not be suited for all types of shorelines. However, they are generally appropriate for coarse-grained materials (gravel, cobbles, and boulders, including coarse sediment mixes).

Trans Mountain said that since diluted bitumen behaves similarly to other products due to the effects of weathering, emergency response procedures and cleanup techniques for diluted bitumen would be similar to other heavy crude oil products for which emergency responders have developed procedures and techniques to respond to accidental spills. Trans Mountain said that Western Canada Marine Response Corporation participated in the Gainford Study.

In addition to the findings in the Gainford Study, Trans Mountain summarized research conducted for the American Petroleum Institute. The study indicated that diluted bitumen products may not form emulsions that are as stable as emulsions formed by some heavy conventional oils. This could result in an improved window of opportunity to burn the diluted bitumen products in-situ when compared to conventional crude oils. Both heavy conventional crude oils and diluted bitumen products achieved high viscosities when weathered. These high viscosities would require that specialized heavy oil skimmers and oil handling systems be used in a spill response. These heavy oil response packages would be effective on both oil types but may be needed somewhat earlier in the response operation in the case of diluted bitumen spills.

Chemical dispersants are likely to be a viable option for both the heavy conventional and diluted bitumen crudes only when the oils are relatively fresh and have not weathered and increased in viscosity to the point where the dispersant no longer mixes well with the oil. The window of opportunity for dispersant use would be short for both of these oil types. Trans Mountain said that the American Petroleum Institute study corroborates many of the findings of earlier studies.

8.1.2.7 Government of Canada research on the behavior, fate, and transport of diluted bitumen

Following Trans Mountain's Gainford Study, the Government of Canada completed a study on the behavior, fate, and transport of diluted bitumen. The research was conducted by ECCC, Fisheries and Oceans Canada, and Natural Resources Canada. The Government of Canada study and Trans Mountain's Gainford Study assessed the same oil types (Access Western Blend and CLWB). The Government of Canada study concluded that the question of whether diluted bitumen products spilled in the marine environment will float or sink depends on their exposure to a number of natural processes and the duration of exposure.

Trans Mountain compared the results of the Gainford Study and Government of Canada study and concluded that the Government of Canada results were generally supportive of the results in the Gainford Study. In particular, Trans Mountain said that both studies:

- showed that the weathered oils are expected to remain floating on saltwater;
- indicated that both oils would float on freshwater for a period of days;
- acknowledged that other contributing factors, such as sediment uptake, may lead to some portion of oil becoming neutrally or negatively buoyant;
- concluded that diluted bitumen oils display high viscosity and increased density relatively quickly during weathering, but otherwise behave similar to how heavy conventional crude oils and heavy refined products would behave if spilled on water;
- noted that water uptake within the oil matrix, mostly through entrainment, affects the density and viscosity; and

- documented physical properties and behaviours of the oils that make them amenable to onwater mechanical response countermeasures, such as booming and skimmers, but less amenable to dispersant use.

Trans Mountain said that the Government of Canada research indicated that fresh CLWB formed a stable emulsion with sufficient agitation. As compared to stable emulsions, mesostable emulsions generally break down substantially within one week. Trans Mountain said that more stable emulsions may be expected to break down more slowly. The degree and rate of breakdown could range from a week to more than a month and would depend on the degree of stable emulsion formation and other variables, such as ambient temperatures and exposure to air and sunlight.

ECCC said that the Government of Canada study was conducted at higher sediment concentrations than typically found in the Fraser River to demonstrate which sediment interactions with oil products were important. Further work would be needed to characterize the behavior of specific oils and to determine how important sediment interactions might be for a spill into the river or its outfall into the Salish Sea.

Elizabeth May and the Pacheedaht First Nation referred to other Government of Canada research which indicated that chemical composition differences in diluted bitumens could make one type of diluted bitumen more prone to submergence than another. The research indicated that tar balls of AWB could submerge in brackish water, and potentially sink in fresh water, after seven days of weathering in the absence of interaction with suspended particulates. The research also indicated that diluted bitumen products may sink in the open marine environment as a result of interaction with suspended sediment particles under a high energy environment.

ECCC said that where research topics overlapped, there was, in general, good agreement between Trans Mountain's research on the behavior and fate of diluted bitumen with the Government of Canada's recent research. ECCC said that there continues to be significant knowledge gaps and uncertainties for the behaviour of the hydrocarbon product classes tested in areas such as evaporation characteristics between different diluted bitumen types; emulsion behavior; shoreline adhesion; and oil/suspended sediment interactions. ECCC said that additional research in these areas would further strengthen spill response planning and risk assessment.

NRCan said that it was developing and expanding its capabilities to do research specific to the behaviour of diluted bitumen in water environments, including wave tank testing, and that it had shared preliminary results within the research community. NRCan said that it would be collaborating with ECCC and Fisheries and Oceans Canada (DFO) on this research. Information is typically provided publicly at response community meetings and through peer-reviewed publications.

8.1.2.8 Chemical characteristics of diluted bitumen

ECCC recommended that Trans Mountain commit to providing spill responders and regulators a specific suite of test data for all types of hydrocarbon products to be shipped, before shipping, to facilitate appropriate spill response preparedness. Trans Mountain said that it would not commit to providing additional information at this time as it believed further testing of the major product types shipped on its pipeline system should be informed by the results of research conducted by the Royal Society of Canada, and the Pipeline and Hazardous Materials Safety Administration work referred to in Section 8.1.4.

Trans Mountain also said that there is already an extensive database on oil composition and properties in the public domain, and that it also collects and maintains comprehensive data related to the physical and chemical characteristics of all oils transported on its system. Trans Mountain makes this information available to regulators and spill responders and trains its personnel in safely approaching a spill site. Trans Mountain said that it is able to identify the product in a storage tank and/or specific pipeline location quickly, and almost immediately provides a material safety data sheet, including the product name, to incoming first responders. As part of its ongoing public awareness program, Trans Mountain said that it also provides training to first responders that includes considerations for safest approach to a release.

The City of Vancouver said that spilled diluted bitumen loses its volatile components more quickly than normal crude oils. This can create greater inhalation and safety hazards. The City of Vancouver said that concentrations of polycyclic aromatic hydrocarbons in diluted bitumen, the most toxic components of petroleum, are comparable to typical concentrations in crude oils. Spilled diluted bitumen retains polycyclic aromatic hydrocarbons longer than conventional crude oils, and are degraded mainly through slow biodegradation and photo-oxidation. Monoaromatic hydrocarbons evaporate within the first hours to days of a spill. The City of Vancouver, the District of North Vancouver, and NS NOPE said that evaporation of diluents, including benzene, from a bitumen spill is a health and safety risk to spill responders.

The Musqueam Indian Band said that the evaporation of the lighter fraction diluent in diluted bitumen is an important weathering process. It said that approximately 50-70 per cent of volatile hydrocarbons are evaporated from heavy oil within 10 to 20 hours after a spill. It referred to research indicating that this process has been shown to take place relatively quickly, over a period of several hours to a few days. A study of diluted bitumen weathering showed that most of the volatile diluent evaporated within 24 to 48 hours. It said that recent Government of Canada research indicates that, in general, the

fate and behaviour of spilled diluted bitumen is similar to that of lighter fuel oils soon after a spill, with behavior changing to that of heavier fuel oils as weathering progresses.

The Squamish First Nation said that the chemical composition and physical properties of bitumen are key to understanding their behavior and environmental fate. It said that, compared to conventional crude oil, diluted bitumen has a greater proportion of light and heavy end molecules and less middle weight molecules. This may cause the lighter components to evaporate more quickly and leave a thicker, more viscous product behind when spilled in water. Diluted bitumen has a higher asphaltene content which may make it more likely to emulsify.

Trans Mountain noted that several intervenors questioned the relative toxicity of diluted bitumen to other crude oils. Trans Mountain said that, in general, polycyclic aromatic hydrocarbons content is low in diluted bitumens compared to many other crude oils and that multiple chemical analyses indicate that diluted bitumens should not be considered more toxic than other crude oils. Trans Mountain said that the human health risk from inhalation of light-end hydrocarbons is not unique to diluted bitumen.

8.1.2.9 Past spill events

Enbridge Kalamazoo spill

Trans Mountain referred to Enbridge Pipelines' July 2010 spill of approximately 3 200 m^3 of diluted bitumen near Marshall Michigan. Approximately 1 300 m^3 of diluted bitumen spilled into the Kalamazoo River system. Trans Mountain said that upon entering the water, the density of the crude oil was slightly less than that of water, and therefore it floated, forming an oil slick that flowed downstream where some became stranded along the banks and in calmer or backwater areas. High river flows entrained some of the oil into the water column (resulting in submerged oil) and transported it downstream. Dam spillways may have resulted in the formation of emulsions. Weathering of the lighter components and interaction of the submerged oil with suspended sediments resulted in its sinking in the water column, and the sedimentation of some crude oil on the river bottom in quiescent or net-depositional areas of the riverbed once flows decreased. Trans Mountain said that the spilled oil may also have picked up sediment through overland movement prior to entering a watercourse which may also have contributed to a portion of the submerged/sunken oil, as did sediment interaction as a result of cleanup techniques. Trans Mountain said that there is a great deal of uncertainty in the amount of oil that was subsequently not recovered and left on the river bed.

The Shxw'ōwhámel First Nation noted the uncertainty in estimates of how much oil sunk during the Kalamazoo spill. The Squamish Nation said that the U.S. EPA had estimated that 10-20 per cent of the spilled oil sank to the river bottom through turbulent mixing with suspended sediment.

Trans Mountain's Burnaby spill

Trans Mountain said that some of the diluted synthetic bitumen product from the 2007 Westridge delivery line spill in Burnaby reached the surface waters of Burrard Inlet, where it was collected and cleaned from shorelines. Trans Mountain said that, based on the rapid response, the oil was readily recoverable using conventional spill recovery equipment, including booms and skimmers, with oil recovery estimated to be greater than 90 per cent. No submerged or sunken oil was noted during that incident.

The Squamish Nation said that favorable weather conditions probably accounted for the higher than average oil recovery rate.

Nestucca Barge spill

Trans Mountain said that a spill of Bunker C heavy marine fuel oil from the Nestucca barge off Grays Harbor, Washington in 1988 resulted in some of the oil being entrained and submerged in the water column. Trans Mountain said that the high energy wave environment was most likely responsible for the submergence. Some of this oil washed up on the coast of Vancouver Island approximately two weeks later. Trans Mountain said that the density of the oil spilled was about 985 kg/m^3.

Lee Harding also referred to the submergence of oil following the Nestucca spill and subsequent washing up of the oil on Vancouver Island.

Living Oceans Society discussed the Nestucca spill and said that the physical properties and chemical composition of bitumen mined from the Alberta oil sands are closely comparable with those of Bunker C oils. Living Oceans Society said that compared with Bunker C oil, the relatively low viscosity of the diluted bitumen would allow it to spread much more quickly to form a thin slick. Once most of the diluent evaporated, the remaining bitumen may become susceptible to

submergence or sinking, and more generally its behaviour in the environment would become very similar to that of Bunker C oil.

Other spills

Trans Mountain provided an overview of other spills in similar environments. It said that studies associated with these spills provide a basis for evaluating the fate, transport and effects of hypothetical pipeline spills of diluted bitumen resulting from the Project. The case studies examined occurred in a freshwater environment, and were located in a cold temperate zone or subarctic location. Trans Mountain said that the spilled oil had physical and chemical properties similar to the diluted bitumen assessed in the ecological risk assessment which formed part of its application. Based on this review and its own research, Trans Mountain concluded that there is some potential for diluted bitumen products to sink in fresh water under some conditions (e.g., interactions between oil and suspended and bed sediments). It said that this could occur for any crude oil. Trans Mountain concluded that the primary fate of spilled diluted bitumen is expected to include weathering (including evaporative loss and dissolution into water) and shoreline stranding, with sinking expected to remain a minor loss pathway.

8.1.3 Modelling the potential fate and behaviour of diluted bitumen spills

8.1.3.1 Potential fate and behaviour of a diluted bitumen spill in a freshwater environment

To understand the fate and behaviour of spilled oil, Trans Mountain selected representative spill scenarios in fresh water bodies along the pipeline route and analyzed them for potential effects. The receiving environments included the Athabasca River, North Thompson River, and the Fraser River. A credible worst-case spill volume, ranging from 1 250 to 2 700 m^3, was modeled at each location as part of Trans Mountain's spill outflow modelling and spill extent mapping for a full-bore rupture scenario. Winter, summer, and spring and fall conditions were assessed. Predicted oil fate varied with the conditions assessed. Most of the oil transported downstream, either on the water or entrained in the water, was generally predicted to eventually strand along the shorelines. In some cases, shoreline oiling was predicted to be quite high. Formation of oil mineral aggregates was predicted to be limited in all of the scenarios assessed, although weathered oil attached to sediment or other particles was predicted to submerge or settle in lower energy areas in some cases. In winter conditions, oil could be trapped under the ice.

Trans Mountain said that the conditions of sufficient suspended sediment concentration and turbulence energy level that would result in the formation of oil mineral aggregates and subsequent sinking are rarely encountered along the lower Fraser River. Trans Mountain said that the Kalamazoo River, the site of the Enbridge Marshall, Michigan spill, has much higher turbidity levels and a more turbulent flow regime. Trans Mountain said that, in the Fraser River, oil that might be deposited to sediment would not find a low flow area where it could be trapped, as it did in the Kalamazoo River. It said that the oil would continue to be dispersed and moved down-river by natural process in the river bed. These processes would tend to break the oil up and further admix it with sand and silt particles, which would also help to facilitate biodegradation of the oil.

As part of its stochastic modelling of spills in the marine environment, discussed below, Trans Mountain also conducted spill modelling for one freshwater location, downstream of the Port Mann Bridge. This location was determined to be representative of a hypothetical incident resulting from an on-land pipe failure. The simulated spill size was 1 250 m^3.

Modelling results for this spill showed that the average length of shoreline affected by the spill ranged from a minimum of 25 km during spring, to a maximum of 36 km during winter. The majority of the oil (74 per cent) became trapped on shore. Trans Mountain said that the amount of oil bound up in oil-mineral aggregates was negligible, even though the potential to form oil mineral aggregates was greater in the Fraser River than in any other sites of study. However, Trans Mountain said that the required energy level to mix the oil and form the oil mineral aggregates was not present in the river. The amount of submerged oil was greater than at the other sites because of the lighter surface water density in the Fraser River.

Trans Mountain said that the differences observed within seasons reflected the strong dependence of the oil on flow conditions in the Fraser River. During the spring and summer when the freshet was at its maximum, the oil was carried out onto the Strait of Georgia and impacts were noted at shorelines along the Gulf Islands and into Boundary Bay. In fall and winter, the oil generally remained within the river, at least for the three-day modelling period.

The Shxw'ōwhámel First Nation conducted oil fates modelling that indicated that, within 48 hours, the density of Cold Lake Blend would reach 0.99 g/cm^3 meaning that it could potentially submerge in fresh water. The modelling showed almost no dispersion of the oil.

The Musqueam Indian Band said that overall, the literature comparing condensate-diluted bitumen to other oil types strongly suggests that, when diluted bitumen is released to surface water, it has the potential to behave as conventional oil, floating on water and becoming emulsified. Over a matter of a few hours weathering would cause spilled diluted bitumen to

lose the condensate diluent by evaporation becoming non-buoyant and potentially sinking. Based on current evidence, the presence of suspended sediment with sizes of fine- to coarse-sized sand may render oil non buoyant and cause it to sink. The Musqueam Indian Band said that there remains much uncertainty regarding the buoyancy of diluted bitumen spills in water, particularly in brackish estuaries, such as the mouth of the Fraser River. The Musqueam Indian Band said that, in summary, current research on the fate of diluted bitumen indicates, that if released into the Fraser River, it could potentially remain buoyant persisting on the surface, become stranded on shore, and/or sink to the bottom sediments as it weathers and is transported downstream.

8.1.3.2 Potential fate and behaviour of a diluted bitumen spill in a marine environment

Trans Mountain conducted stochastic (or probabilistic) computer modelling at five locations to simulate the weathering of spilled diluted bitumen in a marine environment (Figure 16).

The locations modeled include:

- Westridge Marine Terminal (Location A);
- Strait of Georgia (Location D);
- Arachne Reef (Location E);
- Strait of Juan de Fuca (south of Race Rocks) (Location G); and
- Buoy J (Location H).

As discussed in Chapter 14, Section 14.11.2, three locations along the shipping route were not modeled as the marine shipping quantitative risk analysis indicated that an incident in these areas would not likely result in an oil spill.

The modelling was conducted for two spill sizes: a large or credible worst-case scenario (16 500 m^3 for the marine sites and 160 m^3 for the Westridge site), and a medium spill case scenario (8 250 m^3 for the marine sites and 10 m^3 for the Westridge site).

Trans Mountain said that basic weathering information, such as that gained through its Gainford Study, can be used in modelling to forecast what may be expected to happen with oils under a much wider range of assumed conditions. It said that the Gainford tests were conducted to reflect average conditions of Burrard Inlet. Trans Mountain said that its research on oil fate and behaviour, and associated stochastic spill modelling were then used to inform spill response planning.

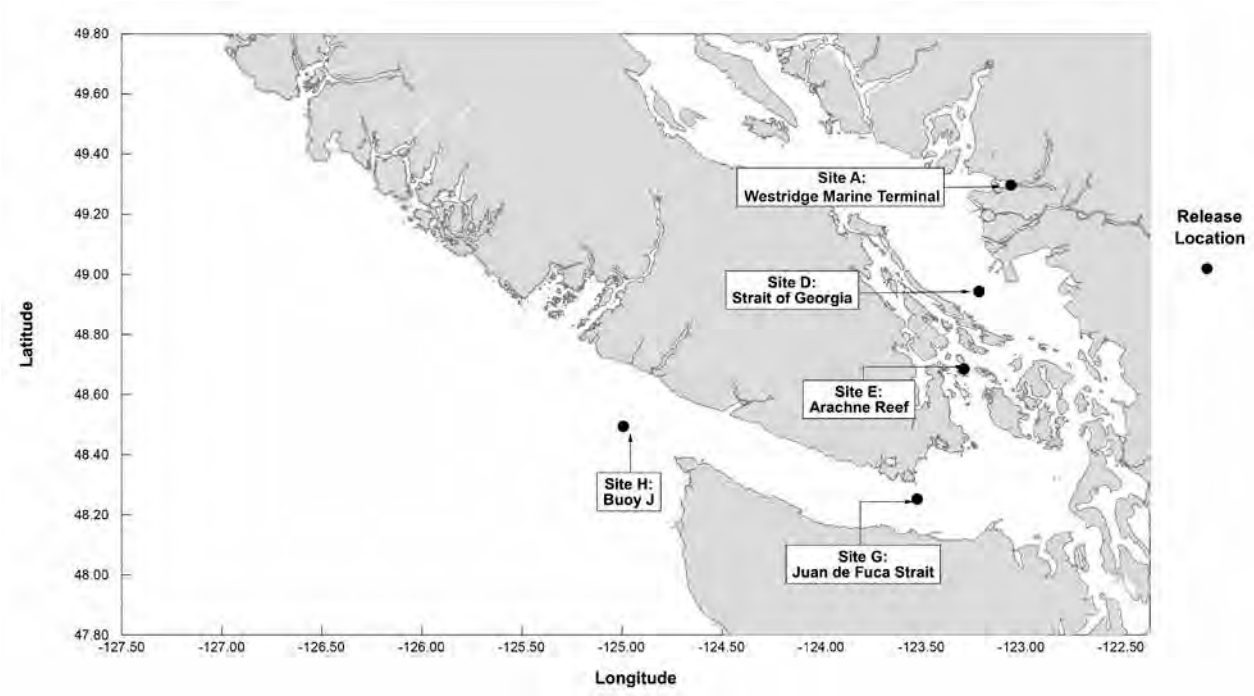
Trans Mountain said that it selected CLWB, which is diluted with condensate, as a representative product for modelling hypothetical spill scenarios since its properties are comparable to other diluted bitumen products transported on the Trans Mountain system. Trans Mountain said that the potential for light-end hydrocarbons contained in the CLWB to volatilize, dissolve or be biodegraded in the hours and days following an oil spill leads to a greater potential for the weathering oil to achieve a density that could sink, either through interaction with suspended sediment particles, or directly, if the density of the weathered oil were to exceed the density of the ambient water.

Trans Mountain said that stochastic modelling generates a probability map for oil exposure for the study area. A different map is generated for each combination of spill volume, location, and season. The stochastic modelling captured the effects of tides, winds, estuarine flow and influence from the open Pacific Ocean. Trans Mountain said that the resulting probability maps do not provide information on a specific spill, but indicate the area that is at risk. It said that an actual spill would only affect a small part of this area, but all parts are at risk. Trans Mountain said that the modelling was conducted over four seasons and showed potential areas contacted by a spill, the length of oiled shoreline, and the mass balance of the oil. (Mass balance refers to the volume of oil: on water; evaporated; retained on shorelines; dissolved; dispersed; bio-degraded; and lost through oil-mineral aggregation.)

Trans Mountain said that stochastic modelling is widely used to develop an understanding of the likely behaviour of an oil slick in the event of a spill. It said that an accidental oil spill from a Project-related tanker in transit would, depending on local currents, be driven by winds, tides and estuarine circulation, and spread and move away from the spill site. Trans Mountain said that the waters between Vancouver Island and the mainland and the interconnecting channels are influenced by tides and freshwater from the Fraser River, as well as other rivers draining into these waters. Surface winds are generally south-easterly in the winter, and north-westerly in the summer. However, weather and wind patterns can change daily.

Trans Mountain said that it chose the areas for spill modelling based on areas with the highest probability of a spill and areas that represented the range of variability in oceanographic and meteorological conditions. To provide more conservative results, the scenarios modeled assumed no spill response measures.

Figure 16: Map of spill locations for the stochastic simulations



Trans Mountain said that the modelling illustrates the importance of developing mitigation strategies that are operational within a very few hours of the start of the incident. It said that the length of shoreline oiled is relevant for determining potential ecological damage, and for estimating shoreline cleanup resources that would be required in the event of a spill.

Trans Mountain said that the mass balance of the spilled oil provides a good summary of a particular spill or, when averaged across all spills, a good understanding of spill behaviour for a spill that would occur in a particular season. It said that the amount of oil bound up in oil-mineral aggregations was negligible for all sites modeled, including the Strait of Georgia site which would be influenced by the Fraser River Plume. For all locations modeled, the majority of the oil was predicted to strand on shore. The length of shoreline oiled depended on location and conditions modeled and ranged from approximately 30 km to 450 km. Trans Mountain said that where stranding of oil on shore was predicted, it was likely to occur relatively shortly after an oil spill.

Trans Mountain said that its stochastic modelling considered the possibility of oil submerging at depth or sinking, and that the amount of oil predicted to sink or submerge in marine waters was essentially zero.

Specific to modelling conducted at Buoy J, Trans Mountain said that depending on the season, between 7 per cent (winter) and 31 per cent (summer) of the spilled oil was left on water after 15 days. The fate of the oil left on water after 15 days would be determined by the prevailing wind and surface current conditions over the course of the spill. Oil remaining on the water after 15 days would either move onto shore or, under the effect of the prevailing currents and winds, continue offshore to be ultimately dispersed in the Pacific Ocean.

The City of Vancouver expressed concern that oil submergence in the high-sediment plume of the Fraser River discharge during spring and summer would be hastened if inorganic suspended particulate material entrained in the water column adheres to the oil, increasing the density of the aggregate formed.

The Islands Trust Council said that it attended a Western Canada Marine Response Corporation (WCMRC) oil spill exercise in which the oil spill simulation software indicated that more than 30 km of Islands Trust Area shoreline would be oiled within 24 hours. Once oil is stranded on shores, the Islands Trust Council expected a lower than average recovery rate because the Salish Sea's sheltered waters are not as effective at naturally washing and flushing shorelines compared with more exposed ocean environments.

Living Oceans Society said that a 16 000 m^3 diluted bitumen spill would likely cause heavy shoreline oiling on tens of kilometres of beaches, and less severe but still substantial oiling on hundreds of kilometres, with numerous resultant environmental effects. It said that the extent of shoreline oiling associated with the Arrow 10 000 m^3 bunker C spill off the

coast of Nova Scotia was broadly consistent with the modelling results presented in the Trans Mountain application, suggesting that the modelling results are generally reasonable as estimates of the extent of likely oiled shoreline. Lingering sediment contamination could occur on a decadal time scale. Living Oceans Society said that more persistent oiling would likely result from a spill of diluted bitumen because the initial viscosity of the diluted bitumen would be much lower than the Bunker C oil released during the Arrow spill, so diluted bitumen would more readily penetrate into porous shorelines.

The City of Vancouver said that the effects, persistence, and fate of oil impinging on shorelines would depend strongly on the shoreline morphology and the environmental conditions at the time of oil stranding. Oil is least persistent on bedrock outcrops and rocky headlands because these provide relatively little surface area for adhesion and are often exposed to more energetic wave conditions that promote oil removal. Oil stranded on rocky armoured beaches may be quite persistent if it penetrates beneath the armour layer and becomes trapped in finer-grained underlying sediments. Penetration of oil stranded on the surface of sandy beaches is limited by low hydraulic permeability. Similarly, penetration of oil stranded on mudflats would likely be limited. Oil stranded on or along marine marshes or intertidal eelgrass beds may persist for years to decades if the oil associates with decaying vegetative material that may impede biodegradation of the oil.

The Pender Islands Conservancy Association said that the Pender Islands have predominantly fractured rock and gravel beaches which would be exceedingly difficult to clean in the event of a diluted bitumen spill.

The Pacheedaht First Nation said that approximately 40 per cent of the shoreline within its traditional territory would be classified as having a long oil residency index.

The Tsleil-Waututh Nation, City of Vancouver and the City of Burnaby conducted modelling of an oil spill in Burrard Inlet using an alternative model. Oil spill trajectories from four oil spill scenarios in Burrard Inlet were modeled with spill volumes ranging from 8 000 m³ at the WMT to 16 000 m³ for a tanker spill at two locations in Burrard Inlet and one location at English Bay. This modelling demonstrated that in the event of a spill of the size modeled, oil would spread quickly throughout Burrard Inlet and beyond.

The Tsleil-Waututh Nation, City of Vancouver and the City of Burnaby said that the model results documented that the vast majority of spilled oil would strand on the shoreline within 24-48 hours. They said that the model described the spread and movement of generic, non-specific floating oil and that neither the oil's physical or chemical properties, nor weathering were assessed, as consideration of these factors is not required to understand the trajectory of spilled oil on the water surface.

As discussed in Chapter 14, Section 14.11.2, Trans Mountain said that the spill volumes modeled by the Tsleil-Waututh Nation, City of Vancouver, and the City of Burnaby were not credible scenarios. Trans Mountain said that the modelling method used by those participants was appropriate for providing basic information for spill response but it was not appropriate for a detailed and comprehensive environmental and socio-economic study. Trans Mountain said that the modelling undertaken was based on an unmitigated spill scenario and that in such a scenario, it would be expected that a spill would impact a large percentage of shoreline given the confined geophysical environment of the subject area.

ECCC said that the modelling tools used by Trans Mountain appear to be appropriate. ECCC recommended that additional model verification and validation be undertaken and that a wider range of environmental inputs be built into the models.

Trans Mountain said that WCMRC, as the certified Response Organization on the west coast, maintains resources for spill response including models for planning and response. Trans Mountain said that the model used in support of its Application was not developed specifically for the Application, and the model is the property of a private consultant. It said that this consultant had indicated that they were willing to work collaboratively with WCMRC to make the model available under license, to provide consultancy services related to the model, and if desired, to improve the model's ease of use for active spill response. Trans Mountain said that WCMRC would be responsible for ongoing maintenance and updating of the model and the associated funding should they choose to use it as a response resource.

8.1.4 Additional research on the fate and behaviour of diluted bitumen

Trans Mountain discussed areas for additional research on the fate and behavior of diluted bitumen. It said that a number of references broadly agree that the fate and weathering of diluted bitumen in a marine environment is contingent on multiple factors, and that more research/experimentation is necessary to fully understand the behaviour of spilled diluted bitumen under a wide range of circumstances and conditions.

Trans Mountain said that the Joint Review Panel for the Enbridge Northern Gateway Project recommended additional research on diluted bitumen to be completed under the guidance of a Scientific Advisory Committee. Trans Mountain said that it has agreed to participate in and support the Scientific Advisory Committee process recommended by the Joint Review Panel and that it was working with the Canadian Energy Pipeline Association (CEPA) and the Canadian Association of Petroleum Producers (CAPP) to create broad industry support in this effort. Trans Mountain said that a framework for development of the Scientific Advisory Committee and its objectives had been established and formation of a management team was expected to be completed in the third quarter of 2014. This team would consist of representatives from Trans Mountain, industry, and government agencies. The management team would lead the prioritization and refinement of

research elements to be conducted in 2015. Trans Mountain said that, as part of such a joint effort, it was willing to provide funding and contributions in-kind, or both, for research to advance oil fate and behaviour knowledge applicable to detailed emergency preparedness and response planning.

Trans Mountain discussed research on the fate and behavior of diluted bitumen in aquatic environments being undertaken by the Royal Society of Canada and the United States Pipeline and Hazardous Materials Safety Administration[82]. Trans Mountain said that the Royal Society of Canada work was being undertaken in response to a request from CEPA and CAPP, and that Trans Mountain, as a CEPA member company, has agreed to support the work of the expert panel through CEPA. Trans Mountain said that a purpose of the Pipeline and Hazardous Materials Safety Administration work was to analyze whether the properties of diluted bitumen differ sufficiently from those of other crude oils commonly transported in U.S. transmission pipelines to warrant modifications of the regulations governing spill response plans, spill preparedness, or clean-up.

Research topics in the above two noted studies include:

- crude oil behaviour in different water types under a range of environmental conditions;
- crude oil chemical composition and toxicity to organisms in aquatic ecosystems;
- microbial processes on crude oils in aquatic ecosystems;
- remediation of crude oils in water and sediments;
- priorities for additional research; and
- optimal strategies for spill preparedness, spill response and environmental remediation.

The Canadian Coast Guard said that, as part of the package of World Class Tanker Safety System initiatives, the federal government is examining the characteristics and behaviour of how various blends of oil react in the marine environment. Scientists from DFO, ECCC and NRCan are conducting this research on how it may affect the sensitivities of the environment, including marine habitats and the fisheries resources they support. The Canadian Coast Guard said that this scientific information would inform the Canadian Coast Guard's knowledge of petroleum products and how they interact in the marine environment, and how to determine the best strategies for response. The findings would also be relevant to the response planning for the terrestrial portion of the Project.

The Squamish Nation said that the most significant knowledge gaps related to diluted bitumen fate and behaviour are poorly understood weathering rates and processes in a wide range of environmental conditions and different behaviours between different diluted bitumen blends.

Trans Mountain said that, although additional research would continue to provide details of specific properties and behaviour under controlled test conditions, the existing information on diluted bitumen and intermediate to lighter heavy fuel oils allows modelling of their fate and behaviour for purposes of the application and spill response planning.

8.2 Environmental behavior of spilled oil – MH-052-2018 hearing

As noted above, this Section 8.2 contains a summary of views of the parties in the Reconsideration. In the MH-052-2018 hearing, several participants submitted updated information on the environmental behaviour of spilled oil, particularly regarding diluted bitumen, the primary oil product which would be transported by the Project. Much of the information is related to research conducted since the Board's OH-001-2014 Report.

8.2.1 Reports summarizing research

Trans Mountain engaged Polaris Applied Sciences to review the status of science and research related to the fate and behaviour of oil (including diluted bitumen) spilled in aqueous environments that would have application to Project-related shipping. The review took into consideration research since the conduct of Trans Mountain's 2013 Gainford study. The report looked at six distinct areas of research: oil properties and weathering, oil-sediment interaction, shorelines and diluted bitumen, oil toxicity, biodegradation, and oil spill countermeasures.

Trans Mountain said that the Polaris report indicates that research continues to corroborate the observations made during the Gainford study that diluted bitumen, in most respects, behaves similarly to conventional crude oils and can be recovered

[82] In response to a request to file late evidence, the Board decided in Ruling 105 that the research conducted for the United States Pipeline and Hazardous Materials Safety Administration would not form part of the Board's evidentiary record for the Project, and gave reasons for its decision. As a result, the Board did not consider this research in its deliberations.

using conventional containment and recovery procedures as diluted bitumen would float on marine waters at least for days to weeks. This conclusion was based on a 2018 spill of a synthetic bitumen mixture into the Little Rock River in Iowa and research conducted by federal government scientists.

The federal departments and agencies noted the work of the Canadian Science Advisory Secretariat which completed a scientific peer review titled Status Report on the Knowledge of the Fate and Behaviour of Diluted Bitumen in the Aquatic Ecosystems in 2018. This process brought together federal scientists and external experts in a workshop format in 2017 to summarize the state of knowledge in this field and to further direct future research efforts. Key conclusions of the workshop and subsequent report included:

- Prompt response actions are of upmost importance for any spill.
- Diluted bitumen exists within the broader continuum of petroleum products. Like conventional oil products, it has a range of potential fates within different environmental components such as surface, bottom, water column, shoreline, and atmosphere.
- Conventional spill response countermeasures are as effective for diluted bitumen as they are for conventional oil products.
- New emerging technologies may improve efficiencies but no new response countermeasures are specifically required to address diluted bitumen because its fate and behaviour is within the range observed for other conventional oils, for which there exist response countermeasures.
- Viscosity and density change more rapidly for diluted bitumen compared to conventional oil products due to rapid evaporation losses and the high, heavy-end content of the weathered oil.
- The fate and behaviour of diluted bitumen is within the spectrum observed for conventional petroleum products but the routine adaptation of response tactics (e.g., skimmers for high viscosity heavy oils) may need to occur more rapidly.
- Based on the behaviour observed during recent incidents and laboratory experiments, the window-of-opportunity for surface-focused countermeasures can range from less than 24 hours to weeks, depending on specific products and site-specific environmental conditions.
- The potential risk of toxic compounds within diluted bitumen, as compared to other conventional crude products, is comparable to other oil products. The rate at which the toxic compounds reach a specific environmental component may be different. As with any spill incident, the relative risks to ecologically sensitive areas will be site and condition-specific. There remain knowledge gaps related to environmental effects.
- To inform greater understanding of the fate and behaviour of diluted bitumen and associated environmental effects and response measures, additional research was recommended with an emphasis on freshwater and cold-water conditions.

The Georgia Strait Alliance said that research summarized in the Canadian Science Advisory Secretariat 2018 report relies almost exclusively on laboratory experiments that cannot adequately reflect real world conditions in the Salish Sea. Georgia Strait Alliance said that the report results suggest that diluted bitumen behaves differently than conventional crude, that diluted bitumen may sink in saltwater in certain conditions, and that spill countermeasures may not work in the same way for diluted bitumen as for conventional crude.

Two reports on oil fate and behaviour that were not on the record during the OH-001-2014 hearing were those published by the Royal Society of Canada and the United States National Academies of Sciences, Engineering, and Medicine. Both reports were filed by or referred to by a number of participants.

- In 2015, an Expert Panel under the Royal Society of Canada published a report entitled “Behaviour and Environmental Impacts of Crude Oil Released into Aqueous Environments.” The Panel relied on scientific literature, key reports and selected oil spill case studies. The Panel found that the dozens of crude oil types transported in Canada exist along a chemical continuum, from light oils to bitumen and heavy fuels, and the unique properties of each of these oil types determine how readily spilled oil spreads, sinks, disperses, and impacts aquatic organisms, including wildlife, and what proportion ultimately degrades in the environment. Despite the importance of oil type, the Panel concluded that the overall impact of an oil spill, including the effectiveness of an oil spill response, depends mainly on the environment and conditions where the spill takes place and the time lost before remedial operations. The Panel identified a number of high priority research needs and it recommended the conduct of coordinated multi-disciplinary research programs between industry, government and academia to further study the effects of oil spills on various marine and freshwater ecosystems, including wetlands.

- In 2016, the United States National Academies of Sciences, Engineering, and Medicine published a report entitled "Spills of Diluted Bitumen from Pipelines, A Comparative Study of Environmental Fate, Effects, and Response." The committee established was tasked with a review of available literature and data to determine the current state of knowledge of the transport, fate, and effects of diluted bitumen once spilled into the environment. The committee compared diluted bitumen and "crude oils commonly transported in U.S. transmission pipelines," which were represented by a set of light and medium crudes. Among other things, the report concluded that spills of diluted bitumen pose particular challenges when they reach water bodies and in some cases, the residues can submerge or sink to the bottom of the water body, depending on densities and combining with particles present in the water. The committee said that the majority of the properties and outcomes that differ from commonly transported crudes are not associated with freshly spilled diluted bitumen, but with the weathering products that form within days after a spill. The committee made a number of recommendations regarding research, preparedness, and response and it said that more research is necessary to improve preparedness for spills of diluted bitumen and to spur more effective cleanup and mitigation measures when these spills occur.

The Province of B.C. provided an annotated bibliography of heavy oil fate and effects literature prepared by Nuka Research and Planning Group. This work included papers and research available since the Board's 2016 report and the reports prepared by the National Academies of Science, Engineering and Medicine and the Royal Society of Canada. The report summarized the state of research in certain topic areas and also highlighted areas of consensus, uncertainty, and disagreement. Areas of general consensus noted by Nuka included:

- Both conventional crude oils and diluted bitumen have the potential to submerge or sink when certain conditions are present;
- Diluted bitumen behaves similar to other heavy oils, which may include conventional crude oils and other heavy fuel blends commonly transported by ship or pipeline, or used as ship propulsion;
- Sunken and submerged oils pose challenges for spill responders to locate, track, contain, recover, and cleanup;
- Diluted bitumen toxicity is similar to, or slightly less than conventional crude oils; and
- Diluted bitumen toxicity differs depending upon the blend, with "lighter" (less dense/viscous) blends of diluted bitumen tending to have higher toxicity than heavier blends.

8.2.2 Government of Canada research

Environment and Climate Change Canada, Fisheries and Ocean Canada, and Natural Resources Canada noted a number of areas of research and other initiatives related to fate and behaviour of diluted bitumen and other oils and associated response technologies that they are working on. Examples include weathering and oil sediment interactions, alternative response measures, shoreline clean-up, and skimmers for high viscosity oils. Some of this research is being conducted in collaboration with academia, industry and oil spill responders.

Fisheries and Oceans Canada said fresh blended bitumen, from a pipeline or loaded on a tanker, will float when accidentally spilled into fresh and marine waters. However, as with conventional crude oils, the density of oil will begin to change following its release into the open environment due to natural weathering processes, such as evaporation, biodegradation, dissolution, and photo oxidation. It referred to research that it had conducted that showed that a diluted bitumen product blended with condensate (Access Western Blend) exceeded the density of fresh water within 48 hours of weathering. Fisheries and Oceans Canada said that based on experimental studies and actual field observations over a range of environmental conditions, weathered condensate/bitumen blends may remain floating from 24 hours to days. It said that there are a number of physical, chemical and environmental factors that influence the rate of density change and thus, the time of sinking for diluted bitumen, if it occurs. It also noted that weathered heavy conventional crude oils and refined products (*e.g.*, Bunker C fuel oil) may also sink under similar natural environmental conditions.

Environment and Climate Change Canada said that tests by it and other groups have found that diluted bitumen products in marine conditions generally do not sink or become submerged under the water surface as a result of evaporation, water emulsification/uptake, or photo-oxidation. It said that in fresh water, extensive evaporation may result in some diluted bitumen submerging or even sinking. Interactions with sediments can result in oil /sediment mixtures that sink.

Natural Resources Canada provided its views on references to Natural Resources Canada research within Chapter 8, Environmental Behaviour of Spilled Oil, in the Board's OH-001-2014 Report. These views were informed, where applicable, by the results of Natural Resources Canada research conducted since the Board's OH-001-2014 Report. Natural Resource Canada said:

- It agreed that research demonstrates that lower viscosity oils may be more prone to formation of oil mineral aggregates than high viscosity oils.

- Its study of new spill treating agents has concluded. It was found that the viscosity of weathered oils severely limited the action of the tested spill treatment additives. Natural Resources Canada's research effort has shifted to the study of how natural degradation processes change the oil with time and how these changes affect oil toxicity with time.
- Its research supported the conclusion of the Board that any sinking of diluted bitumen would likely be in limited quantities. It said that its research suggests that the period of time available for spill response actions on floating oil could be weeks rather than days. However, it is also agreed that depending on weathering state and environmental conditions, spilled diluted bitumen could be prone to submergence.

Elizabeth May said that research conducted by Natural Resources Canada scientists lacked accepted scientific rigour of publication in journals following peer-review and that it should not be given equal weight as other research such as that conducted Fisheries and Oceans Canada scientists. Ms. May said that she could not find public peer-reviewed articles from Natural Resources Canada lead researchers, despite the presence of their findings in recent popular media. Ms. May filed publications from Fisheries and Oceans Canada scientists, the Royal Society of Canada, the National Academy of Sciences, and the Canadian Science Advisory Secretariat.

Living Oceans Society asked Natural Resources Canada for additional details on the slick thickness used in its research informing its conclusion regarding the potential for oil mineral aggregate formation and sinking and submergence of diluted bitumen. Natural Resources Canada said that spill tank and rotary jar tests were performed with slick thicknesses of 5 mm for test comparative purposes. It said that oil spills are not uniform thicknesses and that 5 mm was chosen as a relevant intermediate value from the range of thicknesses possible. It said that major considerations for whether oil will interact with any size of sediment is the fluidity of the oil, the concentration of sediment and the energy of the mixing. As diluted bitumen weathers, its viscosity increases significantly within hours of the spill. Consequently the energy of mixing would need to be very high to get the oil to mix into the water to allow interaction with sediment after a spill in an open environment. It also noted laboratory tests that required very high sediment concentrations to get a significant proportion of the oil to sink. Natural Resources Canada said that under conditions tested to date, diluted bitumen oil masses tested, floated on fresh water for at least 21 days, allowing time for surface recovery. It noted that portions of diluted bitumen have been found to submerge in fresh water after it has been exposed to salt water due to its tendency to pick up the salt water and become more dense than fresh water. It said that to date, it has not conducted research to determine how the weathering rate, fate and behaviour of oil changes at different slick thicknesses and that it is continuing to research oil behaviour for a wider range of conditions.

The Stó:lō Collective and the Province of B.C. asked the federal departments and agencies for their views on the application of research and studies conducted in laboratory settings or geographical areas outside of the Fraser Estuary, Pacific Ocean / Salish Sea, and the Strait of Juan de Fuca to these areas and to "real world conditions":

- Natural Resources Canada said that the accumulated knowledge from previous spill events, supplemented with lab- and tank-scale testing under specific conditions, provides sufficient knowledge to understand the range of behaviours that diluted bitumen may have if spilled in the Pacific Ocean / Salish Sea and the Strait of Juan de Fuca. Natural Resources Canada described its laboratory testing methodologies. It said that research simulations of spill conditions in open tank systems are closest to field spill scenarios. It said that there is scientific consensus that behaviour of all crudes including diluted bitumen will depend upon the environmental conditions of the spill and that the behaviour of diluted bitumen products falls within the range of behaviours found for petroleum crude oils and products. Thus, current spill response technologies for recovery of both floating and sunken oils can be used. However, as diluted bitumen viscosity increases relatively quickly after a spill, use of spill treatment agents such as dispersants have relatively short windows of opportunity for use.
- Environment and Climate Change Canada said that collectively the information that it submitted into evidence and those from other departments, are very valuable in understanding the range of behaviours possible in the waters of southern B.C. While more work is pending, it said that at this time, these studies provide a foundation of knowledge that answer many of the questions of how oil sands products, including diluted bitumen, may behave in the coastal waters of southern B.C. if spilled. It said that lab scale tests inform understanding of the influence of factors such as oil type, water salinity, sediment size, and environmental conditions on oil, water and sediment interaction. These influences may then be validated at a larger scale in test tanks, field tests or spill events. It said that a unique feature of Environment and Climate Change Canada's oil spill research program is that results are applied to actual spill incidents, providing assistance to spill responders and conversely, receiving feedback to the researchers on the direction of their work.
- Fisheries and Oceans Canada said while not specific to the Salish Sea, evidence provided by the federal departments and agencies provide data on hydrocarbon behaviour over a range of temperature, salinity and substrate types in the environment, as well as under controlled lab conditions. Taken together, the data may be used to make predictions for the fate and behaviour of oil in areas in which oil spills have not occurred.

8.2.3 Intervenor reports and evidence

The Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, City of Vancouver, and Living Oceans Society filed a report prepared by Dr. Jeffrey Short on the fate and effect of oil spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary. In this report, Dr. Short submitted that the Board concluded in its OH-001-2014 Report that diluted bitumen from an oil spill originating from the Project may submerge in receiving waters in only limited quantities if at all, and only after several days exposure on the sea surface, during which time most of any diluted bitumen released would be retrieved or remediated by oil spill response actions. Dr. Short also submitted that in reaching this conclusion, the NEB selectively accepted evidence presented by Trans Mountain while discounting or ignoring evidence presented by intervenors that diluted bitumen could submerge much more rapidly.

In his report, Dr. Short also said that if a diluted bitumen spill were to occur within the spring freshet of the Fraser River, including within Burrard Inlet, and under specific environmental conditions, diluted bitumen could submerge within as little as one or two days and in large quantities over widespread areas. This assessment was based on factors such as potential sediment loads, oil film thickness, wind speed, and the temperature and salinity of the surface water.

The Coldwater Indian Band also referred to Dr. Short's report in a report prepared by PGL Environmental Consultants that it filed on potential marine shipping effects on anadromous species. Cheam First Nation, Chawathil First Nation, Kwantlen First Nation, Seabird Island Band, and Stó:lō Tribal Council filed an additional report by PGL Environmental Consultants on potential effects of Project-related vessel traffic. In both reports, based on Dr. Short's conclusions, PGL submitted that diluted bitumen could sink in a relatively short period of time and once sinking, would not be amenable to surface technologies for recovering crude oil spills. PGL also said that the summary report on oil fate and behaviour prepared by Polaris Applied Sciences, submitted by Trans Mountain, overstates similarities between conventional crude oil and diluted bitumen and over-generalizes the behaviour of oil in fresh and salt water.

Trans Mountain said that the contents of Dr. Short's report submitted during the MH-052-2018 hearing are generally the same as those submitted during the OH-001-2014 hearing and therefore, should not alter the Board's determinations in the OH-001-2014 hearing. It said that the likelihood of an oil spill from Project-tankers is low, and there is no evidence that it could occur at the mouth of the Fraser River. It also said that Dr. Short erroneously interpreted the intent and conclusions of Trans Mountain's evidence regarding the fate and behaviour of diluted bitumen and that the opinions presented lack substantiation through provision of specific numbers or reference to relevant expert studies.

Trans Mountain said that studies indicate that a portion of oil, under certain conditions, may submerge or sink, and that these same factors apply to all conventional and unconventional oils. Trans Mountain said that the PGL report prepared for the Coldwater Indian Band relies on incorrect assumptions and it produces incorrect conclusions that cannot be relied on by the Board in the Reconsideration proceeding.

In a report prepared for the Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, and the City of Vancouver, Nuka Research and Planning Group said that new research supports its earlier conclusions that conditions in the Lower Fraser River favour sinking or submergence of diluted bitumen during certain conditions.

Trans Mountain said that past studies have shown that the potential for oil sediment interaction (oil mineral aggregate formation), in the Fraser River or at the mouth of the Fraser River is very unlikely. It said that the required mixing energy level and suspended sediment concentration are too low at this location to result in the formation of oil mineral aggregates. Trans Mountain said that the issues raised by Nuka in the MH-052-2018 hearing were considered and acknowledged by the Board in its OH-001-2014 Report and that Nuka was restating the same issues. It said that the information presented by Nuka in the MH-052-2018 hearing should not change the findings or conclusions of the Board's OH-001-2014 Report.

Cheam First Nation, Chawathil First Nation, Kwantlen First Nation, Seabird Island Band, and Stó:lō Tribal Council said that potential effects of a diluted bitumen spill on the Fraser River have not been adequately considered as there is uncertainty regarding diluted bitumen effects as well as the interaction of diluted bitumen in the complex tidal environment of the Fraser River estuary.] In relation to this concern, Environment and Climate Change Canada referred to research that concluded that the mixing energy and sediment load/type conditions of the lower Fraser are unlikely to form oil particle aggregates but shoreline interactions could increase the potential for oil particle aggregate formation. Fisheries and Oceans Canada noted that although the Fraser River carries sand (coarse particles) during the peak annual freshet, most of the sand settles to the bottom in the upper or mid-reaches of the river, and little of it reaches the mouth. At the river mouth, the particles are predominantly silt and clay (fine to medium-sized particles). Once the river outflow enters the Strait of Georgia, the larger particles sink first, leaving only the finest particles in suspension. It also referred to laboratory experiments that showed the formation of oil particle aggregates at particle concentrations much higher than those expected at or outside the mouth of the Fraser River.

Cowichan Tribes provided an assessment of potential oil fate and behaviour in two reports prepared by EnviroEmerg Consulting. EnviroEmerg said that new studies since the Board's OH-001-2014 Report indicate that diluted bitumen spills present a new challenge for assessing related environmental impacts as their properties are different from conventional oil.

It said that relative to conventional petroleum products, diluted bitumen products evaporate faster, mix more rapidly with sediments, sink faster than conventional oils and disperse less when interacting with some chemical dispersants EnviroEmerg also said that it is generally understood that diluted bitumen products will mostly float even after weathering or having interacted with sediments but it highlighted challenges with response to submerged and sunken diluted bitumen, particularly for a large spill in a large ecosystem such as the Salish Sea.

Elizabeth May said that evidence filed in the OH-001-2014 hearing by ocean scientist David Farmer was ignored since it deals with marine issues. Mr. Farmer's research included findings related to the potential subduction of spilled diluted bitumen below the water surface due to the presence of active tidal fronts along the marine shipping route.

8.2.4 Ongoing research initiatives

Trans Mountain said that it continues to engage with Indigenous groups, the B.C. Ministry of Environment and Climate Change, Ministry of Natural Gas Development, B.C. Oil and Gas Commission, Environment and Climate Change Canada, and Canadian Coast Guard regarding research on the fate and behaviour of diluted bitumen. Trans Mountain is currently either funding or supporting a number of research initiatives, Examples include:

- An independent study commissioned by the Canadian Association of Petroleum Producers and the Canadian Energy Pipeline Association. The study is designed to evaluate and compare the physical and chemical properties of various types of crude oil, including several diluted bitumen products. The products are tested to determine how fresh and weathered oils behave in various marine, estuarine and freshwater settings, under different environmental conditions. The research is being conducted under the guidance of a scientific advisory committee. Trans Mountain said that objective of the study is to continue to inform and improve oil spill preparedness and oil spill response capabilities. The study is planned for completion by the end of 2019.
- Research being conducted by the International Institute for Sustainable Development at the Experimental Lakes Area in Ontario. This multi-year industry and government collaborative program is examining the fate and behavior of diluted bitumen and conventional heavy crude oil in a freshwater shoreline environment. The research involves a controlled spill of oil in the environment and assessment of product recovery efficiency, degradation rates, and cleanup methods. Research results are scheduled to be available in February 2020, with additional monitoring results to follow in 2021.
- Development of an Underwater Seabed Cleanup and Assessment Technique Guide to support planning, decision-making and operational response to nearshore oil that may have submerged or sunken. This initiative is led by a technical advisory committee and funded by various partners.

Trans Mountain said that these and other future research findings would be considered and incorporated into Trans Mountain's emergency response planning, as they become available.

The federal departments and agencies said that it is important that spill responders have the information needed to predict the fate, behaviour and trajectory of a spill, determine the best response plans and actions, and be equipped with the best spill response technologies and equipment. They said that Environment and Climate Change Canada, Fisheries and Oceans Canada and Natural Resources Canada have several ongoing science and research initiatives related to oil spill preparedness and response. The federal departments and agencies said that since 2012, their understanding has improved of the fate and behaviour of petroleum products, including diluted bitumen spilled in marine and fresh waters. They noted that federal scientists, in collaboration with other levels of government, academia, and the private sector, have published more than 60 peer-reviewed papers or conference presentations on diluted bitumen. As part of Oceans Protection Plan funding, $80 million in new science funding for new partnerships was announced, to develop improved knowledge and new technologies.

The federal departments and agencies described the Multi-Partner Research Initiative for Marine Oil Spills. This $45.5 million research program is intended to leverage collaboration on oil spill research among researchers across Canada and around the world. The aim is to advance scientific knowledge in oil spill response and remediation strategies, with a focus on alternative response measures such as spill treating agents, in situ burning, oil translocation, decanting and oily waste disposal, and natural attenuation / bioremediation. Nineteen research projects were launched in 2018-2019. The federal departments and agencies said that the results of most of these projects would be relevant to B.C. as they would assist in the decision-making process should a spill occur as well as providing new options for oil spill response.

Natural Resources Canada said that in collaboration with Environment and Climate Change Canada and Fisheries and Oceans Canada, it was continuing to do research specific to the behaviour of diluted bitumen in water environments, including wave tank testing. In particular, Natural Resources Canada is continuing to explore how air and water temperatures may impact oil behaviour.

Views of the Reconsideration Panel

Taking into consideration new reports and studies that have been completed on this subject since OH-001-2014 as well as considering previous evidence, the Board is satisfied that sufficient evidence has been placed on the record regarding the fate and behavior of an oil spill to support assessment of potential spill-related effects and spill response planning. The Board's views focus on the fate and behavior of oil, primarily diluted bitumen, spilled in aquatic environments. The Board's views on clean-up and remediation of spills to land are included in Chapter 9.

The Board's views on the fate and behaviour of spilled diluted bitumen must be considered in the context that the fate and behavior of any spilled oil ultimately depends on the specific physical and chemical properties of the spilled oil and environmental conditions at the time of the spill event. These conditions, in turn, affect the chemical and physical properties of the spilled oil and subsequent weathering processes and environmental effects, as noted by Trans Mountain, federal departments and agencies, and the City of Vancouver. The Board accepts the Royal Society of Canada's conclusion that despite the importance of oil type, the overall impact of an oil spill, including the effectiveness of an oil spill response, depends mainly on the environment and conditions where the spill takes place and the time lost before remedial operations.

The Board's overall conclusions on the fate and behaviour of spilled diluted bitumen, with an emphasis on that spilled in aquatic environments, are provided at the end of this section.

General properties of diluted bitumen

In the OH-001-2014 hearing, Trans Mountain provided evidence, including its Gainford study, modelling, and a review of other research and past spills that indicates diluted bitumen acts initially as a Group III oil but quite quickly weathers to a heavier Group IV oil state. In the MH-052-2018 hearing, Trans Mountain provided a summary of research conducted since its 2013 Gainford study, prepared by Polaris Applied Sciences, that also indicated the relatively rapid changes in diluted bitumen density and viscosity during initial weathering. This evidence indicates that after initial weathering, diluted bitumen behaves similar to other heavy crude oils and common heavy fuel oils, such as Bunker C. Environment and Climate Change Canada said that, in general, there was good agreement between its research and Trans Mountain's Gainford Study, although Environment and Climate Change Canada also identified knowledge gaps and uncertainties regarding the fate and behavior of diluted bitumen.

Trans Mountain provided evidence that diluted bitumen is not a simple two phase product in which the diluent portion evaporates when spilled, leaving the bitumen portion behind. Rather, diluted bitumen is a blended product with its own unique weathering properties. Trans Mountain's research, and that of the federal departments and agencies, and evidence filed by the Musqueam Indian Band indicate that these properties include rapid initial weathering and potential to form emulsions in water. The Polaris Applied Sciences report concluded that studies on the physical and chemical properties of oil sands crudes show that diluted bitumen products do not abruptly lose the diluent to revert to native bitumen.

The Board heard concerns from many participants regarding the toxicity of diluted bitumen and the fact that it contains carcinogenic compounds, such as benzene. Evidence filed by Trans Mountain, federal departments and agencies, and the Province of British Columbia indicates that although it may be more persistent in the environment, the actual toxicity of diluted bitumen is comparable to, or lower than other crude oils.

The above-noted evidence informed the Board's conclusions regarding the general properties of diluted bitumen which are provided at the end of this section.

Research

During the OH-001-2014 hearing, parties such as Trans Mountain and Environment and Climate Change Canada noted the need for additional research on the fate and behavior of spilled oils. At that time, the Board acknowledged the ongoing research on the fate and behavior of spilled oils, including diluted bitumen products. This research was being conducted by the Royal Society of Canada, the United States National Academies of Sciences, Engineering, and Medicine (sponsored by the United States Pipeline and Hazardous Materials and Safety Administration), and the federal departments and agencies. The Board concluded that the results of this research should continue to inform the potential fate and behavior of spilled oils and assist companies and spill response agencies in spill response planning.

The evidence before the Board during the MH-052-2018 hearing indicates that a substantial amount of work related to the environmental behaviour of spilled oil has been conducted or is ongoing since the Board's OH-001-2014 Report. This work includes original research at the laboratory, mesoscale, and field levels, literature reviews, conferences and workshops, and summary reports collectively prepared by experts in the field. Much of this work has focused on the fate and behaviour of diluted bitumen and related response measures and technologies. Participants in the research

and other work include representatives from government, academia, and private industry at both the national and international level. Research is being funded by government, private, and academic sources.

The Board notes that the evidence indicates that there is communication and collaboration amongst experts and researchers examining the fate and behaviour of spilled oils. Many of the same individuals are cited in original research, conference presentations, or cited as contributors (authors, reviewers, or presenters) to summary reports such as the Royal Society and National Academy of Sciences reports, and the Canadian Science Advisory Secretariat workshop and report. Natural Resources Canada said that it is collaborating in its research with Environment and Climate Change Canada and Fisheries and Oceans Canada. The Board views this communication and collaboration as an important element in maintaining the scientific validity of research and related findings as it balances potentially conflicting objectives and views amongst those involved in the research.

Elizabeth May said that research conducted by Natural Resources Canada should not be given the same weight as that conducted by Fisheries and Oceans Canada as it lacked the scientific rigour of publication in peer-reviewed journals. The Board does not share this view. The Board notes that evidence filed by Natural Resources Canada includes references to Natural Resources Canada research that was published in scientific journals as well as technical conference presentations and papers. Further, the Board notes the collaborative nature of the research being conducted on the fate and behaviour of diluted bitumen and notes that Natural Resources Canada scientists contributed to the Canadian Sciences Advisory Secretariat, Royal Society of Canada and National Academy of Sciences reports, all of which were referred to, and filed by Ms. May. This indicates to the Board that the work being conducted by Natural Resources Canada is considered as scientifically valid amongst those with expertise in the area.

In addition to the original research filed, the Board considers the Canadian Sciences Advisory Secretariat, Royal Society of Canada, and National Academy of Sciences reports as valuable sources of information pertaining to the potential fate and behaviour of oils to be transported by the Project, including diluted bitumen. The Board notes that the Canadian Sciences Advisory Secretariat report focused on diluted bitumen and the Royal Society of Canada report considered a range of crude oil types transported in Canada, including diluted bitumen. In contrast, the National Academy of Sciences report compared diluted bitumen to light and medium crudes and this comparison was not surprisingly, reflected in some of the conclusions reached in the report. For example, the report notes the high density, viscosity, and adhesion properties of diluted bitumen as it weathers as compared to light and medium crudes and discusses resultant potential response challenges. The Board finds that this observation is in line with what it said in its OH-001-2014 Report that after initial weathering, diluted bitumen behaves similar to other heavy crude oils and common heavy fuel oils such as Bunker C which would not be considered light or medium crudes. Thus, as discussed below and in Chapter 14, oil spill response planning should take into account the potential fate and behaviour of diluted bitumen which could differ from lighter oil products.

The Board accepts evidence filed that there are areas of general consensus amongst those with expertise in oil fate and behaviour research and oil spill response regarding the fate and behaviour of diluted bitumen. These areas of consensus were noted in the Canadian Sciences Advisory Secretariat report and in the literature review conducted by Nuka Research and Planning Group for the Province of British Columbia and are described under “Reports Summarizing Research.” These areas of general consensus relate to the fate and behaviour of spilled diluted bitumen and associated response measures.

The federal departments and agencies said that accumulated knowledge to date provides sufficient knowledge to understand the range of behaviours that diluted bitumen may have if spilled in Project area. The Board accepts the views of the federal departments and agencies regarding the applicability of research conducted to date to potential spills associated with the Project. The evidence indicates that a variety of research has been conducted using a range of methodologies and under varying simulated environmental conditions sufficient to inform understanding of potential environmental effects and to inform spill response planning. This research has been further informed by actual spill events of diluted bitumen and similar products.

Sinking and submergence of diluted bitumen

The Board notes that it has differentiated between the sinking of oil to the bottom of the sea or watercourse, and the submergence of oil to below the water surface.

Evidence filed by parties, such as Trans Mountain, the federal departments and agencies, and other intervenors, and past spill examples indicates that diluted bitumen would not typically sink in large quantities, or as a continuous mat in both freshwater and marine environments. Included in this evidence were the results of research conducted by Trans Mountain, the federal departments and agencies, and Alberta Innovates. Trans Mountain also referred to the findings of the Joint Review Panel for the Enbridge Northern Gateway Project with regard to the potential for diluted bitumen to sink in an aquatic environment. Elizabeth May and the Pacheedaht First Nation referred to research conducted by the federal departments and agencies indicating that some diluted bitumen products could submerge in brackish water or

potentially sink in fresh water after approximately seven days of weathering in the absence of interaction with suspended particulates.

In its OH-001-2014 Report, the Board found that the weight of the evidence indicates that any sinking of diluted bitumen would likely be in limited quantities and only after sufficient weathering over a period of days or interaction with sediment and other organic matter under the right environmental conditions. Evidence filed during the MH-052-2018 hearing leads the Board to conclude that this finding remains valid.

The Board is of the view that depending on weathering state and environmental conditions, spilled diluted bitumen could be prone to submergence in an aquatic environment. A number of parties filed evidence confirming this view. This potential for submergence must be considered in response planning.

The Board's views on the potential for spilled diluted bitumen to sink or submerge are further elaborated on below and at the end of this section.

The Board is of the view that the evidence prepared by Dr. Short is not substantively different than that considered previously by the Board in its OH-001-2014 Report. Further, the Board is of the view that Dr. Short fundamentally mischaracterized the Board's findings in its OH-001-2014 Report. The Board did not conclude that submergence of diluted bitumen would occur only after several days of exposure on the sea surface, during which time most of any diluted bitumen released would be retrieved or remediated by oil spill response actions. Nor did the Board selectively accept evidence presented by Trans Mountain while discounting or ignoring evidence presented by intervenors that diluted bitumen could submerge much more rapidly due to factors such as slick thickness, environmental conditions, and sediment levels.

Rather, the Board distinguished between submerged and sunken oil and concluded that the weight of the evidence indicates that any sinking would likely be in limited quantities and only after sufficient weathering over a period of days or interaction with sediment and other organic matter under the right environmental conditions. The Board said that depending on weathering state and environmental conditions, spilled diluted bitumen could be prone to submergence in an aquatic environment and that this potential for submergence must be considered in response planning. The Board also said that the fate and behaviour of any spilled oil ultimately depends on the specific physical and chemical properties of the spilled oil and environmental conditions at the time of the spill event. Evidence considered by the Board in reaching these conclusions included that filed by many participants on a wide variety of topics related to potential fate and behaviour in varying environmental conditions. Further, the Board concluded that the circumstances associated with each spill event would affect the success of the response and there is no guarantee that a spill response would result in the on-water recovery of a significant portion of the oil spilled.

Regarding Dr. Short's assertion that under specific environmental conditions, spilled diluted bitumen within the spring freshet of the Fraser River could submerge within as little as one or two days and in large quantities over widespread areas, the Board notes that issues pertaining to the effects of slick thickness and temperature and salinity of surface water were considered in the OH-001-2014 hearing and informed the Board's views regarding the potential for diluted bitumen to sink or submerge. The Board also notes evidence filed in the MH-052-2018 hearing by Environment and Climate Change Canada, Fisheries and Oceans Canada, and Trans Mountain indicates that the mixing energy and sediment load/type conditions of the lower Fraser River are unlikely to form oil particle aggregates. Natural Resources Canada said that the 5 mm slick thickness used in its research was chosen as a relevant intermediate value from the range of thicknesses possible. Although possible, the Board is of the view that the weight of evidence discussed in the OH-001-2014 and MH-052-2018 hearings does not support Dr. Short's assertion that rapid, widespread submergence of diluted bitumen as a likely event. Further, the marine shipping risk analysis does not indicate that a spill in the areas predominantly affected by the Fraser River freshet as a likely scenario (see Chapter 14).

The Board finds that Dr. Short's evidence was relied upon in reaching the conclusions contained in the PGL Reports filed by the Coldwater Indian Band and other First Nations regarding the potential sinking and submergence of diluted bitumen. Thus, the Board's views on Dr. Short's evidence have also informed its assessment of the PGL reports.

In both the OH-001-2014 and MH-052-2018 hearings, Nuka Research and Planning Group also said that conditions in the Lower Fraser River favour sinking or submergence of diluted bitumen during certain conditions. As described above in its views regarding the same issue raised by Dr. Short, the Board is of the view that the weight of evidence does not indicate rapid, widespread submergence of diluted bitumen as a likely event in the lower Fraser River.

The Board notes that some research referred to by Dr. Short in the OH-001-2014 hearing and Fisheries and Oceans and Canada, Elizabeth May, and others in the MH-052-2018 hearing indicates that some diluted bitumen blends such as Access Western Blend may be more prone to sinking or submergence under certain environmental conditions within a relatively short time frame. The research filed during the MH-052-2018 hearing did not distinguish between sunken and submerged oil but it showed that a diluted bitumen product blended with condensate exceeded the density of fresh water within 48 hours of weathering. The Board notes that individuals conducting this research

represented three different organizations and some also contributed to the Canadian Sciences Advisory Secretariat, Royal Society of Canada, and National Academy of Sciences reports. The Canadian Sciences Advisory Secretariat report acknowledged that the window-of-opportunity for surface-focused countermeasures can range from less than 24 hours to weeks, depending on specific products and site-specific environmental conditions. The Board considers that this finding is in line with its conclusions regarding the potential for diluted bitumen to sink or submerge as noted above in its comments on Dr. Short's report.

In its reports prepared for the Cowichan Tribes, EnviroEmerg Consulting commented on the potential fate and behaviour of spilled diluted bitumen. Based on the collective weight of evidence discussed throughout the Board's views, the Board accepts EnviroEmerg's conclusion that it is generally understood that diluted bitumen products will mostly float even after weathering or having interacted with sediments. The Board also accepts that diluted bitumen products are subject to initial rapid evaporation and are not amenable to dispersant application (see Chapter 14). As discussed below under "Responding to Diluted Bitumen Spills," the Board agrees that there would be specific challenges in responding to submerged and sunken diluted bitumen. The Board does not agree with EnviroEmerg's conclusions that diluted bitumen products mix more rapidly with sediments and sink faster than conventional oils based on the weight of evidence. Natural Resources Canada said that research demonstrates that lower viscosity oils may be more prone to formation of oil mineral aggregates than high viscosity oils. Trans Mountain said that research conducted by Natural Resources Canada and Alberta Innovates concluded that low viscosity oils that readily disperse form oil mineral aggregates while higher viscosity oils do not disperse easily and so form less oil mineral aggregates.

The Board does not agree with Elizabeth May's statement that the research of ocean scientist David Farmer was ignored in the OH-001-2014 hearing since it deals with marine issues. The Board notes that marine shipping safety and the potential effects of marine shipping, including accidents and malfunctions, were considered extensively in its OH-001-2014 hearing. The Board points out that Trans Mountain filed specific reply evidence regarding Mr. Farmer's research which the Board considered along with Mr. Farmer's research and any related information requests. The reply evidence provided by Trans Mountain indicated that subduction of spilled diluted bitumen would not be likely to occur in any appreciable amount. To the extent that any such subduction did occur, the Board finds that it would not be material to the results of the spill modeling conducted by Trans Mountain. This conclusion has informed the Board's views regarding the potential for diluted bitumen to sink or submerge as discussed in this section.

Responding to diluted bitumen spills

Evidence filed by parties such as Trans Mountain, Islands Trust Council, Living Oceans Society, Tsleil-Waututh Nation, City of Vancouver and the City of Burnaby indicates that, if it is not recovered off the water surface, the majority of spilled diluted bitumen could strand on shore, in both a freshwater and marine environment. The extent of shoreline stranding and residency on the shoreline would depend on environmental and shoreline conditions. In a marine spill, the product could also be dispersed out to the open ocean, depending on circumstances. The Board accepts that shoreline stranding would necessitate shoreline cleanup activities which could be challenging due to the persistent nature and viscosity of weathered-diluted bitumen.

Environment and Climate Change Canada said that the modelling tools used by Trans Mountain for its stochastic computer modeling appear to be appropriate. Environment and Climate Change Canada also recommended that additional model verification and validation be undertaken for Trans Mountain's marine spill model. The evidence shows that the model is the property of a private consultant which has offered to work collaboratively with Western Canada Marine Response Corporation to further development of the model. The Board is of the view that it is within the purview of Western Canada Marine Response Corporation (authorized under the Canada Shipping Act) to pursue this further, should it see value in the model as an additional response tool.

Specific to the modelling conducted by the Tsleil-Waututh Nation, City of Vancouver and the City of Burnaby, the Board accepts the parties' position that oil could strand on shore within Burrard Inlet and area. The Board's views on the spill sizes modeled by the parties are included in Chapter 14.

Based on evidence provided by the Squamish Nation, Natural Resources Canada, the City of Vancouver and Trans Mountain, the Board is of the view that heavier hydrocarbon compounds, such as diluted bitumen, that are not recovered during spill response, are likely to be persistent in the environment and resistant to additional biodegradation. Over time, degradation would likely occur but the rate and amount of such degradation would depend on specific circumstances associated with the spill.

The fate and behavior of spilled products must be considered during response planning, and the response to Group IV products requires appropriate cleanup strategies and equipment. Evidence filed by Trans Mountain, Living Oceans Society, Shxw'ōwhámel First Nation, and the federal departments and agencies indicates that such equipment and strategies are available. Nonetheless, the Board is of the view that weathered diluted bitumen could pose particular challenges in response and clean-up due to its potential for submergence and emulsion formation, persistent chemical

and physical properties, and potential for shoreline stranding. These characteristics also lessen the potential for use of counter measures, such as dispersants and in-situ burning. Environmental conditions and spill-specific factors would influence the use of such response tactics. The Board is of the view that these response challenges are not unique to diluted bitumen spills, but can be associated with heavier oil products in general.

Several parties filed evidence indicating that bitumen is quite volatile during the initial stages of a spill. The Board accepts that this volatility must be considered from an oil behavior, and public and responder safety perspective. Trans Mountain has committed to provide, to regulators and first responders, timely information on the physical and chemical characteristics of any product spilled, and that it trains its personnel and other first responders in safely responding to a spill. In light of this information, the Board does not see the need for Environment and Climate Change Canada's recommendation that Trans Mountain commit to providing spill responders and regulators, before shipping, a specific suite of test data for all types of hydrocarbon products to be shipped to facilitate appropriate spill response preparedness.

The Board's views on how the fate and behavior of spilled oil could affect spill response in areas such as response times and resources required, and environmental and socio economic resources are included in Chapters 9, 10, 11 and 14.

Conclusions Regarding the Fate and Behaviour of Spilled Diluted Bitumen

Overall, the collective weight of the substantial evidence filed during the OH-001-2014 and MH-052-2018 hearings lead the Board to conclude, as it did in the OH-001-2014 hearing, that sufficient evidence has been placed on the record regarding the fate and behavior of an oil spill, including diluted bitumen, to support assessment of potential spill-related effects and spill response planning in relation to the Project.

The Board recognizes that there is ongoing research regarding the fate and behaviour of spilled diluted bitumen and it encourages such research. However, the Board is of the view that the weight of evidence before it is sufficient for it to conclude the following regarding the environmental behaviour of spilled oil, including diluted bitumen:

- The fate and behavior of any spilled oil ultimately depends on the specific physical and chemical properties of the spilled oil and environmental conditions at the time of the spill event;
- After initial weathering, diluted bitumen behaves similar to other heavy crude oils and common heavy fuel oils, such as Bunker C;
- Diluted bitumen is subject to rapid initial weathering and has the potential to form emulsions in water;
- The toxicity of diluted bitumen is comparable to, or lower than, other crude oils;
- Sinking of diluted bitumen would likely be in limited quantities and only after sufficient weathering over a period of days or interaction with sediment and other organic matter under the right environmental conditions;
- Depending on weathering state and environmental conditions, spilled diluted bitumen could be prone to submergence in an aquatic environment. The potential for submergence must be considered in response planning;
- Weathered diluted bitumen could pose particular challenges in response and clean-up due to its potential for submergence and emulsion formation, persistent chemical and physical properties, and potential for shoreline stranding. These characteristics also lessen the potential for use of counter measures, such as dispersants and in-situ burning. These response challenges are not unique to diluted bitumen spills, but can be associated with heavier oil products in general;
- Diluted bitumen not recovered during spill response, would likely be persistent in the environment and resistant to additional biodegradation. Over time, degradation would likely occur but the rate and amount of such degradation would depend on specific circumstances associated with the spill; and,
- The initial volatility of diluted bitumen must be considered during response planning from an oil behavior, and public and responder safety perspective.

The Board notes that the assessment of the fate and behaviour of oil is a complex area of research. There are many parties involved in such research and results must be interpreted in the context of the methodology and purpose behind each piece of research, all of which contribute to the overall body of knowledge regarding the potential fate and

behaviour or spilled oil. The Board's views are based on the collective weight of evidence including that filed by Trans Mountain and intervenors. In particular, the views of the Board are informed by:

- Research findings by federal departments and agencies and other scientists since the Board's OH-001-2014 Report;
- Conclusions contained within reports summarizing research, particularly those completed by the Canadian Sciences Advisory Secretariat and the Royal Society of Canada;
- The collaborative nature of completed and ongoing research and reports summarizing that research;
- The areas of general consensus amongst those with expertise in oil fate and behaviour research and oil spill response regarding the fate and behaviour of diluted bitumen;
- The views of the federal departments and agencies regarding the applicability of research conducted to date to potential spills associated with the Project;
- Comments made by Natural Resources Canada regarding references to Natural Resources Canada research in the Board's OH-001-2014 Report; and
- Trans Mountain's Gainford study and its review of research conducted by many parties since its Gainford study.

The Board is of the view that ongoing and future research will continue to contribute to the body of knowledge regarding the environmental behaviour of spilled oil and further inform potential effects and spill response planning. However, as discussed above, the Board is of the view that the current level of understanding of the fate and behaviour of diluted bitumen is sufficient to inform the Board's conclusions regarding potential spill-related effects and spill response planning in relation to the Project.

The above conclusions have informed the Board's application of the precautionary principle to its assessment of the Project. The evidence indicates that oil spill research will continue to evolve and inform potential effects resulting from oil spills and spill response planning. As discussed in Chapter 14, the potential risks of an oil spill has resulted in tangible changes to spill prevention mitigation, such as enhanced tug escort, and the potential fate and behaviour of diluted bitumen has informed spill response planning for the Project in relation to greatly increasing response times and consideration of appropriate response technologies.

9.0 Emergency prevention, preparedness, and response

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.) and to replace "Aboriginal" with "Indigenous," the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report. This chapter addresses emergency prevention, preparedness and response related to the pipeline and facilities. Emergency prevention, preparedness and response related to Project-related marine shipping is found in Chapter 14.

9.1 Overview

As part of its public interest mandate and under its approach to lifecycle regulation, the National Energy Board (Board) requires regulated companies to demonstrate that they are able to safely build and operate their facilities in a manner that protects people and the environment. In the hearing, participants expressed concern about the potential for spills from pipelines, including the Edmonton, Burnaby and Westridge Marine Terminals and tankers associated with the Project. This chapter examines Trans Mountain's ability to anticipate, prevent, and respond to project accidents and malfunctions. The risk of a spill associated with Project-related marine shipping is discussed in Chapter 14. The environmental and socio-economic effects of spills from the Project are discussed in Chapters 10 and 11 respectively.

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

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

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

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

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

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

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

Trans Mountain said that it would employ prevention and mitigation measures, such as engineering designs that eliminate or minimize integrity threats, construction and quality assurance practices that will ensure the integrity of the pipeline and facilities through to commissioning, and ongoing Integrity Management Programs (IMPs), that will be applied once the pipeline and facilities are operational.

9.2 Spill prevention

Trans Mountain said that it considers the prevention of spills to be its primary goal and will employ the necessary management systems and resources to ensure that this goal is achieved on the Project.

In response to the City of Vancouver's questions about Trans Mountain's overall systems analysis to spill prevention and whether the analysis considered, and will continue to consider, legislation, government oversight, local government capacity, local community capacity, and private businesses, Trans Mountain said that its risk-based approach for the pipeline and terminals was focused on the identification of potential risks and the development of site specific and general mitigation measures addressing those risks to prevent failures and reduce the likelihood of oil spills from occurring. Trans Mountain said that local government capacity and local community capacity were considered when assessing construction methods and would be further considered as operating practices are developed. Trans Mountain said that, as an example of this, based upon feedback from local government and local communities, it proposed that the pipelines from the Burnaby Terminal to the Westridge Marine Terminal (WMT) be rerouted using a trenchless construction method that would ensure that these pipelines were not routed directly through the local community. In addition, Trans Mountain said, subject to other considerations, it may be possible in the future to reroute the existing pipeline.

9.2.1 Pipeline spill prevention

This section discusses additional measures pertaining to prevention of pipeline spills or minimizing their potential environmental effects through other spill prevention and mitigation measures. An assessment of Trans Mountain's risk-based approach to design, the likelihood of a spill from the Project and other mitigation intended to prevent spills is discussed in Chapter 6.

Trans Mountain said that spill prevention and mitigation measures are embedded throughout the full project lifecycle and start with the risk assessment of engineering designs at the earliest stages of the project. Formalized risk assessments are conducted to allow for early identification of all applicable hazards and suitable control measures in addition to code-based

design. Trans Mountain has a pipeline integrity management program that will help ensure long-term spill prevention and implement the appropriate mitigation when needed.

Trans Mountain said that the semi-quantitative risk assessment and the company's 60-year operating history demonstrate that the probability of a large pipeline spill is low.

In response to numerous intervenor requests for details respecting Trans Mountain's spill experience in relation to its assessment of risk, Trans Mountain provided a list of spills that have occurred since 1961. Trans Mountain said that from 1961 to the end of 2013, it had reported approximately 81 spills to the NEB, including a number of incidents which were below the reportable threshold. Trans Mountain said that approximately 70 per cent of the releases were contained on Kinder Morgan Canada Inc. (KMC) property and resulted in no residual environmental effects after clean-up and remediation.

Trans Mountain also said that since the in-service date in 2008, there have been no reportable spill incidents on the Anchor Loop section in Jasper National Park or Mount Robson Provincial Park. Trans Mountain said that it investigates all hydrocarbon release incidents on the Trans Mountain Pipeline system. For the seven incidents that have occurred since 2005, the investigation reports included recommendations to prevent future incidents or improve the Company's incident response. For example, a review of the Burrard Inlet release in 2007, where a City of Burnaby contractor struck the Westridge Delivery Line, resulted in the implementation of a Pipeline Protection Department. The Pipeline Protection Department has the sole responsibility to protect the pipeline and associated facilities through pipeline and associated facilities markings, issuance of permits for safe work around pipeline and associated facilities, as well as responding to B.C. and Alberta One Calls.

In response to additional questions from the City of Burnaby and the Strata NW313 on whether Trans Mountain had incorporated learnings from the 2007 Westridge Delivery Line spill into its EMP document procedures, Trans Mountain said that it has made significant changes to its pipeline protection standards and procedures for approval of third-party ground disturbance work near the pipeline. Among the many changes was a requirement that a Trans Mountain inspector must be on site during any mechanical excavation or other ground disturbance within 7.5 m of the pipeline to ensure compliance with the terms of the approval. Trans Mountain said that it continues to facilitate public awareness and monitors ground disturbance activity within close proximity to the pipeline or right-of-way.

Trans Mountain said that the Sumas Tank Farm release in 2012, where a broken pipe on the roof drainage system was contained on company property, resulted in a learning. It showed that there was the need to develop a community air monitoring program which would address concerns the public had related to emissions and identify when evacuation of local residents would be necessary.

The Province of British Columbia and Matsqui First Nation raised concerns about Trans Mountain's spill prevention measures and response strategies for high consequence areas. Trans Mountain said that its target release volumes were established along the entire right-of-way, including at high consequences areas. A conservative estimate of 10 minutes was selected for the Control Center Operator to accurately diagnose a "worst-case" scenario rupture, followed by 5 minutes for the full closure of the remote block valves. Trans Mountain said that full-bore rupture modelling provided a worst-case unmitigated scenario to help the company prioritize locations for spill response planning, and develop strategies to reduce associated consequences. Trans Mountain said that the company has established procedures and training for response to abnormal operating conditions including response to ruptures. Annual training including both knowledge testing and performance testing is completed for each control centre operator on general operating procedures which include response to ruptures.

Trans Mountain said that it had reviewed the investigation reports from the Enbridge Marshall incident into the Kalamazoo River and considered the recommendations from these investigations in context to KMC's established control centre operating practices and procedures. Some of the activities that resulted from its review of these recommendations included providing additional hydraulics training for all control centre operators, review and clarification of roles and responsibilities of personnel regarding response to abnormal operating conditions including response to ruptures, and a review and update of certain control centre procedures and leak detection procedures.

In its response to the District of North Vancouver's concern of whether Trans Mountain considered human error in its risk assessment and the development of spill response times for the spill scenarios, Trans Mountain said that the potential for human error was taken into account in the risk model using several mechanisms so that the risk was not underestimated. These mechanisms included historical human error accident data, human performance error rates (mistakes), human reliability error rates (e.g., incapacitation due to heart attack), and parameters selected towards the conservative end of credible ranges.

In its response to Matsqui First Nation concerns on how human error factored into spill response times in the spill scenarios, Trans Mountain said that human errors are a key consideration in the development of the procedures and processes that must be followed by control centre personnel. These are also built into the training program and the spill scenarios were

developed to reflect this. Trans Mountain added that effects of human errors are continuously mitigated in several ways and the need for communication is built into control centre procedures.

Trans Mountain said that Emergency Response Plans (ERPs) have been developed for the existing Trans Mountain Pipeline (TMPL) system and would be enhanced and implemented on the expanded TMPL system. These plans detail prescriptive procedures, activities and checklists to ensure consistent response to incidents with the common objective of protecting company personnel and contractors, the public, public property, and the environment.

In response to the City of Burnaby's concerns regarding Trans Mountain's response capabilities, available resources and ability to sustain an effective response should an incident occur, Trans Mountain said that no spills are acceptable and that the acceptable frequency is zero. It said that spill prevention measures are implemented for every identified hazard and that from a risk analysis standpoint, likelihood of failure values are calculated to identify conditions where additional prevention methods should be considered. Trans Mountain said that a risk-based design process goes beyond the minimum requirements of CSA Z662 and involves an iterative approach in which risks and the associated factors that are driving the risk are identified and mitigated through the implementation of appropriate mitigation measures. Using this approach, mitigation measures can be pre-emptively identified and incorporated at the design stage to address the principal risks. Trans Mountain said that examples of this would be state of the art instrumentation for leak detection, selection of valve locations to reduce potential spill volumes in high consequence areas and deployment of equipment (e.g., boom deployment able to contain 1500 m^3 around vessels being loaded at the WMT) to prevent system leaks and allow for the containment, isolation, and recovery of any hydrocarbon that may be released.

9.2.2 Westridge Marine Terminal spill prevention

Trans Mountain estimated the credible worst-case spill at the WMT resulting from an incident during loading of a tanker to be 160 m^3. Trans Mountain said that for oil spill modelling purposes, 20 per cent of the oil released was assumed to escape the containment boom which would be placed around tankers during loading (i.e., 32 m^3). Trans Mountain said that the return periods of a spill associated with tanker loading are 34 and 234 years for spills less than 10 m^3 and 103 m^3, respectively. Chapter 14 discusses return periods in more detail.

Trans Mountain said that operational spills, should they occur at the WMT, would be mitigated through the use of protective booming at the terminal and around vessels being loaded.

In response to the City of Port Moody's concerns about the effectiveness of booms in stormy seas and turbulent waters, Trans Mountain said that the selection of its booms need to meet wind speed (up to 16 knots) and wave height (up to 1 metre) requirements for Transport Canada equipment designations of shoreline, sheltered and unsheltered water capability. Trans Mountain said that while these conditions are rare in the vicinity of the WMT, it acknowledged that it needs to be and is prepared to adjust its tactics, boom use (conventional booms versus higher current booms such as Current Busters) and configuration (e.g., double booming techniques) to address the reduced effectiveness of booming and skimming operations under such conditions.

Trans Mountain outlined its parameters for stopping loading of a tanker in the event of excessive wind speeds at the WMT. Trans Mountain said that the current parameters are within the limits set at other marine oil terminals internationally and that limitations for the future would be determined as part of detailed engineering design study for the WMT expansion.

To address the City of Vancouver's concerns regarding fires aboard vessels at the WMT, Trans Mountain said that fire onboard an Aframax or Panamax tanker at berth at the WMT is prevented by adhering to a strict systems approach. This approach includes global regulation on tanker design, construction methods, preventative equipment and processes, such as maintaining cargo tanks in inert condition at all times, only fitting or using intrinsically safe equipment, crew training and certification.

Trans Mountain said that since the implementation of mandatory use of inert gas on all crude oil tankers, the threat of cargo-related fire and explosion onboard a tanker has been almost eliminated. Such threats, resulting from collisions or other high-energy impacts, have been further reduced by the advent of double-hull tankers. Tanker crews are trained to maintain an onboard environment that is free of ignition threats, and various prevention and detection elements are designed in tanker construction.

Trans Mountain said that tanker cargo tanks are kept in inert condition (oxygen content less than eight per cent) at all times, even while loading the tank, further reducing the possibility of fire or explosion involving the tankers cargo tanks. Trans Mountain said that at the WMT, vapour generated in a tanker's cargo tanks during loading is collected and piped to shore for processing. The combined effect of a "closed loading system" further reduces the likelihood of a fire during cargo loading.

Views of the Board

The Board agrees with Trans Mountain that spill prevention and mitigation measures start with the risk assessment of engineering designs at the earliest stages of the project, and are embedded throughout the full project lifecycle. In Chapter 6, the Board provides its view on Trans Mountain's approach to facility design.

Even though advances in technology, regulatory requirements and industry best practices contribute to prevention of oil spills, oil spills can still happen. The Board finds that although all possible environmental conditions cannot be replicated or known, it expects a company to be prepared for spills of all sizes, in all conditions, be well organized to respond quickly by following its emergency preparedness and response procedures and incorporate local considerations. The Board finds that this situational awareness was incorporated in Trans Mountain's spill prevention strategies, spill preparedness and response planning.

The Board requires a company to reduce risk wherever possible, that includes consideration of routing alternatives. The Board notes that Trans Mountain proposed a trenchless reroute of the pipeline from the Burnaby Terminal to the Westridge Marine Terminal due to routing directly through a local community. The Board finds that some level of risk is inherent in the Project and a precautionary approach requires that accidents and malfunctions be planned for. Specific details regarding the location, extent, and effects of a large spill cannot be known in advance because many relevant factors cannot be quantified. In addition to prevention measures, the Board took into account additional information to allow planning, and response preparedness for a wide range of spill scenarios, including credible worst-case scenarios.

Parties such as City of Vancouver, City of Burnaby and the Province of British Columbia argued that Trans Mountain had not provided enough information to inform the Board about emergency preparedness and response. The Board does not share this view. The Board finds that a large spill, due to a malfunction or accident from the pipeline or the terminals, can be mitigated through prevention measures as well as being prepared and response ready. The Board finds that Trans Mountain and other parties have provided extensive evidence regarding oil spill modelling, prevention measures, firefighting systems and firefighting activities at terminals, planning and response to inform the Board's views and requirements regarding malfunctions, accidents, and emergency preparedness and response planning at this stage and for the condition compliance stage of the lifecycle regulatory process. The Board also finds that the broad range of spill prevention and mitigation measures committed to by Trans Mountain, including those to address human error for control centre personnel, are comprehensive and appropriate.

The Board finds that Trans Mountain has provided adequate information to assess the measures, tools, plans, and processes in place to prevent accidents and malfunctions from happening. Pipeline spill prevention measures would include pipeline routing, design, materials, construction techniques, maintenance and implementation of controls to address hazards, and operating procedures that support the integrity of the pipelines and keep the products contained in the system. The Board discussed Trans Mountain's approach to pipeline and facilities design in Chapter 6. Trans Mountain's design decisions that contribute to spill prevention and mitigation include:

- specifying quality pipe material to minimize fracture initiation;
- specifying pipe wall thickness, depth of cover and mechanical protection to minimize the risk of damage from external forces;
- routing the pipeline to avoid geotechnical hazards;
- installing communication systems and instrumentation to control, monitor the pipeline and detect leaks;
- undertaking detailed hydraulic analyses to establish operation limits including overpressure protection; and
- installing valves in locations that reduce potential spill volumes in high consequence areas.

The Board also finds the key aspects of the Pipeline Integrity Management System that would ensure long-term spill prevention and mitigation include:

- undertaking annual risk assessments including the identification, assessment and management of newly identified hazards;
- using in-line inspection (ILI) to assess pipe movement and the presence of damage and defects;
- identifying, monitoring and remediating threats such as unstable soils and low depth of cover at water crossings as part of the Natural Hazard Management Program;

- implementing a Pipeline Protection Program, with a primary focus on preventing pipeline damage from ground disturbance activities;
- monitoring the effectiveness of the cathodic protection system through the implementation of annual test lead surveys and close interval pipe to soil surveys every five years;
- completing pipeline repairs in accordance with technical code requirements and KMC standards;
- implementing system upgrades and technological improvements through a sustaining capital program; and
- promoting continuous improvement through tracking of performance indicators and showing measurable risk reduction.

The Board finds that the above spill prevention and mitigation measures would adequately support the integrity of the pipeline and related facilities. These measures would contribute in preventing and minimizing any size of spill (i.e., both minor and a major spill). The Board finds that Trans Mountain has incorporated appropriate prevention and mitigation in its design and operation of the pipelines and the terminals to reduce the possibility of a fire or explosion and to avoid spills or lessen their effects through appropriate containment and recovery measures. Trans Mountain outlined examples of prevention and mitigation measures, such as:

- secondary containment equipped with hydrocarbon detection;
- fire detection and suppression equipment for storage tanks;
- adequate number of fire and foam monitors at each berth capable of reaching the cargo deck area of the tanker;
- emergency release couplers at the loading arms;
- overfilling detection at the tanker vessel; and
- leak detection at the pipeline.

Trans Mountain said that the above examples of prevention and mitigation measures would prevent system leaks and potential spills from occurring but if they do occur, the measures allow for the containment, isolation, and recovery of any hydrocarbon that may be released. It also committed to deploy booms around tankers before loading arms are connected.

According to the Board's incident database, the majority of occurrences are minor spills from NEB-regulated companies. Most of these spills occurred at station facilities from defective components or fittings, malfunctions. These spills have typically been confined to company property. Trans Mountain's Facility Integrity Management Program (FIMP) includes monitoring and preventative programs for management of the hazards that could affect the safe operation of facilities to prevent and mitigate the impact of petroleum releases and petroleum fires. Should the Project be approved, the Board would use its compliance verification activities to assess implementation and adequacy of the FIMP.

The Board finds that no spill is acceptable from a facility that it regulates. If a spill does occur, the Board has developed guidelines to facilitate well-documented and successful remediation and will be the lead agency to ensure the most stringent criteria for remediation of soil and groundwater are met. Other regulators such as provincial environment and health departments, as well as municipalities, federal departments and Indigenous groups may be involved and may be consulted at various stages in the remediation process.

The Board finds that should the Project be designed, constructed and operated according to the fulfillment of its certificate conditions and Trans Mountain's commitments, the probability of accidents and malfunctions associated with the Project resulting in a large spill, is very low. Examples of large spills include full-bore rupture of a pipeline, larger spill in a facility that migrates off company property, or a breach of a storage tank spilling and igniting its entire volume. The Board also finds that, over the life of the Project, the probability of accidents and malfunctions associated with the Project resulting in a small spill is high. Small spills would include those caused by relatively minor equipment failure or human error and would likely occur on Trans Mountain-owned property such as pump stations and tank farms. In the event of a small spill, response personnel and equipment would be readily available and clean-up would be expected to be effective. Trans Mountain's commitments would be enforced under the Board's regulatory regime.

In the event of a spill, Trans Mountain said that its Emergency Management Program (EMP) for the existing facilities, existing emergency response manuals and reference material, understanding and implementation of the Incident Command System, internal and external inventory of spill response equipment, exercise and training programs and its

commitment to a comprehensive review of the EMP to address the needs of the Project, would help the company respond and manage an incident more effectively.

9.3 Trans Mountain's Emergency Management Program

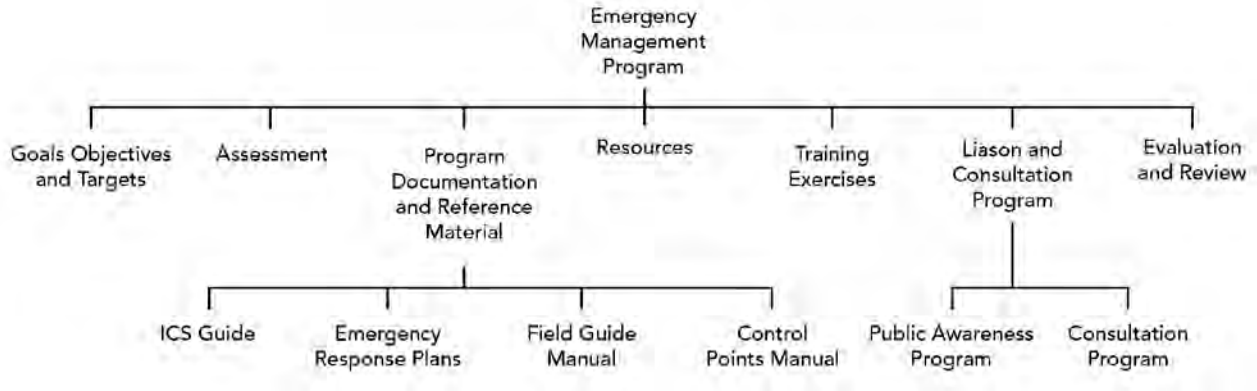
Trans Mountain said that it would review and revise its existing Emergency Management Program (EMP) to address the needs of the expanded pipeline system. The existing EMP will form the foundation for the revised program. Trans Mountain said that the revision of the EMP would include the final design of the Project in conjunction with the existing Line 1 operations, conditions imposed by the Board, and the Province of British Columbia's Five Conditions.

The Province of British Columbia said that minimum requirements must be met by heavy oil pipeline projects. Two of those requirements relate to emergency response, and Trans Mountain said that they would be addressed within the EMP review for the Project:

- World-leading marine oil spill prevention, response, and recovery systems for B.C.'s coastline and ocean to manage and mitigate the risks and costs of heavy oil pipelines and shipments; and
- World-leading practices for land oil spill prevention, response, and recovery systems to manage and mitigate the risks and costs of heavy oil pipelines.

Trans Mountain's EMP is illustrated in Figure 17 below. Trans Mountain said that the EMP outlines the most critical elements for a response to an emergency. The EMP allows for the development of supplemental and supporting documents that address key elements. Thus, the EMP provides a common, structured framework for the development of a skilled and trained workforce, allocation of spill response equipment and resources to appropriate locations, and development of response time targets and pre-defined tactics for expedient and effective response to a pipeline emergency.

Figure 17: Emergency Management Program elements



The EMP is made up of a number of elements used to guide Trans Mountain's emergency planning and response to specific incidents. Trans Mountain said that the EMP documents could provide generic procedures for a response to an incident at any location along the TMPL system, or site-specific procedures for terminals and areas that require tactical response plans. As part of its EMP, Trans Mountain produces the following plans and supporting documents for the pipelines, terminals and tank farms:

- the Incident Command System (ICS) Guide;
- Emergency Response Plans (ERPs): Westridge Marine Terminal ERP, Trans Mountain Pipeline ERP, Terminal and Tank Farms ERP;
- Control Point Manual;
- Tactical Response Plans (e.g., HCAs, submerged and sunken oil);
- Geographic Response Plans;
- Trans Mountain Field Guide;
- Fire Safety Plans; and
- Fire Pre-Plans.

The EMP also considers response tactics for many following types of events, including: pipeline failure, tank failure, fire or explosion related to a tank or spill, submerged oil, and a spill event in the tunnel through Burnaby Mountain.

Trans Mountain said that it uses the Incident Command System (ICS) to guide planning and management processes used in incident response. In Trans Mountain's view, the ICS provides effective coordination and well-established protocols and procedures to manage an incident and provide multi-agency coordination system through a Unified Command structure.

A number of intervenors, including the City of Surrey and Mr. Calvin Taplay, requested a sequence of procedures that would be implemented in the event of an incident and raised questions as to whether the company is able to respond effectively. Trans Mountain provided a list of typical steps that would be taken after a spill. The steps included:

- immediate shutdown of pipeline or other source of release and allow pressure to dissipate to prevent additional release of hydrocarbon and isolate the source of the spill from the rest of the system;
- immediately contact local emergency services and trained Trans Mountain technicians for dispatch to the location, to help secure the area and commence air monitoring to ensure air quality for those in the immediate vicinity;
- control centre issues an Emergency Response Line (ERL) notification to the Incident Management Team (IMT). Upon notification the IMT calls the conferencing line to get information about the incident and begin pre-assigned response duties;
- immediately following the ERL conference call, Trans Mountain notifies the Transportation Safety Board of Canada (TSB) and NEB;
- Liaison Officer begins notifications to other groups not included in the above notifications;
- Logistics Section Chief begins identification of resources required for the response and ordering supplies and equipment; and
- Planning Section Chief begins planning recovery operations and contacting team members required including the Environmental Unit Leader.

Many participants said that Trans Mountain and other responsible agencies must engage in broad consultation in the development of emergency plans and that it must share information about those plans. Simon Fraser University (SFU) said that, in order to properly prepare, maintain, and update its Comprehensive Emergency Management Plan (CEMP), it is especially important that SFU has a clear understanding of all possible risk scenarios to SFU, their likelihood and the potential impacts to SFU, so as to be able to develop procedures and emergency management plans to be followed in response to a specific event. SFU said that it was willing to engage in a dialogue with Trans Mountain to understand the potential risks from the existing Tank Farm and WMT operations and the risks posed by the Project better.

In response to requests for consultation on its emergency response planning, Trans Mountain said that, as part of construction planning and the EMP review for the Project, it will consult with municipalities and first responders, including SFU, the Province of British Columbia, the District of North Vancouver, the Fraser Valley Regional District, the City of Port Moody, the City of Burnaby, the City of Kamloops and emergency response providers.

Mr. Peter Smith said that local authorities have raised concerns over their ability to deal with a major spill or fire. Mr. Smith said that there is little co-operation between those who need to work together, which gives him little confidence in their ability to deal with an emergency situation.

The City of Burnaby said that Burnaby first responders (e.g., fire fighters, RCMP) do not have the capacity or technical training to mitigate a major fire event, such as a multiple tank fire, storage tank boil over, or a release of toxic gas products simultaneously with operations. It said that these first responders would not be able to protect community lives and property outside the facility fenceline and elsewhere in the city in the event of such an incident. The City of Burnaby said that, in order to keep such a major event from escalating, first responders would have to provide interior facility operations simultaneously with exterior fenceline emergency operations, which would leave significant gaps in the broader protection of lives, properties, as well as surrounding environmentally sensitive areas and conservation lands in and around the city.

Trans Mountain said that the current Burnaby Terminal facility has detection, mitigation and fire prevention measures in place for potential fires, which include fire water reservoir and pump system, fixed and portable fire-fighting monitors, an inventory of fire-fighting foam concentrate, and fire-fighting foam trailers. Trans Mountain added that the fire-fighting measures would be further enhanced as part of the Terminal expansion design. These enhancements would include industry-leading fire protection equipment, such as fixed tank rim seal and full-surface fire-fighting foam suppression systems for each new tank installed to ensure that rim seal and full- surface fire suppression systems can be deployed by the push of a button.

Trans Mountain said that the fire-fighting foam suppression systems would be backed up by portable foam and water monitors. Trans Mountain said that the installed fire suppression measures would exceed applicable code requirements. These measures, when combined with tank operating procedures to minimize the accumulation of water within the tanks as well as the extensive maintenance program, would reduce the likelihood of a fire, escalation to a full-surface fire or the potential to have a boil over event to an extremely low probability. If all mitigation fails for preventing a full surface fire, the company said that it has all the equipment on-site to extinguish a full surface fire within the industry standard timeline. Trans Mountain believes that this will prevent a full surface fire thus a boil over event. Trans Mountain said that the design of the expanded Burnaby Terminal would ensure safe access from two directions for all possible fire locations within the terminal facility. The proposed primary and secondary access routes at the Burnaby Terminal will be designed and constructed in accordance with the International Association of Fire Chiefs Emergency Vehicle Size and Weight Regulation Guideline. The primary access routes at Burnaby Terminal will be designed so as to allow the movement of emergency apparatus and equipment, and would allow emergency response access from a minimum of two independent directions.

Trans Mountain said that although the City of Burnaby has not agreed to meet, it is committed to pursuing a mutual aid agreement with the City of Burnaby and to discuss the enhancements for the emergency management program. Trans Mountain also expressed its desire to meet and discuss the design of the fire protection system at Burnaby Terminal prior to the design being finalized.

The City of Port Moody and the City of Kamloops said that Trans Mountain has given little information about the resources that it would direct to the city in the event of a spill or accident. The City of Port Moody said that it does not know what to expect in such an instance and was concerned it would be ill equipped to make any decisions about how to respond to a spill or accident that might affect it.

To address the City of Kamloops concerns about the impact of their work force and the incremental demand it may create upon the city's local emergency services (i.e., firefighting and policing) should an incident occur, Trans Mountain said in the event a municipality is not able to respond or there are competing requirements for local emergency response capacity during an incident, the company would cooperate with local agencies in the overall response and secure additional resources from outside the affected area. Trans Mountain said it was Kinder Morgan Canada's preference to enter into a Unified Command with municipal, provincial and federal authorities to ensure a safe and thorough response to any emergency. In the event that a municipality cannot respond, it would procure additional resources and use the Incident Command System to prioritize objectives to ensure the safety and protection of the public, employees, contractors, the environment, and property.

Trans Mountain said that it is committed to ongoing consultation with municipalities, local and regional emergency responders, police services, fire services and other relevant services to identify and discuss issues in order to meet municipal emergency response requirements, such as continued availability of roadways for use by emergency vehicles.

In addition to consultation with emergency management professionals, first responders and communities along the pipeline corridor, Trans Mountain said that it would engage the general public about pipeline safety and emergency response. Trans Mountain said that it has conducted numerous public consultation meetings in Burnaby and in the neighbouring communities in B.C.'s Lower Mainland since 2012. Emergency planning and response was consistently a topic presented on information boards at public events. Trans Mountain said that this engagement would continue and it will ensure the public have an ability to engage and ask questions about Trans Mountain's pipeline safety and ERPs in the continued engagement.

The Province of British Columbia and the City of Burnaby said that they wanted full disclosure of the EMP documents because it was critical that participants have the opportunity to evaluate the adequacy of the EMP. They said that Trans Mountain's offer to provide copies of the EMP documents to local, provincial, and federal authorities on a confidential basis is of no assistance in the context of the hearing. Trans Mountain said that it had provided, and will continue to provide, the City of Burnaby, the Province of British Columbia and other first responder agencies with copies of its EMP documents.

The Province of British Columbia and the City of Burnaby expressed concerns about the timing of Trans Mountain's detailed spill preparedness and response planning. They said that Trans Mountain had not provided sufficient information or an appropriate level of detail during the application process to demonstrate that the company could respond effectively to a spill. It was their view that Trans Mountain should provide additional information before the Board made its recommendations regarding the Project.

Trans Mountain said that the Emergency Management Program has been developed and enhanced through a combination of learnings from table-top and field deployment spill exercises, and through experience gained through response to live spills, such as the third party strike on the Westridge pipeline in 2007. The existing EMP will form the foundation of the revised program. Trans Mountain said that it was focused on prevention and mitigation measures to reduce the likelihood of oil spills occurring and, if a spill occurs, to limit the consequences through the mature emergency management program that is in place.

Trans Mountain said that it anticipates undertaking the following work as part of developing and enhancing its existing EMP, including making updates to:

- geographic elements, such as control point manuals and Trans Mountain's GIS-based Geographic Response Plan (GRP);
- pre-Shoreline Cleanup and Assessment Techniques (SCAT) and SCAT training;
- equipment and resource need assessment; and
- information gained through first responder, community, Indigenous, and municipal engagement and consultation.

Trans Mountain said that the updated EMP will also reflect the recent Canadian Energy Pipeline Association Mutual Emergency Assistance Agreement, finalized plans with Western Canadian Spill Services, and any new additions as a result of the B.C. land-based spill initiative. The underlying basis for the review of the EMP would include performance standards for estimated response time and response capacity.

Trans Mountain said that the detailed review would be developed collaboratively with stakeholders over of the next two years. Consultation to date has indicated a strong interest in pipeline safety and emergency response. Trans Mountain said that plans include continued engagement with emergency planners and first responders to solicit input to planning efforts and to enhance understandings of pipeline hazards, emergency readiness, and roles and responsibilities in the event of a spill. Finalized EMP documents and supporting documents will be completed in advance of commissioning and operation of the Project.

9.4 Emergency response

Trans Mountain said that it takes full responsibility for any emergency that results from the TMPL system and its facilities. Should an incident occur, Trans Mountain said that staffing and mobilization of an Incident Management Team (IMT) would begin immediately. The IMT members are trained and regularly exercise in a number of ICS positions. Trans Mountain said that each of the key positions in the ICS structure has at least three individuals trained and prepared to respond, ensuring a fully functional response team at all times. Trans Mountain said that it has pre designated potential Incident Command Post (ICP) and Staging Area locations along the current pipeline corridor and in communities where its facilities are located.

Participants raised questions about how Trans Mountain would communicate with the municipalities, residents, businesses, and schools regarding evacuation, coordination of a response, and expected roles in the event of an incident. Trains Mountain said that at the time of the spill incident, it would consult with the local municipal authority to determine the best course of action to protect the public, including immediate notifications as required. KMC's role in notification of schools, businesses and residents would primarily be to provide local emergency services agencies with air quality measurements and other relevant status information on an ongoing basis to help inform the best course of action and subsequent actions taken to direct residents to shelter in place or to evacuate. Trans Mountain said that it was committed to timely communications with those that are directly impacted by any emergency event. The methods used for informing the public include door-to-door delivery of information, social media, traditional media, website updates and a phone hotline.

In response to the NDP's questioning about additional preventative practices for areas of high population density, Trans Mountain said that areas with high population density would have increased pipeline protection activity, including higher patrol frequencies for preventing third party damage from unauthorized ground disturbance activities. Public awareness activities and security measures would also be increased in areas with high population density.

Trans Mountain said that it would work with external emergency response services in a pre-planning capacity. Trans Mountain said that, for example, the City of Burnaby Fire Department has been an active participant in annual training at its facilities. Trans Mountain said that it would continue working with the City of Burnaby regarding its existing operations and, as noted previously, it is committed to engaging the City of Burnaby with respect to response planning for the Project.

9.4.1 Emergency response capacity

In response to participants' concerns that Trans Mountain does not have the appropriate equipment to respond to an incident, Trans Mountain said that it maintains a network of internal and external response resources and personnel. A rigorous training and response exercise program is in place for all operations and head office staff that ranges from detailed equipment deployment drills to full ICS management and organization training and deployment. Trans Mountain said that it belongs to a number of response organizations and participates in mutual aid exercises to supplement the company's self-reliant response capability. Trans Mountain said that it has contracts and master services agreements with a number of response contractors to supply equipment and personnel during an emergency.

Trans Mountain said that it belongs to a number of response organizations and participates in mutual aid exercises to supplement the company's self-reliant response capability. Trans Mountain said that equipment and responder resources could be sourced with mutual aid agreements between WCMRC and Western Canadian Spill Services. The main use would be for marine spills, but the resources can also be used for inland spills as well. Trans Mountain said that the Emergency Response Plans (ERPs) also contain detailed documentation in terms of procedures, staffing, and other relevant information about contract response resources.

Trans Mountain said that, although the maximum response time for field operations personnel to mobilize to site is not defined, field personnel are stationed strategically along the pipeline in order to be able to respond promptly to issues that arise anywhere along the pipeline route. Oil Spill Containment and Response (OSCAR) units are currently deployed by dedicated response personnel. The response personnel are headquartered at approximately 14 locations along the pipeline system. Their response time to site will depend on their location relative to the response area, weather and other factors. For response to water bodies, access routes to spill response control points identified along the existing pipeline are pre-defined and available for use by Trans Mountain spill responders to transport spill response equipment and put into operation.

For response to spill locations on land, Trans Mountain said that vehicular access typically occurs using a combination of roads and pipeline right-of-way. In areas of wet or steep terrain on the right-of-way, tracked vehicles may be required to assist the wheeled vehicles, or may be used to transport required equipment and personnel from response staging area to spill response site.

According to Trans Mountain, a highway tractor is required to transport each OSCAR unit to the spill response staging area. Trans Mountain said that it owns a number of these vehicles and these are located at station sites along the pipeline. The OSCAR units are spaced approximately 2-3 hours of road travel time, allowing for an OSCAR to reach any point on the pipeline within 1-1.5 hours of leaving the stations where they are stored. Trans Mountain said it also maintains jet propelled watercraft.

In responses to spills on both water bodies and on land, Trans Mountain said that if surface access proves to be impaired, alternate access routes and or transportation methods, such as helicopter deployment, may need to be used. The decision to transport equipment by helicopter is made by the Incident Command Post at the time of an incident.

Shxw'ōwhámel First Nation said that the containment and recovery of oil in rivers is often made even more complicated by currents, limited access, debris, ice, snags, and various other issues. Conditions in the Fraser River would render the use of conventional oil response techniques essentially impossible during much of the year. Shxw'ōwhámel First Nation was of the view that bottom booms, filter fences, and trenches must be quickly deployed and their success is highly dependent on bottom current conditions and type of oil. Shxw'ōwhámel First Nation said this would prove to be next to impossible in the currents found in many parts of the Fraser River.

The City of Vancouver, Tsleil-Waututh Nation, and Tsawout First Nation assessed the logistics associated with a pipeline spill at the Port Mann Bridge crossing of the Lower Fraser River. They found that, depending on river velocities, there may not be sufficient time to mobilize and deploy equipment in time to control the spill before it reaches the Fraser Delta.

Trans Mountain said that substantial tidal effects in the Fraser River west of the Port Mann Bridge would slow the flow of both water and spilled substances and provide additional response time. In addition, Trans Mountain said that it uses a multi-modal approach to oil spill response and clean-up, whereby equipment and booms would be deployed close to the source at intermediate distances from the source as well as downstream to capture and clean up the product from river banks and marine environment that could have escaped the deployed boom.

Trans Mountain said that the assessment submitted by the City of Vancouver, Tsleil-Waututh Nation, and Tsawout First Nation was overly conservative and did not acknowledge the design and operational parameters for the pipeline such as the pipeline design, construction, and maintenance methods that make a pipeline leak into the Fraser River a low likelihood event in the first place. Trans Mountain said that it would its risk assessment information to refine the pipeline crossing design. Trans Mountain said that at the Port Mann Bridge crossing, it determined that extra heavy wall pipe (19 mm wall thickness) would be placed at appropriate depths under the river and at entry/exit points to ensure that the pipeline is highly protected against flooding, bank erosion, scour and avulsion.

Shxw'ōwhámel First Nation, Squamish Nation, the City of Chilliwack, the Township of Langley and the Province of British Columbia expressed concerns about a spill migrating into groundwater and the long-term impacts as a result of contamination. Trans Mountain said that it puts considerable effort into preventing releases. When releases occur, timely and effective emergency response prevents impacts to groundwater in most cases. Trans Mountain said it recognizes the importance of aquifers that communities depend upon and that it is committed to engaging communities that have specific concerns related to protection of municipal water sources, and would consider the installation of monitoring wells in strategic locations. Trans Mountain said that it would accurately reflect the location of drinking water supply sources within 100 m of the pipeline, its facility, or areas that could be impacted from a release to help inform emergency response.

Trans Mountain said that, if a pipeline release impacts a community's use of an aquifer, it would source and pay for an alternate water supply to meet the needs of the community until groundwater remediation was complete, and groundwater quality met provincial and federal criteria for its intended use.

Trans Mountain also outlined a number of techniques to contain spills and prevent them from entering watercourses. Trans Mountain said that response options would vary depending on the local terrain and the potential for the oil to migrate through the soil. Soil, water, and groundwater contamination would require remediation and would be completed to applicable environmental quality standards for the area and local land use.

Tsleil-Waututh and Tsawout First Nation, and the City of Vancouver said that Trans Mountain's Application lacks critical detail about how responders would manage practical and logistical considerations that are critical to successful river response, such as site access, travel routes, boat launch access, and tactical planning.

Trans Mountain said that it would enhance its year-round emergency response capability by developing Geographic Response Plans (GRPs) that would consider the various environmental conditions that may be encountered, for example, at the Fraser and North Thompson Rivers. GRPs would become a part of the enhanced EMP.

The GRP project would include:

- a review of both Lines 1 and 2 with production of a response capability analysis;
- development of a complete set of GRPs covering both Lines 1 and 2. The analysis referenced above will serve as a key foundational element for the new GRPs that would be developed. The GRPs will provide responders with guidance and detailed information on access, deployment and product recovery as well as strategies and tactics relevant to environmental conditions throughout the year;
- guidance for KMC responders for other environmental factors such as full or partial ice cover of rivers, streams and lakes, forest fire and smoke, avalanche and flooding conditions.;
- a full review of control points including spacing, access suitability under various environmental conditions and others;
- consultation with First Nations, local and regional governments, as well as Trans Mountain's existing mutual aid partners; and
- shoreline Cleanup and Assessment Technique (SCAT) guidance.

The City of North Vancouver raised concerns about Trans Mountain's capability to contain and recover diluted bitumen. Trans Mountain said that the initial response to a diluted bitumen spill is no different than responding to any other conventional heavy crude oil spill. Trans Mountain said that the products shipped on its system are, by tariff, restricted from having a specific gravity greater 0.94 and would not sink in their unweathered state. Quick response ensures that weathering of spilled oil can be minimized. Trans Mountain said that it trains over 100 field and office response team members, several times a year in the ICS, which provides a common response mechanism for responders and others who are part of the response community. It also said that its WMT staff receive hands-on boat training and carry necessary Transport Canada certification for the operation of the on-site response boat.

Squamish First Nation and Andhra Azevedo were concerned with the difficulties of recovering sunken oil, and whether Trans Mountain had the capability to respond to a spill. Trans Mountain said that if some spilled oil sinks, due to extended weathering and interaction with suspended sediment as a result of a combination of factors such as weather or access, and it could not be easily recovered during the emergency phase (such as oil in shallow water or along shorelines), it would be treated as a post-emergency recovery function. Trans Mountain also said that the remedial actions, including actions required to recover sunken oil, would be developed by the responsible party and regulatory authorities working as part in a Unified Command and would be guided using Net Environmental Benefit Assessment (NEBA) principles. Trans Mountain added that the approach to sunken oil remediation would be similar to cleanup of industrially contaminated sediments in waterways. Each situation would be unique and, where warranted, methods may include:

- capturing the oil where currents and hydrographic conditions are amenable to the deployment of oleophilic material to trap the oil;
- remobilization, containment, and removal of the oil through agitation of sediments (raking, dragging, pneumatic agitation);
- bulk removal of the oil through pumping and/or dredging; or
- long-term monitoring and natural attenuation in areas where remedial actions pose more harm than benefit.

In response to Squamish First Nation's questions regarding the equipment Trans Mountain has to recover sunken oil, Trans Mountain indicated that WCMRC owns equipment to recover floating oils, over-washed oils and submerged and sunken oils that have been purposely re-mobilized for recovery on the surface. Trans Mountain said that neither Trans Mountain nor WCMRC maintains equipment to specifically recover sunken oil and that such equipment can be procured from dredging and remediation contractors.

Trans Mountain said that enhancing its emergency response service or equipment providers list prior to operation of the expanded pipeline system would be part of the enhanced EMP being completed post-decision, during the final design phase of the Project. Trans Mountain said that the EMP would be one of the key inputs to inform the company as to what its future response resource needs will be.

9.4.2 Consultation and evacuation in emergency situations

The Province of British Columbia, Mr. Calvin Taplay, Wembley Estates Strata Council and Simon Fraser University, raised concerns about the adequacy of Trans Mountain's consultation with the public and local authorities in the event of an emergency situation. Trans Mountain said that municipalities' Emergency Measures Offices are often responsible for developing emergency evacuation plans. These offices are not only tasked with planning and implementing emergency response measures, but also with ensuring the overall protection of the public impacted by an incident. Trans Mountain said that it is committed, willing, and able to work with local authorities to determine the best course of action to protect the public and the environment during an incident. It said that it does not plan to develop tactical evacuation plans for municipalities or institutions since it does not have the authority to implement such plans unilaterally.

Ms. Dorothy Doherty said those residents who live close to the Burnaby Terminal need to be included in and be made aware of relevant components of the EMP in order to be informed and aware of the hazards. Ms. Dorothy Doherty said that residents who live close to the Burnaby Mountain Terminal may have difficulties evacuating, in the event of an incident, as evacuation from this area is limited and complex. She said that, if any of the routes are blocked, residents could be trapped, with no way of evacuating.

Halston Hills Housing Co-op and Ms. Doherty asked how teachers and schools should respond if an incident was to occur. Trans Mountain said that the company is open to working with individual schools and School Districts to fully support their safety efforts and ensure their Emergency Response Plans and Trans Mountain's are coordinated.

Trans Mountain said that teachers should respond to a pipeline emergency similar to the way they respond to other emergencies at school, and contact emergency services immediately. If a release is suspected or faint odour detected within the school, they should shelter in place unless advised otherwise by emergency services. For a more substantial release, where strong petroleum odours exist in close proximity to the school, emergency services will advise evacuation to a safe location, in an upwind direction, if possible. The school should also call emergency services and Trans Mountain to report any suspected pipeline issues.

9.4.3 Firefighting capabilities at the Westridge Marine Terminal

In the event of a fire at the WMT, Trans Mountain said that area municipalities have firefighting boats and that harbour tug operators also operate firefighting capable tugs from their bases in Vancouver Harbour.

The Province of British Columbia asked Trans Mountain if it would provide its own firefighting resources to fill any existing gaps in firefighting capabilities at the WMT. Trans Mountain said a consortium of municipal fire departments currently supports emergency response for a marine fire in the Burrard Inlet, including the City of Vancouver, City of Burnaby, City of Port Moody, as well as the District and City of North Vancouver. The City of Vancouver is taking the lead in negotiating a new consortium and funding arrangement for new fire boats and additional training of firefighters to provide continuous coverage. As a tenant of the Port and given its relationship with Port Metro Vancouver, Trans Mountain said it sees an opportunity to support the City of Vancouver's initiative and contribute towards the cost of the new consortium in addition to having Seaspan Marine and SMIT Harbour Towage available to operate firefighting capable tugs from their bases in Vancouver Harbour.

Trans Mountain said that, in the event of a fire or explosion aboard a vessel at berth at the WMT, the ship's machinery spaces are protected with fixed firefighting equipment, such as CO_2, high expansion foam and water mist systems. Trans Mountain said that such systems effectively extinguish a fire in any of these spaces. Trans Mountain said that fire in a vessel's galley or accommodation could be managed effectively by the crew using the ship's firefighting equipment, such as fire hoses and extinguishers, or, depending on the space, fixed equipment such as sprinklers. Trans Mountain outlined training requirements for a tanker crew for fire prevention and response. Trans Mountain said the probability is low of a fire in the galley or accommodation escalating into a fire and explosion involving the cargo, and thus not considered credible.

Trans Mountain said that the WMT has the capacity to apply water and foam to the deck of a tanker at berth. If necessary, water can be supplied to the vessel's fire mains using the international shore connection. Trans Mountain said that current

available firefighting foam for response at the WMT includes 5,600 liters stored at the WMT and 40,850 liters stored at the Burnaby Terminal. Additional quantities can readily be obtained from other Kinder Morgan Canada terminals and also through mutual aid partners.

The City of Port Moody raised a specific concern about expected response time and response agencies for fire at the WMT and on vessels in Burrard Inlet. Trans Mountain said that Westridge personnel would immediately activate the fire suppression system and monitoring according to the Fire Pre-Plans, municipal firefighters would arrive at the Terminal within 15 minutes, and that industrial firefighting contractors would arrive at site within 6-12 hours.

9.4.4 Spill response at the Westridge Marine Terminal

Trans Mountain said that it takes a systems approach for on-water oil spill response. It selects countermeasures appropriate for the physical properties of the oil, its fate and behaviour, and the environmental conditions where the release occurred. This requires the deployment of adequate and well-maintained equipment by a knowledgeable crew managed under a formal incident management system comprised of key stakeholders from industry, government, and communities. Trans Mountain said that the safety of first responders and other response personnel is a key concern, and that every effort is made to ensure that these persons are not put at risk. Trans Mountain said that the Westridge facility response plan, including spill response capacity, would be enhanced as part of the Project.

The TERMPOL Review Committee said that under the CSA, 2001, the WMT, as a prescribed Oil Handling Facility (OHF), must have oil spill response capability, an Oil Pollution Emergency Plan, and an Oil Pollution Prevention Plan. An OHF must also have equipment, personnel, and training and exercise programs that allow it to deploy an immediate response in the event of an oil spill as well as response equipment and resources on site to immediately and safely contain and control an oil spill incident at the facility. As an existing OHF, the WMT already has such plans in place, which will be revised and updated if the Project moves forward.

Trans Mountain committed to submitting its Oil Pollution Emergency Plan for the WMT to Transport Canada for review at least six months before operations begin at the WMT.

Trans Mountain said that WMT operations are equipped to provide immediate response in the event of a spill. It said that the loading operations are enclosed within a boom, additional response equipment is kept on site and personnel are trained based on KMC's (as the operator) Westridge Emergency response plans. Trans Mountain said that it has additional booms stored at Westridge that can be deployed quickly.

Trans Mountain said that, if a spill was to occur, the responsible party (Trans Mountain for a pipeline spill; the tanker owner for a tanker spill) would work with regulatory agencies in a Unified Command to determine both response and remediation strategies appropriate for the specific circumstances of the event. Response strategies employed would focus on controlling the source of the spill, preventing released oil from entering a waterbody, promptly removing oil from the water surface, and removing from the shoreline stranded oil that could be remobilized.

Trans Mountain's evidence was that the spill location and the environmental conditions during the response influence operational effectiveness. Winds, waves, and currents (tidal or wind driven) would affect the following mitigation efforts:

- ability to quickly reach the spill site;
- deployment of booms to contain, concentrate and reduce the spreading of spilled oil;
- mechanical skimming to recover oil from the surface of the water; and
- transfer of recovered oil from smaller skimming vessels into sufficient larger units for temporary storage.

Regarding shoreline protection and mechanical recovery methods such as booming, Trans Mountain said that based on historical response times and regulatory requirements, secondary boom would be deployed at the WMT within one hour of a spill. Federal standards require WCMRC to respond to a spill within six hours for any spill in Port Metro Vancouver. Trans Mountain said that WCMRC has consistently responded to incidents in far less time. Under its proposed enhanced response planning, Trans Mountain said that it and WCMRC have committed to initiating spill response within the Port Metro Vancouver area within two hours.

WCMRC also intends to develop specific oil spill Geographic Response Strategies (GRS) that will form part of area Geographic Response Plans (GRPs) and priority Shoreline Cleanup Assessment Techniques (SCAT) for the coastal shoreline of B.C. As a demonstration project, WCMRC has developed a working Geographic Response Plan system for the areas surrounding the WMT. It said that the results of the demonstration project proved valuable and would be carried out through the province.

To challenge and validate response assumptions, Trans Mountain simulated a response in the event of a spill at the WMT. At the start of the simulation, the state of tide showed that oil would quickly touch the shorelines to the west of Westridge

near Shell docks, and also the shorelines near Maplewood flats. Trans Mountain said that its priority would be to set up collection booms near Shell docks as other locations, such as Maplewood flats and Cates Park, are WCMRC pre-determined boom deployment location in Burrard Inlet. Based on the simulated environmental conditions at the time, the immediate goal of the booms in the scenario was to deflect the oil away from the shoreline west of the WMT and out into open water spaces where it would be more accessible to skimmers.

In the simulation, 300 metres of deflection boom was deployed west of the Shell Dock within three hours, and an additional 400 metres of deflection boom was deployed beyond that point within 4-hours. By the fourth hour, the simulation depicted crews deploying 1 667 metres of protection boom at Cates Park and an additional 867 metres of boom in the area near Westridge. Within 12 hours of the spill, environmental conditions had reduced the thickness of the remaining oil outside the boom to under 10-microns (50-microns is generally considered the threshold for effective mechanical recovery; thicknesses below that value are considered sheens). Trans Mountain said that WCMRC continues to work on developing geographic response plans and look into improving techniques of shoreline oiling prevention including tactical deployment of booms at pre-determined boom locations.

Trans Mountain said that, in the event of an emergency, it can provide air plume dispersion modelling in a short period of time. In the event of a spill, Trans Mountain said that it immediately implements an air monitoring program which would provide site and community air contaminant concentration data to Emergency Services before dispersion modelling results would be available.

For a spill from a tanker at berth at the WMT that may fall under joint responsibility between the vessel operator and marine facility operator, depending on the specifics of the spill, Trans Mountain said that either the Canadian Coast Guard (for a spill originating on water) or the National Energy Board (for a spill originating from the pipeline on land) would be the lead federal agency. The response would be managed under an Incident Command System (ICS) structure with the vessel owner, Trans Mountain, and the appropriate authorities participating in a Unified Command. Decisions as to the appropriate level of response would be determined by Unified Command.

Views of the Board

Trans Mountain's Emergency Management Program

The Board is satisfied with Trans Mountain's commitment to review and revise its existing Emergency Management Program (EMP) to address the needs of the expanded pipeline system. The existing EMP would form the foundation for the revised EMP and be subject to the Board's regulatory requirements and compliance verification activities.

One of the most serious concerns among communities affected should an oil spill occur from a Trans Mountain facility is whether Trans Mountain has the capability to manage the incident effectively. Trust and respect are earned, not given. The public deserves to know that, should an incident occur, there are capable people in place to respond and to make competent decisions on mobilization of equipment and resources, spill detection, tracking and monitoring, and on implementing the most appropriate response strategies.

The development of a comprehensive EMP with appropriate training of personnel and first responders, and consulting and liaising with those potentially involved in an incident response, will help clarify roles and responsibilities, as well as protect the safety of workers and the public. The Board is satisfied that Trans Mountain takes full responsibility for emergency response related to an incident from the Trans Mountain Pipeline system and its facilities. The Board recognizes that even with sophisticated oil spill prevention and safety measures in place, the risk of an oil spill remains.

The Board heard from participants who stressed the importance of consultation between Trans Mountain and municipalities, first responders, Indigenous groups and others in the development of Trans Mountain's enhanced EMP. The Board is satisfied with Trans Mountain's commitment to consult with first responders, communities, Indigenous groups, and regulatory authorities. The objective of this consultation is to enhance its EMP documents for the Project, by gaining local knowledge of the challenges that would be present in different locations at different times of the year. The Board is satisfied that Trans Mountain is committed to building relationships and better understanding of municipal emergency response programs through emergency response exercise and consultation.

Detailed design work and a comprehensive review of the company's existing EMP would be required, post approval, to further inform Trans Mountain's emergency preparedness and response planning. Additional information would be required by the Board to ensure that Trans Mountain's company's EMP documents and capabilities are in place. The Board has included Conditions 90, 117 and 124 related to Trans Mountain's commitment to enhance its existing Emergency Management Program to incorporate the needs of the Project, including consultation with Appropriate Government Authorities, first responders and potentially affected Indigenous groups.

To verify compliance with Trans Mountain's commitments regarding emergency preparedness and response, and to demonstrate that Trans Mountain has developed appropriate site-specific emergency preparedness and response

measures, the Board requires Trans Mountain to demonstrate that it is able to respond immediately to all spills and to incorporate response time targets to an emergency for each 10-km long segment of the pipeline (Condition 125).

Emergency response

The Board heard preparedness is part of a larger response framework based on guiding principles that includes incident prevention, preparedness, rapid and coordinated response and restoration. Preparedness includes planning for credible incident scenarios, developing strategies for effective response, training response teams and resourcing appropriate supplies, equipment and personnel. Engagement of stakeholders in the planning process will better ensure an efficient and effective response if an incident should occur.

The Board finds that an effective response does not guarantee recovery of all spilled oil, and that no such guarantee could be provided, particularly in the event of a large terrestrial, freshwater, or marine spill. The oil spill preparedness and response commitments made by Trans Mountain cannot ensure recovery of the majority of oil from a large spill. Recovery of the majority of spilled oil may be possible under some conditions, but experience indicates that oil recovery may be very low due to factors, such as weather conditions, difficult access, and sub-optimal response time, particularly for large marine spills.

Participants said that Trans Mountain had not demonstrated that its spill response would be effective. Some had differing views as to what an effective spill response would entail. The Board is of the view that an effective response would include stopping or containing the source of the spill, reducing harm to the natural and socio-economic environment to the greatest extent possible through timely response actions, and appropriate follow-up and monitoring and long-term cleanup. The Board is of the view that these elements are addressed in Trans Mountain's design of its response plans.

Trans Mountain and other parties have provided sufficient information to inform the Board's views and requirements regarding emergency preparedness and response planning at this stage in the lifecycle of the regulatory process. Information filed by Trans Mountain was also supplemented by extensive information filed by hearing participants through letters of comment and written evidence.

The Board finds that Trans Mountain and other participants provided sufficient information on oil spill modelling, response planning, and prevention and response measures at this stage of the lifecycle regulatory process. The Board does not share the view held by the Province of British Columbia, the City of Burnaby and Shxw'ōwhámel First Nation that Trans Mountain did not provide enough information to inform the Board about proposed emergency preparedness and response planning.

The Board shares concerns raised by the City of Burnaby Fire Department and others about the need for adequate resources to respond in the case of a fire. The Board finds the 6-12 hour response time proposed by Trans Mountain for industrial firefighting contractors to arrive on site as inadequate, should they be needed immediately for a response to a fire at the Burnaby Terminal. The Board would impose conditions requiring Trans Mountain to complete a needs assessment with respect to the development of appropriate firefighting capacity for a safe, timely, and effective response to a fire at the Westridge Marine Terminal (WMT) and at the Edmonton, Sumas, and Burnaby Terminals. The conditions would require Trans Mountain to assess and evaluate resources and equipment to address fires, and a summary of consultation with appropriate municipal authorities and first responders that will help inform a Firefighting Capacity Framework (Conditions 118 and 138).

When infrastructure is sited, collaboration will be instrumental in achieving a balance of trust, values and preferences necessary for successful emergency response. Effective collaboration requires a clear understanding of roles, responsibilities and tasks among all first responders as well as a common understanding of the situation at hand. This can only be achieved if relationships are built through a perceived need and willingness to collaborate outside the stress of an incident. The Board considers it the mutual responsibility of Trans Mountain and stakeholders to collaborate. Those that do not collaborate or engage in relationships are negatively impacting the preparation and readiness for emergency response. The Board heard about the benefits of collaboration during the City of Abbotsford's final argument. In response to the City of Abbotsford's concerns regarding the absence of an OSCAR unit in Abbotsford, Trans Mountain had moved a unit to its facility in Abbotsford.

During final argument, the Board also heard from the District of North Vancouver, the Fraser Valley Regional District, the Township of Langley, the City of Abbotsford and the Fraser-Fort George Regional District about the lack of consultation to date and the company's failure to incorporate feedback into emergency response planning. They also expressed concerns over fire departments not being equipped or trained for pipeline emergency response, and not having a functional understanding of the various liquids that they could be responding to should an oil spill occur. In addition, the Board heard about the need for emergency response plans and documents developed by Trans Mountain to have meaningful input from local governments, emergency response organizations and first responders, and the need for full-bore rupture exercises. The Board is of the view that consultation and communication between Trans

Mountain and local governments, emergency response organizations and first responders is needed. This consultation and communication must be transparent, genuine, ongoing, structured, collaborative and respectful. The Board is satisfied with Trans Mountain's commitment to ensure first responders within local communities and Indigenous groups are aware of their roles and responsibilities, receive adequate training with respect to emergency incidents that could occur along the pipeline, and have the opportunity to consult and provide input with respect to the enhanced EMP for the Project.

The Board finds that spills can occur and depending on circumstances, spill location and volume, spills may require significant resources, amplifying the need and importance for Trans Mountain to consult and communicate with the aforementioned groups on the complexity of emergency response and the company's ability and capability to respond efficiently and effectively to an incident, should one occur. The Board has imposed Conditions 90, 117 and 124 to help facilitate consultation and communication between Trans Mountain and Appropriate Government Authorities, first responders and potentially affected Indigenous groups.

The Board finds that written evidence provided by the City of Vancouver, Tsleil-Waututh Nation, and Tsawout First Nation provided additional insight into how far an oil spill might travel downstream and that recovery may not be possible, specifically in the Fraser and North Thompson Rivers. Trans Mountain provided sufficient modelling information indicating the potential extent of downstream oil transport. Trans Mountain has considered this information in its response planning and development of Geographic Response Plans as well as tactical response plans. Based on the evidence, in the Board's view, adequate preparation and planning can lead to an effective response, but the ultimate success of the response would not be fully known until the time of the spill event due to the many factors which could inhibit the effectiveness of the response. The Board is of the view that Trans Mountain is being proactive in its planning and preparation for effective spill response. The Board has included a condition for Trans Mountain to conduct full-scale exercises and test a variety of scenarios including a full-bore rupture into the Fraser River at the Port Mann Bridge as well as a full-bore rupture into the North Thompson River, under high flow conditions (Condition 153).

The Board heard that should a spill occur, it was important to protect the environment during and after the spill event. The Board is of the view that it is important to have site-specific data in advance of any spill in order to plan ahead of time. This was raised, in particular, for areas such as the Fraser and Thompson Rivers. Site-specific tactical plans were raised as being extremely useful for enabling rapid deployment of response resources, thereby limiting the impact of a release.

The Board heard that river systems such as the Fraser River, North Thompson River, Coquihalla River, and Coldwater River undergo marked seasonal variations in rates of flow, ice cover, accessibility, and other factors that impact and challenge emergency response operations. Environmental conditions that may reasonably exist for any time of year need to be considered and incorporated into emergency preparedness planning and response, selection of response equipment, and training of personnel.

The Board finds that Trans Mountain has appropriately identified issues which are particularly important for the project for inclusion in its emergency preparedness and response planning process. These include issues such as response under challenging environmental conditions, identification of sensitive and high consequence areas and response measures for submerged and sunken oil that may have escaped deployed boom or containment and will be addressed during remediation. The Board notes that terrestrial spills and spills that impact river banks or shorelines are typically cleaned up in accordance with relevant guidelines and criteria, although long-term monitoring and remediation may still be required.

Being prepared to respond to an incident includes assessing the availability (both local and regional) and the appropriateness of resources (equipment and response personnel) that will be brought to bear during the first 24 to 96 hours, from local sources and from regional sources in order to execute and implement standard and site-specific emergency response procedures and strategies. To facilitate the procurement and the mobilization of emergency response equipment needed during an incident, it is advantageous to own emergency response equipment or have mutual aid agreements or third party contractor agreements which should be prearranged with other industry operators in the region. Equipment caches and agreements may allow for the expedited release of key oil response equipment needed to respond effectively to a major incident before cascading resources can arrive from outside the region, if needed. The Board is satisfied that Trans Mountain has access to internal and external equipment and has mutual aid agreements in place to execute, if needed, should an incident occur.

The Board heard from intervenors that they were concerned about evacuations during an incident resulting from a Trans Mountain facility. While the Board understands that it is primarily the responsibility of a municipality to execute an evacuation, there is a need for a company to map out and support the mobilization and coordination of all relevant agencies and resources. This includes providing clear direction and regular and reliable information to the public and to first responders, which is important for a timely response.

The Board is of the view that Trans Mountain should be more proactive in its approach, as a generic evacuation plan cannot be applied to address all scenarios. Any plan must be based on the particular risks - and in this case, the risks that Trans Mountain facilities potentially pose - for the public living in and working in an area where evacuation could be necessary, and be further adapted according to events as they evolve. Trans Mountain is in the best position to understand the facilities' hazards, and how those hazards will impact the public. The Board is of the view that additional effort needs to be made in this area and has imposed Condition 123 to address Evacuation Plans. The Board also heard Simon Fraser University's (SFU) concerns about evacuation and the challenges related to accessibility to the University via the Burnaby Mountain Parkway and Gaglardi Way intersection, should an incident at the Burnaby Terminal occur. This condition will also require open and transparent dialogue for Trans Mountain to address SFU's concerns.

Detailed design work, consultation and planning would be required, post approval, to inform further Trans Mountain's emergency preparedness and response planning. Additional information would also be required to ensure that Trans Mountain's emergency preparedness and response plans and capabilities are in place. The Board requires Trans Mountain to report on implementation of its emergency response commitments that would involve consultation with appropriate government authorities, first responders and potentially affected Indigenous groups. Trans Mountain would be required to report on:

- its emergency response plan for construction (Condition 89);
- its consultation on improvements to the Emergency Management Program (Condition 90);
- updates on the improvements to the Emergency Management Program (Condition 117);
- its firefighting capacity at terminals (Conditions 118 and 138);
- its emergency preparedness and response exercises before and after commencing operation (Conditions 120, 136 and 153);
- its emergency preparedness and response exercise and training program including a schedule for tabletop and full-scale emergency response exercises (Condition 119);
- the consultation and development consultation of evacuation plans (Condition 123);
- the implementation of improvements to Trans Mountain's Emergency Management Program (Condition 124);
- its emergency preparedness and response plans for the pipeline and for the terminals (Condition 125); and
- its emergency preparedness and response plan for the WMT (Condition 126).

The Board has a comprehensive regulatory regime in place related to pipeline and terminal design, safety, spill prevention and spill preparedness and response. Trans Mountain would be subject to this regime.

Environmental assessment

Small changes have been made to this chapter since the Board's May 2016 OH-001-2014 Report. Most of this chapter is unchanged, since Chapter 10 focuses on the environmental assessment of the Project only (i.e., the pipeline facilities and Westridge Marine Terminal) and this is outside the scope of the Reconsideration. However, the Reconsideration Panel necessarily relies on Chapter 10 views and findings of the Board from the OH-001-2014 hearing in order to make the required recommendation to the GIC under subsection 30(4) of the CEAA 2012 for the designated Project. The Reconsideration Panel's environmental assessment under the CEAA 2012 of Project-related marine shipping is found in Chapter 14.

The only change of substance in Chapter 10 is in Section 10.1 where the scope of the CEAA 2012 environmental assessment has been revised to reflect the Reconsideration Panel's inclusion of Project-related marine shipping in the "designated project" to be assessed under the CEAA 2012. Beyond that, the limited amendments in Chapter 10 provide references to where topics are covered in Chapter 14 to avoid confusion.

10.1 Overview

The Board considers environmental protection as part of its public interest mandate under the *National Energy Board Act* (NEB Act) and assesses environmental protection in each application before it. This includes the current Trans Mountain Expansion Project (Project) where the Board is required to make a recommendation under section 52 of the NEB Act, which requires the Board to have regard to all considerations that appear to the Board to be directly related to the pipeline and to be relevant. Also, under section 52 of the NEB Act, the Board can consider any public interest that in the Board's view may be affected by the issuance of a certificate or the dismissal of the application.

The Board also has a mandate to conduct environmental assessments under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) for projects contained within that Act's *Regulations Designating Physical Activities.* As a responsible authority under the CEAA 2012, the Board must, in its report to the Governor in Council, set out its recommendation regarding the environmental effects of a project. Specifically, the NEB provides a recommendation that a project is likely, or is not likely, to cause significant adverse environmental effects after taking into account the implementation of mitigation measures. For effects that are likely to be significant, the Board must also recommend whether or not they are justified in the circumstances. As part of the Board's environmental assessment under the CEAA 2012, the Board considers any cumulative effects that are likely to result from the Project in combination with environmental effects from other physical activities that have been or will be carried out. The Board also considers the environmental effects of accidents and malfunctions that may occur in connection with the Project.

The Project involves constructing and operating an oil pipeline more than 40 km long that, if approved, would be regulated under the NEB Act. Therefore, the Project is contained within the *Regulations Designating Physical Activities* and the Board has conducted the necessary environmental assessment of it under the CEAA 2012.

This chapter focuses on the changes caused to the biophysical environment by routine Project construction and operations, and on the consequences of potential spills from the pipeline and the facilities. This includes the Westridge Marine Terminal (WMT). The socio-economic effects of routine Project construction and operations are addressed in Chapter 11. Chapter 14 addresses potential effects of the routine operation of Project-related marine shipping, and the consequences of potential spills from Project-related tankers.

10.1.1 Scope of the environmental assessment under the CEAA 2012

The scope of the environmental assessment under the CEAA 2012 includes the following three elements:

1. The physical works and activities making up the Project and Project-related marine shipping (as described by Trans Mountain in its application and subsequent filings).
2. The biophysical and socio-economic elements that are likely to be affected by the Project and Project-related marine shipping.
3. The factors that must be taken into account in conducting an environmental assessment (described in section 19 of the CEAA 2012).

On 2 April 2014, the Board released the Factors and scope of the Factors for its Environmental Assessment under the CEAA 2012. On 12 October 2018, the Board issued the Amended Factors and Scope of the Factors for the Environmental Assessment pursuant to the CEAA 2012 to reflect its decision to include Project-related marine shipping between the WMT and the 12-nautical-mile territorial sea limit in the "designated project" to be assessed under the CEAA 2012. This document is found in Appendix 10.

10.1.2 Potential effects associated with upstream and downstream activities

In its List of Issues for the OH-001-2014 hearing, the Board said that it did not intend to consider the environmental and socio-economic effects associated with upstream activities, the development of oil sands, or the downstream use of oil transported by the pipeline. During the hearing, the Parents from Cameron Elementary School, Burnaby, and the City of Vancouver, with the support of several other intervenors, requested that the Board expand its List of Issues to include these upstream and downstream effects. The Board decided against these requests in its 23 July 2014 Ruling No. 25, stating in part the following:

> "The Project does not include upstream production and is not dependent on any particular upstream development; therefore, any link to environmental changes caused by such upstream production is indirect and is not necessarily incidental to Project approval.
>
> In addition, no particular upstream development is dependent on the Project."

With respect to downstream use, the Board said:

> "The Project does not include downstream use and is not tied to, or dependent on, any particular use in any particular destination... The effects of end use are not directly linked or necessarily incidental to the Board's regulatory process regarding the Project."
>
> "[D]ownstream effects are more effectively assessed and regulated by the jurisdictions where the use occurs."

As a result and as fully detailed in Ruling No. 25, the Board did not consider these upstream and downstream effects in its assessment of the Project.[83] However, the Board did consider greenhouse gas emissions from Project construction and operation.

[83] The City of Vancouver sought leave to appeal Ruling No. 25. Leave to appeal was dismissed by the Federal Court of Appeal on 16 October 2014.

In the MH-052-2018 hearing, the Board received comments that the List of Issues should address effects of other upstream and downstream activities. In its reasons[84] for the Board's decision on the List of Issues, the Board said that the analysis in Ruling No. 25 applies in this case.

The Board received a notice of motion from Stand.earth which states that by excluding consideration of the environmental and economic effects associated with upstream activities (including oil sands development) and the downstream use of the oil intended to be shipped on the pipeline, the Board refused to consider evidence related to the impact of the increase in GHG emissions caused by the Project. The Board has issued Ruling No. 30 in this regard.

10.1.3 Responsibilities under other Acts

10.1.3.1 *Fisheries Act*

Under subsection 35(1) of the *Fisheries Act*, no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Indigenous fishery, or to fish that support such a fishery, unless such work, undertaking or activity is exempted, as per subsection 35(2) of the *Fisheries Act*.

The Board and Fisheries and Oceans Canada (DFO) entered into a Memorandum of Understanding (MOU) on 16 December 2013. Under the MOU, the Board has the responsibility to assess potential impacts to fisheries from proposed NEB-regulated pipeline and power line applications, and notify DFO if any such works may likely require authorization under the *Fisheries Act*. DFO would then be responsible for issuing any *Fisheries Act* authorization(s). The MOU does not apply to marine terminals or marine shipping.

For this Project, the Board was responsible for reviewing Project works related to the construction of the pipeline and facilities (excluding the WMT), and refer any works to DFO that the Board determines may likely require authorization under the *Fisheries Act.* For a detailed discussion of this review, see Section 10.2.5 – Freshwater Fish and Fish Habitat. The Board was also responsible for conducting an environmental assessment of the potential effects of the Project (including the expansion of the WMT) on marine fish and fish habitat, as per the requirements of the CEAA 2012 (Section 10.2.14). The responsibility to review the potential effects from the expansion of the WMT on marine fisheries, under the *Fisheries Act*, remains the responsibility of DFO.

The Board also conducted an environmental assessment, under the NEB Act, of the potential effects on marine fish and fish habitat from Project-related marine vessels (Chapter 14, Section 14.7.3 – Marine Fish and Fish Habitat). The responsibility to ensure that Project-related marine vessels, as well as all other marine shipping vessels, are in compliance with the *Fisheries Act* remains the responsibility of DFO.

10.1.3.2 *Species at Risk Act*

Pursuant to the *Species at Risk Act* (SARA), the Board is required to identify the adverse effects of projects that are contained within the CEAA 2012 *Regulations Designating Physical Activities* on each listed wildlife species and its critical habitat. The Board must also ensure that measures are taken to avoid or lessen those effects, and to monitor them.

On 23 April 2014, the Board notified the Ministers of Environment and Climate Change Canada (ECCC), DFO, and Parks Canada Agency that the Project, if approved and constructed, may affect a number of species listed on Schedule 1 of the SARA (SARA-listed species) and/or their habitat.

In meeting the Board's obligations under the SARA, the Board assessed the environmental effects of the Project on the SARA-listed species. The Board identified the potential adverse effects that the Project might have on listed wildlife species and their critical habitats. The Board considered the mitigation measures proposed to avoid or minimize those effects, and the plans to monitor their effectiveness. The Board also considered all reasonable alternatives (e.g., routing, design, mitigation) to reduce the impact on species' critical habitat. In addition to Trans Mountain's proposed measures, the Board would also impose conditions requiring Trans Mountain to implement measures that are consistent with any applicable recovery strategies and action plans.

Under the MOU with DFO, the Board has the responsibility to determine if proposed projects would impact aquatic species at risk, and to notify DFO of such impacts. DFO would then determine if permitting may be required under the SARA.

With regard to Project-related marine shipping, the Board's responsibilities under section 79 of the SARA is discussed in detail in Chapter 14.

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[84] Board's reasons for the List of Issues, 29 October 2018 (A95187-5)

10.1.4 Environmental and socio-economic assessment methods

In assessing the environmental and socio-economic effects of the Project, the Board considered the environmental and socio-economic setting, potential effects on valued components (both environmental and socio-economic), interactions between the valued components, the adequacy of Trans Mountain's proposed environmental protection strategies and mitigation measures to address them, environmental concerns or issues raised by intervenors and commenters, as well as the adequacy of Trans Mountain's own environmental and socio-economic assessment.

The Board generally adopted the spatial and temporal boundaries for each valued component as defined by Trans Mountain, for both Project effects and cumulative effects. The spatial boundaries (or study areas) are described in Appendix 11. For the temporal boundaries, the Board considered the planning, construction, operations and abandonment phases of the Project.

Section 10.2 provides detailed analyses of potential adverse environmental effects that were of elevated concern to the public or Indigenous groups, or have potential environmental consequences that require additional measures or Board conditions to mitigate them. The absence of a discussion on a particular effect in this section does not imply that it was not assessed.

Where any effects (whether significant or non-significant) were predicted to remain after proposed mitigation is applied (i.e., residual effects), the Board assessed cumulative effects. This involved considering the residual effects associated with the Project in combination with the residual effects of other past, current and future (i.e., reasonably foreseeable) physical facilities and activities, and that have effects within the temporal and spatial boundaries and ecological context adopted for the Project assessment.

In evaluating the significance of cumulative effects, the Board focused on the total cumulative effects resulting from all physical facilities and activities as defined above, considered in combination with Trans Mountain's proposed Project. Section 10.1.5 discusses the Board's views on using this approach for cumulative effects instead of the one originally proposed by Trans Mountain.

In Section 10.1.6, the Board discusses follow-up programs required under the CEAA 2012.

The Board discusses its environmental and socio-economic assessment methods for Project-related marine shipping in Chapter 14.

The Board's conclusion and recommendation to the Governor in Council on its overall CEAA 2012 significance determination for the Project is found in the introduction and disposition section at the front of this MH-052-2018 Report.

10.1.4.1 Indicator species-based approach and species at risk

Trans Mountain used an approach based on indicator species[85] to estimate potential operational effects of the Project on other species, and used this same approach for species at risk. Several intervenors raised concerns that Trans Mountain did not assess certain species as part of the environmental assessment, and that some key indicator species were missing.

Trans Mountain said that using indicators to assess potential Project effects on biotic elements is a commonly-employed method in environmental assessment. It said that it chose key indicators to be representative of certain potential Project effects since it is not necessary to assess all species individually. It said that, based on the information provided for the selected indicators, one could infer the potential effect pathways and likely responses to disturbance of other species with similar ecological requirements. Nevertheless, at the request of the Board and Environment and Climate Change Canada (ECCC), Trans Mountain completed, and filed as evidence, individual assessments for SARA Schedule 1-listed species that may be affected by the Project.

In the MH-052-2018 hearing, several intervenors again raised concerns about using an indicator species-based approach for assessing effects of spills and of the operation of Project-related marine shipping specifically. This issue is discussed in Chapter 14, along with the Board's corresponding views.

[85] This approach involves using one species to represent the similar environmental characteristics of a group of species or a particular ecosystem.

Views of the Board

The Board concludes that as long as the selected indicator species can reasonably represent other relevant species, then relying on this method of assessing Project effects is generally acceptable for most species (with the exception of the SARA-listed species) that have similar habitat or ecological function and requirements, and that are likely to respond similarly to certain effects.

Given the potential for the Project to affect various SARA-listed species, their residences or their critical habitat, and considering their at-risk status and potential sensitivity to further adverse effects, the Board considered it appropriate, in general, to assess the Project's effects on each of those species individually. This provided the Board with greater certainty that effects are appropriately identified, addressed and effectively mitigated, taking the particularities of each species at risk into account. Therefore, the Board has applied this approach to its assessment of species at risk. Although effects and mitigation have been considered for each individual species at risk separately, the Board only provided a species-specific discussion if it was deemed to be necessary (i.e., if a species was likely to be impacted from the Project) in addition to its more general discussion.

10.1.4.2 Determining significance

In determining the significance of residual environmental and socio-economic adverse effects from Project construction and operations, after taking mitigation and offsets into account, the criteria the Board considered were temporal extent, reversibility, geographic extent and magnitude. Appendix 12 provides the common ratings for each criterion, and basic definitions for each rating. The Board took into account ecological and social context when arriving at its findings with respect to each criterion, in addition to any uncertainties with respect to potential effects. Appendix 12 also provides the Board's definitions of "likely to be significant" and "not likely to be significant." In general, Project effects are considered "likely to be significant" when effects are either of "high magnitude," or "long-term, permanent, and of regional or global extent."

The Board's evaluation of the likely significance of adverse effects is presented in a tabular format for most key valued components (or indicators within those components). For each residual effect considered in detail, the Board has provided its views, including a discussion of any additional mitigation or actions required by way of recommended conditions. The significance tables also include a discussion of cumulative effects.

10.1.4.3 Methods for assessing accidents and malfunctions

Trans Mountain said that the methods it used to assess the environmental and socio-economic effects of Project spills were different than the methods it used for assessing the effects of routine Project activities. It said that different methods were required because spills represent low probability, unpredictable events, and are unlike predictable, routine project activities. Trans Mountain used a structured risk assessment approach to identify the consequences of credible worst-case and smaller spills. It conducted ecological risk assessments and human health risk assessments to evaluate potential acute and chronic environmental and socio-economic effects. It said that it assessed the spatial extent, magnitude and time to recover from likely oil spill effects.

Several intervenors, including Pacheedaht First Nation and Squamish Nation questioned Trans Mountain's method for assessing the significance evaluation of spill effects and said that Trans Mountain did not provide significance determinations of adverse effects from accidents and malfunctions, and thus did not follow the requirements of the CEAA 2012. Intervenors said that most large magnitude spill events are of low probability and Trans Mountain did not consider low probability events in determining significance.

Some intervenors, including Chawathil First Nation and Cheam First Nation, said that Trans Mountain used credible worst-case scenarios rather than worst-case scenario spill models. They said that the significance of a spill event cannot be assessed simply by looking at the probability of its occurrence but rather, must also factor in the consequences of the event.

Trans Mountain said that the central test in the CEAA 2012 is whether or not a Project is likely to cause significant adverse environmental effects. It said that likelihood was evaluated as one of several significance criteria and its approach in evaluating significance represents the accepted practice, and that it is a practical and defensible means of fulfilling the requirements of the CEAA 2012.

Views of the Board

Under the CEAA 2012, the Board is required to take into account the significance of effects of accidents and malfunctions that may occur, and to provide a recommendation with respect to whether accidents and malfunctions that may occur are likely to cause significant adverse environmental effects. Given that every conceivable malfunction

and accident cannot be considered in detail, the Board accepts Trans Mountain's approach of considering reasonably credible and representative events to gain an understanding of the types and magnitude of effects that could result from potential accidents and malfunctions. Nevertheless, to provide a robust picture of the risks associated with the Project, the Board considers it important to analyze both the likelihood of such events and the significance of the effects that could result from such events, even if they are unlikely.

This chapter therefore includes a discussion of the potential environmental effects of a spill that might result from accidents and malfunctions involving the Project, such as a spill from the pipeline, from the storage terminals or from the WMT. Chapter 9 provides an assessment of the likelihood of such events occurring, and Section 10.2.17 provides the Board's recommendation with respect to whether there are likely to be significant adverse environmental effects from any accidents and malfunctions. Chapter 14, Section 14.9 discusses the potential environmental effects of spills from Project-related increase in marine vessels on various valued environmental components.

10.1.4.4 Cumulative effects

Trans Mountain evaluated the significance of the Project's contribution to cumulative effects, rather than the significance of total cumulative effects (i.e., cumulative effects from past, existing and reasonably foreseeable physical facilities and activities, including the Project's effects). The Board questioned Trans Mountain regarding its methodology. Although Trans Mountain provided significance evaluations of total cumulative effects for each valued component as the Board requested, it maintained its argument that the Project's contribution to cumulative effects, rather than total cumulative effects, should be the key focus of the assessment.

Views of the Board

The Board does not accept Trans Mountain's position that the Project's contribution to cumulative effects, rather than total cumulative effects, is the appropriate focus for cumulative effects assessment.

Paragraph 19(1)(b) of the CEAA 2012 requires consideration of the significance of the environmental effects described in paragraph 19(1)(a), which includes the cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out. The Board finds this to mean that the focus of any cumulative effects assessment should be on the total cumulative effects. Consistent with this, the Board's Filing Manual states that the "evaluation of significance must focus on the total cumulative effect that may be created from all physical facilities and activities considered in combination with the proposed project." By focusing on total cumulative effects, cumulative effects assessment differs from project-specific effects assessment, and considers what is often the primary threat to valued components; namely the total cumulative effects on that component.

The Board notes that, although the focus when considering the significance of cumulative effects should be on total cumulative effects, the Project's relative contribution to total cumulative effects is also relevant. Thus, for example, if total cumulative effects are considered to exceed a relevant threshold for a particular valued component, then effects on that component will generally be found to be significant unless the Project contribution to total cumulative effects is inconsequential. Such thresholds might include, for example:

- Pollutants exceeding established standards or guidelines.
- A species being at risk because of cumulative effects.
- Habitat disturbance for a species of conservation concern or for a valued ecosystem exceeding an established threshold (such as for linear disturbance density) or otherwise being of sufficient concern to deserve no-net-loss.

If there is no relevant threshold for a valued component but cumulative effects are nevertheless considered substantial, then effects on that component may be found to be significant unless the Project contribution to total cumulative effects is relatively minor.

In the MH-052-2018 hearing, several intervenors raised concerns about the cumulative effects methodology. This issue is discussed in Chapter 14, along with the Board's corresponding views.

10.1.4.5 Mitigation hierarchy and offset measures

The Board requires companies to make considerable efforts to **prevent or avoid** environmental impacts and, if impacts are unavoidable, to **minimize and reduce** them. Where residual effects remain (i.e., the effects cannot be avoided or fully mitigated), **offset** measures can be used to help counteract those effects on a local or regional level.

Offset measures should generally not be seen as a replacement for the other options preceding it in the mitigation hierarchy, but rather be considered a last resort when reasonable efforts at avoidance and mitigation have been exhausted. In such cases, offsets can prove to be an effective tool for balancing environmental protection and development.

In this chapter, the Board has introduced several conditions that would require Trans Mountain to develop offset plans to counter unavoidable residual effects on certain valued components. For example, the Board requires offsets for a number of valued components for which cumulative effects exceed a relevant threshold but reasonable avoidance and mitigation measures are not able to bring the Project contribution down to levels that are inconsequential.

The concept of offsets could vary for each valued component: however, there are some general principles, including:

- equivalency (i.e., compensating with equivalent ecological function at another site);
- additionality (i.e., providing protection beyond business-as-usual or what would have happened anyway);
- comparable location (i.e., offset site should have comparable ecosystem values such as species composition and habitat structure);
- timing (i.e., avoiding or allowing for time lags between impact and compensation);
- duration (i.e., ensuring offset sites are protected for an appropriate amount of time, which may be long-term); and
- accountability (e.g., formalized protection).

The Board expects these principles to be applied in offset plans.

10.1.5 Follow-up program

Trans Mountain committed to a post-construction environmental monitoring program. The Board would impose conditions requiring Trans Mountain to include consideration of soils, weeds, watercourse crossings, riparian vegetation, wetlands, rare plants, lichens and ecological communities, municipal tree replacement, wildlife and wildlife habitat, fish and fish habitat, marine fish and fish habitat, marine birds, marine mammals and species at risk, as part of its post-construction environmental monitoring program. Trans Mountain committed to continue to monitor any unresolved environmental issues remaining after five years, until they are resolved. The Board would impose other conditions incorporating monitoring requirements, such as a ten year monitoring requirement for grasslands.

Paragraph 29(1)(b) of the CEAA 2012 requires a follow-up program. This is intended to verify the accuracy of the predictions regarding potential environmental effects and to determine if mitigation measures are working as intended. The Board's conditions would require Trans Mountain to undertake environmental monitoring, compare results with predicted effects, assess mitigation success, take remedial actions if needed, and report monitoring results and actions taken. Collectively, these requirements constitute a follow-up program under the CEAA 2012.

The Board's conditions also incorporate adaptive management, requiring the implementation of new or modified mitigation measures over the life of the Project in response to mitigation measures that do not achieve full success and to address unanticipated environmental effects.

10.1.6 Adaptive management

A number of participants discussed the interplay of adaptive management and the precautionary principle. Pro Information Pro Environment United People Network (PIPE UP), for example, emphasized adaptive management must be applied in a precautionary manner and said it is not appropriate if:

- potential effects and mitigation strategies are not sufficiently well known to control risk;
- the risk of harm to human health or species at risk may be serious or irreversible; or
- there is a lack of baseline information, conditions do not allow for effective monitoring using appropriate indicators, or there are no thresholds to trigger remedial action.

Adaptive management was also raised in the MH-052-2018 hearing in the context of Project-related marine shipping. This is discussed in Chapter 14, along with the Board's corresponding views.

Views of the Board

The Board generally agrees with the cautions expressed by PIPE UP, as summarized above, concerning reliance on adaptive management, understood here to typically mean the planned application of corrective actions in response to the results of monitoring which is designed to determine if environmental effects and mitigation success are proceeding as expected. In situations where effects may be significant, the Board agrees with PIPE UP that adaptive management should generally not be relied upon to conclude effects will not be significant if there is insufficient understanding of the risks or of the efficacy of mitigation or corrective actions, or where there is insufficient confidence in the effectiveness of monitoring to determine the need for corrective actions. However, in appropriate circumstances, adaptive management can be an important part of the follow-up program for a project to allow for uncertainties. The Board's conditions also incorporate adaptive management, requiring the implementation of new or modified mitigation measures over the life of the Project in response to mitigation measures that do not achieve full success and to address unanticipated environmental effects. For example, Conditions 36, 37, 149 and 150 require Trans Mountain to provide a pre-construction assessment of caribou habitat that could be affected by the Project, a restoration plan for such habitat including quantifiable targets and performance measures to evaluate restoration effectiveness, a monitoring program to verify the effectiveness of restoration measures that includes protocols for how restoration measures will be adapted as required based on monitoring results, and reporting on such effectiveness and adaptations. More generally, for all valued environmental components, Condition 151 requires Trans Mountain to include goals, monitoring results, corrective actions taken, and the observed success of such actions, in each post-construction monitoring report.

10.1.7 Alternative means of carrying out the Project

Section 19 of the CEAA 2012 identifies factors that must be considered in the environmental assessment of a designated project, including "alternative means" of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alternative means.

The Board considered alternative means of carrying out the proposed Project, such as options for alternate locations, routes, construction methods and mitigation measures.

Trans Mountain committed to avoid sensitive areas as feasible when selecting the pipeline corridor and considered alternative construction measures such as trenchless watercourse crossings where that would reduce potential adverse environmental effects resulting from the Project. Trans Mountain committed to use least-risk timing windows and setback distances to reduce effects on wildlife and fish and their habitat during sensitive periods, Trans Mountain said that, in the event of conflicts between the least-risk windows and the construction schedule, it would consult with the appropriate regulatory authorities to develop appropriate mitigation.

A detailed discussion of alternative means of carrying out the Project is included in Chapter 11, Section 11.1, along with the Board's views. Chapter 14, Section 14.6.2 provides a discussion of alternate marine terminal locations, alternate shipping routes and mitigation options the Board considered for Project-related marine shipping in the MH-052-2018 hearing.

10.2 Environmental effects

In reaching its recommendations regarding the significance of adverse environmental effects on the valued environmental components, the Board considered Trans Mountain's environmental assessment, as well as all relevant evidence from intervenors and commenters, including where concerns were raised related to environmental issues resulting from Project construction and operations, and accidents and malfunctions that may occur in relation to the Project.

10.2.1 Air emissions

Trans Mountain conducted an air quality assessment to evaluate air emissions and greenhouse gas emissions that would be generated during Project construction and operations. The spatial and temporal boundaries used for the air quality assessment are described in Appendix 11.

In this section, the Board focuses on:

- ambient air quality;
- air emissions from the Edmonton Terminal;
- air emissions from the WMT and the Burnaby Terminal; and
- fugitive emissions[86] from the Project.

10.2.1.1 Ambient air quality

Trans Mountain said that the overall existing air quality conditions along the proposed pipeline corridor, with respect to the criteria air contaminants (particulate matter, carbon monoxide, nitrogen dioxide and sulphur dioxide), is very good with few exceedances of the relevant ambient air quality objectives. Trans Mountain said that all predicted Project-related concentrations are less than the applicable ambient air quality objectives, except where existing exceedances of applicable guidelines are already occurring (which are mainly attributed to existing background sources).

Living Oceans Society said that Trans Mountain has not provided the fundamental data needed to assess the quality of its air quality measurements, and specifically the quality of the ambient air quality measurements. It said that the background concentrations used in the model for short term concentrations (1-24 hour) were unrealistically high in comparison of average conditions. Living Oceans Society said that unrealistically high background concentrations make the Project's contribution to ambient concentrations appear smaller than it actually is. Living Oceans Society said that credible measurements would be needed to determine the actual impact of Project operations on pollutant concentrations relative to background, taking into account variations in background and Project concentrations across all seasons.

Trans Mountain said that it agrees with Living Oceans Society that ambient background concentrations vary in time and space; however, it took into account elevated background values in order to reflect a reasonable maximum operating scenario when evaluating the Project's potential effects.

10.2.1.2 Air emissions from the Edmonton Terminal

Trans Mountain predicted that the base case air quality (i.e., existing conditions reflecting all projects in the area, including existing Trans Mountain operations) near the Edmonton Terminal, exceeds Alberta's ambient air quality objectives for benzene (1-hour), xylene (24-hour), and hydrogen sulphide (24-hour) concentrations. It said that all anticipated Project-related concentrations are less than the applicable ambient air quality objectives. These contaminants are nonetheless predicted to exceed the applicable objectives when ambient background is included.

Trans Mountain said that the largest source of volatile organic compound (VOC) emissions due to the Edmonton Terminal's existing operations is the storage of light/synthetic crude oil products. It said that, overall, total annual volatile organic compound emissions would increase by 9 per cent between existing and Project-related operations at the terminal.

Trans Mountain said that the total cumulative effects would be significant for the Edmonton Terminal for some of the compounds that exceed the applicable ambient air quality objectives (e.g., benzene, xylene, and hydrogen sulphide). Health Canada expressed concerns regarding Trans Mountain's assessment of these contaminants' health risks. These are discussed in Chapter 11.

With respect to the Edmonton Terminal, Trans Mountain said that it is technically possible to include fixed roofs and odour control systems in its tank designs. It said that internal floating roofs with tank vapour adsorption units may provide an incremental benefit (approximately 3 to 9 per cent) in annual emissions reduction for benzene, xylene, and hydrogen

[86] Fugitive emissions refer to emissions from all non-combustion sources, such as leaks from equipment (flanges, control valves, pump seals), vapours or gases that escape from storage tanks and during tanker loading, and suspended dust from vehicular traffic and equipment. Fugitive emissions are comprised of certain criteria air contaminants, greenhouse gas emissions and volatile organic compounds.

sulphides for the proposed tanks. Nevertheless, it said that installing fixed roofs and odour control systems in addition to floating roofs does not provide any material value given that the terminal is in an industrial location.

Trans Mountain said that there is an existing Strathcona Industrial Association East Edmonton monitoring station in the vicinity and it does not see the need to develop an air emissions management plan for the Edmonton Terminal.

10.2.1.3 Air emissions from the Westridge Marine Terminal (WMT) and the Burnaby Terminal

Trans Mountain said that the ambient background concentrations for particulate matter 2.5 microns or less in diameter ($PM_{2.5}$) and nitrogen dioxide are generally high in the area around the WMT and the Burnaby Terminal due to the existing activities. It said that the largest contributor to predicted $PM_{2.5}$ concentrations is the existing vapour combustion unit at the WMT, from which all soot was conservatively assumed to be $PM_{2.5}$. Trans Mountain said that the proposed vapour combustion unit would be used during peak periods when three tankers are being loaded simultaneously. Otherwise, it would act as a back-up or standby unit.

Metro Vancouver said that it is concerned about particulate matter emissions from the proposed vapour combustion unit at the WMT. Metro Vancouver said that the emission factors Trans Mountain used to estimate the vapour combustion unit's particulate matter emissions are not representative. It recommended monitoring to verify these emissions during operation.

Participants, including North Shore No Pipeline Expansion, Burnaby Residents Opposing Kinder Morgan Expansion and Ms. Erika Plettner, expressed concerns that the Project would increase air emissions from loading and processing at the WMT and from the Burnaby Terminal. The City of Burnaby said that the assumptions Trans Mountain used in its air dispersion modelling may be incorrect, and that it omitted key air pollutants (such as diesel particulate matter, 1,3-butadiene) in the models. As a result, air emission concentrations may be under-estimated at the receptor level within the area of impact.

Metro Vancouver said that the potential effect of benzene emissions from the WMT on ambient air quality has been under-estimated due to the assumed near-perfect VOC collection efficiency of 99.9999 per cent during ship loading.

Simon Fraser University said that there are strong seasonal variations in atmospheric circulation and stability over the Burnaby-Simon Fraser University area that will have a significant influence on the dispersion of any toxic chemicals released into the atmosphere at different times of the year. It said that Trans Mountain did not demonstrate how it carried out simulations using a series of chemical releases with different buoyancy characteristics under different meteorological circulations and stability conditions.

ECCC said that Trans Mountain excluded tanker boiler emissions in its estimation of Project-related marine air emissions, which leads to multiple uncertainties in regards to pollutants such as nitrogen oxides and $PM_{2.5}$. In response, Trans Mountain performed additional dispersion modelling for the combined effects of emissions from the Burnaby Terminal, the WMT, and all marine transportation traffic, including boiler emissions from tankers at berth. It then compared the results with boiler emissions excluded and concluded that the effect of boiler emissions from tankers at berth is negligible.

ECCC said that it found several uncertainties in the Project emission estimates of $PM_{2.5}$ and nitrogen dioxide that increased the uncertainty about the modelled air quality impacts. ECCE recommended that Trans Mountain establish a program to monitor air contaminants, including nitrogen dioxide and $PM_{2.5}$ at or adjacent to Tsleil-Waututh Nation's Burrard Inlet No.3 reserve.

Fraser Valley Regional District said that the predicted increase in VOC emissions from the Project would undermine its efforts to reduce VOC emissions and ozone concentrations in the Fraser Valley Regional District. ECCC said that it examined Trans Mountain's photochemical modelling and found several aspects of analysis were uncertain which reduced confidence in findings related to the magnitude of ozone, $PM_{2.5}$, and reduced visibility.

Metro Vancouver and ECCC pointed to numerous deficiencies in Trans Mountain's photochemical modelling of the formation of secondary particulate matter and ozone. They said that Trans Mountain should work with the Lower Fraser Valley Air Quality Coordination Committee (LFVAQCC) in establishing the scope, methodology, and meteorological and emissions scenarios for carrying out the modelling. Trans Mountain said that it submitted its draft work plan for the updated modelling to that committee for its review, but the committee declined to provide any comments. Nevertheless, Trans Mountain filed the results of its revised photochemical modelling and said that it addressed most of the issues raised by ECCC and Metro Vancouver. Metro Vancouver said that a letter written on behalf of ECCC, Fraser Valley Regional District, Port Metro Vancouver and Metro Vancouver identifies the LFVAQCC's concerns respecting the insufficient amount of time to develop and review the modelling plan and establish emission scenarios and cumulative cases.

With respect to ECCC's specific recommendation for follow-up modelling using 2009 meteorological data, Trans Mountain said that it does not see the need to update the modelling a third time. It said that none of ECCC's concerns are expected to materially affect the updated photochemical modelling results.

Trans Mountain said that, although it agrees that Project emissions would result in an increase in concentrations near the WMT and the Burnaby Terminal, it is committed to meeting the applicable ambient air quality objectives and other regulatory requirements for these terminals. Trans Mountain said that it is in the process of evolving and refining the vapour control designs with the goal of ensuring sufficient recovery and destruction efficiencies to meet the applicable ambient air quality objectives at the WMT. Trans Mountain said that it is committed to working with various provincial and federal agencies with responsibilities related to air emissions from the Project.

10.2.1.4 Fugitive emissions

Trans Mountain said that, in its modelling, it assumed the worst-case scenario of loading three tankers at once, although this is expected to occur for less than 5 per cent of the total loading time in a year. It said that the marine terminal would have two new vapour recovery units. Trans Mountain said that proposed carbon beds upstream of the new vapour combustion and recovery units are expected to remove 99.9 per cent of hydrogen sulphide and mercaptans before entering the units.

Metro Vancouver said that the collection efficiency of 99.9999 per cent used to estimate volatile organic compound fugitive emissions during tanker loading is too high. After further testing, Trans Mountain estimated these fugitive emission rates assuming the more conservative collection efficiency of 99.5 per cent instead of 99.99 per cent and compared them to the relevant ambient air quality objectives. It found that all maximum predicted concentrations using the conservative efficiency were below the relevant ambient air quality guidelines.

Trans Mountain committed to undertaking surveys aboard randomly sampled tankers at the WMT to check cargo tank covers and associated seals for leaks of real-time total hydrocarbon or total volatile organic compounds using a portable monitor. The Loading Master would undertake four such surveys per year (one per season).

Trans Mountain said that fugitive emissions of volatile organic compounds and greenhouse gas emissions could escape from the proposed additional storage tanks at the Edmonton, Sumas, and Burnaby Terminals through working and storage losses. Trans Mountain said that it would install tank vapour activation units on all proposed tanks at the Burnaby and Sumas Terminals to minimize fugitive volatile organic compound losses.

The Fraser Valley Regional District asked questions about an air emissions management plan for the WMT, specifically regarding dust emissions. Trans Mountain said that it would engage the District in developing a Dust Management Plan for the WMT, Sumas Terminal, and pump stations located within the district.

Trans Mountain said that Burnaby Mountain tunnel construction could be expected to generate air emissions, including fugitive and suspended dust emissions. It said that it is committed to implementing air emission and dust control mitigation measures at, and on access to and from, the work site.

Views of the Board

Several intervenors raised concerns about the ambient air quality measurements and noted uncertainties in Trans Mountain's air dispersion modelling. Notwithstanding that there are some limitations and uncertainties in Trans Mountain's air quality assessment and in intervenors' submissions, the Board is of the view that air dispersion modelling is a complex process and, as with any predictive modelling, uncertainties and limitations are inherent.

The Board acknowledges intervenors' interest related to monitoring air emissions from the tank terminals and WMT. In the Board's view, air emissions monitoring is paramount and serves as a valuable tool in verifying and validating the results of any air dispersion modelling. Ambient air quality monitoring provides a realistic assessment of potential impacts of air emissions from Project operations, and precludes any uncertainties or limitations associated with the predictive modelling. To this end, the Board would impose Conditions 52 and 79, requiring Trans Mountain to develop and implement air emissions management plans that are intended to protect both the environment and human health. The Board considered a number of comments from the participants on these conditions with regard to Air Emissions Management Plans. The Board requires Trans Mountain to include, with the filed plans, a summary of its consultations with appropriate government authorities, and any potentially affected Indigenous groups and landowners/tenants.

In their comments on the Board's draft conditions, some intervenors (e.g., Metro Vancouver), requested that the Board require Trans Mountain to provide a description of how data will be made available in real time to support public air quality advisories and public access to air quality information. Conditions 52 and 79 require Trans Mountain to provide reporting details, including a description of how the air quality monitoring data will be made available to the public.

ECCC, in its final argument, emphasized the importance of establishing the local, pre operation baseline for new monitoring sites in order to quantify the magnitude of the impacts attributable to the Project. The Board concurs with ECCC and requires Trans Mountain, as part of the Air Emissions Management Plan for the WMT (Condition 52), to monitor ambient air quality for at least one year prior to commencing operations, with the intent of establishing robust baseline data.

In regard to the Air Emissions Management Plans for the Edmonton, Sumas, and Burnaby Terminals, the Board requires Trans Mountain to establish baseline data as informed by relevant modelling results and using recent existing representative monitoring data (Condition 79). The Board also requires Trans Mountain to include details on the locations of air monitoring sites, including the rationale for the locations selected.

Certain ambient concentrations around the Edmonton Terminal already exceed the applicable ambient air quality objectives. This is likely due to the existing heavy industrial activity in the area. Given that the existing cumulative effects at the Edmonton Terminal are already above the applicable guidelines, the Board finds that any incremental contribution from Project operations could potentially increase the burden on the existing air quality, regardless of how small that contribution would be. Consequently, the Board would impose Condition 137 requiring Trans Mountain to install steel pontoon internal floating roofs and fixed roofs with odour control systems for all proposed new tanks at the Edmonton Terminal. While generally the existing tanks at the Edmonton Terminal were outside the scope of this hearing, the Board nevertheless encourages Trans Mountain to consider employing these types of roofs on their existing tanks or any future expansions.

The Board is not persuaded by Trans Mountain's reasoning that ambient air quality monitoring is not required for the Edmonton Terminal since the contaminants are already being measured by the Strathcona Industrial Association Edmonton East monitoring station. In the Board's view, monitoring air emissions from the Edmonton Terminal would enable Trans Mountain to delineate the source of emissions and be able to mitigate the emissions effectively with the intent of protecting the environment and public health. Therefore, the Board would impose Condition 79 requiring Trans Mountain to develop and implement an Air Emissions Management Plan for the Edmonton Terminal's proposed operations.

As Trans Mountain acknowledged, fugitive emissions of volatile organic compounds and greenhouse gas emissions could escape from the proposed additional storage tanks at the Edmonton, Sumas, and Burnaby Terminals through working and storage losses. In order to confirm that there are minimal fugitive losses from Project construction and operations, and Trans Mountain effectively implements measures to reduce any adverse effects of these fugitive emissions, the Board would impose Conditions 53, 54 and 55 requiring Trans Mountain to develop Fugitive Emissions Management Plans for pump stations, terminals, and the WMT. The Board notes the varying opinions between Trans Mountain and Metro Vancouver regarding the emissions factors and vapour collection efficiency used in estimating fugitive emissions at the WMT. To this end, the Board would impose a condition requiring Trans Mountain to provide the procedures for verifying, tracking and reporting on collection, removal and combustion efficiencies of its equipment (Condition 53).

The Board heard concerns expressed by Fraser Valley Regional District that the predicted increase in volatile organic compound (VOC) emissions from the Project would undermine its efforts to reduce VOC emissions and ozone concentrations in the Fraser Valley Regional District. The Board is aware that ambient background concentrations for $PM_{2.5}$ and nitrogen dioxide are generally high in the area around the WMT and the Burnaby Terminal due to the existing activities.

In their evidence, Metro Vancouver and ECCC identified numerous deficiencies in Trans Mountain's photochemical modelling and requested follow-up modelling using 2009 meteorological data. The Board accepts that there are deficiencies in Trans Mountain's photochemical modelling. However, the Board finds that a number of concerns noted were around monitoring of fugitive VOC emissions during the loading of tankers using real time observations of speciated VOC concentrations at the WMT. Given that the Board would require Trans Mountain to develop and implement an Air Emissions Management Plan for the WMT (Condition 52) and a Fugitive Emissions Management Plan for the WMT (Condition 53), the Board is not persuaded to require Trans Mountain to update the photochemical modelling. These conditions would include requirements for monitoring and managing contaminants, including volatile organic compounds, oxides of nitrogen, ozone and reduced visibility, and a plan to manage fugitive emissions from the WMT.

With respect to boiler emissions from tankers at berth, Transport Canada said that the North American Emission Control Area puts in place the most stringent air emissions requirements for tankers. Under these standards, all tankers must either burn fuel with 0.10 per cent sulphur content or use alternative technology that results in equivalent emissions. The Board agrees with Transport Canada's statement that the implementation of either of these would significantly reduce all sources of sulphur oxide emissions from tankers. As well, as required by North American Emission Control Area (under MARPOL), engines fitted onto tankers after 1 January 2016 will need to meet Tier III nitrogen oxide standards for a reduction of nitrogen oxide emissions of up to 80 per cent.

The Board acknowledges and shares the general concerns raised by several intervenors, including the Métis Nation British Columbia, about the cumulative impacts on air quality, particularly in areas where contaminant levels are already exceeding the applicable ambient air quality objectives. The Board also concurs with Trans Mountain that its proposed mitigation measures for the Project would reduce the severity of Project-related cumulative air emissions. However, to further minimize the cumulative air emissions, the Board would impose Conditions 79 and 137 requiring Trans Mountain to implement measures (e.g., new roof types, a local monitoring station) above and beyond those that it proposed to reduce Project-related impacts around the Edmonton Terminal.

The Board finds that air emissions from construction activities are expected to be intermittent, of limited duration, localized, and reversible in less than a year. Hence, in the Board's view, construction-related air emissions from the Project are not likely to cause significant adverse effects.

Chapter 11 provides a significance evaluation of health effects of air emissions.

Significance evaluation: increase in ambient air emissions during operations at the Edmonton Terminal

	Criteria	Rating	Description
Project effects	Temporal extent	Long-term	Emissions from the terminal (primarily fugitive emissions from tanks) would continue throughout the operations phase.
	Reversibility	Permanent	Emissions from the terminals may only be reversible if and when their operations cease in several decades.
	Geographic extent	Regional Study Area	Emissions from the terminal are expected to dissipate in the Regional Study Area and would vary with changes in operational management and meteorological conditions.
	Magnitude	Low	Emissions from the terminal are expected to be below regulatory thresholds or guidelines, taking into account the conditions the Board would impose requiring an Air Emissions Management Plan, Fugitive Emissions Management Plan, and the installation of steel pontoon internal floating roofs and fixed roofs with odour control systems for all proposed new tanks.
Cumulative effects	Existing local ambient air quality concentrations for benzene, xylene, and hydrogen sulphide already exceed the applicable ambient air quality objectives due to the existing industrial activities in the Regional Study Area. With the conditions the Board would impose around air quality, including measures above and beyond those proposed by the company, the Project's contribution to total cumulative effects is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

Significance evaluation: increase in air emissions during operations at the Burnaby Terminal and the WMT (assessed within the same study area)

	Criteria	Rating	Description
Project effects	Temporal extent	Long-term	Emissions from the terminals (fugitive emissions from storage tanks and during tanker loading exhaust from tankers at berth and service and maintenance vehicles and equipment) would continue throughout the operations phase.
	Reversibility	Permanent	Emissions from the terminals may only be reversible if and when their operations cease in several decades.
	Geographic extent	Regional Study Area	Emissions from the terminals are expected to dissipate in the Regional Study Area and would vary with changes in operational management and meteorological conditions.
	Magnitude	Low	Emissions from the terminals are expected to be below regulatory thresholds or guidelines, taking into account the conditions the Board would impose requiring Air Emissions Management Plans and Fugitive Emissions Management Plans.
Cumulative effects	Existing ambient air quality concentrations for $PM_{2.5}$ and NO_2 are generally high around the Burnaby Terminal and the WMT due to the existing industrial activities. The modelling predictions indicate that ozone and $PM_{2.5}$ could also exceed the applicable objectives in the Lower Fraser Valley as a result of existing activities. With the conditions the Board would impose around air quality, including measures above and beyond those proposed by the company, the Project's contribution to total cumulative effects is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.2 Greenhouse gas emissions

Trans Mountain said that Project construction would generate approximately 1,020,000 tonnes of greenhouse gas emissions (carbon dioxide equivalent (CO_{2e})), of which 899,500 tonnes CO_{2e} would be from land-clearing alone. Trans Mountain said that Project operations would generate approximately 407,000 tonnes CO_{2e} of indirect emissions annually associated with electricity use. Section 10.2.1 provides a discussion on fugitive emissions generated during the operation of the Project.

It said that land-clearing includes removing vegetative waste and preparing sites along the pipeline right-of way and at facility locations, such as at terminals and pump stations. Trans Mountain assumes that it would burn the majority of vegetative waste. Therefore, emissions from land-clearing during construction would account for over 90 per cent of the Project's total greenhouse gas emissions.

Trans Mountain said that it is not possible to estimate how much timber would be salvaged and that it would develop a Timber Salvage Management Plan in accordance with the relevant provincial regulations. In the Lower Fraser Valley, where air quality is an issue, Trans Mountain said that it would avoid burning slash. Instead, it would mulch in-place or transport slash to an approved disposal location.

Trans Mountain said that installing the proposed tanks, associated terminal work, site preparation, vehicle and equipment operation and other construction activities would also result in greenhouse gas emissions.

Trans Mountain estimated the changes in provincial and Canadian annual greenhouse gas emission totals caused by Project operations. These are described in Table 8 below.

Table 8: Total greenhouse gas emission generated by Project construction and annual operations for British Columbia and Alberta (in tonnes CO_{2e})

Province	Total Project construction emissions	Annual Project operation emissions	Annual provincial and Canadian emission totals (2012)	Percentage change in annual provincial and Canadian emissions totals due to Project operations
Alberta	177,000	407,000[1]	249,000,000	0.164
B.C.	844,000	-323[2]	60,100,000	-0.001
Total	1,020,000	407,000	699,000,000 (Canada)	0.058

1 – Indirect emissions associated with electricity use
2 – Emissions expected to decrease due to change of the vapour combustion unit to standby mode

Trans Mountain committed to continuously identifying and integrating design changes over the life of the Project to improve operating efficiency, while reducing greenhouse gas and other emissions. Trans Mountain said that emissions management is embedded in the design of the Project (e.g., replacement of the existing Vapour Combustion Unit with two new Vapour Recovery Units at the WMT, selection of energy-efficient equipment).

Trans Mountain proposed standard mitigation to reduce greenhouse gas emissions from the pipeline and associated facilities. It said that construction greenhouse gas emissions are not required to be reported in either B.C. or Alberta. It committed to common energy pipeline industry practices to minimize direct greenhouse gas emissions during Project construction and operations. Trans Mountain said that it expects the greenhouse gas emissions at all of its facilities to fall below the federal or provincial greenhouse gas reporting thresholds, with the exception of the WMT, which is considered a "Reporting Facility" as it generates greenhouse gas emissions above B.C.'s reporting threshold (i.e., 10,000 tonnes of CO_{2e} annually).

Several participants expressed concerns with respect to the increase in greenhouse gas emissions as a result of the Project. They said that the Project would have a significant impact on the global climate. A number of participants filed evidence about greenhouse gas emissions and climate change concerns from upstream or downstream sources other than marine shipping.

Views of the Board

The Board has focused its assessment on the direct greenhouse gas emissions generated from Project construction and operations, as opposed to assessing the global climate effects of the greenhouse gas emissions (e.g., increased flooding). The Board did not consider greenhouse gas emissions associated with upstream (e.g., oil production) and downstream activities (e.g., end use of the oil) for the reasons explained in the Board's Ruling No. 25 and discussed above in this chapter. In instances where intervenors filed evidence on greenhouse gas emissions associated with upstream and downstream activities other than marine shipping (despite Ruling No. 25), the Board did not consider that evidence.

In the Board's view, attempting to determine and assess the eventual climate change effects of greenhouse gas emissions generated by the Project is not practical in terms of meaningfully informing an environmental assessment recommendation on this Project. The potential effects associated with climate change have been well documented and are serious, but they are a cumulative effect. Although the Project's estimated contribution to increased rainfall, yield reduction in crops etc., can be calculated, these by themselves can appear to be minor and they do not necessarily assist in evaluating significance. Their ultimate effects are also difficult to attribute to any particular project.

Greenhouse gas emissions are a concern because of their long-term accumulation in the global atmosphere. Therefore, the Board focused its assessment on the amount of greenhouse gas emissions from the Project, and considered whether regulatory conditions were required as mitigation beyond existing federal or provincial regulatory requirements.

Construction-related greenhouse gas emissions are not reportable under any federal greenhouse gas regulations. Nonetheless, given the substantial amount of anticipated direct emissions that would be generated by Project construction, the Board would impose Condition 142 requiring Trans Mountain to develop an offset plan for the Project's entire direct construction-related greenhouse gas emissions determined post-construction. The intent of the

offset plan would be to confirm that there are no net greenhouse gas emissions from Project construction. The Board expects Trans Mountain to confirm that its selected offset option is registered under the approved quantification protocols and that it has been verified by an accredited "verification body." The condition would also require Trans Mountain to provide an accounting of offsets to confirm that the no-net emissions goal is realized. The Board expects that offset measures should be above and beyond the mitigation measures implemented for the Project.

The Board recognizes that Project construction would result in a substantial amount of direct greenhouse gas emissions, primarily from land-clearing, and that Trans Mountain is not able to definitively quantify the final amount because it is not able to determine how much timber would be salvaged during construction. The Board would impose Condition 140 requiring Trans Mountain to quantify the total direct greenhouse gas emissions after all construction activities are complete, to provide a more accurate estimate of the direct greenhouse gas emissions that are required to be offset.

A number of participants requested that the Board's draft conditions on greenhouse gas emissions should require Trans Mountain to assess and offset greenhouse gas emissions from Project operations in addition to greenhouse gas emissions from Project construction. The evidence indicates that greenhouse gas emissions during Project operations are expected to be relatively low compared to construction-related emissions, and are guided by the applicable provincial and national regulations. In addition, operational emissions fall below the applicable reporting thresholds, except for the WMT where Trans Mountain committed to report in accordance with applicable reporting regulations. The Board is aware that fugitive emissions escaping from facility and pipeline leaks also include greenhouse gas emissions. In order to confirm that greenhouse gas fugitive emissions are also minimized as much as possible, the Board requires Trans Mountain to consider greenhouse gas emissions in its Fugitive Emissions Management Plans for all pump stations, tank terminals and the WMT (Conditions 53, 54 and 55).

In the Board's view, the direct greenhouse gas emissions from Project construction, without any additional Board imposed mitigation conditions, would have been of substantial magnitude. However, considering Condition 142, that the Board would impose, requiring Trans Mountain to develop and implement a Greenhouse Gas Emissions Offset Plan to achieve no net emissions, emissions from construction are expected to be fully offset and therefore of low magnitude and not significant. Emissions anticipated during operations would be below national reporting thresholds and therefore not considered significant.

10.2.3 Surface water quality and quantity

Trans Mountain identified a number of potential residual effects on surface water quality and quantity that could result from the construction and operation of the pipeline (e.g., reduced water quality due to suspended sediments during construction activities).

Trans Mountain committed to developing Environmental Protection Plans that include a variety of management plans, contingency plans, reclamation plans, and mitigation measures designed to address the potential residual effects. Trans Mountain said that, with the implementation of the general and site- specific mitigation, monitoring, and reclamation measures, any adverse effects on surface water quality or quantity from construction activities can be reduced to acceptable levels or avoided.

Trans Mountain identified numerous watersheds[87] crossed by the proposed pipeline corridor, for which the adverse effects could be considered potentially significant for total cumulative effects.[88] Intervenors expressed similar concerns, indicating that past industrial and urban development has reduced the quality and quantity of surface water.

Participants, including Metro Vancouver, the Yorkson Watershed Stewardship Committee, and Cowichan Tribes, raised various concerns related to adverse effects on surface water quality and quantity from construction and operation of the Project. One of the key issues raised by participants regarding surface water was the alteration or loss of riparian habitat that would result from the construction and operation of the Project. Metro Vancouver and the City of New Westminster said that riparian habitat provides important ecological services to aquatic ecosystems and that degradation of these areas can have a variety of consequences. Metro Vancouver and the City of New Westminster recommended that the pipeline be re-routed to avoid riparian buffers of fish-bearing watercourses, and that Trans Mountain commit to using trenchless crossing techniques, with entry and exit points outside of riparian areas.

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[87] Sturgeon River, Lower and Upper North Saskatchewan River, Pembina River, Lower McLeod River, Athabasca River, Lower North Thompson River, Thompson River, South Thompson River, Lower Nicola River, and Similkameen watersheds.

[88] Trans Mountain considered total cumulative effects as potentially significant for watersheds where the proposed aquatic disturbance threshold was crossed (i.e., if >18 per cent long-term or permanent riparian habitat disturbance existed).

Trans Mountain acknowledged that construction and operation of the pipeline would result in temporary alteration and disturbance of riparian habitat, and estimated that the maximum riparian area that may be disturbed as 334.6 ha, or 0.05 per cent of the total riparian habitat within the Regional Study Area (RSA). Appendix 11 provides a description of the spatial boundaries. Trans Mountain said that disturbance to riparian areas, if not managed appropriately, could potentially result in adverse effects to water quality. Trans Mountain proposed various mitigation measures aimed at reducing impacts on riparian habitat, including limiting riparian vegetation clearing to trenched areas and any required workspace within the proposed pipeline corridor. Trans Mountain said that it would adhere to the Forest Practice Code, Riparian Management Area Guidebook in B.C. during clearing activities, and would adopt riparian buffer setbacks for temporary work spaces based on provincial and federal guidelines. Trans Mountain also committed to revegetating any disturbed riparian habitat and to monitoring these areas upon completion of construction to ensure that they return to similar pre-construction functionality. Trans Mountain further acknowledged that woody vegetation would be allowed to grow back over the right-of-way, with the exception of 3 m on either side of the pipeline, which it indicated would be required for safety considerations and to provide access to the watercourses for operations crews, if required. Trans Mountain also stated that National Energy Board safe operational guidelines require that pipelines are kept clear of large woody vegetation directly over the pipeline.

Salmon River Enhancement Society raised concerns that Project construction will include the destruction of mature forests in riparian areas which they say is part of important habitat for fish, and that once destroyed, cannot be mitigated in a reasonable or timely manner. It also said that there is a need and a requirement to undertake an inventory of riparian habitat that will be destroyed, or otherwise negatively affected in order to determine compensation. Salmon River Enhancement Society indicated that the riparian damage, if viewed collectively for each watercourse crossing in B.C., would comprise a footprint of approximately 700,000 m².

Trans Mountain said that its estimate of riparian disturbance was conservative for a variety of reasons and despite the obvious overestimation, Trans Mountain maintains that the Project's maximum potential disturbance would only affect < 0.05 per cent of riparian habitat within the Project's RSA.

Cowichan Tribes said that the construction and operation of the pipeline is likely to contribute only a small amount to cumulative effects to fish and fish habitats. It said that the hectares of disturbance to riparian and instream habitat caused by the Project is generally small relative to existing disturbances in the B.C. watersheds.

Views of the Board

The Board acknowledges the concerns raised by participants about the effects that Project construction and operation would have on surface water. The Board is of the view that the proposed Environmental Protection Plans would effectively reduce the extent of any effects on surface water quality and quantity. The Board would impose Conditions 72 and 78 requiring Trans Mountain to provide to the Board finalized Environmental Protection Plans prior to construction, and provide the results of post-construction environmental monitoring, including any adaptive management measures that were implemented to address unforeseen issues (Condition 151). The Board would also require Trans Mountain to include with the filed Environmental Protection Plans a summary of its consultations with appropriate government authorities and any potentially affected Indigenous groups (Conditions 72 and 78).

The Board is of the view that Project construction and operation would result in adverse effects on riparian habitat. The Board recognizes that clearing of riparian vegetation will be required for watercourses crossed using trenched methods. The Board acknowledges that a small area (approximately 3 m on either side of the pipeline) will be kept free of large woody vegetation at the majority of watercourses crossed by the pipeline. Generally, the Board considers adverse effects on riparian habitat as temporary, since disturbed riparian habitat is likely to return to a similar pre-construction functionality during the life of the Project. However, in certain situations, such as when mature riparian habitat is removed, adverse effects on riparian habitat would be considered permanent such that riparian habitat may not return to pre-construction conditions within the life of the Project.

The Board recognizes the importance of riparian habitat and given the concerns and recommendations provided by participants, the Board would impose Condition 71 requiring Trans Mountain to develop a Riparian Habitat Management Plan. The condition would require Trans Mountain to conduct pre-construction assessments and quantification of any riparian habitat to be impacted by the Project at all defined watercourse crossings, planting plans for these areas, and monitoring of these areas to confirm they return or are returning to pre-construction functionality. The Board would also require Trans Mountain to provide goals and targets that clearly demonstrate how, over the course of five full growing seasons, riparian habitat has returned, or is trending towards sufficient pre construction functionality.

The Board would also impose Condition 154 requiring Trans Mountain to develop a Riparian Habitat Reclamation Evaluation Report and Offset Plan. The report would include an evaluation of the effectiveness and success of Trans Mountain's Riparian Habitat Management Plan. The report would also identify, after the fifth full growing season, any riparian habitat that has trended, not or is not trending, towards pre construction functionality, and the corrective

actions that Trans Mountain will undertake to ensure riparian habitat returns to pre-construction functionality. The Riparian Offset Plan would apply to all defined watercourse crossings located in watersheds identified during the proceeding as being above the riparian habitat disturbance threshold (>18 per cent of riparian habitat disturbed in the watershed), or classified as High sensitive fish-bearing, and where after the fifth complete growing season, riparian habitat has not returned, or is not trending towards sufficient pre construction functionality.

The goal of these conditions is to minimize adverse effects on riparian habitat and ensure that areas that are disturbed return to pre-construction functionality. The Plans are also designed to ensure that a no-net loss of riparian habitat will occur at High sensitive fish-bearing watercourses and at watercourses within watersheds that have already surpassed environmental regulatory thresholds. The Board would also require Trans Mountain to consult with Indigenous groups, landowners, and appropriate government authorities, and provide a discussion of how they have addressed any outstanding issues as part of the riparian habitat conditions (Conditions 71 and 154).

Significance evaluation: adverse effects on surface water quality and quantity

	Criteria	Rating	Description
Project effects	Temporal extent	Short-term to long-term	Effects on surface water quality and quantity are expected to be mostly short-term (e.g., small sediment plume from instream crossing activities, water withdrawal for hydrostatic testing). Some project interactions, such as the removal of mature riparian vegetation, would result in long-term effects.
	Reversibility	Reversible to permanent	Effects on surface water quality and quantity are expected to be reversible. Once construction activities cease, surface water quality and quantity is expected to return to pre-construction conditions. However, in certain situations, such as when mature riparian habitat is removed, effects are expected to be permanent, as riparian habitat may not return to pre-construction conditions within the life of the Project.
	Geographic extent	Footprint to Local Study Area (LSA)	Effects are expected to be limited to directly disturbed areas and the LSA.
	Magnitude	Low to moderate	Effects from construction and operation activities would generally be of low to moderate magnitude taking into account the mitigation, reclamation activities, and post-construction environmental monitoring.
Cumulative effects	Existing cumulative effects vary by watershed and could be considered substantial or above environmental thresholds in certain watersheds. Urban and industrial development has resulted in various degrees of decreased surface water quality and quantity in watersheds crossed by the proposed pipeline corridor. Taking into account the implementation of Trans Mountain's mitigation measures, and conditions the Board would impose, the Project's contribution to the total cumulative effects on surface water quality and quantity is considered inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.4 Groundwater quality and quantity

In identifying the potential residual effects of Project construction and operation on groundwater quality and quantity, Trans Mountain identified the aquifers along the proposed pipeline corridor, facilities overlying mapped aquifers, horizontal directionally drilled crossings with potential artesian conditions and areas where potential groundwater quantity effects were identified.

Several participants raised issues related to the Project's potential effects on groundwater quality and quantity. Coldwater Indian Band said that it relies on groundwater from local aquifers to meet all domestic and fire-protection needs. It noted its long-standing concerns about the water source's vulnerability to the existing pipeline. Chapter 11 discusses concerns raised by Coldwater Indian Band along with the Board's views.

A number of Indigenous groups, municipal and provincial governments, and federal authorities raised concerns about the potential impacts of the project on groundwater quality and availability, including potential impacts related to a spill or accident.

Other participants expressed concerns regarding protecting groundwater from existing and future contamination at facilities. Trans Mountain said that it has established groundwater monitoring programs at selected facilities, including the Burnaby Terminal and the WMT, to identify impacts on groundwater. It said that, should a release from the pipeline or a

facility occur and groundwater impacts were suspected, it would undertake a hydrogeological investigation to assess site conditions and the magnitude and extent of any impacts.

Participants raised concerns about protecting groundwater from potential storage tank and/or pipeline leaks, and about remediation and groundwater quality monitoring. Trans Mountain said that groundwater is protected through tank design, level transmitters (to prevent overfill), a leak detection system under each tank, secondary containment and hydrocarbon detection within the secondary containment.

Peters Band submitted a report that discusses the site-specific conditions for its reserve lands, and the potential groundwater impacts from a pipeline leak on those lands. The report recommended several mitigation measures that can be incorporated to minimize the risk and extent of contamination. Trans Mountain said that it applies a risk-based design approach through which it would identify areas of higher risk that it would give higher priority for implementing additional risk mitigation measures.

Natural Resources Canada expressed concerns about the potential for groundwater seepage into the proposed tunnel through Burnaby Mountain. It said that accurate seepage estimates are needed to determine the amount of seepage water that would be pumped, treated, and disposed of, and to assess any effects on the local water table (i.e., lowering). Trans Mountain committed to have a qualified engineer and/or hydrogeologist onsite during construction to sample and analyze the water being extracted during the tunneling process.

Trans Mountain proposed mitigation measures to address the Project's potential effects on groundwater quality and quantity. Trans Mountain said that it followed recommendations from several industry and provincial and federal regulatory guidelines in designing construction activities to avoid diversion and unnatural retention of water along the right-of-way.

In conducting its cumulative effects assessment, Trans Mountain said it considered existing activities and reasonably foreseeable developments that could act in combination with the Project. It said that the Project's potential contribution to the total cumulative effects on groundwater quality is attributable to blasting activities or, during horizontal directional drilling, a drilling mud release or overlapping aquifers mixing. Trans Mountain said that the Project's contribution to cumulative changes in groundwater quantity would occur over the construction phase or associated with maintenance activities within one year during the operations phase.

Views of the Board

The Board recognizes the participants' concerns regarding the protection of vulnerable aquifers that may be present along the pipeline route. The Board accepts Trans Mountain's commitments to identify areas of high risk and to implement additional risk mitigation measures where needed. The Board would impose Condition 130 requiring Trans Mountain to develop a groundwater monitoring program for any vulnerable aquifers that may be present along the pipeline route. This would allow the Board to verify that measures to prevent impacts on groundwater quality are adequately implemented.

Metro Vancouver, in providing comments on the Board's draft condition, noted that the groundwater monitoring program should also be required for all municipal and Metro Vancouver owned or operated infrastructure, in addition to Trans Mountain facilities. It said that the groundwater monitoring program condition should also include baseline groundwater data for all sites. The Board is of the view that requiring Trans Mountain to collect baseline data and monitor groundwater for all municipal and Metro Vancouver owned or operated infrastructure is not reasonable since Trans Mountain does not own that infrastructure.

With respect to protecting groundwater from leaks at facilities, the Board acknowledges that Trans Mountain has proposed a leak detection system under each tank, and hydrocarbon detection along with secondary containment for each tank. In order to anticipate, prevent and manage conditions that could affect groundwater, the Board would impose Condition 130 requiring Trans Mountain to implement a groundwater monitoring program at all proposed facilities (pump stations, tank terminals, and Westridge Marine Terminal.

The Board shares Natural Resources Canada's concerns about groundwater seepage into the proposed tunnel and the Board would impose Condition 87 requiring Trans Mountain to develop a groundwater seepage management plan that it would implement during tunnel construction. In the Board's view, this would reduce or minimize any potential effects of groundwater seepage on the local water table.

Significance evaluation: adverse effects on groundwater quality and quantity

	Criteria	Rating	Description
Project effects	Temporal extent	Short-term to long- term	Effects on groundwater quality (e.g., elevated groundwater turbidity, aquifer mixing, contamination from smaller spills) and quantity (e.g., effects of blasting and trench dewatering) are primarily expected to be short-term during the Project construction phase (in the order of days to months). Similar effects arising from maintenance activities would also persist in the order of days to months for each activity. However, maintenance will occur sporadically throughout the operations phase and, therefore, such effects can be considered long-term.
	Reversibility	Reversible	Effects on groundwater quality and quantity are expected to be reversible within the lifetime of the Project.
	Geographic extent	LSA	Effects could extend beyond the Project footprint into the LSA.
	Magnitude	Low to moderate	Taking into account Trans Mountain's proposed mitigation and the conditions the Board would impose requiring a groundwater monitoring program at all facilities, and protective measures for vulnerable aquifers along the pipeline route, the effects due to Project construction and routine operations activities are generally expected to be of low to moderate magnitude.
Cumulative effects	The existing cumulative effects on groundwater quality and quantity are generally not likely to be significant along most of the pipeline corridor. However, effects could be significant in areas where vulnerable aquifers are present or where more concentrated agricultural, municipal and industrial activities result in higher groundwater usage and demand. Taking into account the implementation of Trans Mountain's mitigation measures and the conditions the Board would impose, the Project's contribution to the total cumulative effects on groundwater quality and quantity is expected to be relatively minor.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.5 Freshwater fish and fish habitat

Trans Mountain said that approximately 1,163 watercourses have been identified along the proposed pipeline corridor (256 in Alberta, 907 in B.C.), through four major drainage basins and twenty-one different watersheds (Figure 18 and Figure 19).

Participants identified numerous species of conservation and management concern inhabiting watercourses crossed by the proposed pipeline corridor. Trans Mountain identified five SARA-listed fish species (Table 9) that inhabit watercourses crossed by the proposed pipeline corridor.

Table 9: Aquatic species listed under Schedule 1 of the Species at Risk Act potentially found within the pipeline corridor

Species	Regulatory Status under the SARA
Nooksack dace	Endangered
Salish sucker	Endangered
White sturgeon (Upper Fraser population)	Endangered
Green sturgeon	Special Concern
Westslope cutthroat trout[89] (B.C. population)	Special Concern

[89] Trans Mountain said that Westslope cutthroat trout are introduced in the Lower Mainland and are therefore not considered a conservation concern in the Regional Study Area and Local Study Area.

Figure 18: Aquatics Regional Study Area for Alberta

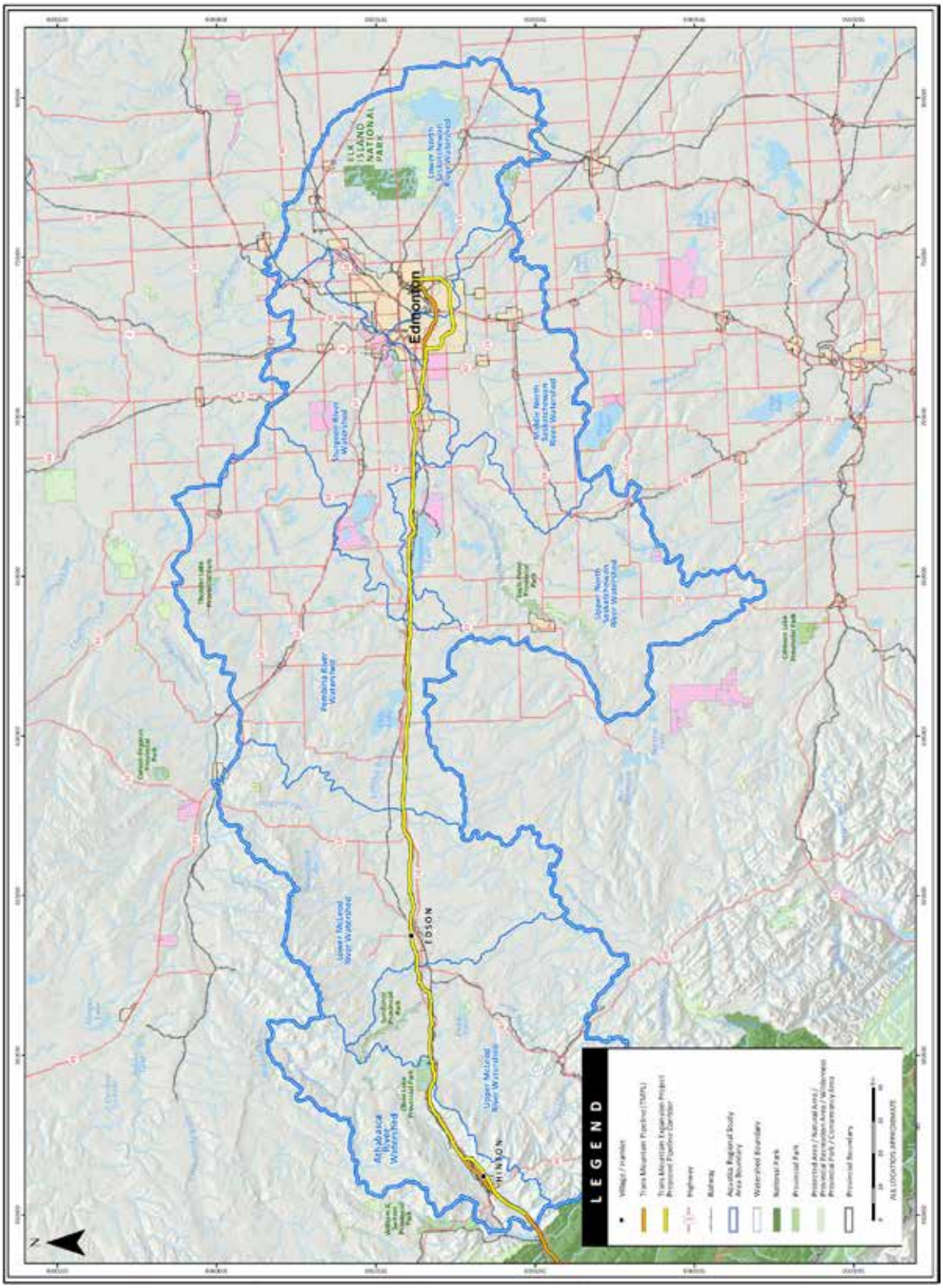
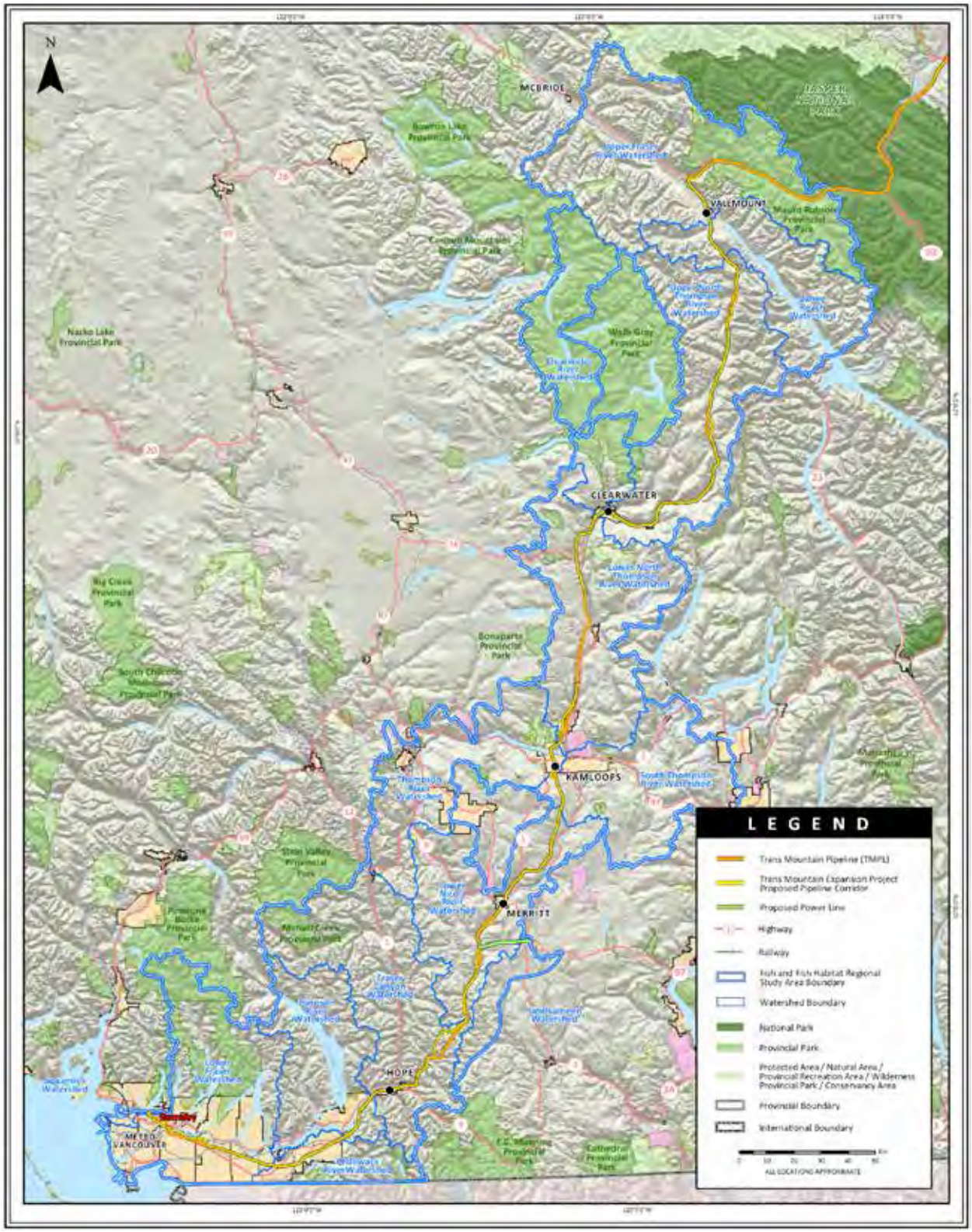


Figure 19: Aquatics Regional Study Area for British Columbia



Trans Mountain identified Pacific salmon[90] as being economically and ecologically important. Trans Mountain said that the Fraser River is considered the largest single salmon producing system in the world and accounts for, on average, approximately 50 per cent of salmon production in B.C. Several participants said that the Fraser River and its tributaries are vital habitat for Pacific salmon on the west coast of Canada. They identified other ecologically and environmentally sensitive areas, such as the Brunette River Conservation Area and Surrey Bend Regional Park, as sensitive fish habitat and home to species of conservation concern.

Participants raised a range of issues related to adverse effects on fish and fish habitat from the construction and operation of the Project. This section focuses on the following key issues:

- watercourse crossings methods, mitigation, and post-construction environmental monitoring;
- *Fisheries Act* authorizations;
- cumulative effects; and
- species at risk.

10.2.5.1 Watercourse crossing methods, mitigation, and post-construction environmental monitoring

Trans Mountain said that it selected appropriate watercourse crossing methods in consideration of the size and the environmental sensitivities of the watercourse (inclusive of traditional ecological knowledge), as well as timing of construction. It proposed trenchless crossing methods for larger, fish-bearing watercourses (e.g., Fraser River, Nicola River and Pembina River). Isolated trenched crossings were proposed for all other high sensitivity watercourse crossings, with priority given to working within least-risk biological windows.[91] Trans Mountain said that, in some instances, working in the least-risk biological windows was not possible (e.g., due to high flow). In these instances, priority was given to isolated trenched crossings outside of the least-risk window, as opposed to wet trenched crossings where excavation is conducted in flowing water.

Trans Mountain proposed to implement numerous mitigation measures to address potential impacts on fish and fish habitat. These include:

- DFO's Measures to Avoid Harm to Fish and Fish Habitat;
- hydraulic isolation will be implemented for any small to medium sized streams that are hydraulically connected to fish habitat, regardless of whether there are fishes or fish habitat at the crossing location, unless flow volumes exceed threshold limits for open-cut with flow isolation methodologies or site conditions preclude the ability to isolate the watercourse;
- Qualified Aquatic Environmental Specialist in Alberta or the Qualified Environmental Professional (QAES/QEP) led fish salvages at each isolated trenched crossing and at all fish-bearing crossings;
- water quality monitoring for suspended sediment during trenchless and isolated trenched crossings of watercourses with high sensitivity fish habitat, or open-cut crossing construction activities where flow is present;
- working within the least-risk biological windows when trenched methods are to be completed, where practicable;
- completing spawning surveys before and during construction (when spawning activity is confirmed or suspected, Trans Mountain committed to implementing measures to deter fish from spawning within the isolated section of the channel or within the immediate zone-of-influence when work is proposed outside of the least risk window);
- species-specific mitigation for Nooksack dace and Salish sucker; and
- measures to facilitate fish migrations in instances where isolated trenched pipeline construction methods are proposed to occur outside the least-risk biological window and channel spanning isolation measures are expected to be in place for more than three consecutive days.

Trans Mountain committed to reclaiming all disturbed riparian habitat and instream habitat to, or trending towards, pre-construction functionality. Trans Mountain said that it is committed to monitoring these areas, post-construction, to

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[90] Pacific salmon is meant to include five salmon species (i.e., Chinook, Coho, Pink, Sockeye, and Chum).

[91] Provincial windows of least risk or Restricted Activity Periods are species and region specific and are established to protect sensitive life history stages of species of management concern including their eggs, juveniles, spawning adults and/or the organisms upon which they feed.

evaluate the effectiveness of reclamation based on a comparison of post-construction conditions to pre-construction conditions.

Participants raised concerns or made recommendations regarding Trans Mountain's proposed watercourse crossing methods, mitigation measures, reclamation, and post-construction monitoring. Salmon River Enhancement Society indicated that the best way to mitigate impacts on fish and fish habitat from Project construction is to implement trenchless crossing methods. It further noted that the B.C. Oil and Gas Commission recommends trenchless methods as a means of protecting watercourses of high fish value.

10.2.5.2 *Fisheries Act* authorizations

In order to identify which crossings could result in serious harm and may likely require authorization under paragraph 35(2)(b) of the *Fisheries Act*, Trans Mountain conducted a self-assessment of the potential for serious harm to fish[92] which evaluated the risk from proposed watercourse construction activities. The results of Trans Mountain's self-assessment indicated that numerous proposed primary (26) and contingency watercourse crossings (46), predominately timed to occur outside of least-risk windows, were of high risk for serious harm. It committed to obtaining *Fisheries Act* authorizations when they are required, which would include measures to offset any residual serious harm, as well as potential specific monitoring requirements. Trans Mountain indicated that the types of offset measures would include habitat restoration and/or enhancement, habitat creation, biological or chemical manipulations, and/or complementary measures, including research-based projects, as defined in DFO's hierarchy of preferences. It noted that any Fish and Fish Habitat Offset Plan would be designed in consultation with regulators, fisheries managers, Indigenous groups and other stakeholders, and with specific consideration for the guiding principles outlined in *DFO's Fisheries Productivity Investment Policy: A Proponents Guide to Offsetting*.

DFO indicated that the Applications for Authorization under paragraph 35(2)(b) of the *Fisheries Act* Regulations establishes the time limits, totaling 150 days, within which the Minister of Fisheries, Oceans and the Canadian Coast Guard must decide whether to issue a paragraph 35(2)(b) authorization, or refuse to do so. DFO also said that when considering the potential issuance of a *Fisheries Act* authorization for a work(s), undertaking(s) or activity(ies) which may adversely affect asserted or established Indigenous or Treaty rights, DFO would undertake consultation with potentially affected Indigenous groups.

Salmon River Enhancement Society said that Trans Mountain's self-assessment failed to quantify the extent of serious harm to fish and fish habitat properly, and also questioned the adequacy of the information used to support the self-assessment, including a lack of site-specific crossing locations and mitigation. Participants also raised concerns about Trans Mountain's self-assessment of potential serious harm in reference to riparian habitat, and said that Trans Mountain had not properly considered riparian habitat under the *Fisheries Act*. Trans Mountain said that removal of riparian vegetation may constitute serious harm if it has a limiting effect on the productive capacity of the watercourse, and if its removal or disturbance represents a potential influence on fish communities. Trans Mountain said that its understanding is based on precedent (i.e., previous DFO determinations on similar projects) and a professional working understanding of the *Fisheries Act* and the associated policies and processes.

Trans Mountain used both field and desktop exercises to determine fish and fish habitat at proposed crossing locations. Trans Mountain said that 95 per cent of the potential watercourses crossings identified along the pipeline corridor had been investigated by a qualified fish biologist, with many sites receiving multiple seasons of sampling. PIPE UP critiqued the watercourse crossing assessments by Trans Mountain, identified information gaps, and proposed a fish sampling program. Trans Mountain said that the fish and fish habitat data collection is more than adequate to support an environmental assessment and permitting for pipeline construction and operation, as per provincial and federal regulatory requirements and industry standards.

[92] For the purposes of the *Fisheries Act*, serious harm to fish is defined as the death of fish or any permanent alteration to, or destruction of, fish habitat.

10.2.5.3 Cumulative effects

Participants, including Kwantlen First Nation, Upper Nicola Band and Lower Nicola Band, expressed concerns that existing cumulative effects, from industrial and urban development, have resulted in decreased fish abundance and health, and that Project construction would contribute to the total cumulative effects. Trans Mountain said that the total cumulative effects for indicator species were potentially significant in watersheds where the aquatic disturbance threshold was exceeded.[93] Trans Mountain said that existing activities that have disturbed riparian and instream habitat include agriculture, rural and urban residential and commercial development, transportation and infrastructure development, utility activities, forestry, mineral resource exploration and development, ongoing recreational activities, and oil and gas exploration and development. Trans Mountain indicated that the Project, in combination with reasonably foreseeable developments, would increase cumulative effects in all watersheds. Trans Mountain said that the Project may contribute < 0.01 to 0.15 per cent, or an average of 0.05 per cent, to total riparian habitat disturbance in RSA (See description of the spatial boundaries in Appendix 11). Trans Mountain also said that the Project's overall contribution to combined instream habitat disturbance would be < 0.01 per cent in Alberta and 0.02 per cent in B.C.

Participants, including Metro Vancouver and Yarrow Ecovillage, said that substantial restoration activities have occurred in watercourses crossed by the proposed pipeline and that Project construction could potentially compromise the progress of habitat enhancement measures. The City of New Westminster said that habitat enhancements in the upper reaches of the Brunette River, and associated off-channels, have resulted in marked improvement in fish habitat quality. It said that the Project alignment adds risk to the ongoing successful improvements and the positive trajectory of this recovering system as fish habitat. The City of Coquitlam recommended that Trans Mountain avoid any disturbance to streams in Coquitlam, or alternatively, to provide additional habitat compensation to enhance stream habitat. Trans Mountain acknowledged the implementation of habitat enhancement measures completed by local stakeholders and municipalities. Trans Mountain said that existing compensation areas within watercourses will be avoided or minimized during construction and that any disturbance to compensation areas will be re-established during the construction and reclamation phases. Trans Mountain also committed to implement additional enhancement measures (e.g., boulder clusters, large woody debris) at watercourse crossings deemed high risk by the self-assessment, and, in the event a *Fisheries Act* authorization is required, would implement offset measures to compensate for the serious harm.

10.2.5.4 Species at risk

Trans Mountain indicated that seven proposed watercourse crossing locations are within the proposed critical habitat for Nooksack dace and Salish sucker. Trans Mountain proposed to cross six of these crossings using an isolated trenched watercourse crossing method. Trans Mountain said that it had not studied the possibility of trenchless crossings within critical habitat for these species. Trans Mountain said that the proposed species-specific mitigation and construction timing would limit the potential for serious harm to Nooksack dace and Salish sucker. Trans Mountain committed to obtaining the necessary permits under the SARA for the salvage of all relevant freshwater fishes.

DFO said that the proposed mitigation measures may effectively mitigate potential localized effects on Nooksack dace and Salish sucker, but that trenchless crossings are preferred methods for reducing impacts on fish and fish habitat. DFO said that the enhancement of the specific habitat features and functions that benefit the Nooksack dace and Salish sucker may assist in furthering the recovery of these species. Metro Vancouver recommended that Trans Mountain commit to using trenchless crossings within areas of critical habitat, or re-route the pipeline to avoid impacts on critical habitat.

Trans Mountain indicated that no other fish species at risk have critical habitat identified within the pipeline corridor and that, with the implementation of mitigation measures and appropriate watercourse crossing methods, effects on fish species at risk are anticipated to be low. Trans Mountain said that Athabasca rainbow trout was recently uplisted by the Committee on the Status of Endangered Wildlife in Canada to Endangered and that the publication of the *Alberta Athabasca Rainbow Trout Recovery Plan 2014-2019* suggests that Athabasca rainbow trout could likely be listed under the SARA before Project construction.

[93] Sturgeon River, Lower and Upper North Saskatchewan River, Pembina River, Lower McLeod River, Athabasca River, Lower North Thompson River, Thompson River, South Thompson River, Lower Nicola River, and Similkameen watersheds.

Views of the Board

The Board acknowledges the concerns raised by participants in regards to fish and fish habitat and more specifically, Pacific salmon. The Board is of the view that proposed watercourse crossings designs, mitigation measures, reclamation activities, and post construction environmental monitoring, as proposed by Trans Mountain, are appropriate and would effectively reduce the extent of effects on fish and fish habitat. The Board is also of the view that the baseline data, including collection methods, used by Trans Mountain to support their environmental assessment was appropriate for the scope of the Application. The Board finds that the assessment methods used by Trans Mountain are based on proven industry standards and are commonly applied approaches used in pipeline assessments. The Board is of the view that watercourse crossings are fairly standardized with ample guidance from industry as well as federal and provincial regulators, and when completed according to such guidance, are generally considered low risk.

The Board concurs with Trans Mountain's self-assessment of the potential for serious harm, in that the majority of proposed watercourse crossings are not going to constitute serious harm under the *Fisheries Act.* The Board acknowledges that some proposed watercourse crossings, because of timing or environmental conditions, are considered higher risk and have a higher potential for serious harm.

The Board agrees with participants that finalized, site-specific information is needed to make an accurate serious harm determination for higher risk crossings. In order to fulfill the responsibilities of the National Energy Board under the Memorandum of Understanding with DFO, the Board would impose Condition 43 requiring Trans Mountain to file site-specific information with the Board, prior to construction. The Board will use this information to conduct a site-specific review of each of the proposed watercourse crossings where Trans Mountain cannot meet all of Fisheries and Oceans Canada's Measures to Avoid Causing Harm to Fish and Fish Habitat, and to verify the results of Trans Mountain's self-assessment of the potential for serious harm. The Board would refer to DFO any watercourse crossing activities that may likely require authorization under the *Fisheries Act.* DFO would then be responsible for issuing any authorizations. The Board would impose Condition 110 that requires Trans Mountain, in the event it requires a *Fisheries Act* authorization(s), to file any finalized authorizations with the Board prior to construction. The Board notes that if any *Fisheries Act* authorization(s) are required for the Project, DFO has acknowledged it will undertake consultation with potentially affected Indigenous groups. Trans Mountain also committed to developing any Fish and Fish Offset Plans in consultation with regulators, fisheries managers, Indigenous groups and other stakeholders.

The Board understands participants' concerns regarding the consideration of riparian habitat as part of serious harm determination. The Board generally agrees with Trans Mountain's assertion that removal of riparian vegetation may require a *Fisheries Act* authorization if it has a limiting effect on the productive capacity of the watercourse, and if its removal or disturbance represents a potential influence on fish communities. The Board would impose Condition 43 requiring Trans Mountain to provide site-specific riparian habitat information prior to construction. The Board will then consider the riparian habitat information as part of its site-specific review. The Board would also impose conditions requiring Trans Mountain to develop a Riparian Habitat Management Plan and Riparian Habitat Reclamation Evaluation Report and Offset Plan aimed at reducing the impacts of construction on riparian habitat (Conditions 71 and 154). A detailed discussion on these conditions is provided in the surface water quality and quantity section (Section 10.2.3).

The Board recognizes the concerns of participants related to cumulative effects on fish and fish habitat in watersheds crossed by the proposed pipeline corridor. The Board acknowledges Trans Mountain's voluntary commitment to develop an Environment Stewardship Program as part of the Community Benefit Program, where Trans Mountain would seek opportunities, alone or in partnership, to restore, secure, or enhance elements of aquatic ecosystems above and beyond regulatory requirements. The Board recognizes the local knowledge held by Indigenous groups and the local community, including species experts and expects Trans Mountain to consult with these groups as it develops the Environmental Stewardship Program. The Board is of the view that voluntary programs, such as the Environmental Stewardship Program, are essential in addressing total cumulative effects and in promoting recovery of impacted species and habitats.

The Board recognizes that the proposed trenched crossing methods would result in adverse effects on riparian habitat within Nooksack dace and Salish sucker critical habitat. The Board recognizes that Recovery Strategies for both Nooksack dace and Salish sucker state that failure to maintain adequate riparian reserves as part of critical habitat is likely to cause population level impacts. As such, the Board would impose Condition 75 requiring Trans Mountain to use trenchless methods when working in the critical habitat of these species, with entry and exit points located outside of riparian habitat, when feasible. The Board is mindful that there are constraints associated with trenchless crossings and acknowledges that trenchless crossings may not be practicable at all crossings locations within critical habitat of these species. In the event trenchless crossings are not feasible, the Board would require a clear rationale as to why a trenchless crossing is not feasible, as well as the updated watercourse crossing method, any proposed site-specific

mitigation, species-specific enhancement measures, reclamation measures, and post-construction monitoring (Condition 75). The Board shares DFO's view's, that the proposed isolated crossings, including mitigation, reclamation, post- construction monitoring, and species-specific enhancement measures, if implemented appropriately, would likely mitigate localized residual effects on the Nooksack dace and Salish sucker and potentially aid in the recovery of these species. However, given the sensitive nature of Nooksack dace and Salish sucker populations, the Board is of the view that avoidance of any adverse effects is preferable to mitigating effects.

The Board also recognizes that Athabasca rainbow trout may be listed under the *Species at Risk Act* (SARA), prior to construction but after the permitting stage. The Board would impose Condition 92 requiring Trans Mountain to provide to the Board updates on any changes to species listings under Schedule 1 of the SARA and their Recovery Strategies, Action Plans or Management Plans. The condition would require Trans Mountain to design construction methods and develop mitigation that align with these strategies and plans, and eliminate or minimize any potential effects.

Significance evaluation: adverse effects on fish and fish habitat

	Criteria	Rating	Description
Project effects	Temporal extent	Short-term to long-term	Effects are generally considered short-term; however, in some situations, effects would be expected to be of longer duration. For example, removal of mature riparian vegetation could result in effects that last in the order of years to decades, and as such, would be considered a long-term effect.
	Reversibility	Reversible to permanent	Effects are mostly expected to be reversible, allowing for disturbed areas to recover to pre-construction conditions within the life of the Project. In certain situations, such as when mature riparian habitat is removed, effects could be permanent, as riparian habitat may not return to pre-construction conditions within the life of the Project
	Geographic extent	LSA	Effects are expected to be localized to the Project footprint and the LSA.
	Magnitude	Low to moderate	Effects from construction and operation of the Project are expected to be of low magnitude taking into account Trans Mountain's proposed mitigation, reclamation activities and post-construction environmental monitoring. Some individual watercourse crossings do have the potential to result in serious harm; however, in these situations, offset measures would be required to compensate for any residual serious harm, and therefore the effects are expected to be of moderate magnitude.
Cumulative effects	Existing cumulative effects differ in the various watersheds crossed by the proposed pipeline corridor. Numerous current and historical activities have reduced the abundance and health of fish species and the quality of habitat within the pipeline corridor. For some species and watersheds, existing cumulative effects could be considered substantial or above environmental regulatory thresholds. Taking into account the implementation of Trans Mountain's mitigation measures, and the conditions the Board would impose, the Project's contribution to the total cumulative effects on fish and fish habitat is expected to be relatively minor.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.6 Soil and soil productivity

The primary issues related to soil and soil productivity raised during the hearing were:

- soil degradation and decrease in soil productivity;
- disturbance of pre-existing soil contamination; and
- soil contamination from construction.

10.2.6.1 Soil degradation and decrease in soil productivity

Trans Mountain said that potential effects from construction and from maintenance activities include:

- decreased soil productivity due to mixing of topsoil or root zone material with subsoil, or mixing undesirable lower subsoils with upper subsoil horizons;
- degradation of soil structure due to compaction and rutting; and
- loss of topsoil or root zone material due to wind and water erosion.

Trans Mountain conducted a soil survey on lands with agricultural capability, documenting soil characteristics at approximately 2,000 sites along the proposed corridor. It proposed mitigation measures which include salvage of topsoil or of root zone material, three-lift soil separation at areas with identified poorer quality lower subsoils, traffic restrictions when soils are wet, and protection of soil windrows from erosion.

Trans Mountain said that there will be on-site inspection and monitoring by a Professional Agrologist on all farms in the Fraser Valley during construction to ensure that appropriate soil handling protocols are implemented. It said that landowner or lessee requests, such as for additional soil sampling or alternative soil handling techniques, would be reviewed by a Professional Agrologist, and that it would accommodate landowner and Crown land authority topsoil/root zone material salvage requests, if feasible. Trans Mountain said that if a landowner or lessee, or the Agrologist, has concerns about potential soil compaction, soil compaction testing would take place and if soil compaction is found to be greater than in adjacent undisturbed areas, decompaction processes will be initiated.

Trans Mountain said that its post-construction environmental monitoring program would assess the success of soil mitigation measures, and, where soil productivity appears to be impaired, soils would be tested if warranted and appropriate remedial measures identified and implemented. It said that it anticipates that the extent and severity of soil mixing, compaction, rutting and erosion would be minor, and said that past projects have shown residual effects can generally be resolved within two to three years post-construction. Trans Mountain said that it may take longer than five years to alleviate some effects, such as mixing of unexpected, undesirable, lower subsoils with upper subsoil horizons, and that reversibility would be longer term where topsoil is stored in berms for long-term facilities such as at access roads and terminals.

Yarrow Ecovillage said that, even if soil is removed in layers, the Project would disturb the subsurface and surface soil organisms and structure they depend on, thus reducing soil quality and hence its fertility and ability to provide biocontrol against pests and pathogens, with potential loss in whole or in part of organic certification.

Trans Mountain said that, while soil handling during construction may affect soil organisms, studies show that soil biology of stockpiled topsoil bounces back relatively quickly once replaced. Trans Mountain's Pipeline Environmental Protection Plan includes some mitigation measures for organic farms and farms transitioning to organic status, such as cleaning equipment to minimize the spread of weeds, salvaging topsoil from the entire construction right-of-way, and prohibiting the use of herbicides. Trans Mountain committed to develop additional mitigation at Yarrow Ecovillage in cooperation with the landowners and users and their organic certification boards, and to work with owners, users and boards on all organic farms to ensure that soil handling procedures do not affect organic certification.

Metro Vancouver and the Grasslands Conservation Council of British Columbia said that soil disturbance and erosion could be increased if the right-of-way becomes adopted for human recreational uses. Trans Mountain said that its Traffic and Access Control Management Plan is intended to control disturbance from increased access during and following pipeline construction, in particular in areas of high soil erosion hazard and where increased access could disturb reclamation efforts on sensitive terrain.

10.2.6.2 Disturbance of pre-existing soil contamination

Trans Mountain said that there have been five historical spills along the existing Trans Mountain pipeline right-of-way, and that they were remediated to the applicable standards at the time. Trans Mountain confirmed that soil testing at these sites would occur prior to soil disturbance. It said that it conducted a cursory inventory of potential third party contaminated sites to identify potential sources of contamination that could impact the Project. Trans Mountain said that, if contamination is suspected or if previously unknown contamination were discovered during construction, it would implement mitigation measures in its Contamination Discovery Contingency Plan and Waste Management Program.

Metro Vancouver and the City of New Westminster said that Trans Mountain's contamination discovery program is likely insufficient to detect many important chemicals that may not be seen or smelled, and that such contaminants, once disturbed, can re-enter the environment and waterways, increasing the exposure of biota to toxins. They suggested that Trans Mountain should conduct contaminated sites investigations prior to construction, especially in areas of historic industrial activity along the right-of-way. In response, Trans Mountain said that, based on the final route, it would update the preliminary inventory and re-assess potentially contaminated areas prior to construction. Trans Mountain said that, if contamination is confirmed on the right-of-way, site-specific mitigation, remediation, and monitoring measures would be developed, when warranted.

10.2.6.3 Soil contamination from construction

Trans Mountain described mitigation and contingency measures to avoid contamination from spot spills, inadvertent release of drilling mud, and release of hydrostatic test water. Trans Mountain said that no residual effects of pipeline construction and maintenance were identified for soil contamination.

Yarrow Ecovillage referenced a study that found increased presence of heavy metals in soils in pipeline construction areas. Trans Mountain said that the study, which found elevated metals in the working space and right-of-way of two recently installed Chinese pipelines, suggested the potential sources of these metals are incomplete cleanup after welding, burning of oil on the pipeline, and mechanical wear of tires and brakes, each of which would be avoided or mitigated by different construction practices in Canada or by Project mitigation. Trans Mountain concluded that there is very little risk of heavy metal contamination from construction of the Project, but committed to a statistically valid sampling and testing of soils prior to construction and before re-spreading topsoil at Yarrow Ecovillage to ensure there has been no metal contamination of the soil.

10.2.6.4 Cumulative effects

Trans Mountain said that a broad range of existing activities and land uses have already disturbed approximately 39 per cent of the soils in the LSA, which increases to approximately 41 per cent with the Project and reasonably foreseeable developments, of which the Project contributes 2 per cent.

Views of the Board

The Board is of the view that the effects of pipeline construction on soil and soil productivity are generally well understood. Trans Mountain has committed to a suite of mitigation measures to reduce such effects, and these measures have proved effective on past projects.

The Board would impose conditions requiring Trans Mountain to include updated mitigation measures in the Environmental Protection Plans (EPPs) to be filed prior to construction (Conditions 72, 78 and 81). These EPPs must also include updated management and contingency plans, a number of which (such as the Wet/Thawed Soils Contingency Plan) are relevant to soil and soil productivity. The Board would also impose conditions requiring Trans Mountain to address the potential for soil erosion due to increased access in the Access Management Plan, and to include soil issues in the post construction environmental monitoring reports, including in the final report identification of any outstanding soil issues that require ongoing action or assessment (Conditions 47 and 151). The Board would impose general conditions that require Trans Mountain to implement all commitments it has made during this hearing, and to file updated commitments tracking tables before, during and after construction (Conditions 2 and 6).

The Collaborative Group of Landowners Affected by Pipelines (CGLAP) recommended the Board impose additional conditions with regard to appropriate tires and tire pressures for Project vehicles on agricultural lands; to make three-lift soil separation, de-compaction and soil core sampling mandatory on all agricultural lands in the Fraser Valley; and to require Trans Mountain to file, and make publicly available, a study on pipeline temperature effects of the existing Trans Mountain pipeline being conducted by the University of the Fraser Valley and underwritten by Trans Mountain.

Given Trans Mountain's commitments related to soil handling and wet weather conditions, including those describing how it will respond to landowner requests in relation to soil sampling or soil handling techniques and to landowner concerns about potential soil compaction, the Board is not persuaded of the need for the additional conditions proposed by CGLAP. Further, the Board is not privy to the agreement between the University of the Fraser Valley and Trans Mountain with regard to the temperature effects study, and declines to impose a condition requiring it to be filed. The Board would impose Condition 99 requiring Trans Mountain to maintain and file its landowner consultation records, which must include a summary of the issues or concerns raised by landowners together with the actions, or explanation for no actions, taken in response.

The Board is satisfied with Trans Mountain's response to Yarrow Ecovillage's concerns about disturbance to organic farm soils, which includes commitments to develop additional mitigation in cooperation with landowners, users and organic certification boards to ensure that soil handling procedures do not affect organic certification. The Board would also require Trans Mountain to address potential adverse effects of treatment measures for weeds, such as contamination of organic lands by prohibited substances, in the Weed and Vegetation Management Plan (Condition 45).

The evidence indicates that Trans Mountain has conducted only a cursory inventory of potential third party contaminated sites to-date, but has committed to a more comprehensive review of such pre-existing contamination prior to construction, including site assessments and remediation measures where appropriate. The Board would impose Condition 46 requiring Trans Mountain to file a Contamination Identification and Assessment Plan prior to construction, to demonstrate the adequacy of the identification and assessment procedures that were and are being used.

With regard to the study submitted by Yarrow Ecovillage concerning the potential for pipeline construction to result in heavy metal contamination of soils, the Board is satisfied with Trans Mountain's risk assessment, which takes Canadian construction practices and Project mitigation into account, and with its proposed soil sampling to be undertaken at Yarrow Ecovillage.

Significance evaluation: adverse effects on soil and soil productivity

	Criteria	Rating	Description
Project effects	Temporal extent	Medium- to long-term	Effects are expected to be mostly medium-term, but long- term in the case of facilities and if mix unanticipated poor lower subsoils with upper subsoils.
	Reversibility	Reversible to permanent	Medium-term effects are reversible in the post-construction phase, whereas long-term effects at facilities would continue until post-abandonment.
	Geographic extent	Footprint to LSA	Effects expected to be limited generally to directly disturbed areas, although unanticipated contamination if disturbed could migrate off-footprint.
	Magnitude	Low to moderate	Residual effects could include reduction in soil productivity, although proposed mitigation, reclamation and monitoring measures are expected to limit the severity of such effects.
Cumulative effects	Although a relatively high percentage (approximately 39 per cent) of soils in the LSA are already disturbed, given Trans Mountain's mitigation and reclamation measures and the Board's conditions, the Project's contribution to total cumulative effects is expected to be relatively minor.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.7 Rare plants and lichens, and vegetation communities of concern

The primary issues raised during the hearing regarding rare plants and lichens, and vegetation communities of concern (including wetlands of concern) were related to federally-listed (i.e., under the SARA) and provincially-listed plant and lichen species at risk, provincially-identified rare ecological communities, and grassland communities in the interior of B.C.

Trans Mountain said that construction and operation of the proposed pipeline would disturb or alter about 2,231 ha of native vegetation, and, although such areas would revegetate with appropriate native species, species composition would be altered. It said that vegetation within at least 3 m on either side of the pipeline centreline would be maintained to not exceed 1 m in height to allow for aerial reconnaissance and access for operational maintenance. Trans Mountain said that long-term loss of native vegetation may occur at long-term facilities, and that vegetation communities and populations adjacent to disturbed areas may also be indirectly affected by edge effects, changes in surface drainage patterns, soil erosion, and dust deposition.

10.2.7.1 Survey methods

Trans Mountain said that it conducted vegetation surveys on lands where access was available, at locations that were representative of the different vegetation types in the area and at locations with a high potential to support rare plants and lichens, or vegetation communities of concern. It said that there are eight federally-listed plant and lichen species with historical occurrences within the RSA (see Appendix 11 for a description of the spatial boundaries), and 13 others with high or moderate potential to occur along the pipeline corridor. Trans Mountain said numerous provincially listed plant and lichen species and rare ecological communities are listed as encountered or were observed within the pipeline corridor.

A number of participants, including ECCC, questioned the adequacy of Trans Mountain's vegetation surveys. Trans Mountain responded that its rare plant survey methodology was based on the Alberta Native Plant Council Guidelines for Rare Plant Surveys and the British Columbia Protocols for Rare Plant Surveys. It said that surveys were conducted during biologically appropriate times for the species with potential to occur in the area, and that experienced, professional biologists conducted the surveys. Trans Mountain said that once the Project footprint has been determined, supplemental surveys would further delineate or verify rare plants and communities where necessary and inform site-specific mitigation.

10.2.7.2 Mitigation

Trans Mountain said general measures to mitigate effects on native vegetation include paralleling existing linear disturbances, utilizing workspace on adjacent existing rights-of-way, and siting temporary facilities (such as work camps and stock piles) on existing disturbances to the extent practical. It said that detailed reclamation strategies would be finalized before construction and described in the Reclamation Management Plan.

Trans Mountain detailed potential mitigation measures for rare plants and lichens and vegetation communities of concern, together with circumstances where each mitigation would be used, the expected level of success and measurable goals to determine success. Trans Mountain said that site-specific mitigation measures are dependent on the finalization of the Project footprint, but in general:

- complete avoidance would be adopted for rare plants, lichens, and communities ranked S1 or S1S2[94] and for species or critical habitat that are protected under provincial or federal legislation, subject to factors such as construction and workers' safety;
- disturbance reduction could include measures such as placement of protective structures over plants of concern, and restricting use of herbicide near vegetation communities or sub-populations; and
- where avoidance and disturbance reduction are not feasible, alternative reclamation techniques would be used, such as propagating and transplanting to suitable receiving sites, and stripping the upper 15 cm of topsoil separately where feasible to make use of the existing seed bank.

Trans Mountain said that offsets for rare plants, lichens and communities are unnecessary because other technical mitigation options are available which would sufficiently mitigate potential impacts. It said that not all non-standard restoration measures would be effective, practical, or economically feasible at all locations. In its comments on the Board's draft conditions, Shackan Indian Band emphasized the importance of avoidance in cases where the effectiveness of mitigation and offsets is unproven.

For rare plants and lichens and vegetation communities of concern that are disturbed, Trans Mountain said that some species can recolonize or re-establish in one growing season if the seed bank and habitat is available, whereas effects to others (such as mature trees) would reverse over the long term. Trans Mountain said that due to potential connectivity among populations, alteration of occurrences of rare plants or lichens may affect the viability of other populations in the RSA.

[94] S1 means critically imperilled in a province, S1S2 is critically imperilled to imperilled, while S2 is imperilled.

10.2.7.3 Post-construction monitoring

Trans Mountain said that post-construction environmental monitoring would use baseline vegetation data from surveys on and off the right-of-way; that reclamation of native vegetation would be deemed successful when vegetation growth on and off the right-of-way are comparable; and that if reclamation measures are unsuccessful, remedial measures would be implemented as soon as feasible.

Trans Mountain said that where warranted, a rare plant specialist would revisit the locations of previously documented rare plants and lichens and vegetation communities of concern one full growing season after cleanup to determine the effectiveness of mitigation measures. Where a rare plant population is determined to have returned to a state of overall health and vigour comparable to, or better than, the status documented pre-construction, the issue would be considered resolved; otherwise, additional monitoring and corrective measures may be recommended.

In response to an Adams Lake Indian Band information request, Trans Mountain described post-construction monitoring results from 2012 for a previous expansion of the Trans Mountain pipeline (the TMX Anchor Loop project), for which 69 per cent of rare vascular and 72 per cent of rare non-vascular plant sites were successfully mitigated, and 31 per cent and 28 per cent respectively were unsuccessfully mitigated.

10.2.7.4 SARA-listed species with critical habitat

ECCC said that it considers activities that would adversely impact the survival or recovery of a SARA-listed species, or any activity likely to destroy critical habitat under the SARA, to have caused significant adverse effects. ECCC said that avoidance is often the only known means to ensure the critical habitat of plant species would not be destroyed, and that a number of Trans Mountain's proposed mitigation measures have risks and uncertainties, such as time lags and risk of failure with habitat restoration. In particular, ECCC cautioned against concluding that offsets are likely to be effective in the context of critical habitat for plant species at risk, and that offsets cannot compensate for the loss of irreplaceable habitat. ECCC said it continues to identify critical habitat for species, and so encourages the use of the most up-to-date information regarding recovery planning.

In addition to the mitigation described above, Trans Mountain described the further mitigation it would implement with regard to SARA-listed plant species that have critical habitat overlapping the pipeline corridor (see Table 10). Trans Mountain said that additional surveys for SARA-listed toothcup, whitebark pine and relevant vegetation species of concern would continue in summer 2016, and that it would prepare appropriate mitigation measures if such species or their critical habitats were encountered within the Project footprint. It said that the potential for Project mitigation to be unsuccessful is very low for SARA-listed plant and lichen species.

Table 10: Proposed further mitigation for SARA-listed plant species with critical habitat that overlaps the pipeline corridor

SARA-listed plant species	Mitigation
Toothcup (Endangered)	Critical habitat for toothcup is crossed by the proposed pipeline corridor at Mission Flats near Kamloops. Shoreline disturbance in proximity to known toothcup populations would be avoided by implementing horizontal directional drilling (HDD) at the North Thompson River crossing, and the small portion of temporary workspace that overlaps the critical habitat polygon does not contain attributes of toothcup critical habitat. In the unlikely event the HDD is unsuccessful, critical habitat destruction can still be avoided by positioning the construction footprint in areas of existing disturbance to the greatest extent practical, and by applying mitigation such as narrowing the construction right-of-way, retaining the seedbed, and employing appropriate salvage, propagation and transplant techniques.
Whitebark pine (Endangered)	Five candidate critical habitat regeneration areas intersect the proposed pipeline corridor. The proposed route parallels pre-disturbed rights-of-way and mainly follows low elevation forested valleys well below the treeline, whereas whitebark pine habitat is high elevation, upper subalpine habitat. The intersected candidate areas are mostly covered by dense canopy forests that do not provide the attributes for a shade-intolerant species such as whitebark pine, and rare plant surveys within the proposed pipeline corridor did not identify the presence of whitebark pine in these areas.
Haller's apple moss (Threatened) and Mexican mosquito fern (Threatened)	Critical habitat for Haller's apple moss and early draft critical habitat for Mexican mosquito fern overlap a 1 km buffer centered on the reactivation segments (as does candidate critical habitat for whitebark pine). Upon determination of areas requiring work, field surveys would be completed as needed to inform the development of site-specific mitigation measures. The potential for interaction is expected to be low given the disturbance footprints of reactivation activities are relatively small and mostly within the existing Trans Mountain pipeline right-of-way and pump stations, and given the proximity of existing disturbances.
Roell's brotherella moss (Endangered, though not yet SARA-listed)	Environment and Climate Change Canada suggested early draft critical habitat (which is based on occurrence) could overlap the proposed pipeline corridor. However, Trans Mountain said an occurrence of *Roell's brotherella* originally located within the Burnaby Terminal was determined to be a location error, and therefore no existing occurrences are located within the proposed pipeline corridor.

Trans Mountain said that if its resource specialists consider recovery to be unacceptable or habitat loss to be beyond predicted effects during the Post-Construction Environmental Monitoring program, additional mitigation measures would be implemented which could include transplants, seed collection, appropriate salvage, propagation and habitat improvements.

10.2.7.5 Grasslands

A number of participants noted particular concerns with disturbance to grasslands in the B.C. interior. The Grasslands Conservation Council of British Columbia, for example, said that such grasslands are a rare ecotype in B.C., occupying less than one per cent of the land base, are critical to one-third of the province's threatened or endangered species for some portion of their annual lifecycles, can take 50 years or more to recover from significant disturbance, and that B.C. has already lost over 20 per cent of its original grasslands to forest ingrowth, land conversion and invasive plants. Dr. Lauchlan Fraser said that grasslands are notoriously difficult to restore due to the characteristic low annual precipitation and relatively low productivity of the ecosystem.

Trans Mountain said that the Bunchgrass biogeoclimatic zone is intersected by the proposed pipeline corridor for a total of approximately 35 km and that approximately 158 ha is predicted to be directly disturbed or altered by the footprint. Trans Mountain described the mitigation it could implement in native grasslands, such as retaining sod and using the vegetative mat if a competent sod layer exists, and said that the preferred reclamation method is seeding a native seed mix. Trans Mountain committed to additional mitigation and offsets within the Lac du Bois Grasslands Protected Area, which intersects the preferred routing for approximately 10 km (see Section 10.2.12).

Trans Mountain said that establishing a cover of native grassland species (or a cover crop species) would occur over the medium-term (i.e., 1 to 10 years), that greater species diversity may take longer than 10 years, and that revegetation to habitat function equivalent to areas adjacent to the right-of-way is expected within the operational life of the Project. It said that cryptogamic crust (a thin layer of living organisms such as fungi and lichens on the soil surface) may take on the order of decades to centuries to return to pre-construction conditions, and that such crusts are highly susceptible to trampling.

Trans Mountain said that it would salvage, store, and redistribute topsoil after construction, and that this has been effective for rehabilitation of the cryptogamic crust.

10.2.7.6 Cumulative effects

Trans Mountain said that a broad range of existing activities and land uses have already disturbed native vegetation in the RSA. It said areas of existing disturbance have previously been converted to non-native cover types that provide little to no habitat value for rare plants and rare lichens, and where rare ecological communities are unlikely to persist.

Trans Mountain applied a habitat disturbance threshold of 40 per cent based on literature that indicates risk is highest when total habitat loss measured at the landscape (regional) scale exceeds 50 per cent. Trans Mountain said that this disturbance threshold is already exceeded by existing land conversion and disturbance at the RSA scale in Alberta and in the B.C. Georgia Depression ecoprovince / lower mainland development area, and thus total cumulative effects on native vegetation and on rare plants and lichens and vegetation communities of concern is potentially significant in these areas. Trans Mountain said that total cumulative effects for SARA-listed plant and lichen species are also significant in some areas because of disturbance from existing activities. Trans Mountain said that, in the Bunchgrass biogeoclimatic grassland zone, total cumulative effects would constitute approximately 34 per cent disturbance with the Project contributing four per cent.

Views of the Board

The Board is of the view that the effects of pipeline construction on native vegetation, and the effectiveness of related mitigation and remediation, are generally well understood.

The Board would impose Conditions 72 and 78 requiring Trans Mountain to file, before construction, updated Environmental Protection Plans, which include the Reclamation Management Plan and Rare Ecological Communities or Rare Plant Species Discovery Contingency Plan. The Board would require the Post-Construction Environmental Monitoring Reports to address rare plants, lichens and ecosystems, and the Access Management Plan to address the potential for adverse effects on vegetation due to increased access along the right-of-way (Conditions 47 and 151). The Board would also require Trans Mountain to consider relevant updates for plants and lichens listed under *Species at Risk Act* (SARA), and consequences for Project mitigation and monitoring, prior to construction and throughout the Project lifetime (Condition 92).

The Board would impose Condition 40 requiring specific mitigation and monitoring measures to be updated and included in a Rare Ecological Community and Rare Plant Population Management Plan to be filed prior to construction. This condition would also require Trans Mountain to demonstrate the overall adequacy of surveys for rare ecological communities and rare plants and lichens. In the Board's view, a single year of monitoring to determine the effectiveness of alternative reclamation techniques, such as transplantation, as suggested by Trans Mountain, may not be sufficient, and so the Rare Ecological Community and Rare Plant Population Management Plan would be required to address the appropriate monitoring duration for each type of mitigation measure.

Although Trans Mountain said it does not see the need for offsets, the Board notes that monitoring of previous projects (such as the TMX Anchor Loop) has shown that mitigation for rare plants is not always successful. The Rare Ecological Community and Rare Plant Population Mitigation Evaluation Report and Offset Plan would therefore require an overall evaluation, five years post-construction, of the success of mitigation and of the need for offsets where ongoing effects remain, as well as the need for further corrective actions and monitoring on-site (Condition 155).

The Board finds that offsets may not be feasible or effective for some rare ecological communities or rare plants and lichens, and so reiterates the primary importance of avoidance and mitigation to avoid and reduce adverse effects. Offsets should generally be used only as a last resort and when they have a reasonable chance of success. In the Board's conditions, Trans Mountain would therefore be required to justify any use of offsets, to explain why avoidance and mitigation cannot feasibly avoid residual effects, and to discuss any limitations on the potential effectiveness of offsets for the particular community or species. For SARA-listed plant species in particular, the Board finds that Trans Mountain's proposed avoidance and mitigation measures are expected to avoid adverse effects on these species and their critical habitat, and so offsets are not expected to be required.

The Grasslands Conservation Council of British Columbia recommended that the Board's conditions related to rare plant and ecosystem mitigation include species of concern listed S2 (imperilled) or higher in addition to those that are federally listed under the SARA, given that federal listing is a coarse filter at the national scale and so can miss the variability and status of species and ecosystems at the provincial scale. The Board agrees that species and communities at risk at the provincial level with a status of S2 (imperilled) or higher should receive special attention, similar to species at risk at the national level. Consequently, the Board would include in the Conditions 40 and 155 related to rare ecological communities and rare plants a requirement for Trans Mountain to address S1, S1S2 and S2 species, including an evaluation of the potential need for and feasibility of offsets.

The Grasslands Conservation Council of British Columbia also recommended that the Board impose specific conditions to oversee the mitigation and reclamation of grasslands given their sensitivity to disturbance. It said that post-construction monitoring should be for 30 years given that the standard five years post-construction monitoring would only indicate if interim cover is re-establishing itself. It said that offsets should be required to compensate for lost productivity due to invasive plants, and that Trans Mountain should be required to manage and control access in such rare and ecologically sensitive areas for the lifetime of the pipeline.

With regard to grasslands in the B.C. interior, the Board agrees with participants' views that special attention should be focused on mitigation, reclamation and monitoring in these areas, given the importance, rarity and sensitivity of these grasslands, and the long duration and potential difficulties in successfully reclaiming them. The Board would therefore impose Conditions 42 and 157 that require a Grasslands Survey and Mitigation Plan prior to construction, and a Grasslands Reclamation Evaluation Report and Offset Plan to evaluate reclamation success after ten years, and to determine the need for offsets and for ongoing monitoring and corrective actions on-site.

Significance evaluation: adverse effects on rare plants and lichens and vegetation communities of concern

	Criteria	Rating	Description
Project effects	Temporal extent	Medium- to long-term	Effects are expected to be mostly medium-term, but can be long-term at facilities along the right-of-way due to vegetation maintenance, for certain communities such as mature trees and grasslands, and if mitigation is unsuccessful.
	Reversibility	Reversible to permanent	Medium-term effects are reversible during the post-construction phase, but long-term effects might extend beyond the lifetime of the Project.
	Geographic extent	Footprint to LSA	Effects are expected to be mostly restricted to the Project footprint, although some effects, such as edge effects and dust and effects on local populations, can extend off the footprint.
	Magnitude	Low	With surveys, avoidance, mitigation and offsets (as a last resort), net effects are expected to be mostly of low magnitude, although there is potential for loss of rare plant or community occurrences if undetected or if mitigation is unsuccessful.
Cumulative effects	Existing cumulative effects to native vegetation are already substantial in the Vegetation Regional Study Area in Alberta and in the lower mainland of B.C. Furthermore, the reason that rare plants, lichens and vegetation communities are at risk is often because existing cumulative effects have already exceeded a sustainability threshold for the species or community. Despite substantial existing cumulative effects on native vegetation, given Trans Mountain's mitigation and reclamation measures and the Board's conditions, the Project's contribution to total cumulative effects is expected to be relatively minor. For species or communities that are imperilled or critically-imperilled at the provincial level, given the additional measures required in the Board's conditions (which include offsets as a last resort under the mitigation hierarchy), the Project's net contribution to total cumulative effects is expected to be inconsequential. For SARA-listed species, given the additional measures committed to by Trans Mountain and as required in the Board's conditions, the Project's contribution to total cumulative effects is expected to be inconsequential and offsets are not expected to be required.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.8 Forests

The primary issues raised during the hearing regarding forests were related to old growth forests in B.C., the potential degradation of forest health, and the loss of urban trees. With regard to forests generally, Trans Mountain said that construction of the proposed pipeline, facilities and associated power lines would create new forest clearing, increase the existing corridor width where existing linear disturbances are paralleled, and create indirect edge effects in adjacent forest. Trans Mountain said temporary workspaces would be planted with timber tree species in forested areas, although effects to mature trees would take decades to reverse and the right-of-way would be maintained free of high vegetation throughout the Project's lifetime.

10.2.8.1 Old Growth Management Areas

Trans Mountain said that Old Growth Management Areas (OGMAs) in B.C. originated under the B.C. Forest Practices Code as a key element of biodiversity planning, and a key goal of OGMAs is ensuring relatively undisturbed ecosystems are represented on the landscape. A number of participants raised concerns about effects on OGMAs. For example, the Stó:lō Collective said that right-of-way clearing width within OGMAs should be minimized and actual effects should be monitored and compared to predicted effects.

Trans Mountain said that 66 OGMAs are crossed by the pipeline corridor, and that two are crossed by the Kingsvale power line. It said that avoidance of OGMAs is the top priority where possible, followed by minimization of impact and use of existing linear features to the extent practical. It said that, as the Project footprint continues to be refined, it would work with the British Columbia Ministry of Forest, Lands and Natural Resource Operations to reduce unavoidable effects, and it committed to reviewing replacement options if unavoidable effects would result. Trans Mountain said that post-construction environmental monitoring would include identifying where actual effects on OGMAs deviate from anticipated effects, documenting changes to newly created edges in OGMAs, and identifying if further mitigation is required should windthrow levels exceed natural levels.

10.2.8.2 Forest health

Trans Mountain said that construction activities have the potential to exacerbate forest health related damage. For example, timber clearing could result in an accumulation of excess woody debris that could in turn lead to increased bark beetle populations, and damage to residual trees could compromise tree health and increase susceptibility to other forest health factors such as pathogens.

Trans Mountain said that mitigation would include minimizing coarse woody debris left on the right-of-way and damage to trees at the edge of the right-of-way; obtaining local beetle flight data to determine the appropriate tree clearing period; and following applicable legislation, regulations, and guidelines with respect to the movement of construction debris. Trans Mountain concluded that no residual effect on forest health due to construction is anticipated.

10.2.8.3 Urban trees

A number of participants noted the importance of urban forests and trees. Calvin Taplay, for example, noted the valuable ecological services that trees provide in an urban context and Sandra Martin expressed concern about the loss of mature trees and the length of time it would take for trees to grow to replace them.

Trans Mountain committed to engage a qualified arborist to develop a Tree Plan specific to municipal lands within the City of Abbotsford, including a survey identifying the species and number of trees to be removed, and to plant new trees, either on the construction right-of-way or on other City-owned property. Trans Mountain said that it would extend the same or equivalent commitment to other municipalities.

Views of the Board

The evidence indicates that some mature trees and old growth forest would be lost as a result of the Project, and regrowth of trees back to similar size would take decades. The Board acknowledges the importance of Old Growth Management Areas given the cumulative effects on old growth forests in parts of B.C. The Board would therefore impose Condition 76 requiring Trans Mountain to file, prior to construction, an Old Growth Management Areas Mitigation and Replacement Plan with the aim of no-net-loss to old growth forests within Old Growth Management Areas overall. The Board agrees with participants about the importance of minimizing effects within Old Growth Management Areas, and so requires the mitigation hierarchy, in which avoidance and mitigation are favoured over offsets, to be followed.

The Board is satisfied with Trans Mountain's commitments related to forest health and urban trees.

Significance evaluation: adverse effects on forests

	Criteria	Rating	Description
Project effects	Temporal extent	Long-term	The right-of-way would be cleared of high vegetation for the lifetime of the Project, and replanted trees often take decades to mature.
	Reversibility	Reversible to permanent	Some replanted areas are expected to resemble pre-construction conditions within the lifetime of the Project, whereas other areas would take longer to mature (e.g., old growth) and the right-of-way would remain cleared of high vegetation for the lifetime of the Project.
	Geographic extent	Footprint to LSA	Direct effects would generally be limited to the Project footprint, whereas indirect edge effects would extend off the footprint, as could the exacerbation of forest pests.
	Magnitude	Moderate	Forests would be cleared and maintained as low height vegetation along the entire right-of-way.
Cumulative effects	Existing cumulative effects on old growth and mature forests in B.C. are already substantial in some areas. There has also been substantial forest health related damage in some areas, such as from mountain pine beetle. Despite such substantial cumulative effects, given Trans Mountain's mitigation and the Board's conditions for Old Growth Management Areas (which would, as a last resort under the mitigation hierarchy, require replacement or other offsets), and given Trans Mountain's mitigation measures related to forest health and urban trees, the Project's contribution to total cumulative effects is expected to be relatively minor.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.9 Wetlands

Trans Mountain said that 538 wetlands are potentially crossed by the proposed pipeline corridor, and that 23 are crossed by the proposed Kingsvale power line corridor. It said that not all of these wetlands would be disturbed because the pipeline right-of-way would be routed within the corridor to avoid wetlands to the extent practical, and power structures are typically placed outside of areas of water. Trans Mountain said that potential effects to wetlands include loss or alteration of hydrological function, biogeochemistry function, and habitat function.

A number of participants expressed concerns related to effects on wetlands. The City of Surrey said that bog ecosystems (such as at Surrey Bend Regional Park) develop very slowly and are highly sensitive to changing hydrological and nutrient regimes, and that disturbance could result in the eventual replacement of bog habitat with swamp or fen ecosystems. The Salmon River Enhancement Society said that bogs are typically very difficult to restore once damaged and that bogs are some of the more increasingly rare ecological communities in the southeastern portion of B.C.

10.2.9.1 Surveys and mitigation

Trans Mountain said that it reviewed aerial surveys and satellite imagery of the wetlands encountered by the Project, and that it has ground surveyed 413 of the 538 wetlands crossed (77 per cent) during the pre-construction field programs. It said that it aims to conduct ground surveys at all remaining wetlands encountered by the Project prior to construction unless unable to obtain landowner access permission.

Trans Mountain said that the proposed pipeline corridor has been routed to avoid wetlands and to follow existing linear infrastructure where feasible. It said that mitigation would include:

- hydrological function: standard pipeline construction and operational activities to avoid the diversion or natural flow impedance of water, reclamation to pre-construction profiles, and re- establishment of surface drainage patterns;
- biogeochemistry function: salvage of surface material in unsaturated wetlands, and erosion and sediment control measures where warranted; and

- habitat function: minimal disturbance construction techniques such as the use of matting or compacted snow or ice over vegetation, salvaging and replanting woody species in areas of particular sensitivity where warranted, and re-establishment of wetland substrate to allow natural recovery using the native seedbank.

Trans Mountain said that past studies and monitoring following past projects have shown the proposed mitigation measures, along with supplemental remedial measures where warranted and with the passage of time, have proven to be successful, and that wetland habitat function generally returns successfully within two to three years. It said that many of the wetlands crossed by the pipeline corridor are also either crossed by, or are adjacent to, the existing right-of-way, which speaks to wetland resiliency and recovery following temporary disturbance.

Trans Mountain said that tree re-growth in treed wetlands can take longer than 10 years, that tree growth would be restricted along the right-of-way for the duration of the Project's lifetime, that permanent disturbance may occur at facilities, and that wetlands of low functional condition are unlikely to recover to their type and class and may not recover as functional wetlands.

10.2.9.2 Post-construction monitoring

To measure the effectiveness of mitigation and reclamation measures, and the need for remedial measures, Trans Mountain said that ground-based surveys would be conducted at all wetlands disturbed during construction and that their condition would be compared to their pre-construction state and to wetlands located adjacent to the right-of-way. It said that wetland functions are being evaluated pre- construction based on the ground-survey field work, with each wetland assigned to one of four functional condition categories (high, high-moderate, low-moderate, or low) based on a weighted sum of individually evaluated functions. It said that the goal is to return all wetlands to the same functional condition category post-construction. Trans Mountain said that, if a wetland recovers to the same functional condition category but at a lower score, additional remedial measures may be recommended to ensure the wetland reaches its full recovery potential within the category.

ECCC said that the Federal Policy on Wetland Conservation goal of no-net-loss of wetland functions applies to all wetland functions, individually, and that Trans Mountain's approach of assigning each wetland a functional condition category based on a sum of individual function scores could allow for the loss of an individual function. Trans Mountain said that its assessment is intended to inform a wetland's overall functional condition, and that each functional condition category represents a range of scores to accommodate the seasonal and annual variation and dynamic nature of wetlands, and to allow for some subjectivity inherent in these types of assessments.

10.2.9.3 No-net-loss and compensation

ECCC said that the Federal Policy on Wetland Conservation's goal of no-net-loss of wetland functions applies:

i. on federal lands and waters,

ii. in areas affected by the implementation of federal programs where the continuing loss or degradation of wetlands has reached critical levels; and

iii. where federal activities affect wetlands designated as ecologically or socio-economically important to a region.

ECCC identified the areas for (ii) as including the lower mainland/Fraser valley region of B.C. and the 'White Area' (or settled areas) of Alberta, and for (iii) as including all eelgrass beds and red- and blue-listed wetland ecological communities in B.C. and environmentally significant areas in Alberta. It emphasized the mitigation hierarchy under which compensation should only be used as a last resort, and said that where wetland losses have been severe, no further loss of any remaining wetland area may be deemed essential, such as in the 'White Area' of Alberta.

The British Columbia Wildlife Federation recommended that Trans Mountain go beyond no-net-loss and adopt a net-gain strategy for all wetlands impacted by the pipeline expansion.

Trans Mountain said that no-net-loss of function applies to all wetlands disturbed by the Project. It said that, if at the end of the last year of monitoring (i.e., year five after construction), should any wetland not be on a trajectory to recovering its pre-construction functional condition, and additional remedial measures are not determined to be appropriate, then compensation would be considered following consultation with regulatory authorities. Trans Mountain provided a Preliminary Wetland Compensation Plan, and said that the type of compensation and approach to be taken would be determined through consultation with ECCC, and that Trans Mountain would ensure all of ECCC's requirements are met.

ECCC said that the no-net-loss goal in the Federal Policy on Wetland Conservation also applies to the temporary loss of wetland function, noting that such temporary loss can affect migratory birds and species at risk that are dependent on

wetland habitats for part or all of their lifecycle, potentially jeopardizing the survival and recovery of species. ECCC recommended that measures be implemented so that the temporary loss of wetland functions is reduced to the extent possible. In its comments on the Board's draft conditions, the Katzie First Nation said that both temporary and permanent wetland losses could impact traditional use of lands and resources, and so supported a requirement for offsets for both, as did the B.C. Wildlife Federation, which noted a temporary loss of wetlands could have long-term impacts on wildlife populations. Trans Mountain said that temporary alterations would be noted as wetlands recover over time, but that it is not reasonable to implement offsets for temporary losses because pipeline construction would cause temporary alteration of wetland function but wetlands are still anticipated to function overall with the implementation of appropriate mitigation measures.

10.2.9.4 Cumulative effects

Trans Mountain said that a broad range of existing land uses have already disturbed wetlands in the RSA (see Appendix 11 for a description of the spatial boundaries). Trans Mountain said that total cumulative effects are significant within the City of Edmonton and lower mainland developed area in B.C. where permanent loss or alteration of many wetlands has likely occurred. Trans Mountain assumed that regulatory standards (i.e., the goals in the Federal Policy on Wetland Conservation and the Alberta Wetland Policy to protect and restore wetlands) have been exceeded because long-term or permanent wetland loss and alteration has occurred.

Views of the Board

The Board is of the view that the effects of pipeline and power line construction on wetlands, and of the effectiveness of related mitigation and remediation, are generally well understood. Trans Mountain has provided a suite of mitigation, reclamation and monitoring measures for wetlands, and has avoided numerous wetlands via routing decisions. The Board would impose Conditions 41 and 156 requiring Trans Mountain to provide an update on such measures prior to construction in the Wetland Survey and Mitigation Plan, and an evaluation of reclamation success five years post-construction in the Wetland Reclamation Evaluation Report and Offset Plan.

Trans Mountain committed to no-net-loss of function at all wetlands. Trans Mountain proposed a method for determining the need for offsets based on an evaluation of overall wetland functionality by summing the scores of individual wetland functions. Environment and Climate Change Canada (ECCC), in contrast, said that no-net-loss in the Federal Policy on Wetland Conservation applies to each wetland function individually, and that using a sum of scores could result in the loss of individual function. The Board notes that areas to which the Federal Policy on Wetland Conservation applies include areas where wetland losses have already reached critical levels as well as wetlands designated as ecologically or socio-economically important to a region, highlighting the importance of maintaining each individual function in such areas. The Board finds ECCC's approach to be persuasive for areas to which the Federal Policy on Wetland Conservation applies, and so the wetlands conditions would require no-net-loss for each individual function in such areas, while allowing for reasonable natural variation.

Trans Mountain proposed determining whether wetland compensation is required after the last year of Post-Construction Environmental Monitoring, based on whether wetland function is on a trajectory to returning to its pre-construction functional category and on whether additional remedial measures are appropriate. ECCC, in contrast, said that no-net-loss in the Federal Policy on Wetland Conservation also applies to the temporary loss of wetland function and, together with other participants, noted the potential importance of such losses to migratory birds and species at risk. The Board is of the view that Trans Mountain's approach to no-net-loss could result in losses to wetland function of up to a decade or more, given the construction period, the five years of post-construction environmental monitoring, the potential for further remedial actions, the additional time for a wetland on a trajectory to achieving its pre-construction function to actually achieve it, and the potential additional time for offset sites to develop the desired compensatory functions. The Board finds ECCC's approach to be persuasive for areas to which the Federal Policy on Wetland Conservation applies, and so the wetlands conditions would require no-net-loss to include the temporary loss of wetland functions in such areas.

In summary, the Board's wetland conditions would require offsets to be implemented for any temporary or ongoing loss in any individual wetland function for wetlands in areas to which the Federal Policy on Wetland Conservation applies. In all other areas, the conditions would require offsets for any ongoing loss to overall wetland function still evident at the end of the five-year post-construction monitoring program. An evaluation of the potential for further actions on-site would also be required. Given these requirements to ensure no-net-loss for all wetlands, with stricter requirements where existing cumulative effects are already critical and where wetlands are designated as ecologically or socio economically important to the region, the Board is not persuaded to require a net gain strategy, as suggested by the British Columbia Wildlife Federation. Finally, the Board reiterates the importance of the mitigation hierarchy, in which avoidance and mitigation to avoid and reduce adverse effects are generally favoured over offsets, and this is reflected in the wetlands conditions.

Significance evaluation: adverse effects on wetlands

	Criteria	Rating	Description
Project effects	Temporal extent	Medium-term to long-term	Effects are expected to be mostly medium-term given reclamation measures, although some effects (such as at facilities, or due to vegetation maintenance along the right-of-way at treed wetlands) would remain for the lifetime of the Project.
	Reversibility	Reversible to permanent	Medium-term effects are reversible during the post-construction phase, but long-term effects might extend beyond the lifetime of the Project.
	Geographic extent	Footprint to LSA	Effects are expected to be mostly limited to the Project footprint, although changes in wetland functions (such as hydrology and biogeochemistry) could affect adjacent wetlands and nearby surface waters.
	Magnitude	Low to moderate	Disturbed wetlands would generally suffer some loss or alteration of function until successfully reclaimed, although some function would generally continue during that time.
Cumulative effects	Given the Board's conditions concerning mitigation and, as a last resort under the mitigation hierarchy, offsets to achieve no-net-loss of overall wetland function by the end of the Post-Construction Environmental Monitoring Program, the Project's contribution to total cumulative effects is expected to be relatively minor. In areas to which the Federal Policy on Wetland Conservation applies, which includes areas that have already reached critical levels of cumulative loss or degradation, given the additional measures required by the Board's conditions (which includes no-net-loss in such cases to also address temporary losses and losses to individual wetland functions), the Project's contribution to total cumulative effects is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.10 Weeds

Trans Mountain said that pipeline construction is expected to cause some weed introduction and spread, and that this may extend beyond the footprint and LSA to the RSA (see description of the spatial boundaries in Appendix 11). Trans Mountain said that non-native and invasive species introduced or spread by the Project can exert competitive pressure on, and alter, native vegetation, and can out compete crops and forage grasses.

A number of participants expressed concerns related to weeds. The Upper Nicola Band raised concerns about the introduction of non-native invasive weeds and the use of herbicides. Metro Vancouver and the City of New Westminster said that clearing of native vegetation, exposure of bare soils, and increased access can all raise the risk of invasive species spreading and establishing. It said that many invasive plants have low habitat value for endemic and native organisms, which may be displaced as a result, and that removal of invasive species can have adverse impacts such as potential accidental mortality to wildlife and their nests from mowing. The City of Chilliwack emphasized the need for a comprehensive weed management plan that clearly identifies how invasive plants would be managed throughout the lifetime of the Project, and that Trans Mountain should be required to demonstrate how it has developed the plan with input from local governments.

10.2.10.1 Surveys, mitigation, and monitoring

Trans Mountain said that it would conduct pre-construction weed surveys to document any problem vegetation infestations on and immediately adjacent to, the construction right-of-way and at each facility. It said that survey results would be used to inform the need for pre-construction treatments and for heightened mitigation during construction.

Trans Mountain provided a preliminary Weed and Vegetation Management Plan which describes prevention, monitoring, and remedial measures to control non-native weed species, and post treatment inspections and evaluation. Trans Mountain said that the objective is to manage provincially- and regionally-designated weed species to a level, by density and distribution, equivalent to, or less than, levels on adjacent lands with equivalent or similar land use and land management.

Trans Mountain said that it would manage problem vegetation using an integrated vegetation management approach that combines non-chemical (mechanical/manual), cultural (seeding), and chemical (herbicide) treatment options tailored to the plant species and conditions at the site. It said that it would adhere to all provincial regulations related to designated

noxious and invasive plants, and to all applicable regional and municipal by-laws pertaining to the use of pesticides, such as pesticide-free zones and buffers at water bodies.

Trans Mountain said that it consults with all landowners or Crown land managers regarding the control of problem vegetation on their land, and that it only uses pest control methods they approve. It said that it would contact each municipality and/or regional invasive plant council to determine additional species of concern and any specific mitigation recommended for the applicable areas. Trans Mountain said that its proposed mitigation measures are effective industry standard measures and that past experience has shown that mitigation resulted in limited weed issues, although it may take up to 10 years to reverse residual effects in certain circumstances.

10.2.10.2 Cumulative effects

Trans Mountain said that existing cumulative effects range from "not significant" to "significant," given that weeds typically establish in previously disturbed areas and that existing disturbance within the RSA is comparatively high in settled areas of western Alberta, in the City of Edmonton, and in the lower mainland development area of B.C.

Views of the Board

Project construction and ongoing operations and maintenance activities have the potential to introduce and spread invasive plants off the right-of-way and it could take years to bring them under control. There was agreement between Trans Mountain and intervenors about the importance of controlling invasive plants that could result from the Project. The Board is satisfied that Trans Mountain has proposed a suite of mitigation measures to control such introduction and spread, and that such measures have proved to be effective in the past.

The Board would impose Condition 45 requiring Trans Mountain to file, prior to construction, an updated Weed and Vegetation Management Plan including a summary of weed survey results, mitigation and monitoring that would be undertaken during and after construction and throughout the operational life of the Project, and consideration of the potential adverse effects of treatment measures. In addition, the Board would impose Condition 47 requiring Trans Mountain to address, in the Access Management Plan, the potential for adverse effects on vegetation due to increased access along the right-of-way.

Significance evaluation: adverse effects of weeds

	Criteria	Rating	Description
Project effects	Temporal extent	Short-term to medium-term	Where weeds are introduced or spread despite prevention measures, it may take less than a year or up to 10 years to reverse residual effects.
	Reversibility	Reversible	Control measures are expected to reverse any introduction or spread of weeds within the lifecycle of the Project.
	Geographic extent	Footprint to Regional Study Area	Weeds that are introduced or spread have the potential to spread off the right-of-way.
	Magnitude	Low to moderate	With prevention, monitoring and remedial measures, the introduction and spread of weeds is expected to be kept under control, limiting the magnitude of adverse effects.
Cumulative effects	The presence of weeds and resulting adverse effects is already substantial in some areas with high existing disturbance. Despite such substantial existing cumulative effects, given Trans Mountain's prevention, monitoring and remedial measures, and the Board's conditions, the introduction and spread of weeds is expected to be reduced to relatively minor levels.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.11 Terrestrial wildlife and wildlife habitat

Trans Mountain said that the following are potential Project effects on wildlife, including migratory birds, and their habitat:

- change in habitat from vegetation clearing and sensory disturbance;

- change in movement from reduced habitat connectivity and creation of barriers or filters to movement; and
- increased mortality risk resulting from collisions with vehicles or equipment, loss or disruption of habitat features, or sensory disturbance.

Trans Mountain said that the Project rights-of-way would be periodically maintained to early seral stage forest habitat (herb and shrub stages). Trans Mountain said that wildlife mortality risk could result from maintenance of early seral vegetation on linear corridors that would lead to increased predator efficiency and improved access for trapping, hunting, and poaching of wildlife.

Various participants raised concerns about Project effects on wildlife, including terrestrial migratory birds and their habitat. For example, the City of New Westminster raised concerns about adverse effects of construction noise on wildlife. It said that the impacts would depend on which species are in the area and what life history stage they are in when encountering the disturbance. Trans Mountain committed to mitigation, such as avoiding construction during sensitive timing windows for wildlife, to the extent feasible.

ECCC said that the Project would adversely affect migratory birds through the removal and fragmentation of existing habitat, through sensory disturbance, and through increased human and predator access. It recommended that Trans Mountain apply timing windows and buffers to reduce effects on migratory birds and that Trans Mountain take additional measures to avoid and minimize impacts on habitats for all migratory birds where biodiversity hotspots are identified from survey work.

ECCC said that the Project crosses a number of priority habitat areas for migratory birds and species at risk, including wetlands, riparian areas, grasslands, protected areas, parks and Important Bird Areas. ECCC recommended that Trans Mountain:

- identify biodiversity hotspots and consider additional mitigation measures for those areas;
- avoid impacts during key sensitive periods of use by migratory birds and minimize the frequency of Project maintenance clearing/vegetation management to the extent feasible;
- complete pre- and post-construction surveys within priority habitat areas for migratory birds in order to:
    - establish a robust baseline to predict potential Project impacts in priority habitat areas; and
    - verify the accuracy of the predicted effects, manage potential cumulative effects, and apply the results in support of a monitoring and mitigation strategy;
- undertake habitat restoration and enhancement and consider conservation offsets for impacts on migratory bird habitat in priority habitat areas, such as Important Bird Areas; and
- complete specific surveys for swifts and swallows prior to clearing activity in areas of high suitability habitat for these species.

Trans Mountain said that it would review areas with high suitability for swifts and swallows to identify active colonies that may be affected by construction activities to ensure the appropriate mitigation is implemented. Trans Mountain said that it continues to review the results of field surveys and other migratory bird data sources and would consider this information in Project routing and mitigation planning. Trans Mountain said that this information would be detailed in updated Environmental Protection Plans and Environmental Alignment sheets. Trans Mountain committed to implementing ECCC's recommendations related to avoidance of habitat and/or sensitive periods of use by migratory birds through micro-routing, timing windows, and protective buffers. Trans Mountain said that it would incorporate select surveys for migratory birds and bird habitat features into the post-construction environmental monitoring program. Trans Mountain said that the results of post-construction migratory bird surveys would inform the need for, location of, and type of adaptive management measures to facilitate the success of mitigation and reclamation measures.

Trans Mountain said that it would not propose conservation offsets to address the Project's residual or cumulative effect on migratory birds since the Project's predicted residual effects would range from low to medium magnitude, they are reversible in the long term, and the Project's contribution to cumulative effects would range from negligible to medium magnitude. Trans Mountain did, however, propose to restore the construction right-of-way to natural vegetation communities in grassland areas, along with monitoring of the reclaimed grassland areas during the post-construction monitoring program. It said that it would discuss the installation of nesting and roosting structures in that priority habitat areas with ECCC and the British Columbia Ministry of Forests, Lands, and Natural Resource Operations. Trans Mountain also provided a Preliminary Wetland Compensation Plan, as discussed in Section 10.2.9.

The Upper Nicola Indian Band raised concerns about avian collisions with power lines at the proposed Kingsvale pump station. Trans Mountain said that it would develop an Avian Protection Plan using information and best practices outlined by the Avian Power Line Interaction Committee (2006, 2012).

Trans Mountain proposed standard mitigation for Project effects on wildlife and wildlife habitat. It said that it would outline detailed mitigation in environmental protection plans.

10.2.11.1 Cumulative effects

Trans Mountain said that the Project was likely to interact with existing and reasonably foreseeable disturbances to contribute to cumulative effects on wildlife. A discussion, including Board views, on Project contribution to cumulative effects on grizzly bear, caribou, and other terrestrial wildlife species at risk, is found later in this section.

10.2.11.2 Monitoring and follow-up

Trans Mountain committed to a post-construction environmental monitoring program over a five year period to determine the effectiveness of mitigation, and identify the need for further monitoring and adaptive measures. Trans Mountain said that it would use pre-construction baseline data in monitoring wildlife and wildlife habitat as a basis to compare construction and post-construction monitoring data.

Trans Mountain said that follow-up programs, which could extend beyond five years, would be developed for select wildlife indicator species. It said that, upon completion of the post-construction environmental monitoring program, monitoring by Trans Mountain personnel would occur regularly throughout the life of the Project to assess any issues raised by stakeholders including regulatory authorities, and that it would implement warranted mitigation measures in a timely basis.

Views of the Board

The Board acknowledges that the Project has the potential to adversely affect wildlife and wildlife ng migratory birds and their habitat. The Board finds that Trans Mountain's proposed mitigation is reasonable and would address the majority of the potential impacts on wildlife and wildlife habitat, including migratory birds and their habitat.

Environment and Climate Change Canada (ECCC) recommended that Trans Mountain be required to consider conservation offsets for impacts on migratory bird habitat in priority habitat areas. ECCC defined priority habitats as riparian areas, wetlands, grasslands, protected areas, parks and Important Bird Areas. The Board would impose conditions requiring Trans Mountain to file a Wetland Survey and Mitigation Plan and a Wetland Reclamation Evaluation and Offset Plan (Conditions 41 and 156). Trans Mountain would be required to mitigate effects on wetlands and to implement offsets for any temporary or permanent loss in any individual wetland function for wetlands in areas to which the Federal Policy on Wetland Conservation applies (see Section 10.2.9).

In addition, the Board would impose conditions requiring Trans Mountain to file a Riparian Habitat Management Plan, Grasslands Survey and Mitigation Plan, Riparian Habitat Reclamation Evaluation Report and Offset Plan, and Grasslands Reclamation Evaluation Report and Offset Plan (Conditions 71, 42, 154 and 157). (See Sections 10.2.5 and 10.2.7 subsection on Grasslands for more details on these topics.) These conditions would require Trans Mountain to implement and monitor appropriate mitigation, restoration, and offset measures for riparian, wetland, and grassland habitats that could be used by migratory birds, and other wildlife. The conditions would also require corrective actions, if needed, based on monitoring results. The Board is of the view that these plans would mitigate and offset effects on migratory birds, through their habitat, and is not persuaded that a separate condition is required for conservation offsets specific to migratory birds.

ECCC also recommended that Trans Mountain be required to file a plan that would include a summary of surveys conducted for swifts and swallows, identification of biodiversity hotspot locations and a description of additional measures, other than those committed to in the Environmental Protection Plans, to avoid and minimize impacts on habitats in biodiversity hotspots for all migratory birds.

Trans Mountain has committed to review areas with high suitability for swifts and swallows, and to ensure that appropriate mitigation is applied. Trans Mountain has also committed to consider the results of field surveys and other migratory bird data sources in Project routing and mitigation planning. Given that the Board would impose conditions requiring Trans Mountain to file updated environmental protection plans for facilities, pipeline and Westridge Marine Terminal, including updated management plans, that could include an Avian Protection Plan (Conditions 78, 72 and 81), and to file post-construction environmental monitoring reports (Condition 151), the Board is not persuaded that a separate condition for swifts and swallows, priority habitat locations and additional mitigation measures is warranted.

In general, the Board finds that, taking into account mitigation proposed by Trans Mountain and the conditions the Board would impose, the Project is not likely to cause significant adverse environmental effects on wildlife and wildlife habitat. Significance evaluations for each of caribou, grizzly bear, species at risk, and marine birds are provided in Sections 10.2.11 and 10.2.16.

10.2.11.3 Woodland caribou

The southern mountain population of woodland caribou is listed as Threatened under Schedule 1 of the *Species at Risk Act*. The proposed Project would cross each of the Wells Gray and Groundhog subpopulations and the Mount Robson local population of southern mountain caribou (map provided in Figure 20). The proposed Hinton to Hargreaves pipeline reactivation segment would cross the South Jasper caribou range. Trans Mountain said that the Groundhog herd is small and extremely isolated from other southern mountain caribou populations and has a high probability of extinction within 30 years.

Participants, including B.C. Nature and Nature Canada and ECCC, raised concerns about Project effects on southern mountain caribou and its critical habitat. ECCC said that there is high potential that some portion of southern mountain caribou critical habitat would be destroyed by the Project, and surveys of biophysical attributes[95] of critical habitat would need to be completed in the area of overlap between critical habitat and the Project footprint, once the footprint is delineated. ECCC said that destruction of biophysical attributes within critical habitat constitutes critical habitat destruction, regardless of its proximity to other disturbances.

ECCC recommended that destruction of the biophysical attributes of critical habitat as described in the Southern Mountain Caribou Recovery Strategy, be avoided. ECCC stated that avoidance of critical habitat is the only known means to ensure critical habitat will not be destroyed, since a number of mitigation measures and approaches proposed by Trans Mountain have risks and uncertainties associated with them. ECCC said that reclamation of southern mountain caribou habitat is not only uncertain, but the time scale required for habitat restoration is longer term and may not meet the immediate recovery needs of the impacted southern mountain caribou herds.

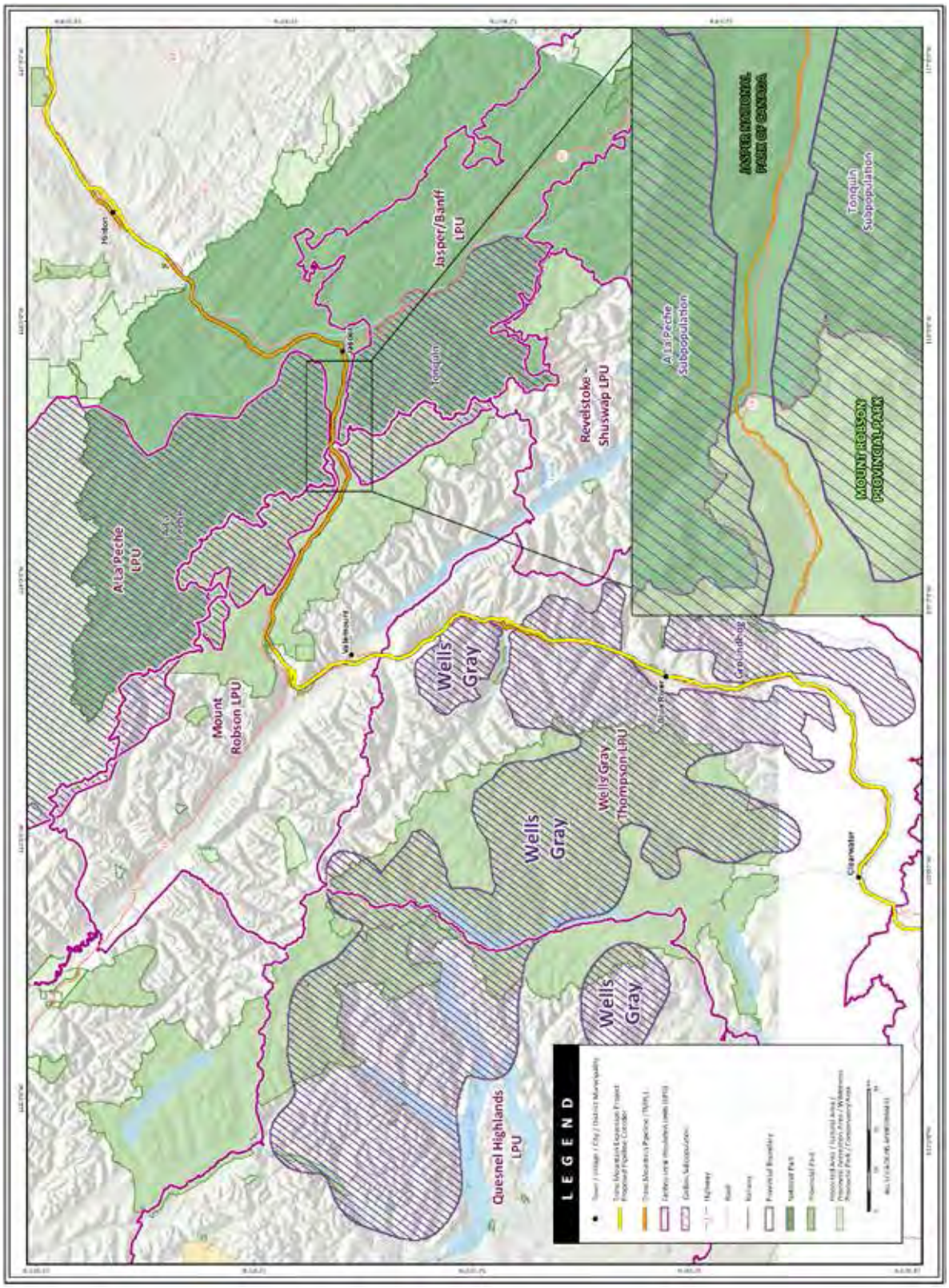
ECCC asked Trans Mountain for an assessment of alternative approaches that would reduce impact of the project on southern mountain caribou. Trans Mountain said that pipeline corridor and site selection was one of the primary mechanisms to avoid or reduce Project effects on wildlife, and it would use existing access to facilitate Project construction in caribou range to avoid additional disturbance. Trans Mountain said that the revised corridor proposed in the Froth Creek to Finn Creek area is approximately 4.9 km shorter in the Groundhog caribou range than the previously proposed corridor. Trans Mountain said that the pipeline corridor is proposed adjacent to existing linear disturbance for approximately 71.7 per cent of its length through Wells Gray caribou range, and would parallel the existing Trans Mountain pipeline right-of-way for the entire length in the Groundhog caribou range. Trans Mountain said that alternate routes to fully avoid the Groundhog caribou range would result in creation of a new linear corridor in close proximity to the North Thompson River. Trans Mountain noted that since the Project parallels existing disturbances within the Wells Gray and Groundhog caribou ranges, incremental disturbance within the Wells Gray and Groundhog caribou ranges as a result of the Project is minimal (i.e., less than 0.01 per cent change from existing conditions).

Trans Mountain committed to avoiding critical habitat for species designated as Endangered or Threatened under the SARA to the extent feasible. It further committed to consult with ECCC where avoidance cannot be accomplished, to develop mitigation measures that would ensure that the residual effect is within regulatory tolerance. Trans Mountain said that the location and extent of critical habitat for southern mountain caribou is under review and being updated by ECCC. Trans Mountain said that it would complete additional field work to review the location of critical habitat, including biophysical attributes, and this information would be used to inform route refinement and mitigation measures.

Trans Mountain said that it would consider extending the length of trenchless crossings within caribou ranges to leave a vegetated screen for line-of-sight and to reduce access by both humans and predators along the pipeline right-of-way following construction. Trans Mountain said that the project effects on ungulate winter range is minimized by paralleling the proposed pipeline corridor with the existing Trans Mountain Pipeline right-of-way, thereby reducing the amount of new cut and minimizing fragmentation. Trans Mountain said that re-routing the right-of-way around the ungulate winter range would result in a new linear corridor that is not contiguous with existing disturbance, and additional clearing of forested land.

[95] Habitat characteristics required to carry out life processes

Figure 20: Caribou ranges crossed by the Project



ECCC said that if avoidance of critical habitat is not possible, then a detailed mitigation and monitoring plan should be developed that would aim to support the survival and recovery of southern mountain caribou in the context of the recovery strategy. ECCC recommended that the mitigation and monitoring plan be developed in consultation with provincial and other qualified species experts.

ECCC said that Trans Mountain should demonstrate that all technically and economically feasible measures have been taken to first, avoid, and then minimize adverse impacts on critical habitat, such as conducting activities on the right-of-way that leaves critical habitat intact to the full extent possible. ECCC recommended that the mitigation and monitoring plan provide for monitoring of mitigation effectiveness and incorporate adaptive management where monitoring demonstrates inadequacies and concerns in the mitigation measures employed.

In addition to general mitigation measures, Trans Mountain committed to file a mitigation plan for southern mountain caribou that would be prepared in consultation with the appropriate regulatory authorities.

ECCC said that the Project would result in conditions that would favour other prey species and a consequent increase in predator density in critical habitat, if not effectively mitigated. It said that the primary threat for most southern mountain caribou populations is unnaturally high predation rates as a result of human-caused and natural habitat loss, degradation and fragmentation. Trans Mountain noted that the cumulative effects of habitat alteration and resultant increased predation have led to declining numbers of southern mountain caribou. It said that the Project would interact with existing and reasonably foreseeable disturbance to increase the area of early seral habitat in the Wells Gray and Groundhog caribou ranges. Trans Mountain said that since the Project parallels existing disturbances within the Wells Gray and Groundhog caribou ranges, the Project ' s contribution to cumulative fragmentation would be reduced and creation of new access in caribou range would be avoided.

Trans Mountain committed to prepare and file a Traffic and Access Control Management Plan to mitigate environmental effects associated with increased access and subsequent increased concentration of hunting and increased predation of wildlife. Trans Mountain said that, along segments of the construction right-of- way where mitigation measures are implemented to control human access (in particular, motorized access), the effectiveness of access control would be determined by visually assessing evidence of human access (e.g., disturbance to vegetation establishment and cover, soil erosion, and disturbance of access control measures). The results would then be used to identify areas that require additional measures to prevent access along the right-of-way.

Views of the Board

Key issues raised with respect to effects on the southern mountain population of woodland caribou are the potential for loss of critical habitat and potential for increased mortality risk.

In reaching its views regarding the significance of adverse environmental effects on the southern mountain population of woodland caribou, the Board considered Project effects, including effects on critical habitat as identified in the Southern Mountain Caribou Recovery Strategy and in evidence provided by Environment and Climate Change Canada (ECCC). The Board also considered whether Trans Mountain's proposed mitigation for southern mountain caribou is consistent with the Southern Mountain Caribou Recovery Strategy.

The Board agrees with ECCC's preference that destruction of critical habitat be avoided. The Board expects Trans Mountain to demonstrate that it has avoided critical habitat for southern mountain caribou, including biophysical attributes of critical habitat, to the fullest extent possible. Nevertheless, the Board realizes that habitat avoidance is not possible in all instances, or it is possible, but with resulting impact elsewhere.

The Board acknowledges that Trans Mountain has proposed to avoid some habitat for southern mountain caribou through corridor alignment, and where habitat avoidance was not possible, Trans Mountain proposed to align the corridor adjacent to existing disturbances to reduce Project effects on southern mountain caribou and its habitat. The Board finds that paralleling the existing right-of-way will avoid or reduce new cut and fragmentation. Trans Mountain has committed to conduct additional field work to locate particular biophysical attributes of critical habitat in order to inform route placement. The Board considers Trans Mountain's attempts to reduce effects on southern mountain caribou habitat, through direct avoidance and by routing adjacent to existing disturbances, to be reasonable.

To confirm that Trans Mountain reports on the extent of caribou habitat that may be affected, directly and indirectly, by the proposed pipeline route, the Board would impose Condition 36 requiring Trans Mountain to file a Pre-Construction Caribou Habitat Assessment for each caribou range potentially affected by the Project that would describe the type of habitat characterized by biophysical attributes of critical habitat, as defined in the Southern Mountain Caribou Recovery Strategy.

The Board is of the view that after attempts are made to avoid critical habitat through route placement, mitigation and restoration of caribou habitat are necessary to reduce Project effects on critical habitat. To confirm there is no-net-

loss of caribou habitat, the Board would impose Condition 37 requiring Trans Mountain to file a Caribou Habitat Restoration Plan. The objective of the Plan is to restore as much habitat as possible and assist in identifying and quantifying the extent of any unavoidable and residual habitat loss that remain. The Board would also require an Offset Measures Plan for Residual Effects on Caribou Habitat (Condition 128) for each caribou range potentially affected by the Project to offset for such unavoidable and residual effects. Trans Mountain would be required to take into account temporal loss of habitat and the literature on conservation offsets for caribou in the development of the Offset Measures Plan. The Board is of the view that offsets are a last resort and should only be applied after habitat avoidance, mitigation and habitat restoration are implemented. The Board would also require Trans Mountain to provide details in the Caribou Habitat Restoration Plan of how proposed mitigation and restoration measures for these species are consistent with the Recovery Strategy for the Woodland Caribou, Southern Mountain Population in Canada (2014).

The Board acknowledges ECCC's view that reclamation of southern mountain caribou habitat is uncertain. Given this uncertainty, the Board recognize the need for monitoring and verifying the effectiveness of caribou habitat restoration and offset measures, and the need for corrective measures should monitoring determine that reclamation and offset measures are not effective. The Board would therefore impose Condition 149 requiring Trans Mountain to file a Caribou Habitat Restoration and Offset Measures Monitoring Program to monitor and verify effectiveness of caribou habitat restoration and offset measures, and to identify protocols for how those measures would be adapted, as required, based on monitoring results. The Board would further impose Condition 150 requiring Trans Mountain to report monitoring results in Caribou Habitat Restoration and Offset Measures Monitoring Reports.

The Board finds that with mitigation, including human and predator access control, the potential for the Project to measurably affect predator-prey dynamics and, therefore, mortality risk for caribou, as a result of incidental predation, is low. To verify that Trans Mountain designs an effective access management plan that would control and monitor human and predator access into new disturbance areas in affected caribou ranges, the Board would impose Condition 47 requiring Trans Mountain to file an Access Management Plan that would include monitoring for effectiveness of access control measures and adaptive management measures, if needed, based on monitoring results.

Significance evaluation: adverse effects on Woodland caribou

	Criteria	Rating	Description
Project effects	Temporal Extent	Short-term to long-term	Effects on habitat along the new right-of-way are expected to be long-term, as the right-of-way is maintained in a semi-cleared state. Effects on right-of-way contiguous to existing right-of-way are not expected to be temporally additive. All effects are long-term within the ranges but are expected to be offset within the medium-term. Effects on mortality risk are expected to be short-term as access measures are implemented.
	Reversibility	Reversible	Effects on habitat and mortality risk during the Project life are expected to be reversible, since offsets would be applied to mitigate effects of maintaining the right-of-way in a semi-cleared state through Project operations. There is likely a lag time between project effects and when offsets are implemented and become effective. Effects on increased mortality risk are expected to be reversible as access control measures are implemented during the life of the Project.
	Geographic Extent	Local Study Area to Regional Study Area	Direct project effects on caribou habitat are expected to be limited to the Local Study Area; however, potential for increased mortality risk from the Project is expected to contribute to effects at the Regional Study Area level.
	Magnitude	Moderate	Effects are expected to be moderate given that the right-of-way would be maintained in early seral vegetation state for the life of the Project.
Cumulative effects	Existing cumulative effects on Woodland caribou are already substantial. The reason that Woodland caribou are at risk is because existing cumulative effects have already exceeded a sustainability threshold for the species. Taking into account Trans Mountain's mitigation measures, and the conditions the Board would impose to confirm there is no-net-loss of caribou habitat, the Project's contribution to total cumulative effects on Woodland caribou is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.11.4 Grizzly bear

The proposed Project would intersect two Bear Management Areas (Grande Cache and Yellowhead) in Alberta, three viable Grizzly Bear Population Units in B.C. (Columbia-Shuswap, Wells Gray, and Robson), and the threatened North Cascades Grizzly Bear Population Unit in B.C. (map provided in Figure 21). Trans Mountain said that the proposed pipeline reactivation segment from Hinton to Hargreaves would cross grizzly bear secondary habitat and grizzly bear core habitat, although it does not expect the reactivation segments to have a measureable effect on wildlife and wildlife habitat.

Grizzly bears are blue-listed in B.C., designated as "At Risk" in Alberta, and listed as Threatened under the *Alberta Wildlife Act* and *Wildlife Regulation*. The western population of grizzly bear is federally listed as a species of Special Concern according to the Committee on the Status of Endangered Wildlife in Canada. Trans Mountain said that the North Cascades grizzly bear population is at risk of extirpation. It said that hunting is allowed for the Columbia Shuswap, Wells Gray, and Robson population units in B.C., while it is not allowed for the North Cascades population unit in B.C., or the Grande Cache and Yellowhead Grizzly Bear Management Units in Alberta.

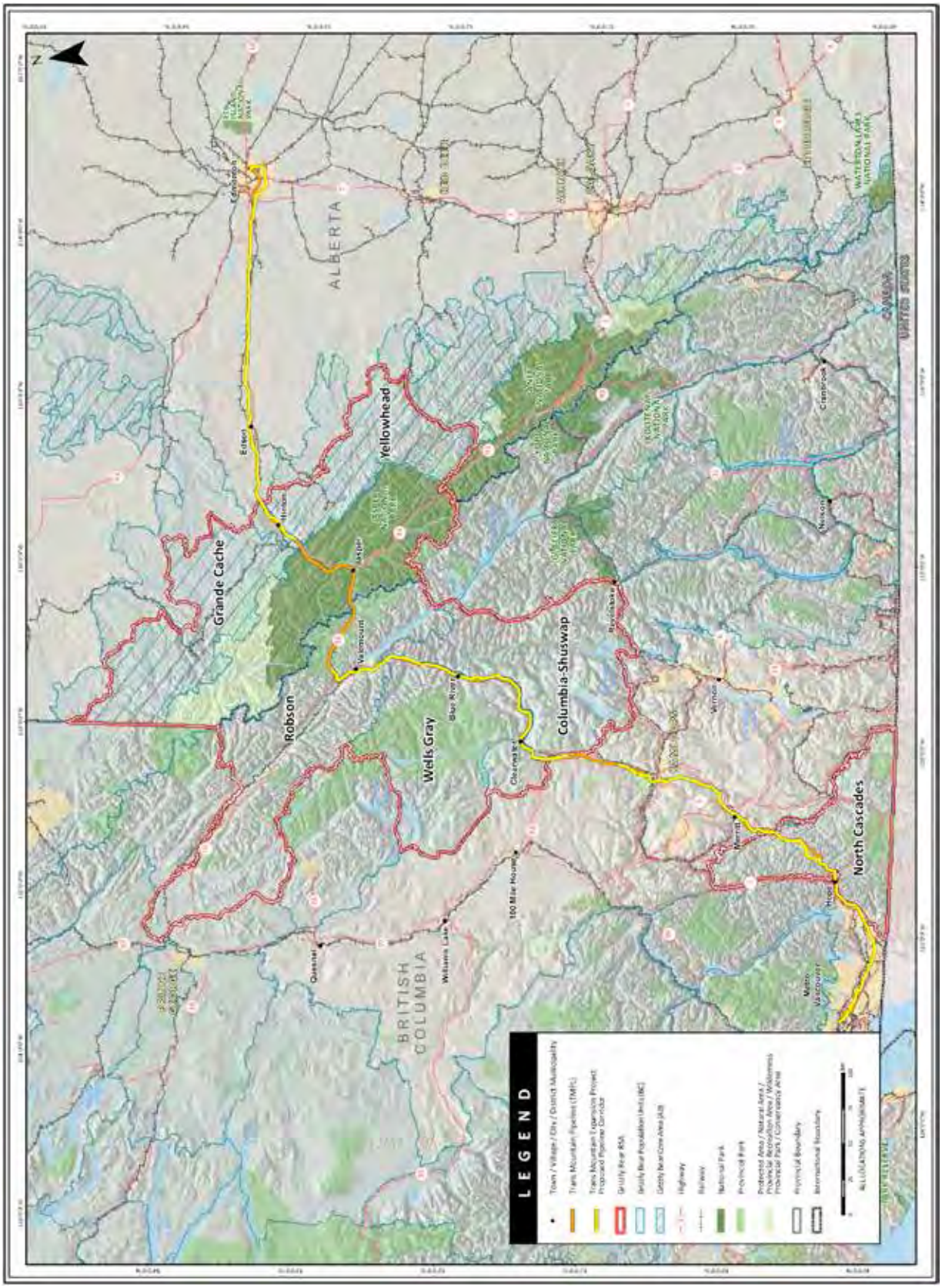
Trans Mountain attempted to reduce Project effects in the grizzly bear population units through avoidance and by aligning the proposed Project with existing disturbance to the extent feasible. It said that routing to avoid the North Cascades Grizzly Bear Population Unit would require new cut across mountainous terrain in areas with limited access and would cross through the Threatened Stein-Nahatlatch Grizzly Bear Population Unit, which would otherwise not be affected by the Project. Trans Mountain said that the entire length of the proposed pipeline corridor within the North Cascades Grizzly Bear Population Unit is located within an existing transportation corridor that is largely restricted to the Coquihalla River Valley, and is parallel to existing Trans Mountain Pipeline (TMPL) right-of-way for 82 per cent of its length.

Intervenors, including Canadian Parks and Wilderness Society – B.C. Chapter and Lower Nicola Indian Band, asked about Project effects on grizzly bear and their habitat, including effectiveness of grizzly bear habitat after commencement of construction and cumulative effects of mortality risk. In response to issues raised by the Lower Nicola Indian Band regarding effectiveness of grizzly bear habitat, Trans Mountain said that, despite the potential increase in available forage that can be expected from vegetation clearing for Project construction and operations, effective habitat for grizzly bear is predicted to decrease within the Local Study Area (LSA) due to increased mortality associated with cleared areas where human access is possible. Trans Mountain said that it would implement access management mitigation measures to reduce access along the right-of-way following construction, and attraction of wildlife to the right-of-way during operations would be reduced by avoiding attractive forage species in seed mixes used for reclamation.

Trans Mountain said that cumulative effects of human development are identified as the greatest threat to grizzly bear. Trans Mountain said that the Alberta Grizzly Bear Recovery Plan identified objectives that would limit the rate of human caused mortality per Bear Management Areas by maintaining open road densities at or below 0.6 km/km^2 for Grizzly Bear Priority Areas and at or below 1.2 km/km^2 in all remaining grizzly bear range. Trans Mountain said that hunting is a major factor for grizzly bear mortalities in B.C. and that, in addition to hunting pressure, human access increases the risk of human-bear conflicts that can result in bears being relocated or destroyed.

Trans Mountain said that the existing average motorized access density in the Columbia-Shuswap, Wells Gray, Robson and North Cascades Grizzly Bear Population Units currently exceeds the threshold of 0.6 km/km^2, suggesting a high risk of grizzly bear mortality and displacement under current conditions. It said that the predicted contribution of the Project and reasonably foreseeable developments to motorized access density would not cause the average density to exceed 0.6 km/km^2 at the regional scale for the Grande Cache and Yellowhead Grizzly Bear Population Units that are below this threshold under current conditions. It also said that the average motorized access density at the grizzly bear population unit scale would not change substantially as a result of the Project. Trans Mountain said, however, that the proposed pipeline corridor and reasonably foreseeable disturbances are predicted to have a localized effect on the motorized access density within each grizzly bear population unit intersected by the Project, which would cause localized increases from baseline conditions below 0.6 km/km^2 to levels that exceed the threshold.

Figure 21: Grizzly bear Regional Study Area



Trans Mountain said that mitigation proposed is expected to adequately address the Project's contribution to cumulative effects on mortality risk, with one exception. Trans Mountain said that the Project would contribute to grizzly bear mortality risk in the Northern Cascades Grizzly Bear Population Unit, causing an incremental effect on mortality risk for a threatened population.

In response to Adams Lake Indian Band's concerns related to cumulative effects on grizzly bear mortality risk, Trans Mountain committed to develop and implement a mitigation strategy for the North Cascades, Grande Cache, and Yellowhead Grizzly Bear Population Units. Trans Mountain said that the grizzly bear mitigation strategy would include objectives consistent with current regulatory guidelines and would be developed in consultation with the appropriate regulatory authorities.

In addition to standard mitigation, Trans Mountain proposed to coordinate access and new clearing requirements with other industrial users in the area to minimize human activity in grizzly bear habitat and to control access where access cannot be avoided. Trans Mountain said that it expects the implementation of the Wildlife Conflict Management Plan as part of the environmental protection plans would prevent any direct bear mortalities associated with Project construction and operations.

Trans Mountain committed to prepare and file a Traffic and Access Control Management Plan to mitigate environmental effects associated with increased access and subsequent increased concentration of hunting at previously inaccessible locations. It said, where mitigation measures are implemented to control human access (in particular, motorized access), it would determine the effectiveness of access control by visually assessing evidence of human access (e.g., disturbance to vegetation establishment and cover, soil erosion, and disturbance of access control measures). The results would be used to identify areas that require additional measures to prevent access along the right-of-way. Trans Mountain said that it would monitor the success of access control measures implemented along segments of the construction right-of-way as part of the post-construction environment monitoring program.

Views of the Board

Key issues raised by participants relate to Project effects on grizzly bear habitat, and the Project's contribution to increased cumulative mortality risk.

The Board recognizes that, while habitat avoidance is preferred, habitat avoidance is not possible in all instances, and may involve trade-offs with other important habitat types. The Board acknowledges Trans Mountain's efforts to route the Project adjacent to existing disturbance in each of the potentially affected grizzly bear population units. The Board notes that Trans Mountain's proposed pipeline corridor does not avoid the North Cascades Grizzly Bear Population Unit due to potential effects on another threatened grizzly bear population unit. Nevertheless, the Board accepts Trans Mountain's intent to route adjacent to existing disturbance for most of the pipeline corridor length in the North Cascades Grizzly Bear Population Unit.

The Board recognizes that, although vegetation clearing would result in some forage opportunities for grizzly bear along the right-of-way, the benefit of increased forage habitat would be tempered by an increase in mortality risk due to potential human access along the cleared areas.

The Board acknowledges Trans Mountain's proposed mitigation strategy for the North Cascades, Yellowhead and Grande Cache Grizzly Bear Population Units. In order to confirm that direct and indirect effects of Project activities on grizzly bear populations with an elevated conservation status are mitigated in a measurable way and reported on, the Board would impose Condition 56 requiring Trans Mountain to file Grizzly Bear Mitigation Plans for each vulnerable grizzly bear population unit / grizzly bear management area. As part of these plans, Trans Mountain would be required to monitor the effectiveness of mitigation measures, apply corrective measures as needed, and report on monitoring results in post-construction monitoring reports. Trans Mountain would also need to justify if a mitigation plan is not provided for a vulnerable grizzly bear population unit or a particular grizzly bear management area.

The Board is of the view that access restriction measures at the cleared Project right-of-way would assist in reducing Project-related grizzly bear mortality risk. To verify that Trans Mountain designs an effective access management plan that would control and monitor access into new disturbance areas in grizzly bear local population units and management areas, the Board would impose Condition 47 requiring Trans Mountain to file an Access Management Plan that would include monitoring for effectiveness of access control measures and adaptive management measures, if needed, based on monitoring results.

Significance Evaluation: adverse effects on grizzly bear

	Criteria	Rating	Description
Project effects	Temporal Extent	Long-term	Effects on habitat loss from vegetation clearing and operational maintenance to an early seral vegetation stage would be expected to persist through the life of the Project. Effects on mortality risk are expected to be long-term, as some access could be possible, even with implementation of access control measures.
	Reversibility	Reversible	Effects on each of grizzly bear habitat and mortality risk are expected to be reversible since vegetation would be allowed to regrow to an extent after construction, and because human access on the right-of-way would be limited after the Project is decommissioned or abandoned.
	Geographic Extent	Local Study Area to Regional Study Area	Effects of Project construction on grizzly bear habitat are limited to the wildlife Local Study Area. However, potential for increased mortality risk from Project construction and operations would contribute to cumulative effects in the Regional Study Area.
	Magnitude	Low to moderate	Early seral vegetation would be maintained along the pipeline right-of-way and could provide foraging habitat, though habitat effectiveness would be lessened by increased mortality risk from human access along the right-of-way. Though human access to the new right-of-way would be limited by access control measures, an increase in mortality risk from some amount of human access along the right-of-way could occur.
Cumulative effects	Existing cumulative effects on mortality risk is considered substantial for each of the Columbia-Shuswap, Wells Gray, Robson and North Cascades Grizzly bear population units due to existing regional exceedances of the generally accepted linear disturbance threshold in these population units. Existing cumulative effects on mortality risk for the Grande Cache and Yellowhead Grizzly bear management areas are not considered substantial as the threshold would not be exceeded at the regional level for these population units, though it is noted that hunting is closed for those two bear management areas. Taking into account the implementation of Trans Mountain's mitigation measures, and the conditions the Board would impose, the Project's contribution to the total cumulative effects on grizzly bear is expected to be inconsequential for each of the Columbia-Shuswap, Wells Gray, Robson and North Cascades Grizzly bear population units. Taking into account the implementation of Trans Mountain's mitigation measures, and the conditions the Board would impose, the Project's contribution to the total cumulative effects on grizzly bear is expected to be relatively minor for the Grande Cache and Yellowhead Grizzly bear population units.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.11.5 Other terrestrial wildlife species at risk

Trans Mountain said that the Project has the potential to affect various SARA-listed terrestrial wildlife species, as outlined in Appendix 13. Trans Mountain said that the Project could affect species at risk through habitat loss, change in movement, and increase in mortality risk. Trans Mountain and ECCC said that the Project has the potential to cross critical habitat for a number of species at risk, including woodland caribou which is assessed earlier in this section. Trans Mountain said that the Project would cross the Sowaqua Spotted Owl Wildlife Habitat Area, which is classified as a Long-Term Owl Habitat Area, and for which a provincial no-net-loss policy is in place.

Participants raised concerns about Project effects on species at risk and their habitat, including:

- project effects on habitat and Trans Mountain's efforts to avoid critical habitat for species at risk; and
- Trans Mountain's proposed mitigation if critical habitat cannot be avoided and potential effectiveness of mitigation measures for species at risk.

The Métis Nation of British Columbia raised specific concerns about Project effects on bat species, and said that Trans Mountain did not propose mitigation measures to limit impacts on bats during rearing, or during feeding after hibernation.

The Métis Nation of British Columbia also raised concerns about effects of blasting on bats. ECCC said that little brown myotis and northern myotis are listed as Endangered under Schedule 1 of the SARA because their populations are experiencing unprecedented declines. ECCC recommended that Trans Mountain conduct additional field studies on bats and consider that information during Project micro-routing, and when finalizing specific mitigation measures in the Project environmental protection plans. Trans Mountain agreed to conduct surveys for bats to identify habitat features, and to implement mitigation to reduce effects on bats and their habitat.

ECCC said that there is potential for species that could be impacted by the Project, and that are not currently listed as Threatened or Endangered under Schedule 1 of the SARA, to be listed as such within a time frame that overlaps with Project construction and operation. ECCC specifically said that this potential is high for barn owl, and said that listing would require critical habitat identification to the extent possible.

ECCC said that there is potential for the Project to result in destruction of critical habitat for several species listed as Endangered or Threatened under Schedule 1 of the SARA. ECCC said that it considers activities that would adversely impact the survival or recovery of a SARA-listed species, or any activity likely to destroy critical habitat, to be a significant adverse effect. ECCC recommended that Trans Mountain avoid activities with the potential to destroy critical habitat of the SARA-listed species. ECCC said that, in the event that avoidance of critical habitat is not fully incorporated into the Project, a detailed species-specific mitigation and monitoring plan be developed before Project decisions are made.

ECCC stated that avoidance of critical habitat is the only known means to ensure critical habitat will not be destroyed since a number of mitigation measures and approaches proposed by Trans Mountain, as well as other mitigation approaches, have risks and uncertainties associated with them. ECCC said that alternative pipeline installation methods such as trenchless methods, as well as avoiding barriers to dispersal, seasonal avoidance, den and hibernacula avoidance and micro-routing around biophysical features have the potential to avoid destruction of critical habitat for some species. ECCC noted that additional survey work to determine the precise distribution of critical habitat (i.e., the locations that possess the biophysical attributes within critical habitat) would aid Trans Mountain in determining how the destruction of critical habitat could be avoided.

In its comments on conditions, ECCC recommended a change in the Offset Measures Plan for Residual Effects on Caribou Critical Habitat that would allow for offsets for all species at risk whose final, proposed, candidate and early draft critical habitat is directly or indirectly affected by the Project. ECCC noted that a biodiversity offset is only appropriate where it is intended to address the residual adverse impacts that remain after Trans Mountain has considered and adopted the best technically and economically feasible alternative project design or location that would avoid the impacts of the project and measures to minimize the impacts of the project.

ECCC stated that a biodiversity offset may include various activities such as restoration, enhancement, or creation of species ' habitat or measures that reduce threats to the provision of ecological services or to a species. ECCC further stated, in final argument, that there are limits to what can be offset. ECCC said that offsets cannot compensate for the loss of irreplaceable habitat and offsets may not be appropriate where there is a high probability of the offset failing or where the impacts of failure would be significant. ECCC reiterated in final argument that it recommends avoidance of the destruction of critical habitat.

The Shackan Indian Band, in response to proposed conditions to be imposed by the Board, said that it considers creation of habitat unproven, and the proper approach under these circumstances is avoidance.

Trans Mountain said that offsets should only be implemented as the last stage of the mitigation hierarchy if all the measures to avoid, minimize and restore on-site will not alleviate residuals effects to insignificant levels. Trans Mountain said it would follow regulatory guidance in the development of avoidance, minimization, and restoration measures to avoid the need for offsets. Trans Mountain also said that, should offsets for species at risk be determined necessary by the provincial authorities with responsibility to manage the populations and their habitat, in consideration of the mitigation and habitat restoration plans, it would work with the provincial authorities to determine the most appropriate offset approach.

Trans Mountain committed to avoiding critical habitat for species designated as Endangered or Threatened under the SARA to the extent feasible. It further committed to consult with ECCC where avoidance cannot be accomplished, to develop mitigation measures that would ensure that the residual effect is within regulatory tolerance.

In response to questions from the Board, Trans Mountain said that methods to avoid critical habitat that would be implemented include reducing the right-of-way width where feasible, micro-routing (avoidance of specific features within the Project footprint), and Project scheduling to avoid sensitive periods for wildlife. Trans Mountain said that it continues to conduct wildlife field work to identify the biophysical attributes of critical habitat, and to review pipeline installation methods to avoid or reduce disturbance to critical habitat.

Trans Mountain said that information from ECCC and provincial regulatory authorities regarding refined critical habitat mapping, along with its field survey information would be used to determine overlap of the Project footprint with critical habitat and allow for design modifications, such as micro-routing, to avoid or reduce Project impacts on critical habitat.

Trans Mountain committed to develop mitigation plans for each wildlife species whose draft, candidate, proposed or final critical habitat is directly or indirectly affected by the Project. It said that the mitigation plans would consider timing of Project activities and would include measures to minimize disturbance and to restore or enhance habitat. Trans Mountain also committed to review and evaluate offset options for Sowaqua spotted owl habitat.

Views of the Board

In reaching its views regarding the significance of adverse environmental effects on terrestrial wildlife species at risk, the Board considered Project effects on SARA-listed species, as well as effects on critical habitat of these species as identified in a Recovery Strategy and in evidence provided by Environment and Climate Change Canada (ECCC). The Board also considered whether Trans Mountain's proposed mitigation is consistent with applicable recovery strategies.

The Board acknowledges ECCC's view that destruction of critical habitat would be a significant adverse effect. The Board is of the view that restoration of critical habitat, including biophysical features that cannot be avoided by the Project, is necessary to reduce Project effects on species at risk.

The Board acknowledges the Shackan Indian Band's preference for habitat avoidance. Subject to further consideration at the detailed route stage, the Board is satisfied with efforts made by Trans Mountain to avoid critical habitat, and finds that, where avoidance was not possible, Trans Mountain aligned the proposed corridor adjacent to existing disturbances to reduce effects on critical habitat. The Board is of the view that further avoidance of critical habitat may be possible during detailed route alignment, once surveys for biophysical attributes of critical habitat are completed to allow for identification and location of critical habitat in relation to the Project pipeline and facilities. The Board acknowledges that Trans Mountain would implement measures, such as reducing the right-of-way width where feasible, micro-routing (avoidance of specific features within the Project footprint), and Project scheduling to avoid and reduce effects on critical habitat. The Board encourages Trans Mountain to consider further reasonable alternative Project activities affecting critical habitat of wildlife species at risk, such as trenchless pipeline installation methods, avoiding barriers to dispersal, and avoiding dens and hibernacula, as recommended by ECCC.

The Board considered ECCC's recommendation that Trans Mountain be required to provide offsets for species at risk whose final, proposed, early draft and candidate critical habitat would be affected by the Project. ECCC defines offsets as restoration, enhancement or creation of a species' habitat, or measures that reduce threats to the provision of ecological services or to a species. Trans Mountain has committed to develop and implement mitigation plans for each wildlife species whose early draft, candidate, proposed or final critical habitat is directly or indirectly affected by the Project. The Board acknowledges that Trans Mountain's mitigation plans would include measures to minimize disturbance to habitat, and to restore or enhance habitat. Trans Mountain said it would work with provincial authorities to determine the most appropriate offset approach, should those authorities deem offsets to be necessary for provincially managed species at risk, in consideration of the mitigation and habitat restoration plans. The Board would impose Condition 44 requiring Trans Mountain to file Wildlife Species at Risk Mitigation and Habitat Restoration Plans for each species whose draft, candidate, proposed or final critical habitat is directly or indirectly affected by the Project, and that such plans include details of post-construction monitoring of the mitigation and habitat restoration measures proposed.

Trans Mountain would also be required to provide details, in the Mitigation and Habitat Restoration Plans, of how proposed mitigation and restoration measures for these species are consistent with applicable recovery strategies and action plans. The Board would require Trans Mountain to consult with appropriate government authorities and any species experts on the mitigation and habitat restoration plans. The Board would also require Trans Mountain to provide a description of and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan. In the Board's view, the plans would adequately address ECCC's recommendation on offsets, as offsets are defined by ECCC.

The Board would also impose Condition 38 requiring Trans Mountain to file a Sowaqua Spotted Owl Mitigation Plan to ensure that mitigation and offset measures are implemented in the Sowaqua Long-Term Spotted Owl Habitat Area potentially affected by the Project.

The Board shares ECCC's concern that Project construction and operations could potentially impact wildlife species that are not yet listed as Endangered or Threatened under Schedule 1 of the SARA, but that would be so listed within a time frame that overlaps with Project construction and operation. To address this concern, the Board would impose Condition 92 requiring Trans Mountain to file a summary of any relevant updates, including new Schedule 1 listings, or new or amended Recovery Strategies, Management Plans or Action Plans including identification of critical habitat, identification of avoidance measures, as well as mitigation and monitoring measures.

In general, the Board finds that, taking into account mitigation proposed by Trans Mountain and imposed conditions, Project construction and operation are not likely to cause significant adverse environmental effects on wildlife species at risk. The Board expects that Project effects on federal at-risk small mammals, birds, amphibians, reptiles, and invertebrates would be limited to the Local Study Area. The Board expects that, in general, Project effects on species at risk would be of short- to long-term temporal extent, depending on the species affected, and reversible given implementation of mitigation including plans for restoration or enhancement of habitat as part of formalized mitigation plans during Project construction and operation. The Board expects that effects on species at risk would be of moderate magnitude, given Trans Mountain's efforts to avoid habitat for species at risk or to align adjacent to existing disturbance, and to implement mitigation, including that outlined in formalized mitigation plans.

The Board recognizes that the reason wildlife species are at risk is often because existing cumulative effects have already exceeded a sustainability threshold for the species. The Board is of the view that, despite substantial existing cumulative effects on SARA-listed wildlife species, with Trans Mountain's measures and the imposed conditions, the Project's contribution to the total cumulative effects is expected to be inconsequential.

10.2.12 Parks and protected areas

10.2.12.1 Provincial and municipal parks, and protected and sensitive areas

Trans Mountain said that the Project would cross four parks and protected areas in B.C.: Finn Creek Provincial Park, North Thompson River Provincial Park, Lac Du Bois Grasslands Protected Area and Bridal Veil Falls Provincial Park. Trans Mountain said that the Project would strive to produce a net benefit to native biodiversity and ecological integrity in those regions. Alternatives considered by Trans Mountain to avoid or reduce effects on parks and protected areas in B.C. are discussed in Chapter 11.

Trans Mountain said that it would work with B.C. parks to develop offset projects that align with each of the parks' management objectives, and that it would provide to the Board a summary of the proposed offset projects once they are defined, and the necessary approvals to construct and operate in the parks have been granted.

Trans Mountain proposed to identify and undertake an offset project, or a suite of projects, in order to produce a measurable ecological benefit of a comparable nature and extent, so as to result in no-net-loss of native biodiversity and ecological integrity on a regional basis. It said that projects that are selected for the purpose of offsetting loss of native biodiversity and ecological integrity would be monitored following construction to assess whether targets have been met and performance measures have been achieved.

Several participants asked about opportunities for enhancements that might be provided for regional parks and sensitive areas along the route of the Project. Trans Mountain said that community benefit agreements continue to be executed, and that some would focus on sensitive ecosystems and municipal parks while others would focus on environmental and socio-economic matters relevant to their communities.

Participants, including Lisa Craig and the City of Burnaby, raised concerns and asked questions about the potential impacts (disruption, destabilization) of proposed tunneling through an environmentally sensitive area, the Burnaby Mountain Conservation Area. Trans Mountain said that proposed tunneling to route the pipeline expansion through Burnaby Mountain would be completed entirely from portals located within the Burnaby and WMT facilities. Trans Mountain said that there would be no impact on the Burnaby Mountain Conservation Area lands through clearing or any other construction activities. It said that the tunnel would be backfilled to prevent the development of a conduit for groundwater flow.

The City of Burnaby raised concerns that the alternative route from the Burnaby Terminal to the WMT would pass through the Burrard Inlet Conservation Area, potentially resulting in loss of trees, including those that may support Great blue heron. In response to questions from the City of Burnaby, Trans Mountain said that the Burnaby Streets Alternative Alignment pipeline route is an alternative route, with the tunnel option through Burnaby Mountain as the preferred route. Trans Mountain said that during a survey in 2014 no active Great blue heron colonies were found. Trans Mountain said that if the alternative route through the conservation area is selected for construction, a search for heron nests would be completed. If active or inactive heron nests are found, Trans Mountain said it would contact the appropriate regulatory authority. Trans Mountain outlined mitigation measures for Great blue heron nesting colonies including implementation of setback buffers and least risk timing windows. A detailed discussion on Project effects on forests and urban trees including Board views is provided in Section 10.2.8. A detailed discussion on alternative routes from the Burnaby Terminal to the WMT, including Board views can be found in Chapter 11.

10.2.12.2 Jasper National Park

Parks Canada Agency (Parks Canada) recommended a number of conditions related to proposed pipeline reactivation works in Jasper National Park, including a request for an updated Project specific environmental protection plan and restoration plan, a DFO compensation plan (if serious harm is expected and offsetting is deemed necessary by DFO), a post-reactivation monitoring program, a pre- and post-reactivation follow-up program for wetland function, and a remediation program for previously unidentified contaminated sites. Trans Mountain agreed with the requests and agreed to work with Parks Canada to develop a set of Management Objectives/Desired End Results with appropriate and applicable monitoring and performance criteria for the proposed reactivation activities.

Parks Canada said that, with the implementation of Trans Mountain's environmental protection and mitigation measures, along with any site-specific conditions required by Parks Canada, and if Management Objectives / Desired End Results are accomplished, it is unlikely that the Project would cause significant adverse effects to the ecological integrity of Jasper National Park.

Views of the Board

The Board recognizes Trans Mountain intent to establish net benefit proposals in B.C. parks related to native biodiversity and ecological integrity.

The Board finds that the tunneling of Burnaby Mountain to place the Westridge delivery lines would not result in any environmental effects on the Burnaby Mountain Conservation Area because the tunnel portals would be located within the Burnaby and Westridge Marine Terminal (WMT) facilities. The Board views on geotechnical issues related to the proposed tunnel through Burnaby Mountain are found in Chapter 6.

Trans Mountain maintains the Burnaby Mountain tunnel option as its preferred option.[96] In the event that the tunnel construction method through Burnaby Mountain is not feasible, Trans Mountain proposes to use an alternate route, which is a trenched pipeline construction following Burnaby streets and the Canadian Pacific rail line from the Burnaby Terminal to the WMT. The Board heard concerns raised by participants about the alternative 'streets' option from the Burnaby Terminal to the WMT potentially affecting the Burrard Inlet Conservation Area, including Great blue heron that may nest in the conservation area. The Board finds Trans Mountain's proposed mitigation for potential effects on Great blue heron in the conservation area to be reasonable and acceptable.

The Board would impose conditions requiring Trans Mountain to develop and file, environmental protection plans (Conditions 72, 78 and 81), habitat offset and restoration plans (Conditions 40, 41, 155 and 156), and a contamination identification and assessment plan (Condition 46) for the Project that are also expected to reduce environmental impact of reactivation activities within Jasper National Park. The Board is of the view that these conditions would adequately address Parks Canada's recommendations specific to pipeline reactivation at Jasper National Park.

Effects of the Project on valued environmental components within the parks are considered in Project effects assessment sections for fish habitat, vegetation and wildlife (Sections 10.2.5, 10.2.7 and 10.2.11).

10.2.13 Marine sediment and water quality

The Board considered Trans Mountain's effects assessment and all related evidence from participants, including evidence regarding construction-related effects and the potential for contaminant releases during WMT operations.

In this section, the Board focuses on:

- marine sediment sampling;
- dredging and Disposal at Sea Permit; and
- mitigation and monitoring.

[96] Alternative corridors are discussion in Chapter 11, Section 11.1.2.

10.2.13.1 Marine sediment sampling

Trans Mountain said that historical reports for the existing berth at the WMT indicate elevated levels of certain contaminants (such as polycyclic aromatic hydrocarbons, cadmium, and mercury) in subtidal sediment. Mr. A.G. Lewis said that the existing and proposed docking facilities are in an area noted for chronic oil contamination and that there are historic sources of polycyclic aromatic hydrocarbons. He said that the existing sediments survey should be expanded to characterize the extent and chemical nature of oiled sediments. Mr. Lewis was of the view that sediment disturbance will affect both the distribution and abundance of organisms in the area and will introduce sediment into the water column, thus increasing the risk of biological damage.

Trans Mountain conducted further sediment sampling in 2013 that showed exceedances of some metals, polycyclic aromatic hydrocarbons, and polychlorinated biphenyl in the top 0.5 m of the sediment layer in some locations. Trans Mountain said that further sediment sampling would aid in better delineation of areas that would require land disposal for sediments dredged during construction.

ECCC said that, based on the current chemical and physical information, it would not consider the top 0.5 m of the sediment layer suitable for disposal at sea, and would require further sampling and testing, including biological testing.

10.2.13.2 Dredging and Disposal at Sea Permit

Based on preliminary engineering and design plans, Trans Mountain estimates that it would dredge approximately 150 000 m^3 from the intertidal and nearshore subtidal zones. It said that it is committed to reduce the amount of dredging required at the WMT to the extent feasible by identifying feasible alternative engineering options and construction methods.

ECCC recommended that Trans Mountain demonstrate how it considered various engineering options and construction methods that could reduce or eliminate the dredge footprint and volume of material proposed for disposal at sea. Trans Mountain said that it is investigating construction and sediment management methods with this aim in mind. Trans Mountain committed to provide details on alternative options and methods in its Disposal at Sea Permit application, should dredging and disposal at sea become its preferred option.

Trans Mountain said that, if it applies for a permit, it would follow all requirements and timelines of the permitting process, including submitting a waste prevention audit after submitting its permit application. It added that it will not seek a Disposal at Sea Permit for any blasted or excavated material.

10.2.13.3 Mitigation and monitoring

Trans Mountain committed to the following measures to manage and reduce potential Project effects on marine sediment and water quality during construction:

- design the expanded terminal in a way that minimizes the dredge footprint or avoids dredging altogether;
- use clamshell dredge and silt curtains to limit sediment release and dispersal during dredging;
- monitor turbidity and total suspended solids during in-water construction activities; and
- follow erosion and sediment control measures on land to limit sediment releases to water.

Trans Mountain said that its primary mitigation during WMT operations would be to treat stormwater from hydrocarbon storage and handling areas to remove hydrocarbons prior to discharging it into Burrard Inlet. It said that surface water from the dock's loading area and the process areas of the foreshore would be directed to the oil/water separator and discharged through the existing outfall to Burrard Inlet. Run-off from the dock roadway and all other areas outside of the process areas would continue to drain directly into Burrard Inlet.

Trans Mountain said that it will monitor the surface water discharged to the marine environment to ensure compliance with the conditions of the British Columbia Ministry of Environment's discharge permit.

Views of the Board

The Board recognizes that the marine sediment and water quality surrounding the Westridge Marine Terminal (WMT) have been affected by historical and existing terminal activities. Trans Mountain's most recent sampling showed exceedances of certain contaminants and finds that additional marine sediment sampling is necessary to delineate areas that, if dredged, would require sediment disposal on land.

With respect to dredging methods, Trans Mountain has committed to reduce the amount of dredging required at the WMT by identifying feasible alternative engineering options and construction methods. In the event that Trans Mountain seeks a Disposal at Sea Permit from Environment and Climate Change Canada (ECCC), Trans Mountain has committed to follow all requirements and timelines of that permitting process. The Board accepts ECCC's comment that any proposed disposal at sea will only be considered for approval under the *Canadian Environmental Protection Act, 1999* if it is demonstrated to be the most technically and environmentally preferable option. Therefore, the Board has revised Condition 35 on Marine Sediment Management Plan accordingly.

Trans Mountain said that it would treat stormwater and surface water from the dock's loading area at the existing stormwater treatment facility before discharging it into Burrard Inlet. The Board understands that this treatment facility is operated under a British Columbia Ministry of Environment discharge permit and that it will be expanded to accommodate the increased stormwater discharge from the terminal expansion.

In light of the above, the Board has imposed Condition 35 requiring Trans Mountain to develop a marine sediment management plan that would be included within the Environmental Protection Plan for the WMT. The plan would include the results of supplemental marine sediment surveys, a volume quantification of sediment to be dredged and disposal options. The plan would also include monitoring details for the terminal's construction and operations phases, for both biotic and non-biotic parameters. The Board requires Trans Mountain to include a summary of its consultations with appropriate government authorities and potentially affected Indigenous groups, in the plan.

Significance evaluation: adverse effects on marine sediment and water quality

	Criteria	**Rating**	**Description**
Project effects	Temporal extent	Short-term to long- term	During construction, effects are expected to be limited to the period when dredging occurs. Effects from stormwater discharges are expected to occur sporadically throughout the operations phase.
	Reversibility	Reversible	Effects from dredging are expected to be reversible once that activity is complete. Effects from stormwater discharges are expected to be reversible once terminal operations cease.
	Geographic extent	Local Study Area	Effects are expected to be limited to the Local Study Area during both construction and operations.
	Magnitude	Low	Effects from dredging and stormwater discharges are expected to be within the applicable criteria.
Cumulative effects	The Board finds that some contaminants are present at levels higher than the applicable criteria due to historical and existing terminal activities. Taking into account the implementation of Trans Mountain's proposed mitigation, and the condition the Board has imposed aimed at protecting marine sediment and water quality, the Project's contribution to the total cumulative effects is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.14 Marine fish and fish habitat

Trans Mountain defined Burrard Inlet as a productive marine environment, supporting a diverse assemblage of algae, invertebrates, and marine fish, including three SARA-listed marine fish species of Special Concern: Bluntnose sixgill shark, Green sturgeon, and Yelloweye rockfish (inside waters population). Trans Mountain indicated that Burrard Inlet, or portions of it, are considered DFO Important Areas for Dungeness crab and Pacific salmon. Trans Mountain said that one DFO Important Area for Dungeness crab overlaps with the LSA (Appendix 11 provides a description of the spatial boundaries). Trans Mountain said that Pacific salmon are known to use numerous different streams within Burrard Inlet for important life stages. Trans Mountain said that Pacific salmon likely use the LSA to some extent, but it is not considered high quality habitat. Trans Mountain also indicated that three Rockfish Conservation Areas (RCA) are located within the RSA, including the Eastern Burrard Inlet RCA, located within the LSA.

Trans Mountain, DFO, and Tsleil-Waututh identified that Burrard Inlet has been cumulatively impacted by industrial and urban development. Tsleil-Waututh said that Burrard Inlet was historically one of Canada's most productive marine fish habitats. Trans Mountain said that urban and recreational development has resulted in a large percentage of intertidal habitat being modified, resulting in a range of total cumulative effects both on habitat and species that utilize such habitat, and that cumulative effects are expected to persist with or without the Project.

Several concerns were raised by participants about impacts on marine fish and fish habitat from the construction activities associated with the expansion of WMT. In this section, the Board focuses on:

- alteration or loss of marine fish habitat;
- mortality or injury to marine fish; and
- mitigation and offsets.

A discussion of the introduction of aquatic invasive species from Project-related marine vessel ballast water, and underwater noise produced from Project-related marine vessels on marine fish, is provided in the marine fish and fish habitat assessment in Chapter 14, Section 14.7.3.

10.2.14.1 Alteration or loss of marine fish habitat

Trans Mountain acknowledged that the expansion of WMT would result in loss and alteration of marine fish[97] habitat. Trans Mountain estimated the amount of habitat to be lost or altered from the expansion of WMT based on preliminary engineering designs (Table 11).

Table 11: Approximate area of marine fish habitat to be destroyed or permanently altered

Habitat	Area to be lost (m^2)
marine riparian habitat	2,252
intertidal habitat	4,323
subtidal habitat	13,002
Total	**19,577**

Trans Mountain said that subtidal and intertidal habitats that are lost or permanently altered will be partially offset by new rip-rap habitat along the outer face of the fill area. It said that the intertidal area would retain the general physical characteristics that are currently present. It acknowledged that habitat loss may result in a temporary decrease of the productive capacity of surrounding habitats.

The Village of Belcarra suggested that Trans Mountain should be required to create additional eelgrass habitat within Central Burrard Inlet as compensation for the increased footprint of the WMT. Trans Mountain said that construction of the WMT would not adversely affect any eelgrass habitat, and that the environmental conditions in the area may not be suitable for eelgrass establishment, so eelgrass habitat creation is not a suitable offsetting measure.

[97] The term marine fish is meant to include all marine organisms (e.g., fish, invertebrates, eggs).

10.2.14.2 Injury or mortality

Trans Mountain said that some marine organisms would likely be injured or killed from pile driving, infilling, and potential dredging activities. It said that sessile organisms such as marine invertebrates would be at highest risk of harm, whereas mobile species, such as marine fish, would likely disperse from the area, avoiding impacts. It acknowledged that pile driving could result in injury or potentially death of marine fish from high pressure energy waves. Trans Mountain said that mortality or injury from high pressure sound waves would be unlikely, as sound pressure waves capable of causing injury or mortality would be in the immediate vicinity (i.e., within several metres) of pile driving, and that marine fish are most likely to disperse from the area when preparatory activities commence.

DFO said that Trans Mountain's proposed mitigation would minimize injury and mortality to marine fish and invertebrates, but that some minor fish mortality may still occur. Trans Mountain said that, if some mortality of marine fish and invertebrates occurred, it would not affect the viability of localized populations.

Trans Mountain said that residual effects of construction and operations of the WMT on SARA-listed marine fish are considered unlikely due to the low abundance of these species within the RSA.

10.2.14.3 Mitigation and offsets

Trans Mountain has proposed numerous mitigation measures that it submits are consistent with federal regulatory guidelines, industry best management practices, and align with Best Management Practices for Pile Driving and Related Operations developed by the B.C. Marine and Pile Driving Contractors Association. These include:

- conducting all infilling and any potential dredging within least-risk biological windows to avoid sensitive life stages of marine fish;
- hydrophone monitoring when installing piles, whether an impact hammer or hydraulic drive is used;
- using bubble curtains when an impact hammer will be used to install piles (type and usage of bubble curtains will be discussed with Fisheries and Oceans Canada);
- a crab salvage program within the dredge and fill footprint; and
- water quality monitoring during marine construction activities (i.e., dredging of the marine environment from onshore and/or the marine environment, marine drilling, pile installation, infilling, etc.) in order to assess the effectiveness of mitigation measures in place to reduce potential effects to water quality and sediment quality during construction.

Trans Mountain identified that the construction activities associated with the expansion of WMT would likely result in serious harm and could require Authorization under paragraph 35(2)(b) of the *Fisheries Act*. Trans Mountain provided a preliminary marine fish offsetting plan that proposed the construction of rock reefs with the purpose of providing high value marine fish habitat to offset any residual serious harm resulting from the expansion of WMT. Trans Mountain said that, in the event a *Fisheries Act* authorization would be required, a finalized marine fish habitat offsetting plan would be developed that would include detailed offsetting measures, as well as compliance and effectiveness monitoring to confirm that offsetting habitat was constructed as planned and functioning as intended. Trans Mountain also acknowledged that the offsetting measures presented in their preliminary marine fish habitat offsetting plan were conceptual and would be refined through further discussions with DFO, participating Indigenous groups, and other interested parties.

DFO said that a detailed review of the Project in regards to serious harm would only occur during the permitting phase. DFO indicated in its final argument that when considering the potential issuance of a *Fisheries Act* authorization for a work(s), undertaking(s) or activity(ies) which may adversely affect asserted or established Indigenous or Treaty rights, DFO will undertake consultation with potentially affected Indigenous groups. DFO further recommended that the Proponent develop a follow-up monitoring program to assess the effectiveness and adequacy of mitigation measures implemented during and post-construction.

Views of the Board

The Board is of the view that construction activities associated with the expansion of the Westridge Marine Terminal (WMT) are expected to result in the loss and alteration of marine fish habitat and some mortality or injury of marine fish. The Board recognizes that Burrard Inlet, and portions of the Local Study Area, are considered important habitat for some marine fish species (e.g., DFO Important Area for Pacific salmon). However, the Board is of the view that the proposed mitigation measures would effectively mitigate the extent of the effects on marine fish and fish habitat.

The Board is mindful of DFO's recommendation that Trans Mountain develop a follow-up monitoring program to assess the effectiveness and adequacy of mitigation measures. The Board would impose Condition 151 requiring Trans Mountain to conduct a post construction monitoring program of marine fish and fish habitat for the expansion of the WMT and file the results with the Board.

Trans Mountain has acknowledged that the construction activities associated with the expansion of the WMT would likely require a *Fisheries Act* authorization. As the Memorandum of Understanding between DFO and NEB does not apply to marine terminals, the responsibility for reviewing the effects on marine fisheries from the expansion of the WMT under the *Fisheries Act* is the responsibility of DFO. The Board would impose Condition 109 requiring Trans Mountain to provide a finalized copy of the *Fisheries Act* authorization with the Board, prior to construction, in the event DFO determines one is required for the expansion of the WMT. If DFO determines a *Fisheries Act* authorization is required for the expansion of the WMT, Trans Mountain would be required to offset any residual serious harm as part of the authorization. The Board acknowledges the recommendation of the Village of Belcarra, but is of the view that any requirements for offsets related to the expansion of the WMT are best addressed by DFO. The Board acknowledges that should a *Fisheries Act* authorization be required, Trans Mountain has committed to developing a finalized marine fish habitat offsetting plan that would be refined through further discussions with DFO, participating Indigenous groups, and other interested parties. The Board recognizes DFO has indicated that, when considering the potential issuance of a *Fisheries Act* authorization for a work(s), undertaking(s) or activity(ies) which may adversely affect asserted or established Indigenous or Treaty rights, DFO will undertake consultation with potentially affected Indigenous groups.

The Board would require Trans Mountain to file a finalized Environmental Protection Plan for the WMT (Condition 81). The Board requires Trans Mountain to include with the filed plan, a summary of its consultations with appropriate government authorities and any potentially affected Indigenous groups. In its summary, Trans Mountain must also provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plans.

The Board recognizes that there is potential for SARA-listed species at risk to be present in the Regional Study Area (RSA) during construction activities, but given the proposed mitigation and the rare occurrences of these species in the RSA, the Board is of the view that impacts on these species are unlikely.

Significance evaluation: adverse effects on marine fish and fish habitat

	Criteria	*Rating*	*Description*
Project effects	Temporal extent	Medium-term	Effects from various construction activities (e.g., infilling, pile driving and potential dredging) are expected to occur intermittently throughout the expansion of the Westridge Marine Terminal (taking months to years) resulting in effects on marine fish and fish habitat (e.g., mortality, alteration or loss of habitat).
	Reversibility	Reversible to permanent	Marine resources are generally expected to resemble pre-construction conditions within the life of the Project, ultimately making the effects reversible. Some effects could be considered permanent (i.e., mortality of an individual marine fish); however, they are not expected to result in noticeable changes to marine fish abundance.
	Geographic extent	Footprint to Local Study Area	Effects are expected to be localized to the Project footprint and the Local Study Area.
	Magnitude	Low to moderate	Effects from the construction of the Project would be limited to a few or many individuals. Generally speaking, the Local Study Area is not considered high quality marine fish habitat. However, for some species, the Local Study Area has been designated as a DFO Important Area and would be considered valuable habitat. Mitigation measures, reclamation activities, post-construction environmental monitoring and potential offsets through a *Fisheries Act* authorization are expected to reduce the magnitude of effects and would therefore considered to range from low to moderate magnitude.
Cumulative effects	Existing cumulative effects could be considered substantial and above environmental regulatory thresholds within the Regional and Local Study Area. Burrard Inlet has been altered by urban and industrial development that has resulted in a loss of habitat and a decrease in marine fish abundance. Taking into account the implementation of Trans Mountain's mitigation measures, the conditions the Board would impose, and a potential *Fisheries Act* authorization, the Project's contribution to the total cumulative effects on marine fish and fish habitat is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.15 Marine mammals

Trans Mountain indicated that five SARA-listed marine mammal species, including two ecotypes of killer whales, could potentially occur in the RSA; namely Grey whale (Special Concern), Stellar sea lion (Special Concern), Harbour porpoise (Special Concern); North Pacific Humpback whale (Special Concern), Bigg's killer whale (Threatened); and Southern resident killer whale (Endangered). No critical habitat for SARA- listed marine mammal species has been identified in the RSA (Appendix 11 provides a description of the spatial boundaries).

Trans Mountain said the Harbour seal is the most common marine mammal found within Burrard Inlet, and that sightings of other marine mammals are considered rare. DFO acknowledged that Trans Mountain accurately characterized existing marine mammal resources within the RSA for the proposed WMT Expansion.

Tsleil-Waututh identified that Burrard Inlet has been cumulatively impacted by industrial and urban development. Tsleil-Waututh said that Burrard Inlet was historically one of Canada ' s most productive marine fish and wildlife habitats.

Participants expressed concerns related to adverse effects on marine mammals from the expansion and operation of WMT. In this section, the Board focuses on:

- permanent or temporary auditory injury;
- sensory disturbance; and
- mitigation

A discussion of the effects of Project-related marine shipping on marine mammals is provided in Chapter 14, Section 14.7.2.

10.2.15.1 Permanent (PTS[98]) and temporary auditory injury (TTS[99])

Trans Mountain said that, based on its comparative study of underwater noise levels from similar projects against the proposed thresholds, as well as the effectiveness of proposed mitigation measures, it is unlikely that permanent auditory injury to marine mammals would occur. Trans Mountain said that temporary auditory injury could occur to marine mammals, but would be localized to marine mammals found within several metres of pile driving, and is therefore unlikely. DFO shared a similar view as Trans Mountain, stating that the residual effects of temporary auditory injury resulting from the expansion of the WMT will likely be low risk.

10.2.15.2 Sensory disturbance

Trans Mountain said that, within the LSA and, potentially portions of the RSA, underwater noise levels produced from construction activities would be capable of causing sensory disturbance to marine mammals. Trans Mountain said that effects associated with sensory disturbance can range from physiological responses (e.g., increased stress hormones) to behavioral responses (e.g., startles responses, avoidance behaviors). It said that the extent of sensory disturbance depends on a number of factors, including: the source level, frequency and duration of the underwater noise; and the context and the species in question.

Trans Mountain said that the intermittent nature of pile driving would allow for the behavior of some marine mammals to return to normal after sound production ceases, and that it is possible that some marine mammals may habituate to construction activities. Trans Mountain said that effects could be more pronounced for more sensitive species, such as the harbour porpoise, and could result in temporary avoidance of construction areas for these species. Trans Mountain said that SARA-listed species are unlikely to be affected from residual effects of construction and operation of the WMT due to the low abundance of these species within the RSA.

DFO said that sensory disturbance to marine mammals would likely be intermittent in nature and likely result in some avoidance behaviors, but ultimately the residual effects of sensory disturbance will likely be low risk to marine mammals.

10.2.15.3 Mitigation

Trans Mountain committed to developing a Marine Mammal Protection Program which includes mitigation measures aimed at protecting marine mammals during construction activities associated with the expansion of the WMT. It said that the mitigation measures are aligned with Best Management Practices for Pile Driving and Related Operations developed by the B.C. Marine and Pile Driving Contractors Association, and includes:

- a marine mammal survey prior to any marine activities to determine the presence of cetaceans or species at risk in the exclusion zone (in the event a cetacean or species at risk is encountered in the exclusion zone or in close proximity, all marine operations will be temporarily suspended until the mammal has left the area or does not appear for 30 minutes);
- pile driving only during daylight hours to ensure marine mammals can be seen (in the event, pile driving would have to occur outside of daylight hours, Trans Mountain will consult with DFO to develop mitigation appropriately); using a vibratory driver, rather than an impact hammer, when possible, to install piles (vibratory drivers do not produce the high impulse signatures of impact pile driving);
- bubble curtains would be used in conjunction with an impact hammer (type and usage of bubble curtains will be discussed with Fisheries and Oceans Canada); and
- using a hydrophone to confirm the assumptions, at the onset of pile-driving, concerning source levels, potential exceedances of marine mammal auditory injury levels, and effectiveness of mitigation measures (sound levels will be monitored both onshore and in-water during loud underwater construction activities, in order to allow for adjustments of exclusion zone based on changes in field conditions; monitoring will take place for 30 minutes prior to and during marine construction activities).

DFO said that the mitigation measures proposed by Trans Mountain are standard measures that are technically feasible and have been successfully implemented in past projects, and will largely mitigate the residual effects on marine mammals from the construction activities associated with the expansion of WMT. DFO said the Marine Mammal Protection Program

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[98] permanent threshold shifts

[99] temporary threshold shifts

framework is preliminary in nature and is lacking detailed information on construction mitigation and monitoring programs; however, it does provide a good overview of measures aimed at mitigating impacts of pile installation, which is anticipated to result in the greatest effect on marine mammals residing in or migrating through the LSA.

Views of the Board

The Board is of the view that the proposed mitigation measures would reduce the extent of adverse effects on marine mammals. The Board agrees with DFO's assessment and would impose Condition 81 that requires Trans Mountain to develop a Westridge Marine Terminal (WMT) Environmental Protection Plan, which will include finalized mitigation and monitoring plans associated with the expansion of the WMT. The Board would expect Trans Mountain to finalize the plan in consultation with DFO, as well as potentially affected Indigenous groups. The Board would also impose Condition 151 requiring Trans Mountain to conduct a post-construction monitoring program for marine mammals from the expansion of the WMT and file the results with the Board.

The Board is of the view that construction activities associated with the expansion of WMT are unlikely to result in permanent or temporary auditory injury to marine mammals, and considers such effects to be low risk. The Board acknowledges that construction activities associated with the expansion of WMT has the potential to result in sensory disturbance to marine mammals. The Board is of the view that sensory disturbance would be limited to a few individuals due to the limited abundance of marine mammals in Burrard Inlet. The Board recognizes that there is potential for SARA-listed species to be present in the RSA during construction activities, but given the proposed mitigation and the rare occurrences of these species in the RSA, the Board is of the view that impacts on these species are low risk.

Significance evaluation: adverse effects on marine mammals.

	Criteria	Rating	Description
Project effects	Temporal extent	Medium-term	Sensory disturbance of marine mammals is expected to occur from pile driving associated with the expansion of the Westridge Marine Terminal. Pile driving is expected to occur intermittently for the duration of construction activities. Therefore, effects are expected to last in the order of months to years.
	Reversibility	Reversible	Marine mammal behaviour is expected to return to normal once construction activities (i.e., pile driving) cease.
	Geographic extent	Local Study Area to Regional Study Area	Effects are expected within the Local Study Area; however there remains the possibility that sensory disturbance could occur at the Regional Study Area.
	Magnitude	Low	Marine mammal habitat within the Regional and Local Study Area is not considered high quality habitat. Effects from construction activities associated with the expansion of the Westridge Marine Terminal are expected to be limited to a few individual marine mammals and unlikely to impact marine mammal resources as a whole.
Cumulative effects	The Regional and Local Study Areas were historically considered high quality habitat for marine mammals; however, industrial and urban development have since substantially altered these areas, limiting the quality and availability of marine mammal habitat. Existing cumulative effects could be considered substantial or above environmental regulatory thresholds for Burrard Inlet. Taking into account the implementation of Trans Mountain's mitigation measures and the conditions the Board would impose, the Project's contribution to the total cumulative effects on marine mammals is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.16 Marine birds

The Westridge Marine terminal is located at the edge of the English Bay and Burrard Inlet Important Bird Area which attracts tens of thousands of migratory birds along the Pacific Flyway and is globally important habitat for Western grebes, Barrow's goldeneye and surf scoter. The area is also nationally important habitat for Great blue herons. Trans Mountain said that bird abundance in the inlet has been recorded at more than 24,000 birds during peak spring months, and the marine areas of the Central Harbour have the greatest abundance of waterbirds.

Trans Mountain said that three marine bird species listed under Schedule 1 of the SARA, which may be observed using habitats within Burrard Inlet, are: Great blue heron, Long-billed curlew (special concern), and Marbled murrelet (threatened). Trans Mountain said that critical habitat has not been identified for any of the three species.

Participants, including B.C. Nature and Nature Canada, Mr. A.G. Lewis and ECCC, raised concerns about the effect of WMT construction and operation on marine bird mortality caused by collisions with infrastructure, and behavioural alterations caused by sensory disturbance. Trans Mountain said that bird collisions with the WMT or vessel infrastructure would be rare. When they occur, it would be primarily due to disorientation caused by night lighting of the terminal, or lack of visibility during weather events. Trans Mountain committed to implement mitigation measures to reduce the potential for light-induced collisions, such as using low level or low intensity lighting, and informing Project-related vessel operators of the hazards regarding bird strikes occurring at night. Trans Mountain said that the risk of mortality could be further minimized by monitoring and recording marine bird collisions and adapting management goals to eliminate the potential for recurring fatal collisions.

ECCC recommended that Trans Mountain implement an Avian Mitigation and Monitoring Plan to assess the effectiveness of proposed mitigation measures to avoid harm to migratory birds that could arise from activities related to the WMT facility. ECCC said that this monitoring should include post-construction monitoring at the WMT, including berthed vessels.

Trans Mountain said that bird strikes and collisions would be reported to Trans Mountain's Lead Activity Inspector and the Environmental Inspector or Kinder Morgan Canada's Operations Supervisor. Trans Mountain said it would report the date, time, location, environmental conditions, and the species and number of individuals involved, as well as recommended follow up actions and communications.

Trans Mountain said that information regarding mortality and collision events would be compiled by the Environmental Monitor and included, as applicable, in post-construction monitoring reports for the WMT.

Views of the Board

Trans Mountain has committed to various mitigation measures to reduce effects of construction and operation of the Westridge Marine Terminal (WMT) on marine birds. In addition, Trans Mountain has committed to compile information regarding mortality and collision events and to include that information in post-construction monitoring reports. The Board expects Trans Mountain to include this information in the post-construction monitoring reports related to the Project.

Given the mitigation measures and reporting committed to by Trans Mountain, in Board's view a separate condition for an Avian Monitoring Plan, as requested by ECCC, is not required.

Significance evaluation: adverse effects on marine birds - Westridge Marine Terminal construction and operation

	Criteria	Rating	Description
Project effects	Temporal Extent	Long-term	Sensory disturbance and potential for collisions would be expected to persist through the life of the Project.
	Reversibility	Reversible	Sensory disturbance effects would be expected to be reversible at the population level.
	Geographic Extent	Local Study Area	Effects would be expected at the Westridge Marine Terminal.
	Magnitude	Low	Effects would be expected to be minimal at the population level.
Cumulative effects	Existing cumulative effects are not considered to be substantial. Taking into account the implementation of Trans Mountain's mitigation measures, the Project's contribution to the total cumulative effect on marine birds is expected to be relatively minor.		
Recommendation	Not likely to cause significant adverse environmental effects.		

10.2.17 Accidents and malfunctions

Chapter 9 discussed Trans Mountain's ability to anticipate, prevent, and respond to Project accidents and malfunctions. This section discusses the potential environmental effects of a spill that might result from such accidents and malfunctions involving the Project, such as a spill from the pipeline, from the tank terminals, or from WMT. Chapter 11 discusses the potential socio-economic effects of such spills.

The section of the current chapter is focused on potential spills from the Project, rather than potential spills from marine shipping associated with the Project. However, oil spilled from the pipeline or facilities can enter the marine and estuarine environment and affect valued components in the vicinity of the spill, which are discussed in this chapter.

Chapter 14 discusses the prevention, preparedness, and response measures related to potential spills from the increase in marine shipping associated with the Project, as well as the potential environmental and socio-economic effects of such spills. Some of the information in Chapter 14, Section 14.9 on the potential effects of a tanker spill on certain valued environmental components may also be relevant here if oil spilled from the pipeline or from a terminal reaches such components.

10.2.17.1 Ecological risk assessment methods

Trans Mountain conducted a qualitative ecological risk assessment to evaluate the potential environmental effects to the ecological receptors resulting from exposure to crude oil releases from the pipeline. It selected case studies of oil spills from environments similar to the Project, based on a literature review.

To assess the effects of a pipeline spill, Trans Mountain selected the following four hypothetical oil spill locations:

- in proximity to the Athabasca River near Hinton, Alberta;
- the North Thompson River near Darfield, B.C.;
- the Fraser River near Hope, B.C.; and
- the Fraser River near the Port Mann Bridge in greater Vancouver.

Table 12 describes the pipeline spill scenarios considered for the assessment.

Trans Mountain said that it considered winter, summer, and spring/fall seasons in evaluating the interactions between spilled oil and ecological receptor groups. It considered Cold Lake Winter Blend (CLWB) as a conservative choice due to the higher risk associated with inhalation of volatiles and/or exposures to volatile hydrocarbons. For each river, season and ecological receptor type, Trans Mountain evaluated the expected spatial extent, magnitude, duration, and reversibility of negative environmental effects.

Trans Mountain estimated the potential recovery times of the freshwater and terrestrial environment. Several issues raised by participants related to the potential recovery are discussed below.

Trans Mountain said that the spatial extent of environmental effects would vary, depending upon the season and river characteristics, and that the magnitude of environmental effects was often rated "high," at least locally. It said that the duration of the effects, taking into consideration oil spill response and restoration activities, were typically less than five years, and often 12 to 24 months. All rated negative environmental effects were considered to be "reversible."

Table 12: Pipeline spill scenarios

Pipeline Location (Reference Kilometre Post)	Credible Worst-Case Spill Volume (m^3)	Smaller Spill Volume (65 per cent of Credible Worst-Case) (m^3)	Description
309.0	2,700	1755	Athabasca River Scenario Location: approximately 10 km east of Hinton at a forest site approximately 200 m from the Athabasca River.
766.0	1,400	910	North Thompson River Scenario Location: approximately 3 km north of Darfield at partially cleared lands approximately 100 m from the North Thompson River.
1,072.8	1,300	845	Fraser River Near Hope Scenario Location: forested stream crossing site in west Chilliwack upstream from Trans-Canada Highway approximately 600 m from Vedder Canal, a Fraser River tributary.
1,167.5	1,250	812.5	Fraser River and Delta Near Port Mann Bridge Scenario Location: approximately 500 m west of Port Mann Bridge at an industrial site on the south bank approximately 400 m from the Fraser River.

Trans Mountain conducted a Preliminary Quantitative Ecological Risk Assessment for the WMT to assess the potential environmental effects to marine ecological receptors resulting from potential spills during product loading.

Spatial boundaries for this assessment included the geographic extent where potential effects are expected to be measurable and considered the oil spill footprint, as well as the RSA defined as the area of English Bay, Vancouver Harbour, and Burrard Inlet east of the First Narrows, including Indian Arm and Port Moody Arm.

Trans Mountain evaluated two hypothetical oil spill scenarios as part of this assessment. This included scenarios representing two crude oil spill volumes:

- a spill of 160 m^3 due to a large break in a loading arm (with assumption that 80 per cent is retained by a boom placed around the vessel being loaded); and
- a smaller volume of 10 m^3 (which remains within the containment boom).

Trans Mountain evaluated each hypothetical spill scenario using stochastic fate and transport modelling under a range of environmental conditions, including winter, spring, summer and fall. Trans Mountain said that it selected the CLWB as the representative crude oil because it is already transported by Trans Mountain, and is expected to remain a major product transported by the new line.

Trans Mountain considered the summer season as the credible worst-case because increased hydrocarbon concentrations in water and air would increase exposure to people and organisms relative to colder ambient conditions.

Trans Mountain also conducted a detailed quantitative risk assessment that builds on the results of the preliminary qualitative risk assessment. It said that the detailed assessment focuses on changes in the health of the ecological receptors from exposures associated with hypothetical spills resulting from a loading accident at the WMT.

Trans Mountain said that the potential risks of negative environmental effects from crude oil exposure from each spill scenario were evaluated for four main ecological receptor group/habitat combinations as follows:

- shoreline and near shore habitats;
- marine fish and supporting habitat;
- marine birds and supporting habitat; and
- marine mammals and supporting habitat.

Trans Mountain said that each of the four ecological receptor groups contain a variety of habitats and/or individual receptor types that have differing sensitivity to crude oil exposure (ranked on a scale of low to very high). In defining the potential ecological consequence of crude oil exposure at any given location, Trans Mountain considered the overlap of the likelihood of crude oil presence, and the sensitivity of ecological habitat or receptors that may be present at that location.

Trans Mountain said that the observed effects and distribution of oil from the 2007 Westridge delivery line spill in Burnaby are similar to the predictions made in the WMT detailed ecological risk assessment. For example,

- the observed effects of surface oiling on fish and wildlife after the 2007 spill are consistent with, and similar to those predicted by the detailed quantitative ecological risk assessment (i.e., no fish kill, and limited effects from direct oiling on birds and marine mammals);
- the predictions of the assessment for the extent and intensity of shoreline oiling are very similar to the effects observed after the spill in 2007; and
- the observed recovery of shoreline biota is consistent with predictions provided in the assessment (i.e., less than 2 years in lightly oiled areas, and 2-5 years in more heavily oiled areas).

10.2.17.2 Potential effects on valued environmental components

Spilled oil, depending on factors such as its trajectory and weathering, can affect a valued environmental component in a similar way, regardless of whether it is spilled from the pipeline or from a storage or marine terminal. This section therefore considers the potential effects of spills on valued components without always distinguishing the particular source where it is unnecessary to do so.

Freshwater and aquatic biota

Trans Mountain said that biological effects of oil spills to freshwater environments vary widely in relation to the characteristics of spilled oil, the physical dimensions and other characteristics of the receiving waterbodies, season, and other factors. Trans Mountain said that if relatively fresh oil reaches water, oil spreads over the water surface forming an oil slick. Volatile hydrocarbons quickly evaporate into the atmosphere, and some of the lighter water-soluble components that would otherwise evaporate may dissolve in the water, resulting in concentrations that may be toxic to aquatic organisms. As oil is transported downstream, it can become stranded on shorelines and riparian vegetation, retained in the water column as droplets, or retained within coarse bed substrates. The rate of spreading, dissolution and dispersion of hydrocarbons would be slower in the low-turbulence environments of ponds and lakes compared to the Burrard Inlet or an estuary setting, but faster in highly turbulent rivers, where the hydrocarbon would also move downstream and spread laterally.

Trans Mountain said that evidence shows that hydrocarbon concentrations in affected waterbodies are often high immediately following a spill and that water quality typically recovers within days to weeks following an oil spill into inland waters. Trans Mountain indicated that after some historical oil spills (e.g., Kalamazoo River, Wabamun Lake) hydrocarbon concentrations in surface water were generally reduced below aquatic thresholds or guidelines within weeks to months of the spill.

Trans Mountain indicated that hydrocarbons may have lethal and non-lethal effects on aquatic biota, depending on the sensitivity of the species or life stage exposed, and the degree and duration of exposure. Trans Mountain said that hydrocarbons have the potential to effect fish and fish habitat by: altering essential habitat; physically smothering organisms; and exposing fish to acute or chronic toxicity. Trans Mountain said that the primary mechanisms of toxicity identified for fish and fish eggs exposed to hydrocarbons, are: non-polar narcosis and Blue sac disease.

Intervenors raised concern over spilled oil resulting in phototoxicity to fish. Living Oceans Society said that Trans Mountain's application failed to consider any consequences that may result from photo-enhanced toxicity. Trans Mountain said that phototoxicity remains an incompletely understood mechanism of hydrocarbon toxicity, particularly with respect to the phototoxic activity of individual polycyclic aromatic hydrocarbon (PAH) molecules, and exposure to both the PAHs and relevant wavelengths of ultra violet light. Trans Mountain said it agrees with intervenors that phototoxicity is a recognized mechanism of hydrocarbon toxicity to juvenile fish. Beyond this however, Trans Mountain said it believes that phototoxicity is not the primary mechanism of toxicity likely to be responsible for environmental effects in the event of a crude oil spill. Trans Mountain said that the ecological relevance of PAH phototoxicity remains questionable, and that it should not be used for environmental management decisions unless its ecological relevance is firmly established.

Trans Mountain said that case study evidence shows that effects on fish, fish eggs and larvae are limited to the period of a few days to a few years after a release, depending on a variety of factors. Trans Mountain said that water concentrations are likely to decrease below effects thresholds within days to weeks after a spill and that relatively little oil appears to become entrained into riverbed gravels where it would remain subject to weathering so that recovery would likely occur over a period of weeks to months. Trans Mountain said that oil could persist for long periods of time in silty sediments when deposited in slow-moving areas of water. It further said that although the uneven distribution of hydrocarbons in sediment could result in some areas where effects on developing fish eggs could occur, it is equally likely that areas with lower deposition would remain unaffected. Trans Mountain indicated that, depending upon the type of oil spilled and the characteristics of the receiving environment, a portion of the reproductive capacity of a single year-class of fish could be lost, and that recovery would occur in subsequent years.

Trans Mountain said that floating aquatic plants would be killed if it came in contact with an oil slick. It said that submerged aquatic plants would be less vulnerable, as they would be exposed primarily to dissolved hydrocarbons and are not considered likely to fall within the most sensitive groups of aquatic biota to such exposure. Trans Mountain said that emergent aquatic plants would generally be quite tolerant of moderate exposure to floating oil (such that a portion of the stem was oiled). Trans Mountain said that aquatic plants are not expected to be an important part of the ecological structure of most of the larger rivers crossed or paralleled by the proposed pipeline corridor, as the rivers draining in mountainous areas of western Canada have high water levels and flow rate, as well as high turbidity level, that would limit the quality of habitat for aquatic vegetation.

Trans Mountain said that shoreline and riparian vegetation are expected to be affected only in cases where rivers are in flood condition at the time of an oil spill such that the riparian areas are overwashed by oil. Trans Mountain said that areas subject to heavy oiling, such as the initial overland flow path from a spill site to the aquatic environment, may require aggressive remedial actions so that all habitat is initially destroyed, then reconstructed and seeded with appropriate native seed mixes. It said that annual plant communities typically recover from moderate oiling within one or two years.

Trans Mountain said that aquatic invertebrates exhibit a broad range of sensitivity to hydrocarbon exposure. Sensitive species such as stoneflies, mayflies and caddisflies would be expected to respond to dissolved hydrocarbon exposure at

levels similar to sensitive fish species, while other invertebrates are expected to be more tolerant. It said that case studies show that although benthic invertebrate community biomass and diversity are affected by oil spills, they recover quickly.

Participants provided evidence that described the various effects, both acute and chronic, from exposure of aquatic biota to spilled oil. Of particular concern was potential for spilled oil to enter the Fraser River and estuary, and the corresponding impacts on important commercial, recreational, and cultural fisheries, such as Pacific salmon. Raincoast Conservation Foundation said that 42 species of fish use the Lower Fraser River and estuary for a part or all of their lifecycles and specifically highlighted Pacific salmon. It said that due to the large diversity of populations and their variable life histories and use of the lower river, there is not time of year when salmon are not vulnerable to an oil spill. Raincoast Conservation Foundation indicated that Pacific salmon currently face numerous natural and anthropogenic stressors. It further indicated that cumulative effects and effects associated with historical oil spills worked in combination to negatively impact fish species. Raincoast Conservation Foundation said that a spill during peak migration of economically important or at risk species could be devastating to those populations.

Trans Mountain's qualitative ecological risk assessment for the Fraser River and Delta near the Port Man Bridge B.C. spill scenario indicated that the magnitude of an oil spill effect on the fish and fish eggs, and aquatic invertebrates aquatic receptors would be of low magnitude and have a short recovery period. Trans Mountain indicated for the aquatic vegetation receptor, the magnitude of oil spill effects would range from low to high, depending on the season, and that recovery would occur between 1 year and 18 months. Metro Vancouver said that Trans Mountain's qualitative risk assessment is largely subjective and poorly validated, and assumed an optimistically continuous window within which clean-up and remediation was possible. Metro Vancouver said it anticipates that impacts of spill into the Fraser River or its connected tributaries, directly or via overland delivery, are anticipated to have much larger scale impacts that take much longer to remediate, if they can be remediated at all.

Trans Mountain recognized the biological importance and significant diversity of fish in the Fraser River and estuary. It said that a crude oil spill into the Fraser River could have substantial negative effects that could be long lasting if prompt and effective measures were not taken to mitigate the immediate effects by containment and recovery. Trans Mountain said that evidence from actual case studies showed that freshwater ecosystems recover from oil spills, often within relatively short periods of time.

Participants also raised concerns over the potential for spilled oil to submerge or sink. The City of New Westminster said that once dilbits sink to the bottom of a river, stream, or lake, hyporheic flows can introduce dissolved hydrocarbons from oil stranded in gravels into the surrounding water. It said that at low flow rates, hydrocarbon concentrations in interstitial waters of spawning shoals would likely achieve concentrations that would reduce embryo survival of fish and fisheries productivity and have ongoing impacts on benthic invertebrates. Trans Mountain indicated that in past spills, such as the Kalamazoo River, that crude oil deposition to sediments occurred primarily in quiescent, soft-bottom areas of the river (particularly within impoundments) and not in net-erosional areas of the river bed such as gravel or cobble bed sections. Trans Mountain said that it is unlikely that a large proportion of spilled crude oil in the Lower Fraser River would be deposited to sediment. It said that oil that might be deposited to sediment would not find a quiescent environment where it could be trapped, as it did in the Morrow Lake head pond in the Kalamazoo River. Trans Mountain said that gravel and sand river bed materials would continue to be dispersed and moved down-river by natural process in the river bed. These processes would tend to break the oil up and further admix it with sand and silt particles, which would also help to facilitate biodegradation of the oil.

Metro Vancouver said that since oil in freshwater environments is more likely to sink, clean-up efforts aimed at rehabilitating freshwater systems are expected to be more physically damaging to the habitat. It said that dredging and removal of contaminated substrates and vegetation may be required after dilbit settles, and that if this is required within a major salmon migration corridor such as the Fraser River, the stirring up of sediments and presence of humans and equipment could further impede successful migration and spawning success. Metro Vancouver said that the cleanup for the Kalamazoo dilbit spill has proven extremely difficult for these reasons, and despite experimenting with many different cleanup techniques, no highly effective methods appeared to emerge that dealt with sunken dilbit and did not cause extensive harm to the environment.

Participants also raised concerns regarding oil spills having long-term consequences on aquatic species at risk. The City of New Westminster said that a spill in watercourses inhabited by Nooksack dace or other SARA-listed species would potentially have a significant impact on the recovery of these species.

Soil

Trans Mountain said that hydrocarbon in soil could adversely affect soil productivity and soil invertebrates. It said that emergency response activities could further affect soil by admixing, compaction, rutting, and erosion.

Trans Mountain said that remediation activities would result in restoration of soil quality to levels that would support the recovery of both plant and invertebrate life, and that prior land use could be restored in the short to medium term.

Terrestrial vegetation

Trans Mountain said that effects of spilled oil could include physical smothering, habitat modification and toxicity, resulting in the death of plants and of contacted foliage and that oiling could lead to ecosystem changes, including loss of overall diversity, rare species and rare ecological communities. Trans Mountain said that response and remediation activities could disrupt habitat and provide an opportunity for invasion by non-native or weedy species. It said that areas subject to heavy oiling may require aggressive remedial actions (likely requiring extensive excavation), meaning that all habitat is initially destroyed.

Trans Mountain said that annual plant communities typically recover from moderate oiling within one or two years, while forest communities could require longer than 10 years. Metro Vancouver said that plant species of conservation concern and sensitive plant communities would likely be lost permanently in locations affected by a terrestrial spill because it is difficult to remediate and re-establish conditions that replicate those that supported rare plant assemblages.

Wetlands

Trans Mountain said that potential effects of spilled oil include death of plants and die back of contacted foliage, alteration of habitat through changes in species composition, and that contaminated sediments can negatively affect rooted aquatic plants and re-contaminate the water if disturbed. It said that areas subject to heavy oiling may require aggressive remedial actions so that all habitat is initially destroyed. The National Oceanic Atmospheric Administration Shoreline Assessment Manual filed by Cowichan Tribes said that for marshes, natural removal rates are very slow and that thick oil on vegetation is usually removed when the vegetation dies back and sloughs off.

Trans Mountain said that recovery of wetlands generally begins about 12 months after the spill and is effectively complete after five years. It said that much aquatic vegetation regenerates from buried root systems, in which case recovery is essentially complete in the year following the spill. It said that oil spilled in wetlands tends to have a long residence time, can cause interior oiling and pooling, may result in a slow rate of recovery in some wetlands, and that there have been instances where wetlands can take upwards of 20 years to naturally recover from a spill. Trans Mountain said that it is committed to achieving the goal of no-net-loss of wetland function in the case of a spill, and that it would use the wetland baseline information collected pre-construction for comparison with post-spill reclamation.

The City of Surrey and Metro Vancouver said that a spill in bogs and fens (such as in Surrey Bend Regional Park) can be particularly problematic, given that oil would tend to saturate peat layers, and that this would necessitate the complete removal of the peat and other surface vegetation during spill cleanup. They said that restoration of bogs and fens is not straightforward because they develop over considerable periods of time with the slow accumulation of peat.

Wildlife

Trans Mountain said that exposure to oil in the freshwater environment from a pipeline spill could result in lethal and sub-lethal effects on mammals, birds, amphibians, and reptiles from various effects pathways (loss of waterproofing of fur or feathers, ingestion or inhalation of toxins, dermal exposure, reduced mobility, and decline in food availability).

B.C. Nature and Nature Canada raised concerns about the mortality of aquatic birds caused by a crude oil spill from the pipeline. In response to their concerns, Trans Mountain said that any mortality of birds caused by a crude oil spill would be a significant adverse environmental effect, and no such mortality of birds is acceptable under any circumstances. Trans Mountain said that, while the ecological risk assessment did not directly consider exposure to lingering oil, such effects would be implicitly incorporated into estimates of recovery.

Based on the detailed quantitative risk assessment for the modelled credible worst-case 160 m^3 spill at the WMT, Trans Mountain concluded that mortality of terrestrial wildlife is not likely to result from minor exposure to crude oil. While there could be exposure of terrestrial wildlife to floating crude oil, Trans Mountain said that such exposure would affect only a small portion of overall wildlife habitat and the effects were likely to be minor.

Trans Mountain said that its Emergency Response Plan would include measures to protect wildlife and wildlife habitat, including species at risk and critical habitat, in the event of an oil spill.

Trans Mountain said that the population recovery of mammals and birds could take up to five years, depending upon the extent of the injuries, and the reproductive capacity of the affected population. Trans Mountain said that the recovery of amphibian populations would be fairly rapid (i.e., one or two breeding cycles) because of their high reproductive potential. Trans Mountain also said that turtles tend to be long lived and have lower reproductive potential so recovery from serious harm at the population level could take longer, potentially five years or more.

Marine sediment

Trans Mountain said that sedimentation of oil may occur when dispersed oil enters the water column if it combines with suspended particulate matter, and settles to the bottom. Trans Mountain said that the results of the oil spill modelling indicated that negligible amounts of oil would become suspended as droplets in the water column, due to the sheltered nature of Burrard Inlet and the relatively viscous characteristic of the oil. Therefore, it was unlikely that a smaller spill of CLWB would result in any high magnitude or long lasting negative effects in the sediment.

Marine vegetation

Numerous participants expressed concerns about the effects of oil spills on particularly productive and sensitive marine vegetation communities, such as the salt marshes at the Maplewood Conservation Area in Burrard Inlet and the brackish marshes of the Fraser River. ECCC said that, depending on the volume, location, time of year, and other factors, an oil spill could have serious, long-lasting effects on important habitats such as marshes. Trans Mountain said that marshes generally occupy the upper end of the intertidal zone where oil is more likely to become stranded and impacts can be severe, including conspicuous death of the aboveground or above-water vegetation. It said that plants can have high survival rates where the upper portion of the vegetation remains un-oiled, allowing for respiration and photosynthesis to continue.

Trans Mountain said that where there is heavy oiling, measures may be required to remove as much of the oil as needed to speed the overall rate of recovery. It said that intrusive remedial options, such as mechanical oil removal, vegetation cutting and removal, and sediment reworking/tilling, have the potential to cause additional adverse effects, such as damage to plant roots and/or mixing oil into the soils.

Potential effects on other marine vegetation communities, such as eelgrass and kelp beds, are discussed in Chapter 14, Section 14.9.

Trans Mountain said that marshes generally recover on their own within one or two growing seasons after light to moderate oiling, and that plants that grow from rhizomes in the soil or sediment usually regenerate even if the aboveground portions exhibit die-back. It said that, with the implementation of appropriate oil spill response activities, recovery of oiled shoreline habitat within two to five years following a large spill is a reasonable expectation, and referenced studies from a number of previous spills.

Cowichan Tribes questioned the assertion of complete recovery within two to five years, and said that Trans Mountain did not discuss the potential for residual effects resulting from disruption of biological community structure. Cowichan Tribes said this process can, in turn, free up habitat space which can be utilized by opportunistic species that can slow or inhibit the recovery of the original community.

A number of participants said that there is potential for long-term retention of oil in marshes. Trans Mountain said that it does not dispute that small amounts of crude oil can become sequestered and remain in brackish marshes and that small amounts of sequestered oil do get released, but said that there is no direct link between such low levels of exposure and biological effects at the individual or population level.

Tsawwassen First Nation filed a study of the Louisiana salt marshes following the BP-Deepwater Horizon oil spill. The results included a finding that marsh vegetation displays remarkable resilience to oil spills, and that the effects of the oil concentrate and are confined to the marsh edge, so that the marsh vegetation recovers fully in non-eroded areas after approximately one and a half years. However, the study also found that death of the stabilizing root matrix at the edge of marshes, characterized by erosive edges or cliffs, led to accelerated erosion and permanent marsh ecosystem loss.

Marine fish

Trans Mountain said that two major mechanisms of toxicity to fish are non-polar narcosis and Blue sac disease. Trans Mountain said that acute effects of hydrocarbon exposure on fish are generally caused by exposure to relatively soluble components of crude oil, and that these compounds also tend to be volatile and are rapidly lost to the atmosphere so the initial 24 to 48 hours following an oil spill represent the timeframe when acute toxicity is most likely to occur.

Trans Mountain said that the potential for toxicity to the marine fish community is greatest near the surface where more soluble hydrocarbons can dissolve from the floating fresh oil or form droplets that can be temporarily dispersed down in to the water column by wave action. Trans Mountain said that extensive formation and dispersion of oil droplets into the water

column is unlikely to occur in the sheltered waters of Burrard Inlet. It said that the potential for acutely toxic concentrations of hydrocarbons to extend down into deep water is very low, due to the limited solubility of hydrocarbons and the dilution that would accompany mixing into deep water.

Trans Mountain said that its ecological risk assessment indicated that fish habitat would be affected by the WMT credible worst-case spill scenario. It said that due to the limited fetch in Burrard Inlet and the low potential for dissolved hydrocarbon concentrations in water to reach thresholds that would cause mortality of fish or other aquatic life, the potential for negative effects is generally low. Trans Mountain said the risk would be greatest in shallow water areas under weather conditions that caused spilled oil to be driven into shallow areas with wave action, leading to localized high concentrations of dissolved hydrocarbons in the water. Trans Mountain said that this could result in the death of fish, as a result of narcosis, or could cause abnormalities in developing embryos if spawn was present. Trans Mountain said that negative effects would be greatest if the spill occurred at a time when shallow water was being used as spawning or nursery areas for marine fish and invertebrates. Trans Mountain said that the area with the highest probability of effects is located near the confluence of Indian Arm and Burrard Inlet. It said that critical habitats and spawning areas, as well as developing eggs and embryos in shallow water habitat located in proximity to the WMT, would be most likely to be affected.

Living Oceans Society said that diluted bitumen entrained into the water column can be ingested directly by fish, and by numerous other species of jellyfish and other free-swimming suspension feeders. It said that free-swimming suspension feeders that accumulate submerged diluted bitumen provide an indirect route for contaminating their predators, which include juvenile, sub-adult and adult salmon species associated with the Fraser River watershed and also salmon hatcheries in Burrard Inlet. It said that contamination of these species, in turn, provides a pathway for secondary exposure for other species that consume them, such as marine mammals. In addition, suspension feeding organisms inhabiting shorelines are also vulnerable to oil exposure through ingestion of submerged oil droplets entrained in the water column.

Trans Mountain said that recovery of the marine fish community would occur in the short-term because of the limited spatial extent of potential effects of spilled oil on fish and fish habitat, and the generally low potential for the credible worst-case scenario to cause acute lethality to fish. Trans Mountain said that even under a worst-case outcome event where a localized fish kill might be observed, it is expected that the lost biological productivity would be compensated for by natural processes within one to two years. Tsleil-Waututh Nation indicated that an oil spill could result in the local extinction of culturally important species.

Trans Mountain said that the ecological risk assessment indicates that near shore and shoreline habitats would be affected by the WMT credible worst-case oil spill scenario. It said the area with the highest probability of oiling and negative effects is located near the confluence of Indian Arm and Burrard Inlet. Trans Mountain said that very little of the potentially affected shoreline habitat in Burrard Inlet is the type that would tend to sequester spilled oil. It is expected that Shoreline Cleanup and Assessment Technique would be applied to the spilled oil that reached shorelines, and that most of this oil could be recovered. Trans Mountain said that biological recovery from spilled oil, where shoreline communities were contacted by and harmed by the oil or by subsequent cleanup efforts, would be expected to lead to recovery of the affected habitat within two to five years and that these conclusions are consistent with evidence from the Westridge delivery line release caused by third-party damage.

Living Oceans Society said that oil impinging on shorelines may kill organisms that respire aerobically by smothering them. It said that embryos of fish and other species that develop on the intertidal or shallow subtidal reaches of shorelines may die from toxic effects, and if mortalities of intertidal organisms are widespread and nearly complete, as is often the case when shorelines are smothered by oil or when cleanup operations are extensive and highly damaging, these communities may require years to recover. Living Oceans Society said that once incorporated beneath the surface of some beaches, diluted bitumen may persist for considerable periods in the absence of physical disturbance and that these lingering reservoirs of diluted bitumen pose long term threats to intertidal organisms.

Participants also raised concerns over the potential impacts from oil spill cleanup measures. Living Oceans Society indicated that shoreline cleanup methods could result in mortality of organisms. Musqueam Indian Band said that oil dispersants have been shown to increase the toxicity of petroleum oil to aquatic life, both experimentally and in the field. It said that research has also shown that dispersants alone can be toxic to fish in the absence of petroleum. Trans Mountain said that dispersant use is not pre-approved for use in Canada today and can only be undertaken on a case by case basis, which will involve a Net Environmental Benefit Analysis. Trans Mountain said that it is generally accepted practice that dispersants are precluded from use in the following conditions which are present in areas of Burrard Inlet: dispersants are not used in shallow water (depth less than 10 to 20 m) to avoid the dispersed oil from contacting the seabed; dispersants are not used in the presence of filter feeding organisms that could ingest the dispersed oil; and dispersants are unlikely to be used in fish spawning habitats or within the area of shallow water fisheries.

Trans Mountain said that the portion of the 2007 Westridge delivery line spill that ran into Burrard Inlet and its remediation resulted in intertidal habitat loss, mortality of intertidal fauna, such as starfish, barnacles and limpets, and limited and localized effects to subtidal organisms. Trans Mountain said that there was no evidence of direct effects on fin-fish species

from the 2007 spill. Trans Mountain said that surface samples collected one and two weeks after the incident were below detection limits for extractable petroleum hydrocarbons. While concentrations of polycyclic aromatic hydrocarbons were above detection limits at a few locations, none exceeded water quality guidelines that are protective of the marine environment. The follow up monitoring and assessment report concluded that oil concentrations in the water column likely peaked soon after the release, and decreased to background levels within days.

Marine mammals

Trans Mountain said that aquatic mammals, such as sea otter, river otter and mink that rely upon fur for insulation in cold ocean water, are extremely sensitive to oiling with a high potential of oil ingestion if coastal habitat is oiled. It said that marine mammals that rely upon blubber for insulation are less sensitive to external oiling, although the potential for mortality cannot be ruled out due to other exposure pathways or mechanisms, and that oil ingestion remains a potentially important exposure pathway. Trans Mountain also noted that fouling of baleen plates can have adverse effects on baleen whales.

Trans Mountain said that its ecological risk assessment indicates that marine mammals and marine mammal habitat would be affected by the WMT credible worst-case oil spill scenario. It said that the area with the highest probability of oiling is located at the confluence of Indian Arm and Burrard Inlet. Trans Mountain said that the actual effects would depend upon the size of the oil spill, the efficacy of measures intended to promptly contain and recover spilled oil, the ability of oil spill responders to capture and treat oiled animals, and the intrinsic sensitivity of the animals to exposure. Trans Mountain said that animals like the otter would be most at risk, with lower potential for mortality of harbour porpoise and harbour seals. It said that exposure of other whales and pinnipeds was quite unlikely due to their low occupancy in Burrard Inlet and that at the population level, lost individuals would likely be compensated for by natural processes within one to two years. Trans Mountain said that following the 2007 Westridge delivery line spill, three dead harbour seal pups were found, but cause of death could not be determined and only one had signs of oiling. Trans Mountain said that no other effects on marine mammals, including otters, were reported in Burrard Inlet from the 2007 spill.

Living Oceans Society said that a major spill of diluted bitumen in Burrard Inlet or near the Fraser River estuary could inflict population-level mortalities on resident and migratory marine mammals. It said that oil spills are capable of causing extensive mortalities of marine mammals when present in large numbers and that an estimated 300 harbour seals and 2,800 sea otters died as a result of the Exxon Valdez oil spill. Living Oceans Society said that large-scale mortalities of birds and mammals could de-stabilize or permanently alter the food web of Burrard Inlet and the Fraser River estuary, and cause ecosystem-level effects there and beyond.

Marine birds

Trans Mountain evaluated potential environmental effects on marine birds from exposure to floating oil based on predicted thickness of oil on the surface of the water. Trans Mountain assumed that harm would result in any area where slick thickness is 10 micrometres or greater, but that mortality is not likely to occur in areas with lesser exposure to oil.

Several participants raised concerns about oiled birds. B.C. Nature and Nature Canada raised concerns about the methodology Trans Mountain used to determine effects on marine birds from oil spills from the WMT. B.C. Nature and Nature Canada said oil slick thickness thresholds used by Trans Mountain to evaluate effects of oil spills on marine birds may underestimate marine potential effects of a spill on marine birds.

Trans Mountain said that potential effects on marine birds and mammals exposed to crude oil on the water surface were evaluated using a commonly applied benchmark. Based on the detailed quantitative risk assessment for the modelled credible worst-case 160 m^3 spill at the WMT, Trans Mountain concluded that seabirds such as sea ducks, cormorants, gulls and other species could be exposed to crude oil in the event of a spill. However, in the context of the Burrard Inlet Important Bird Area, the area of effect is small, and population-level effects on birds were unlikely.

ECCC recommended that critical habitat in any section of the pipeline corridor and facility areas be considered in the development of Emergency Response Plans. Trans Mountain committed to consider species at risk and critical habitat in development of Emergency Response Plans.

Trans Mountain said that operational spills, should they occur at the WMT, would be mitigated through the use of protective booming at the terminal and around vessels being loaded. It said that small oil spills that remain confined in the protective boom and are quickly remediated would have very minor effects in terms of exposures to wildlife. It said that in the unlikely event of a credible worst-case spill and if some of the crude oil were to escape from the protective boom, greater environmental effects would result.

B.C. Nature and Nature Canada raised concerns about effects of chronic oil spills on marine birds. Trans Mountain said that the vessels calling on the WMT are required by law to follow the *Vessel Pollution and Dangerous Chemicals Regulations* made under the *Canada Shipping Act, 2001*. Trans Mountain said that it would provide reception facilities at the WMT to service

the needs of the Project-related marine vessels. Trans Mountain would also screen the tankers calling on the WMT to check for malfunctions to pollution prevention equipment or history of non-adherence to provisions of the *Canada Shipping Act, 2001* and MARPOL.

Trans Mountain noted that taking into account the oil spill recovery and wildlife protection actions that would follow an accidental oil spill, it remains likely that seabirds would be harmed by an accidental spill at the WMT. However, at the population level, lost individuals would likely be compensated for by natural processes within one to two years.

Views of the Board

The Board acknowledges the concerns raised by participants in regards to Trans Mountain's ecological risk assessments, but is of the view that Trans Mountain's ecological risk assessments methods were appropriate. The Board disagrees with intervenors, such as Metro Vancouver who critiqued Trans Mountain's ecological risk assessment, stating it was largely subjective and poorly validated. The Board finds that Trans Mountain provided a comprehensive ecological risk assessment that provided the Board with an indication of the potential effects of an oil spill. The Board acknowledges that while the evidence filed by intervenors offered context to the discussion of potential effects of an oil spill, it generally lacked any structured approach commonly applied in ecological risk assessments.

The Board is of the view that the effects of a spill from the pipeline, a storage terminal, or the WMT would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time, the effectiveness of containment and cleanup, the valued components that are impacted, and the weather and time of year of the spill.

For example, a small spill contained within the Project footprint on frozen ground could have relatively minor and non-significant effects. On the other hand, a credible worst-case spill and subsequent cleanup activities could impact numerous valued components, and effects on those components could be long-term, of regional geographic extent, and of high magnitude, as summarized by Trans Mountain and the participants. Although such effects would be expected to diminish over time with the implementation of cleanup activities and the process of natural degradation of the oil, if such an event occurred, its effects would probably be adverse and significant.

The Board is of the view that although impacts from a credible worst-case spill would probably be adverse and significant, natural recovery of the impacted areas and species would likely return most biological conditions to a state generally similar to pre-spill conditions. Such recovery may be as quick as a year or two for some valued components, or may take as long as a decade or more for others. Valuable environmental values and uses could be lost or diminished in the interim. For some valued components, including certain species listed under the SARA, recovery to pre-spill conditions may not occur.

Therefore, the Board would require Trans Mountain to provide finalized Emergency Response Plans (Conditions 125 and 126). The Board would require Trans Mountain to identify High Consequence Areas, including species at risk critical habitat, and incorporate these considerations into the development of their Emergency Response Plans.

For the purposes of the CEAA 2012, the Board finds that effects from a credible worst-case spill would be adverse and significant. However, as discussed in Chapter 9 with regard to the likelihood of spills, the Board finds that such events are not likely. Therefore, the Board recommends that there are not likely significant adverse effects for the purposes of the CEAA 2012.

The Board has incorporated the potential environmental consequences of a spill outlined above into its discussion on spill risks in Chapter 1, and considered them in its overall weighing of the benefits and burdens of the Project in Chapter 2.

Court File No: A-321-19 (lead file),
A-323-19, A-324-19, A-325-19,
A-326-19, A-327-19

FEDERAL COURT OF APPEAL

BETWEEN:

CHIEF RON IGNACE and CHIEF ROSANNE CASIMIR, on their own behalf and on behalf of all other members of the STK'EMLUPSEMC TE SECWEPEMC of the SECWEPEMC NATION, UPPER NICOLA BAND, COLDWATER INDIAN BAND, SQUAMISH NATION, TSLEIL-WAUTUTH NATION, AITCHELITZ, SKOWKALE, SHXWHÁ:Y VILLAGE, SOOWAHLIE, SQUIALA FIRST NATION, TZEACHTEN, YAKWEAKWIOOSE

Applicants

and

ATTORNEY GENERAL OF CANADA, TRANS MOUNTAIN PIPELINE ULC and TRANS MOUNTAIN CORPORATION

Respondents

and

ATTORNEY GENERAL OF ALBERTA

Intervener

BOOK OF MAJOR DOCUMENTS
VOLUME 3 of 4

September 26, 2019

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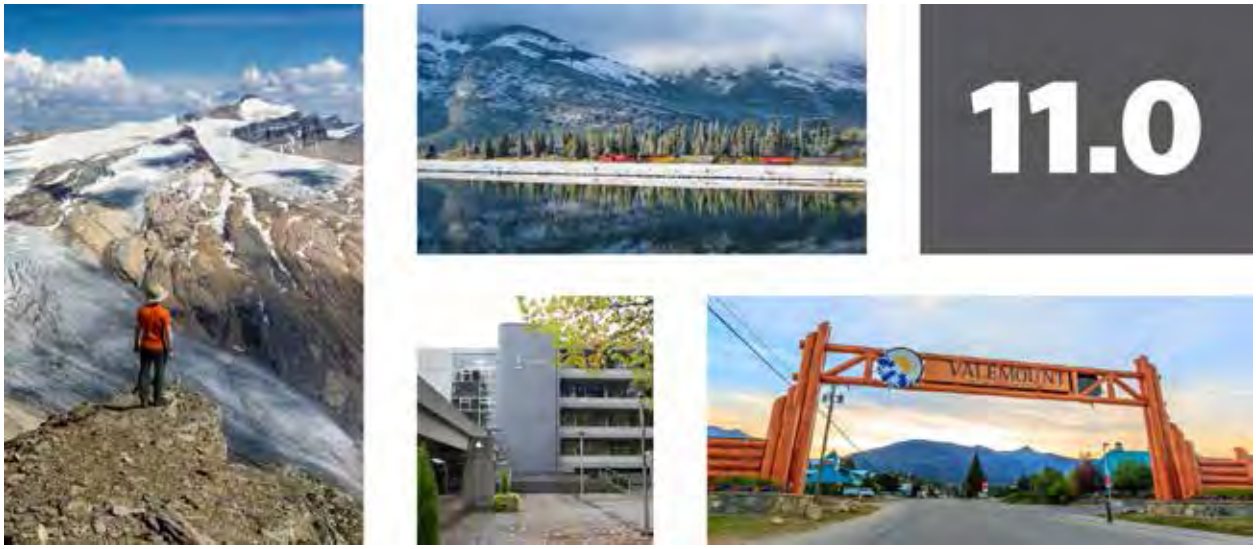

People, communities, and lands

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.) and to replace "Aboriginal" with "Indigenous," the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report.

The Board considered options such as alternate marine shipping routes, marine terminal locations, and alternate mitigation options to reduce the effects in Chapter 14.

The Board's expectations regarding a company's evidence in relation to the potential socio economic effects caused by the existence of a project are set out in the Board's Filing Manual. The evidence is expected to identify and consider the effects a project may have on people and communities in the vicinity of the project right-of-way (RoW) and the project's facilities. The Board uses the information about these effects gained through the evidence filed by the company and by other participants in the hearing to help inform its public interest determination.

This chapter discusses evidence related to the potential direct and indirect socio economic effects of the Trans Mountain Expansion Project, and the Board's views on these matters. The Board's approach to its assessment of the environmental and socio economic effects of the Project is outlined in Chapter 10. The Project's potential socio economic effects resulting from a Project-related increase in marine shipping activities are discussed in Chapter 14.

11.1 Land requirements and routing

The Board requires applicants to provide a description and rationale for the proposed general route of the pipeline, the location of associated facilities, and the permanent and temporary lands required for the project. The Board also requires a description of the land rights to be acquired, as well as the land acquisition process and the status of land acquisition activities. This information allows the Board to assess the appropriateness of the proposed general route of the project, the proposed land requirements and the applicant's land acquisition program. The Board is also required to assess the alternate means of carrying out a project pursuant to section 19 of the *Canadian Environmental Assessment Act 2012* (CEAA 2012).

During the hearing, the Board considered the general route proposed for the Project, the potential environmental and socio-economic effects of the Project, as well as all evidence and commitments made by Trans Mountain regarding the design, construction and safe operation of the pipeline and associated facilities. The detailed route for the Project has not been finalized. If a certificate is issued, Trans Mountain is required to file its Plan, Profile and Book of Reference (PPBoR) with the Board, as set out in sections 33 through 39 of the *National Energy Board Act* (NEB Act). This will enable the Board to consider the best possible detailed route for the Project. It is during this detailed route approval process that landowners may submit any written objections they have to the proposed location of the pipeline on their property, and a detailed route hearing may

be held to further consider the best possible detailed route at that location, or the most appropriate methods or timing of the construction of the pipeline.

11.1.1 Land rights and acquisition

Trans Mountain said that, in order to construct, operate and maintain the pipelines, facilities and Project infrastructure, land rights must be acquired from Crown and private landowners in both Alberta and B.C. It identified a 150 meter-wide corridor for the proposed pipeline route. Trans Mountain said that it made the decision early in the planning phase of the Project to study and apply for a pipeline corridor rather than the approximately 45 m RoW that would be required during construction. This would allow a certain amount of flexibility for minor alignment adjustments during the detailed engineering and design phase.

Trans Mountain said that the new pipeline would be adjacent to the existing Trans Mountain Pipeline (TMPL) easement for 73 per cent of the total length, and would parallel other existing RoWs 16 per cent of the total length. A new pipeline corridor would be required for 11 per cent of the total length of the proposed pipeline route.

The estimated requirements to construct, operate and maintain the pipeline, facilities and associated infrastructure are listed in Table 13. Trans Mountain said that the actual quantities would be determined at completion of engineering design and construction planning.

Table 13: Land area summary

Requirements	Land Area Required in Alberta (ha)	Land Area Required in B.C. (ha)	Other Considerations
RoW	621.2	1,178.9	18.3 m wide combination of existing TMPL and new RoW. Proportion to be determined following engineering design.
Temporary workspace	906.2	1,726.8	Average 26.7 m wide.
Westridge Marine Terminal	--	1.4	The current dock extends 75 m into Burrard Inlet and the new dock is anticipated to extend approximately 250 m into Burrard Inlet. Maximum marine footprint of construction activities may be approximately 350 m into Burrard Inlet.
Black Pines pump station	--	2.25	Freehold forested land. New permanent access roads will be required for the new Black Pines Pump Station located less than 0.5 km from the nearby road and within a 15 to 20 m wide RoW.
Darfield pump station	--	0.07	Freehold agricultural land.
Hinton pump station	0.3	--	Freehold forested land.
Supplemental overhead power service:			
Edson pump station	To be determined	--	
Edmonton terminal	0.3	--	Approximately 100 m at 30 m wide RoW.
Kingsvale pump station	--	117.5	Approximately 24 km at 50 m wide.
Black Pines pump station	--	12.0	Approximately 2.4 km at 50 m wide.
Temporary construction lands:			
Construction camps	3 to 5	6 to 10	One site in Alberta, two sites in B.C.
New access	To be determined	To be determined	Access roads to the new pipeline construction RoW, where it is not contiguous with the existing pipeline alignment, will be from existing public and private access points and roads, controlled existing access, rights-of-way of others, and existing shoo-flies and trails. Where temporary access roads and shoo-flies are required, these will typically be 5 m wide to accommodate equipment and machinery.
Stockpile sites	23	44	Four sites in Alberta; eight sites in B.C.

Trans Mountain said that no additional permanent land is expected to be required at the Edmonton, Kamloops, Sumas and Burnaby terminals, although temporary offsite staging/parking areas could be required. This temporary requirement would be determined during construction planning.

Trans Mountain requested that the Board issue an order, pursuant to section 58 of the NEB Act, exempting it from the requirements of subsections 31(c), 31(d) and 33 of the NEB Act in relation to yet to be specified select temporary lands or infrastructure required for construction of the Project. In its Application, Trans Mountain provided a list of preliminary locations for camp sites, stockpile sites, and new temporary and permanent access roads.

The Stó:lō Collective raised concerns regarding Trans Mountain's plan to place a Project staging area on one of their important spiritual and burial sites called Lightning Rock.

Table 14 provides the geographic distribution and relative percentage of Crown and private lands traversed by the proposed pipeline corridor.

Table 14: Land ownership for proposed pipeline corridor

Breakdown of Crown and Private Tracts of Land	Alberta	B.C.	Total	Percentage
Total Crown Tracts	331	662	993	25.71
Total Private Tracts	682	2 157	2 839	73.50
Total Indigenous Tracts	0	31	31	0.80
Total Unknown Tracts	0	6	6	0.01
Total Tracts	1 013	2 856	3 869	--

As described in Chapter 4, Trans Mountain said that it consulted with landowners and occupants within the applied-for 150 meter-wide pipeline corridor and alternate corridors, as well as those within 1.5 km of the pump station locations. In addition to the consultation it has already undertaken, Trans Mountain said that it would seek all necessary land rights and approvals for the new pipeline, Black Pines pump station site, additional land for expansion of the two existing Darfield and Hinton pump station, and for temporary workspace for the pipeline, power lines and cathodic systems, by negotiating for easement or statutory RoW agreements, temporary workspace agreements, lease agreements, and fee simple purchase agreements.

Trans Mountain said that the land acquisition process commenced in May 2014, and that all land would be acquired with strict adherence to, and in accordance with, the provisions of the NEB Act. As of 31 December 2014, Trans Mountain said that in Alberta, it had provided service of notices, pursuant to section 87 of the NEB Act, to approximately 50 per cent of landowners and had executed approximately 17 per cent of the total easement agreements required. In B.C., it had provided service of notices, pursuant to section 87 of the NEB Act, to approximately 14 per cent of landowners and had executed approximately 4 per cent of the total easement agreements required.

The Collaborative Group of Landowners Affected by Pipelines and Metro Vancouver expressed concern with the methodology Trans Mountain used for establishing market value for the purposes of determining the value of land rights acquired for the Project. In response to this concern, Trans Mountain said that, based on research undertaken by accredited appraisers, B.C. Assessment valuations had been used as a basis for residential properties but values included an uplift to address any undervaluation that existed. It said that for non-residential properties, such as park lands, appraisers took into consideration zoning and development restrictions, as well as market values for lands adjacent to, but without such zoning.

11.1.2 Alternative means of carrying out the Project

As required under the CEAA 2012, section 19, the Board considered alternative means of carrying out the Project, including Project-related marine shipping. These alternatives represent various technically and economically feasible ways that an applied-for project can be carried out, and which are within Trans Mountain's scope and control. This chapter discusses alternative means in relation to the pipeline component and Westridge Marine Terminal.

During the MH-052-2018 hearing, the Board considered alternative means of carrying out Project-related marine shipping, and the environmental effects of such alternative means under Issue # 3 in the List of Issues (Appendix 1). The Board

considered options such as alternate marine shipping routes, marine terminal locations, and alternate mitigation options to reduce the effects in Chapter 14.

11.1.2.1 Pipeline corridor selection process

Trans Mountain said that it selected its pipeline corridor route by applying the following hierarchy of routing criteria:

- siting the proposed corridor on, or adjacent to the existing TMPL or adjacent to easement or rights-of-way of other linear facilities;
- siting the proposed corridor in a new easement selected to balance a number of engineering, construction, environmental and socio-economic factors; and
- minimizing the length of any new easement before returning to the TMPL easement or other rights-of-way.

Several participants expressed concern that there was not adequate information on the detailed route of the pipeline and therefore, they were not able to fully assess the impacts that the Project could have on their respective interests. Metro Vancouver said that the final routes and maps were still in planning phases and it appeared that much of the environmental impact analysis had not been completed on the proposed and possible alternate routings. It said that it has not been provided with the exact pipeline routing, and this was a significant concern given that the routing affects many of the sensitive ecosystems, species at risk, regional parks and greenways, infrastructure, health and air quality, seismic hazard concerns, emergency response, regional planning and cumulative impacts. Metro Vancouver said that the iterations related to proposed and alternate routes had made it virtually impossible to assess the potential impacts that the pipeline construction and operations would have upon the Metro Vancouver environment, especially on sensitive ecosystems, riparian areas, geological environments, Regional Parks and infrastructure owned by Metro Vancouver.

11.1.2.2 Pipeline corridors in parks and protected areas

Various intervenors raised concerns about the Project routing through B.C. Provincial Parks and other protected areas. Issues raised included proposed routing through provincial parks (rather than avoiding them), concerns around park boundary adjustments, and the Project's potential effects on the biophysical nature of parks.

Trans Mountain said that, in consultation with the Ministry of Environment and B.C. Parks personnel, it determined that the proposed routing within provincial parks would require the temporary adjustment of park boundaries at each of Finn Creek Provincial Park, North Thompson River Provincial Park, Lac du Bois Grasslands Protected Area and Bridal Veil Falls Provincial Park, to facilitate construction within the park. Trans Mountain said that this could be achieved by submitting a Boundary Adjustment Request to B.C. Parks under the *B.C. Park Act*, and in accordance with the March 2010 Provincial Protected Area Boundary Adjustment Policy, Process and Guidelines.

Trans Mountain said that it considered alternative corridor locations to avoid or reduce Project effects on provincial parks as part of its Boundary Adjustment Proposal to B.C. Parks.

Lac du Bois Protected Area

B.C. Nature and Nature Canada, and the Grassland Conservation Council of British Columbia raised concerns about the pipeline corridor passing through the Lac du Bois Grassland Protected Area and suggested alternate routing options to avoid the protected area.

Trans Mountain said that the existing Trans Mountain RoW is effectively "full" and did not have space for the installation of another pipeline. It said that the Telus fiber-optic RoW through the protected area was a very suitable route for new pipeline construction and said that the City of Kamloops preferred the Lac du Bois routing in order to avoid disruption to the community of Westsyde.

A detailed discussion of Project effects on grasslands, including grasslands in Lac du Bois Protected Area, mitigation and offsets committed to by Trans Mountain, and the Board's views on these, is included in Chapter 10.

Colony Farm Regional Park

Various participants raised concerns about the use of Colony Farm Regional Park as a temporary staging area for the proposed trenchless crossing of the Fraser River, given its importance as a wildlife habitat. The City of Coquitlam said that CP Rail has lands or land rights immediately to the west of Colony Farm Regional Park that could be used as a construction staging area.

Trans Mountain said that it was undertaking a detailed construction study to determine if it is possible to remain outside of Colony Farm Regional Park by using the adjacent railway access road and CP Rail spurs. Trans Mountain said that it had not completed this study.

Brunette River Conservation Area

Some intervenors raised concerns about the proposed routing through the Brunette River Conservation Area.

Trans Mountain said that it preferred the Brunette River Conservation Area option because it would result in fewer impacts to residential and commercial properties as well as urban infrastructure. The corridor that follows the existing pipeline RoW outside of the Brunette River Conservation Area was unsuitable due to dense residential and urban development immediately on, or adjacent to, the existing pipeline RoW. Trans Mountain said that it would use trenchless construction technology in the conservation area.

11.1.2.3 Coldwater Indian Reserve 1

The Coldwater Indian Band raised concerns about Trans Mountain's preferred pipeline corridor outside of the east boundary of the Coldwater Indian Reserve 1. The Coldwater Indian Band said that its members have a high level of anxiety because of potential added impacts to its drinking water and the Coldwater River.

The Coldwater Indian Band said that Trans Mountain did not consult them about the removal of the various corridor options from consideration. The Coldwater Indian Band said that its preliminary assessment of the corridor options suggested that the West Alternative could be a better option based on the potential effects to its aquifer, its rights and its overall quality of life and sense of well-being.

Trans Mountain said that consultation with the Coldwater Indian Band on the corridor options occurred as early as May 2013 and that it had continued to update the Coldwater Indian Band since the Application was filed with the Board. Trans Mountain maintained that the proposed preferred pipeline corridor was selected following consultation with affected stakeholders and assessment of the route options against the routing criteria established for the Project.

11.1.2.4 Westridge Marine Terminal (WMT)

Trans Mountain said that it considered potential alternative marine terminal locations based on feasibility of coincident marine and pipeline access, and it screened the alternative locations based on technical, economic and environmental considerations.

Trans Mountain said that it considered each of a northern-leg and a southern-leg option for the Project. In its assessment of a northern leg option, it considered marine terminal locations at Kitimat and Prince Rupert. While Prince Rupert was expected to provide superior access for deep draft tankers and to have the most developed port and maritime infrastructure, these advantages were negated by technical challenges and uncertainties related to pipeline access.

Trans Mountain said that, relative to the southern expansion of the existing system, the northern leg option would involve a 250 km longer pipeline, higher capital costs, greater technical challenges, including routing through high alpine areas of the Coast Mountains or extensive tunneling, and fewer opportunities to benefit from existing operations and infrastructure, such as use of the existing Trans Mountain RoW and facilities. Trans Mountain determined that expansion along the existing TMPL route was more favourable.

Trans Mountain said that although use of existing facilities was favoured by best practices, it considered potential southern terminal alternatives. It considered feasibility of requisite pipeline access and the location of storage facilities, as well as marine access by tanker.

Trans Mountain considered six alternative southern terminal locations including Howe Sound, Vancouver Harbour, Sturgeon Bank, Washington State, Boundary Bay and Roberts Bank. Trans Mountain determined that Howe Sound and Vancouver Harbour had no feasible pipeline access, and that Howe Sound, Vancouver Harbour and Sturgeon Bank had no feasible land in close proximity for storage. Trans Mountain further determined that Boundary Bay had insufficient water depth for a marine terminal, and a terminal location at Washington State would require a longer pipeline, depending on terminus location.

Trans Mountain conducted a screening level assessment to assess the Roberts Bank alternative location further. The assessment was conducted based on desktop studies of technical, economic, and environmental considerations for marine access, storage facilities, and pipeline routes to a terminal at that location.

Trans Mountain said that the potential sites in the Lower Mainland and the estuary of the Fraser River delta represent complex environmental values, multiple stakeholders, regulatory regimes, and Indigenous interests. For the purposes of the

screening assessment, Indigenous concerns and interests for the Roberts Bank alternative were assumed to be similar to those for Westridge and likely to include concerns for impacts on traditional rights, environmental protection, and potential interest in economic opportunities.

Trans Mountain concluded that a new marine terminal and pipeline to Roberts Bank would result in significantly greater cost, larger footprint and additional environmental effects, as compared to expanding existing facilities. The Roberts Bank alternative would require a land area of approximately 100 acres for 20 storage tanks, as well as ancillary equipment and buildings, a larger dock structures with a 7 km trestle, and a 14 km longer pipeline that diverges further from the existing pipeline corridor. This alternative would result in an estimated $1.2 billion higher capital cost and assumed higher operating costs.

Trans Mountain said that while both the Westridge and Roberts Bank terminal alternatives have positive and negative attributes, the WMT was selected as the preferred alternative.

Participants, including the City of North Vancouver, raised concerns about the proposed expansion of the existing WMT and assessment of alternative marine terminal locations.

The City of Burnaby said that Trans Mountain did not provide an assessment of the risks, impacts, and effects of the alternate locations proposed for the marine terminal at Kitimat, B.C., or Roberts Bank in Delta, B.C. The City of Burnaby noted that both the alternate locations are more remote than the WMT and are likely to pose significantly fewer risks to tankers than the WMT, and have significantly fewer impacts to densely populated areas.

11.1.2.5 Applied-for alternative pipeline corridor placements

Trans Mountain said that, while it has finalized a preferred pipeline corridor, it identified technically feasible alternative corridors in a limited number of specific areas in response to issues raised during Indigenous, stakeholder and landowner engagement. Trans Mountain said that these alternative corridors provide the flexibility to address remaining Indigenous, landowner or stakeholder issues. Table 15 identifies the alternate corridors for which Trans Mountain is seeking approval.

Table 15: Alternate pipeline corridors

Alternate Corridor Name	Rationale for Applying for Alternate Corridor
Westridge Delivery Lines (using conventional pipeline construction)	Trans Mountain said that in response to feedback from residents and stakeholders in Burnaby requesting that the Project routing minimize disruption to their residential and developed areas, Trans Mountain revised its preferred pipeline corridor for the Westridge Delivery Pipelines to a trenchless installation by tunneling through Burnaby Mountain and underneath Barnet Marine Park. In the event that the tunnel construction method through Burnaby Mountain and under Barnet Marine Park is not feasible, Trans Mountain proposes to use an alternate corridor, which is a trenched pipeline construction following Burnaby streets and the Canadian Pacific rail line from the Burnaby Terminal to the WMT.
River Crossing Contingencies: 1. Pembina River Crossing Contingency Alternate 2. Raft River Crossing Contingency Alternate	In the event of a potential failure of the proposed horizontal directional drilling (HDD) installation, an alternate is required at separate locations to meet the technical requirements of conventional installation methods
B.C. Provincial Parks: 1. Finn Creek Provincial Park 2. North Thompson Provincial Park 3. Lac du Bois Protected Area	The preferred pipeline corridors are subject to the approval of Boundary Amendment application to B.C. Parks. In the event the Boundary Amendment is not approved, an alternate corridor is required outside of the Park boundaries

11.1.2.6 Route re-alignments outside of proposed preferred pipeline corridor

Trans Mountain said that, as of the close of the evidentiary record for the hearing, it was still investigating several alternate pipeline corridors outside of the proposed preferred pipeline corridor it had presented in its Application. These are in proximity to:

- Edmonton Lewis Estates community;

- Ohamil Indian Reserve 1;
- Tzeachten Indian Reserve 13;
- Surrey Bend Regional Park; and
- Coquitlam between Hartley Avenue and United Boulevard or Brigantine Drive.

In order to accommodate these potential alternate corridors, Trans Mountain requested approval from the Board for the preferred pipeline corridor with a condition that, concurrent with the filing of the PPBoR pursuant to section 33 of the NEB Act, Trans Mountain would file with the Board a description of, and supporting information for, any proposed detailed route re alignments located outside of Trans Mountain's preferred corridor.

Edmonton – Whitemud Drive / Lewis Estates

Trans Mountain identified its preferred corridor route as aligning within the Edmonton Transportation/Utility Corridor, including Whitemud Drive, because the original pipeline, which bypassed the city boundaries when first built, was now located within the city boundaries.

The City of Edmonton objected to Trans Mountain's use of Whitemud Drive due to the negative impact it would have on the adjacent landowners. The City of Edmonton objected to how the proposed pipeline would increase the City's cost of operating and maintaining the affected portions of Whitemud Drive, and interfere with plans to expand the roadway. It said that it supported an alternate route traversing the Lewis Estates community.

Trans Mountain said that it would work with the City of Edmonton to mitigate conflicts related to the physical alignment and design of the pipeline and the future Whitemud Drive expansion. It committed to further investigate the Lewis Estates alternate route which could impact numerous additional residences.

Ohamil Indian Reserve 1

Trans Mountain proposed a preferred pipeline corridor that avoided crossing the Ohamil Indian Reserve 1 and is located within the Trans-Canada Highway easement. Trans Mountain said that, due to uncertainty regarding the process of acquiring sufficient legal rights and whether the pipeline can be located within the Trans-Canada Highway easement, it was investigating an alternate pipeline corridor that would cross the Ohamil Indian Reserve 1.

Tzeachten Indian Reserve 13

Trans Mountain said that it and Tzeachten Indian Band entered into an Agreement in Principle that would allow its preferred pipeline corridor to traverse Tzeachten Indian Reserve 13 and be located adjacent to the existing TMPL RoW. Trans Mountain said that discussions were ongoing and that route options, both on and off Tzeachten Indian Reserve 13, remain under consideration.

Surrey Bend Regional Park

Several intervenors raised concerns about proposed alignment of the pipeline corridor through the Surrey Bend Regional Park with concerns raised about potential effects on the bog ecosystem in the park. The City of Surrey and Metro Vancouver submitted an assessment in support of two alternative routes that would avoid the Surrey Bend Regional Park. Trans Mountain said that, unless the B.C. Ministry of Transportation and Infrastructure were to grant Trans Mountain a variance and share their RoW, neither of the alternative options presented were possible.

Trans Mountain said that a custom construction methodology would be used to limit intrusion into park land, which Trans Mountain would completely rehabilitate. It said that the concerns about the proposed corridor through the park are manageable and can be mitigated to provide a no-net-loss solution. Trans Mountain said that it is nonetheless committed to continue to pursue and investigate options with the B.C. Ministry of Transportation and Infrastructure to share its RoW and avoid the park.

A detailed discussion of Project effects on wetlands (including bogs), the mitigation and compensation committed to by Trans Mountain, and the Board's views on these, is included in Chapter 10.

Coquitlam - Schooner Street

Trans Mountain proposed that the pipeline follow the existing Trans Mountain pipeline RoW in Coquitlam at Schooner Street until it reaches a residential area on Schooner Street, where it would divert away from the existing RoW.

The City of Coquitlam requested that Trans Mountain revise the proposed corridor to avoid impacts to prominent businesses, industrial vacancies and proximity of City utilities within Schooner Street. It proposed a re-route away from Schooner Street along an alignment between Hartley Avenue and United Boulevard. Trans Mountain said that this re-alignment has the potential to impact new businesses.

Views of the Board

The Board finds that Trans Mountain's route selection process, route selection criteria, and level of detail for its alternative means assessment are appropriate. The Board further finds that aligning the majority of the proposed pipeline route alongside, and contiguous to, existing linear disturbances is reasonable, as this would minimize the environmental and socio-economic impacts of the Project.

The Board acknowledges the concern raised by the City of Burnaby that Trans Mountain did not provide an assessment of the risks, impacts and effects of the alternate marine terminal locations at Kitimat, B.C., or Roberts Bank in Delta, B.C. The Board finds that Trans Mountain has provided an adequate assessment, including consideration of technical, socio-economic and environmental effects, of technically and economically feasible alternative marine terminal locations.

With respect to the route deviations, the rationale for most deviations was to reduce the potential for land use conflicts. Therefore, the Board finds the proposed deviations and supporting criteria to be appropriate.

The Board recognizes that some parties have concerns about the many route changes proposed since the Project was announced. While route changes may have been confusing for some, a number of the changes were the result of input from Indigenous groups, landowners and communities along the RoW, as well as government stakeholders. The Board acknowledges that several intervenors did not agree with the route selection process and that it may not have produced desired or acceptable route selection outcomes for some participants. The Board notes that the detailed route for the Project has not been finalized, and that this hearing assessed the general route for the Project, the potential environmental and socio-economic effects of the Project, as well as all evidence and commitments made by Trans Mountain regarding the design, construction and safe operation of the pipeline and associated facilities. While finalizing the detailed pipeline route, the Board expects Trans Mountain to continue engaging with affected people and communities, and to continue to be responsive to, and address to the extent possible, any concerns raised.

The proposed Project would cross four parks and protected areas that would require the temporary adjustment of those park boundaries. The Board notes the existing process under the *B.C. Park Act*, and the Provincial Protected Area Boundary Adjustment Policy, Process and Guidelines for provincial park boundary adjustments, to facilitate construction within a park. This required Trans Mountain to submit an assessment to B.C. Parks to outline alternatives that would avoid the use of protected lands and the reasons those alternatives are not considered feasible.

The Board understands Trans Mountain's preference for flexibility at this stage of the Project with respect to part of the routing. Specifically, Trans Mountain is seeking approval from the Board for six alternative corridors, so that it can make a decision at a later stage regarding which of the corridors would form the final route. It is the Board's view that sufficient information has been provided to consider all corridors, including these six alternatives. Trans Mountain must subsequently select one corridor prior to filing its Plan, Profile and Book of Reference (PPBoR) with the Board. Until the final corridor is selected, the Board directs Trans Mountain to consider and include both preferred and alternate corridor information when filing any follow-up reports or fulfilling any conditions (to the extent that the reports or conditions apply to each corridor).

The Board is of the view that the opportunity exists for detailed route alignments that may further minimize impacts to those directly affected. The Board acknowledges the consideration by Trans Mountain, in consultation with Shxw'ōwhámel First Nation, Tzeachten First Nation, and the B.C. Ministry of Transportation and Infrastructure, of three route re alignments that extend beyond the applied-for corridor width of Trans Mountain's preferred route, in proximity to Ohamil Indian Reserve 1, Tzeachten Indian Reserve 13, and Surrey Bend Regional Park, respectively.

If the Project is approved, Trans Mountain will be required to prepare a PPBoR that depicts the proposed detailed route of the Project. The Board would impose Condition 7 requiring Trans Mountain to file, with its PPBoR, an environmental and socio-economic assessment of each proposed route re alignment, including an update on its consultation with all appropriate government authorities, potentially affected Indigenous groups and affected landowners and tenants.

With respect to Trans Mountain's request for approval of the proposed route re alignments in proximity to the Lewis Estates community in Edmonton, Alberta, and United Boulevard and Hartley Avenue in Coquitlam, B.C., these re-alignments extend beyond the applied-for RoW width of Trans Mountain's preferred route and were not filed with the Board until late in the regulatory process. Given the late filing and the insufficient evidence to assess Trans Mountain's consultation, and the potential socio-economic and environmental effects associated with these proposed route re-

alignments, the Board denies Trans Mountain's request, without prejudice to Trans Mountain filing an application for a variance under section 21 of the NEB Act. The Board notes Trans Mountain's commitment that all land acquisition would comply with the provisions of the NEB Act. The Board has reviewed Trans Mountain's anticipated requirements for permanent and temporary land rights and finds these to be appropriate. The Board also finds that, based on the evidence before the Board at this time, Trans Mountain's process for the acquisition of land rights is appropriate.

With respect to Trans Mountain's request that the Board issue an order, pursuant to section 58 of the NEB Act, exempting Trans Mountain from the requirements of subsections 31(c), 31(d) and 33 of the NEB Act in relation to yet to be specified, select temporary lands or infrastructure required for construction of the Project, the Board grants this exemption order. However, given the preliminary nature of the locations of temporary lands filed with the Application, and concerns expressed by potentially affected parties, the Board would impose Condition 60 requiring Trans Mountain to file a finalized list of locations for all temporary lands to be used, and an environmental and socio-economic assessment of each location including an update on its consultation with all appropriate government authorities, potentially affected Indigenous groups, and affected landowners and tenants.

This section 58 Order would only come into effect if the Governor in Council directs the Board to issue a Certificate in respect of the Project, and when such a Certificate, if directed, is issued.

11.2 Occupancy and resource use

Trans Mountain said that the Alberta portion of the proposed pipeline corridor crosses trapping areas and land used for agricultural, commercial, industrial, oil and gas, recreational, and rural and urban residential purposes. The B.C. portion of the proposed pipeline corridor crosses trapping areas and land used for agricultural, commercial, forestry, industrial, mining, recreational, rural and urban residential, guide-outfitting and tourism purposes. Trans Mountain said that the Project has the potential to affect local communities, Indigenous groups and other stakeholders engaging in these types of activities.

11.2.1 Forestry

Trans Mountain identified numerous forest tenures or land dispositions related to forestry along the proposed pipeline corridor, including timber management areas, Crown tenures, other forestry-related tenures and in B.C., Old Growth Management Areas.

Trans Mountain said that, as a result of clearing necessary for pipeline construction, there will be a loss of forestry resources and a reduction of land base for timber harvest during construction and operations. It said that exact short- or long-term loss of forestry resources would be determined once the RoW has been finalized.

Trans Mountain said that it planned to use existing linear disturbances (including the existing TMPL RoW) and existing temporary workspace in order to reduce the disturbance of forestry and timber resources, and maximize the land available for future timber production. It said that it would notify and consult with all affected licensees or permit holders, and compensate timber tenure holders where economic loss is proven and necessary.

Indigenous groups, including Alexander First Nation, Alexis Nakota Sioux Nation, Enoch Cree Nation, Ermineskin Cree Nation, Montana First Nation and Samson Cree Nation, expressed concerns about the loss of merchantable timber along the RoW and how timber would be salvaged. Trans Mountain said that prior to clearing, a scope of work would be drafted for clearing activities, including a Timber Salvage Management Plan. In addition, Trans Mountain said that it would schedule meetings with Indigenous groups to gain feedback and explore opportunities for clearing and timber harvest.

11.2.2 Aggregate, mineral, and oil and gas resource activities

Trans Mountain said that land in certain areas along the proposed pipeline corridor and throughout the Project study area, specifically in the rural Alberta and Fraser-Fort George/Thompson-Nicola regions, is used for mineral, aggregate, and oil and gas resource development and infrastructure.

Trans Mountain said there would be some reduction in land base for subsurface activities, including oil and gas activities, and mineral and aggregate extraction, as a result of construction of the Project. It said that the reduction in land base would occur primarily in the limited areas where the proposed pipeline corridor deviates from the existing TMPL RoW and affects new land. Trans Mountain said that, where the proposed pipeline corridor already follows the existing TMPL RoW and other linear disturbances, future subsurface and extraction potential has already been limited.

Trans Mountain said that its proposed mitigation measures include advanced notification and consultation about the construction schedule to coordinate planned activities, and secure agreements with Crown subsurface rights holders, where required.

11.2.3 Trapping, hunting, and recreational fishing

Trans Mountain said that trapping, hunting, fishing and outfitting activities occur along the proposed pipeline corridor and throughout the Project study area. Trans Mountain said that construction activities will overlap with hunting seasons and trapping activities. These may cause disruption to resource users in the immediate vicinity of construction activities, including disruption of livelihood or use patterns for individuals that use land and resources for outfitting, trapping, hunting and fishing.

Trans Mountain said that it planned a variety of measures to mitigate the construction-related effects, including:

- providing advanced notification of construction schedules;
- direct notification to affected tenure holders; and
- compensation to affected trappers according to established industry and provincial protocols, if reduced fur harvest and lost revenue is proven.

Trans Mountain said that in the event of a spill, recreational fishing, hunting and trapping activities could be disrupted due to restricted or prohibited access at the source site and response area. For recreational fishing, these restrictions would typically apply during the active cleanup period, but could extend until affected resources are stable or recovered. Trans Mountain said noise and traffic associated with emergency response activities could cause further disturbance to trapping activities in the areas immediately around response sites, and this could result in reduced trapping success.

11.2.4 Use of designated recreational areas, protected areas and non-consumptive areas

Trans Mountain identified a number of parks and protected areas with known human uses that are crossed by the proposed pipeline corridor, and that could be disturbed during construction activities and during periods of site-specific maintenance. It said that it considered outdoor recreation stakeholders and their activities in these areas, including camping, snowmobiling, skiing, ATVing, mountain biking, mountaineering and hiking, wildlife viewing and rafting groups.

Trans Mountain said that the overall Project-related effects on parks and protected areas are associated with the potential construction-related physical disturbance to natural and built features that may have intrinsic, interpretive and recreational value. It said this could result in a change in access and use patterns to certain recreational areas within parks as people divert to other areas to avoid construction-related sensory effects, including nuisance air emissions, noise and visual effects. Trans Mountain said that the effects may also result in an overall decrease in the quality of the outdoor experience of Indigenous and non-Indigenous users during construction and, at times, during site-specific maintenance.

Trans Mountain said that a pipeline spill could affect the tourism and recreation industry both by directly disrupting the activities of tourists and recreationalists and by causing economic effects to recreation or tourism-based businesses. In the event of a spill, boating and camping may be restricted or prohibited at the source site and downstream. These restrictions would typically apply during the active cleanup period, but could extend until affected resources are stable or recovered.

Several participants, including the Hinton Mountain Bike Association and Calvin Taplay, provided descriptions of the many recreational activities that are available to users along the RoW. They said that interruption to these activities during construction and operation, or as a result of spills, could affect their ability to enjoy these recreational areas.

Participants expressed concern that the proposed pipeline route across parks and trail systems could result in a reduction in undisturbed nature, and provide additional access points for individuals to use the trails for purposes other than their designated use. Metro Vancouver said that it would be detrimental for the proposed pipeline to traverse through environmentally sensitive ecosystems where installation is challenging, maintenance and monitoring is difficult, and where a pipeline breach and spill could have catastrophic consequences that would be difficult or impossible to fully address.

The Parks Canada Agency said that reactivation of the existing pipeline in Jasper National Park has the potential to impact the local tourism industry. It recommended requiring Trans Mountain to schedule reactivation activities outside of the summer peak tourist season to minimize the conflicts between potential tourist use and pipeline reactivation traffic along existing access routes.

Trans Mountain said that it would implement a number of mitigation measures to reduce disturbance to valued natural or built features, including:

- minimizing disturbance to recreational trails and use areas;
- providing advanced notification and consultation with appropriate authorities and land users prior to construction;
- reducing sensory disturbance (e.g., through noise and dust abatement); and

- working with potentially affected stakeholders when completing the final design for Traffic and Access Control Management Plans.

Trans Mountain said that even with mitigation measures, certain natural features with intrinsic values could be disrupted depending on the final RoW selection and that residual sensory disturbance would occur.

11.2.5 Residential land use

Trans Mountain said there are a number of residential use areas, including playgrounds, schools and housing that are crossed by the proposed pipeline corridor. In order to reduce or avoid more densely populated residential areas, Trans Mountain said that it made several routing decisions, such as:

- following the proposed new Highway 16 to avoid a number of residential properties in the Town of Hinton, Alberta;
- revising the preferred pipeline corridor in the City of Chilliwack, B.C. area to follow a B.C. Hydro RoW to avoid Watson Elementary School playground, several rural properties and three high density residential subdivisions; and
- diverting from the existing TMPL RoW in the Township of Langley and the City of Surrey, B.C. to minimize encroachment on urban areas.

Trans Mountain said that, despite these alternations to the route, construction could disturb features such as yards, fences, storage sheds, garages, or other features on residential properties, and community use areas, such as schools, playgrounds and other public facilities. Trans Mountain said that aesthetic disturbances and access restrictions would result from construction activities. Potential socio-economic effects of large spills will vary depending on the exact location and nature of the incident; however, pipeline spills may potentially damage homes resulting in costs for individuals.

Several participants, including Geoffrey Senichenko and the Simon Fraser Student and Graduate Student Societies at Simon Fraser University, expressed concern regarding the impact the Project would have on residences and quality of life. They said that the Project is unsuitable for large urban areas, particularly in the Lower Mainland region, due to the proximity to residences and schools. They say that these factors increase public safety issues.

Intervenors raised concerns regarding the level of disruption to fully developed residential neighborhoods during construction, and a lack of comprehensive traffic mitigation and noise management plans. They were also concerned about the impact a spill, accident or malfunction would have on their daily lives. Burnaby Residents Opposing Kinder Morgan Expansion (BROKE) described the impact and damage caused by the 2007 Burnaby rupture as an example of potential impacts on residential property and quality of life.

Trans Mountain said that it has developed a Socio-Economic Management Plan (SEMP) that will reduce effects on the human environment, with a number of measures focused on managing and reducing effects in an urban environment. It committed to develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation. Trans Mountain committed to:

- avoiding the disturbance of built features to the greatest extent practical;
- consulting with governments and residents regarding specific construction activities and schedules in residential areas; and
- providing compensation to private land and property owners, according to established industry protocols, where losses or damages are proven.

11.2.6 Westridge Marine Terminal (WMT)

Trans Mountain said that the WMT is located near residential, commercial, recreational and industrial land uses. The nearest residences to the facility are approximately 75 m south of the WMT property boundaries. There is a range of marine vessel traffic, commercial fishing activity and recreational use in the area of Burrard Inlet around the WMT.

Trans Mountain said that construction-related activities at the WMT will result in numerous barge deliveries to the site, as well as other construction-related traffic around the new dock area. These activities could result in disruption to marine access and use patterns for all marine users, Indigenous traditional users, commercial, recreational and tourism users, as people divert to other areas to avoid construction activities. Commercial users could experience minimal delays when accessing marine terminals in Port Moody Inlet during construction. Trans Mountain said that a decrease in quality of the experience of Indigenous and non-Indigenous marine commercial, recreation and tourism users could occur and result in a temporary change in business practices for tourism operators.

In order to lessen potential negative effects, Trans Mountain committed to communicating construction activities and schedules to the marine community in Burrard Inlet to allow users to consider alternate movement patterns during construction. This would include advanced announcements in local newspapers and the placement of warning signs offshore and onshore near the construction activities.

Trans Mountain said that the presence of the expanded dock complex at the WMT during operations could cause disruption to recreational and traditional marine users due to marine traffic congestion. This effect could be more prominent when tankers are berthed at the terminal. It said that the area available for fishing could be permanently reduced as a result of the dock expansion and increased presence of tankers.

Trans Mountain said the existing WMT is visible from numerous points on and near the south and north shore of Burrard Inlet in the Metro Vancouver Region. While the new docks will extend further into Burrard Inlet, the current design has explicitly reduced the potential incremental visual impact, particularly for nearby residential areas on the south shore of Burrard Inlet.

Trans Mountain said nuisance air and noise emissions will occur during operations and periodic site-specific maintenance activities as a result of pumps, ship loading, ship berthing (including anchor chains) and support equipment located on the site. It said that the types of sounds would be similar to those already generated on the site; however, sounds related to ship loading and berthing could occur more frequently.

Several participants described their regular activities in the area of Burrard Inlet around the WMT and identified issues, including increased noise and light, which are of concern to residents and marine users.

Tsleil-Waututh Nation said that certain direct effects of Project-related activity at the WMT could result in loss of quiet and privacy for its members carrying out cultural obligations.

North Shore No Pipeline Expansion (NS NOPE) estimated that the WMT expansion would leave only 800 m of passage between docked tankers and the lighthouse at Cates Park. It said this would create a bottleneck for boat traffic, which could lead to an increase in collisions. NS NOPE said the Project is incompatible with current and future residential and recreational uses, that the WMT and the anchorages currently used already negatively affect residents and users of Cates Park, and that the proposed expansion will increase these impacts.

Trans Mountain said that it worked extensively with Port Metro Vancouver (PMV), the Pacific Pilotage Authority (PPA) and the B.C. Coast Pilots to determine a preferred dock layout at the WMT. It also incorporated feedback from the City of Burnaby and from community discussions into the Environmental and Socio-economic Assessment (ESA). Trans Mountain said that it considered approximately 20 layouts during the evaluation and study process, and would design the dock to reduce visual effects on nearby residential areas, minimize interference with existing anchorages, and reduce its footprint on Burrard Inlet.

Trans Mountain said that noise levels from tankers at anchorage would occur, but that noise levels at the nearest homes would be in compliance with *B.C. Oil and Gas Commission Noise Control Guidelines (2009)*. A predictive noise modelling study would be done and the results used to determine if any noise reduction measures are required. Trans Mountain committed to adhere to all applicable federal and provincial guidelines, regulations and legislation for noise management. It also committed to conducting an area lighting study on impacts to the surrounding communities.

11.2.7 Agricultural land use

Trans Mountain said that land use along approximately 49 per cent of the new pipeline ROW is agricultural, including pasture and grazing, field crops, organic and specialty crops, and livestock and poultry facilities.

Trans Mountain said that, during specific periods of construction and site-specific maintenance, agricultural land use patterns could be disrupted or restricted, resulting in an inability to use land for crops and lost productivity. Other potential effects include noise and vibration, potential weed infestations, and interference with watering systems.

Trans Mountain said that a spill could cause negative economic effects on agricultural land use due to the restriction of movement of livestock and planting or harvesting in the affected area, as well as loss of vegetation and soil productivity as a result of soil contamination. Contamination of water sources may require farmers to bring water in from out of the area to irrigate crops or to water livestock. The extent of these effects would depend on several factors, including volume, product and length of exposure. In the event of effects on businesses or landowners, Trans Mountain said it will make initial mitigation efforts to contain the hydrocarbon release, followed by clean-up and restoration of the site. Landowners and businesses will be compensated for impacts directly resulting from a hydrocarbon release.

Yarrow Ecovillage expressed concern with respect to impacts of pipeline construction on its physical assets, including a waste water treatment system, irrigation, and hothouse operation. Trans Mountain said that current routing of the RoW and temporary workspace (TWS) alleviates most of the physical asset impact issues. It committed to placing the proposed

pipeline within the existing 18 m TMPL RoW, ensuring the waste water ponds and marsh located north of the RoW and TWS will not be impacted by construction, developing a strategy that ensures that adequate temporary irrigation lines are installed and that permanent irrigation lines are re-established as quickly as possible after construction, and maintaining access to the south portion of the Yarrow Ecovillage property at all times during construction.

The Collaborative Group of Landowners Affected by Pipelines expressed concern that the proposed pipeline will cause problems related to crop productivity after construction due to depth of cover and soil compaction issues. It requested that the Board impose several conditions that it said would ensure landowners are properly compensated for damage resulting from construction, ongoing inspection, maintenance or repair, and that it suggested would address what it believes are areas of vagueness in the NEB Act regarding compensation matters.

To mitigate these and other Project-related effects, Trans Mountain committed to, among other measures:

- developing a Land Program Execution Plan that incorporates all specific commitments made to individual landowners during the construction planning process, and consult the Land Program Execution Plan throughout the pipeline construction activity phases for identification of specialized land uses and any unique, specialized construction practices;
- ensuring that a professional Agrologist is onsite during construction activities on all farms in the Lower Mainland of B.C.;
- ensuring general and farm-specific agricultural biosecurity protocols are adhered to;
- consulting with landowners regarding notification preference and construction schedule; and
- compensating for disturbance activities resulting in productivity loss, if necessary.

11.2.8 Industrial and commercial use areas

Trans Mountain said that the proposed pipeline corridor would cross a number of industrial and commercial areas, and that some businesses may be physically disturbed or experience disruptions related to noise and dust from construction activities. Where municipal roads are being used for construction, nearby businesses could experience disrupted access, resulting in reduced visits to these business during construction. Trans Mountain said that pipeline spills could potentially damage business and commercial establishments, resulting in lost income for affected neighbourhood businesses.

The City of Coquitlam said that the proposed pipeline alignment along Hartley Avenue, Schooner Street and United Boulevard would be located near significant commercial businesses, which are largely dependent on motorist traffic. It said that prolonged construction could result in business loss and contribute to high industrial vacancy rates.

Trans Mountain committed to a number of mitigation measures to decrease Project-related effects, including:

- consulting with affected stakeholders;
- avoiding key use areas to the greatest extent possible;
- using urban pipeline construction practices to reduce nuisance emissions;
- providing alternate access routes for local businesses, where practical; and
- providing compensation agreements to address any direct economic loss.

11.2.9 Municipal land use and bylaws

Trans Mountain said that numerous areas of land use and development plans are crossed by the proposed pipeline corridor. These include areas zoned or otherwise noted for a range of uses or protection, including environmental significance, residential, commercial and industrial use, parks and natural areas, trail systems, resource/mineral potential and community watersheds.

Several municipalities expressed concern that the proposed Project may contravene existing municipal bylaws. Several noted that approval of permits and variances to bylaws may be required. The City of Burnaby provided a summary of 13 bylaws with which the Project could conflict. The City of Burnaby said that it strictly enforces its bylaws, in accordance with its duty to its citizens, and that it intends to maintain this practice with regard to the Project, should it be approved. As such, in many cases where its City bylaws require permits, the City of Burnaby said it may choose not to facilitate the construction of the Project, and such permits may be denied. Absent any explanation by Trans Mountain that the proposed activities could be completed in compliance with Burnaby bylaws, the City of Burnaby said that the proposed activities must be considered unlawful.

Several municipalities expressed concern that the proposed Project may conflict with existing and future land use plans, particularly in areas of dense urbanization. The City of Edmonton expressed concern that the proposed Project would impact the City's future land use planning along Whitemud Drive. It said that it plans to make significant improvements to Whitemud Drive in the next 20 years, particularly at 207 Street, 215 Street and 231 Street, and having the Project pipeline in the Whitemud Corridor would restrict the City's ability to optimize the design of its future infrastructure for the area and would substantially increase the cost of realizing the planned expansion. The City of Edmonton also said that the proposed Project would severely restrict the City's ability to implement a naturalization plan for the affected portions of Whitemud Drive.

The City of New Westminster expressed concern that pipeline construction may limit the ability of New Westminster to meet its local and regional land use planning objectives for residential park and trail development, as well as restoration and enhancement plans as outlined in the several city policies, official community plans, as well as in Metro Vancouver's Ecological Health Action Plan. Specific areas of concern which may be impacted included developing a recreational greenway in the Brunette Valley corridor, the planned Sapperton Green development, and a pedestrian crossing over the Brunette River to connect the cities of New Westminster and Coquitlam to form part of the local/regional greenway.

Trans Mountain said that it anticipates engaging with municipal representatives, through the formation of technical working groups, to ensure that goals are respected and adhered to for long-term land development. Trans Mountain said it would apply for, or seek variance from, all permits and authorizations that are required by law, and would continue to work with all municipalities to understand the applicability of bylaws and standards related to the construction and operation of the Project.

11.2.10 Navigation and navigation safety

The NEB Act requires the Board, when making its recommendation, to take into account the effects that the issuance of a certificate in respect of a pipeline that passes in, on, over, under, through or across navigable waters, might have on navigation, including safety of navigation. Jurisdiction over shipping safety remains with Transport Canada.

The Board has considered the potential of the pipeline crossings, marine terminal, and ancillary works related to the project to adversely affect navigation and navigation safety at navigable waters.

Trans Mountain said that the proposed pipeline corridor would cross four watercourses considered navigable, 34 watercourses considered potentially navigable and 92 potentially navigable wetlands in Alberta. In B.C., the proposed pipeline corridor would cross 49 watercourses considered navigable, 70 watercourses considered potentially navigable and 84 potentially navigable wetlands. Activities associated with reactivated segments of the existing TMPL are not proposed to be located in, on, under, over, through or across a navigable watercourse or wetland.

Potential for one navigable wetland was identified by Trans Mountain at the Blackpool Pump Station; however, Trans Mountain said that the wetland would not be affected by construction work at the facility.

Trans Mountain said that the power line associated with the Black Pines Pump Station is proposed to cross the North Thompson River, while the power line associated with the Kingsvale Pump Station is proposed to cross nine potentially navigable wetlands.

Trans Mountain said that the existing WMT is located in Burrard Inlet, which is a key navigable waterway. Trans Mountain said that commercial traffic in Burrard Inlet includes cargo ships, oil tankers, cruise ships and container ships. Burrard Inlet is also used intensively for recreational navigation.

Trans Mountain said that, during the construction phase for the WMT, marine users could inadvertently enter the construction zone at the marine terminal, which may have implications for the safety of commercial, recreational, tourism and Indigenous users of Burrard Inlet who typically travel in the vicinity of the marine terminal. Trans Mountain said that some minor disruption to marine access and use patterns could occur during operations related to the presence of the expanded dock at the marine terminal and its increased footprint in the Burrard Inlet.

Trans Mountain said that navigation and navigation safety are not considered to interact with the construction and operation at the Edmonton, Burnaby or Sumas terminals since the proposed work at these facilities would not be located a near a navigable waterway.

Trans Mountain said that potential offsets for serious harm to marine fish would involve construction of subtidal rock reefs within the Eastern Burrard Inlet Rockfish Conservation Area. It said that it would need to locate the rock reefs to ensure safe navigation of vessels is not affected. Trans Mountain said that the top of the reefs would be no less than 4 m below chart datum, ensuring that the constructed reefs do not pose a hazard to navigation.

The City of Burnaby asked Trans Mountain to describe how the WMT would impact marine navigation in Burrard Inlet, including use by recreational marine vessels. The City of Burnaby asked Trans Mountain how it would amend its application either to ensure that there would be no impact to marine navigation, or to select a different terminus.

Trans Mountain said that the potential effects of the expansion of the WMT on navigation in Burrard Inlet, including on recreational marine users, are primarily considered to be related to access through the eastern portions of Burrard Inlet during Project construction. With respect to operations of the expanded terminal and facilities, marine users are anticipated to adapt to the presence of the expanded dock over the long term, such that movement patterns would resume. To ensure optimal navigation safety, Trans Mountain designed the dock to specifically not interfere with existing anchorages and to minimize its footprint in Burrard Inlet.

Trans Mountain committed to a number of mitigation measures to minimize the impact of the Project on navigation and navigation safety, including marine navigation and navigation safety in the Burrard Inlet related to the expanded WMT. Trans Mountain committed to standard mitigation as part of its SEMP and EPP to reduce Project effects on navigation and navigation safety in the freshwater and marine environments.

11.2.11 Visual and aesthetic resources

Trans Mountain said that the visual quality of the landscape adjacent to the RoW or other construction areas could be adversely affected by the Project over the short-term due to land disturbance and activities during periods of construction and site-specific maintenance. There could also be periods of night lighting around construction sites.

Trans Mountain committed to a number of mitigation measures to reduce the short-term visual effects of construction, including narrowing the RoW to reduce the number of trees to be removed, installing trees and shrubs at potential access points and viewsheds, and ensuring that lighting for all construction activities is directed downward, where feasible.

Trans Mountain said that, in certain areas, the Project is anticipated to have longer-term visual effects related to the presence of the new pipeline RoW and new or expanded above ground structures. It said this may, for some land and resource users, affect their visual experience, and that this effect would be considered a nuisance or inconvenience.

A number of intervenors raised concerns related to permanent tree loss and replacement within urban areas along either the preferred or the alternative routes. Many said that trees could potentially be removed, affecting the quality of life for residents, as well as the ecological services these trees provide in an urban context.

Trans Mountain said that the potential long-term visual effects would be reduced by paralleling an existing linear disturbance for a majority of the route, maintaining existing vegetation buffers, re-seeding of disturbed land in accordance with the Pipeline Reclamation Management Plan, and engaging a qualified arborist to develop a Tree Plan specific to municipal lands in consultation with the municipality and landowners.

The Province of British Columbia requested the Board impose a condition requiring Trans Mountain to conduct additional visual modelling of select locations, identified in consultation with stakeholders including the Province of British Columbia, where the proposed pipeline corridor deviates from the existing TMPL system RoW. The condition would require Trans Mountain to share the modelling results and, through consultations, identify any additional site-specific mitigation. Trans Mountain said that although it has already made such commitments, it would accept such a condition.

Trans Mountain said that the proposed new tanks at the Edmonton, Sumas and Burnaby terminals would be situated in existing disturbed industrial areas, which would minimize their visual and aesthetic effects.

Trans Mountain said that the visual impacts of the Black Pines Pump Station are considered minimal to substantial, depending on the observer viewpoint, and committed to landscape the station to limit visual impacts. No notable change in visual quality is anticipated for the remaining pump stations.

Views of the Board

The Board acknowledges that the Project would pass through areas of importance to many groups and stakeholders, including Indigenous groups, landowners, communities, tourists and recreational users. The proposed pipeline corridor traverses parks and other areas, including Jasper National Park, Surrey Bend Regional Park and Colony Farm Regional Park, used for a variety of recreational pursuits. In the case of residential, agricultural and industrial land use, the Board notes that Trans Mountain's preferred corridor alignment attempts to maximize the use of existing RoWs and provide for greater pipeline routing flexibility, where possible.

The Board notes that Trans Mountain has committed to notifying and consulting with current land users and landowners. Trans Mountain has also developed a socio-economic management plan, which outlines measures that would be implemented to mitigate potential adverse effects on the many land users that could be affected by the Project. As discussed further in Sections 11.3 and 11.4, the Board would impose Condition 13 requiring Trans Mountain

to file with the Board a plan for monitoring the potential adverse socio-economic effects resulting from construction activities.

The Board finds Trans Mountain's approach to consult with relevant authorities and affected stakeholder groups to develop plans that will reduce disturbance within parks and recreational areas is appropriate. The Board also finds Trans Mountain's programs for working with potentially affected landowners and land users to identify and address site specific land-use interests in its detailed route design and pipeline land agreements, where possible, appropriate for reducing potential disruptions and Project effects. The Board is of the view that Trans Mountain's proposed mitigation measures and commitments can effectively address the Project's potential effects on land use and land users.

Regarding the concerns expressed about compensation for damages from the construction and operation of the proposed pipeline, section 75 of the *National Energy Board Act* (NEB Act) requires companies to do as little damage as possible and make full compensation for all damages sustained by persons as a result of the companies' exercise of their powers under the NEB Act. Sections 88 to 103 of the NEB Act set out processes for negotiation and arbitration to settle compensation matters, and these matters are the responsibility of the federal Minister of Natural Resources.

The Board acknowledges the many concerns expressed about the proposed tunnel for the pipeline through Burnaby Mountain. The Board considered these concerns, and all evidence on the record with respect to the proposed tunnel. The Board finds that, although both the preferred and alternate corridor routes for the Westridge Delivery Lines are acceptable, the proposed route through Burnaby Mountain is the preferable route because it avoids residential areas and urban infrastructure, reduces environmental effects during construction and operation, and minimizes risk during operation.

Generally speaking, companies are expected to obtain any federal, provincial or municipal permits or authorizations required by those jurisdictions, and Trans Mountain has committed to comply with, or seek variance from, all municipal bylaws, including those involving noise. To ensure that noise impacts associated with the construction of the Project will be addressed, the Board would impose Conditions 74, 80 and 86 requiring Trans Mountain to file noise management plans prior to construction for work involving the tunnel construction for Burnaby Mountain, horizontal directional drilling, and pump stations, tank terminals and the WMT. To ensure that noise impacts associated with the operation of the Project will be addressed, the Board would also impose Condition 141 requiring Trans Mountain to submit to the Board the results of post-construction noise surveys conducted at both the Sumas and Burnaby Terminals, and the WMT, demonstrating compliance with the *B.C. Oil and Gas Commission's B.C. Noise Control Best Practices Guideline (2009)*.

The Board acknowledges the concerns raised by municipalities along the pipeline corridor that the proposed Project may limited their ability to meet existing and future land use planning objectives. As discussed in Section 11.3, the Board recognizes the need for effective communication between Trans Mountain and potentially affected municipalities in the design phase of the Project to ensure local and regional land use plans are considered and properly addressed to minimize any impact to municipalities. As set out in Chapter 4, the Board would impose Conditions 14 and 49 requiring Trans Mountain to file with the Board terms of reference for the technical working groups, as well as reports of the meetings of the technical working groups.

The Board notes that several participants raised concerns regarding the expansion of the WMT, including disruption to movements of recreational and traditional marine vessels, and impacts from light emissions. The Board is of the view that Trans Mountain's commitment to design the WMT expansion to reduce its footprint in Burrard Inlet and minimize interference with existing anchorages can effectively reduce the impacts of expansion on residents and marine users. To address potential light impacts associated with the operation of the WMT, the Board would impose Condition 82 requiring Trans Mountain to file a light emissions management plan for the WMT. This plan would require that Trans Mountain employ industry best practices to minimize extraneous light pollution, and limit any nuisance lighting disturbances for nearby residents and marine users, to the extent possible.

The NEB Act amendments that came into force on 3 July 2013 require the Board to take into account the effects that issuance of a certificate in respect of a pipeline that passes in, on, over, under, through or across navigable waters might have on navigation, including safety of navigation, when making its recommendation.

Construction of pipeline crossings, the marine terminal, and ancillary works associated with the Project could affect navigation and navigation safety without the application of appropriate mitigation measures. Trans Mountain must abide by design criteria for power line crossings of waterways under the *Canadian Standards Association standards for overhead systems* (CSA C22.3). Trans Mountain has committed to limit Project impediments to navigation, to inform user groups on a regular basis, and to mark hazards to navigation. The Board considers the mitigation proposed by Trans Mountain to reduce Project effects on navigation and navigation safety in the freshwater environment and marine environment at the WMT to be acceptable.

The Board would impose Condition 48 requiring Trans Mountain to submit to the Board for approval, prior to construction, a listing of navigable waterways proposed to be crossed by the pipeline or affected by fish habitat offset works, or any ancillary components proposed to support the Project. Trans Mountain is also required to provide an assessment of Project effects, including effects of fish habitat offsets on navigation and navigation safety (outside of marine shipping), and proposed mitigation measures. This assessment would contain a listing of any issues raised by waterway users and Indigenous groups regarding navigation use, how issues have been addressed, and proposed mitigation measures to address project effects on navigation and navigation safety for each navigable waterway.

The Georgia Strait Alliance, the Pacheedaht First Nation and the Tsawwassen First Nation recommended that the condition be expanded to include marine waterways and shipping lanes. The Board notes that jurisdiction over shipping safety in marine waterways remains with Transport Canada.

The Board accepts Trans Mountain's rationale to parallel existing linear disturbances for the majority of the route as a way to reduce long-term visual effects. Trans Mountain has committed to work with municipalities and landowners to develop specific plans to reduce the potential long-term impacts related to the presence of the new pipeline RoW. To ensure that visual impacts will be addressed in areas where the proposed pipeline corridor deviates from the existing Trans Mountain Pipeline system RoW and are highly visible to the public, the Board would impose a Condition 95 requiring Trans Mountain to submit to the Board a visual impact plan prior to construction. In the Board's views, this plan would ensure that Trans Mountain, in consultation with all appropriate government authorities, potentially affected Indigenous groups, and affected landowners and tenants, identify and implement measures that minimize visual disturbances for nearby residents and land users, to the extent possible.

11.3 Infrastructure and services

11.3.1 Utilities and infrastructure

Trans Mountain said there will be an increase in Project-related vehicle traffic on highways and access roads during construction, including vehicles used for the transportation of equipment, supplies and workers to various locations along the proposed pipeline corridor. Various physical restrictions, such as steep side slopes, rivers, railways, and pipelines, require that the proposed pipeline parallels roads within highway rights-of-way.

Trans Mountain said that limitations to future municipal linear infrastructure planning and maintenance to existing sub-surface facilities may occur because of the necessity to obtain permits or permission to construct or install new facilities across, on, along or under an existing pipeline RoW. It said there are also limitations with regard to mechanically excavating within 30 m of the RoW.

Trans Mountain said that the Project is expected to cause a temporary increase in demand for water during construction due to direct water needs of the Project, such as for hydrostatic testing and dust suppression, and indirect potable water needs of the construction workforce. There is also expected be a temporary increase in solid and liquid waste flow and water services due to waste from temporary facilities and the increased population associated with temporary workers during construction.

Trans Mountain said that pipeline spills could potentially damage infrastructure, causing municipalities to incur infrastructure repair and replacement costs.

Several municipal intervenors said that municipalities and others whose utilities are impacted and who have jurisdiction over highways would incur present and future costs as a consequence of the proposed pipeline impacting their utilities, and as a consequence of the proposed pipeline occupying or crossing highways. They expressed concerns that Trans Mountain's Application did not identify the burden of the proposed Project on municipalities whose highways and utility corridors constitute a significant portion of the proposed pipeline route.

The City of Edmonton said that approximately $12,000,000 in municipal infrastructure mitigation costs are anticipated should the proposed pipeline be installed along Whitemud Drive. Having the proposed pipeline located along Whitemud Drive would restrict the City's ability to maintain and repair the affected portions of Whitemud Drive, limit the City's opportunity for optimization and innovation for the future expansion of Whitemud Drive, and severely restrict the City's ability to implement its Naturalization Plan for the affected portions of Whitemud Drive. The City argued that should the Board recommend approval of the preferred route along Whitemud Drive, conditions should be imposed requiring Trans Mountain to financially compensate the City for all costs associated with having the pipeline along Whitemud Drive, including all costs that arise during the Whitemud Drive expansion.

The Cities of Surrey, Burnaby, Coquitlam, Abbotsford and the Township of Langley collectively commissioned a study to assess the additional costs incurred by each municipality to operate, maintain and construct municipal infrastructure impacted by the existing pipeline and proposed Project. The study concluded that the projected additional costs these

municipalities would incur over 50 years as a result of the proposed Project would exceed a total $93,000,000, including administrative and replacement costs for municipal infrastructure.

Trans Mountain said that the study submitted by the Lower Mainland municipalities was based upon a number of unsubstantiated assumptions or incomplete information, and provided only a partial analysis of the additional costs the five municipalities would face should the Project be approved. It said the study ignored taxes, fees and land rights payments received by municipalities for the existing pipeline and those projected for the Project, omitted consideration of the routing, design and construction practices adopted by Trans Mountain, and was silent on consultation with municipalities to identify, mitigate and minimize social and economic impacts on communities.

Collectively, the municipalities of Abbotsford, Burnaby, Coquitlam, Langley and Surrey requested the Board impose several conditions on Trans Mountain. They said were designed to ensure minimal impairment of the municipalities' property and regulatory rights in respect of their highways and other utility infrastructure, and ensure municipalities and their taxpayers were not subsidizing the private business interests of Trans Mountain. They said that other regulators at both the federal and provincial level have recognized that it is not for municipalities or the province to pay these costs and subsidize the shareholders of private entities. The City of Coquitlam said that federal telecommunications companies subject to the *Telecommunications Act*, federal railways subject to the *Railways Act*, provincial pipelines subject to B.C.'s *Oil and Gas Activities Act*, and provincial electrical utilities subject to B.C.'s *Utilities Commission Act* are all subject to various forms of cost recovery or cost allocation regulating their interactions with, and the liability of, host municipalities. They said that the inclusion of their proposed conditions is necessary for Trans Mountain to effectively discharge its obligations under section 75 of the NEB Act to make full compensation to persons suffering damages as a result of its exercise of its rights under the NEB Act. Furthermore, they said that these conditions would provide a practical approach to prevent the Board from being called upon to repeatedly adjudicate access and compensation disputes in each municipality through which the Project is proposed to be constructed. The City of Surrey said that the NEB has jurisdiction to impose conditions related to impacted utilities including highway occupation and highway crossing uses pursuant to section 108 of the NEB Act.

Several intervenors expressed concerns regarding what they suggested would be substantial impairment to a municipality's ability to maintain or alter an existing roadway crossed by a federally regulated pipeline, because of section 112 of the NEB Act and the NEB's *Pipeline Crossing Regulations*. The City of Burnaby said that the existing practice requires the municipality or utility owner to obtain written permission from Trans Mountain prior to its repair or construction activities, and in practice, to accept any conditions imposed by the pipeline company. It further said that in most cases work is carried out under the supervision of Trans Mountain, and puts the pipeline company in a position to insist on compensation for its additional costs. The municipalities of Abbotsford, Burnaby, Coquitlam, Langley and Surrey requested the Board impose conditions on Trans Mountain that prohibit the company from including provisions in its crossing permits issued under the NEB's *Pipeline Crossing Regulations* that commit municipalities to terms and conditions, including indemnities to which they suggest they otherwise would not be subject.

In response to the municipalities of Abbotsford, Burnaby, Coquitlam, Langley and Surrey, Trans Mountain said that their proposed conditions should not be imposed by the Board because they are not within the Board's statutory mandate. Trans Mountain said that although the Board has broad jurisdiction to impose conditions on the issuance of a certificate pursuant to section 52 of the NEB Act, it does not have the authority to alter the substantive provisions of the NEB Act through the imposition of conditions. Further, the conditions are unnecessary in light of Trans Mountain commitments and the alternative remedies available under the NEB Act. It said that existing statutory remedies, such as section 75 of the NEB Act, are designed to address specific land use conflicts and compensation matters as they arise from the construction and operation of an interprovincial pipeline, and the NEB Act does not provide for blanket compensation or crossing orders in relation to speculative future conflicts or works. Trans Mountain said that by requesting that the Board impose conditions that Trans Mountain be required to grant unconditional consent regarding all future roadworks above the pipeline, the municipalities are asking the Board to go beyond its statutory mandate under section 112 of the NEB Act and the NEB's *Pipeline Crossing Regulations*, and deviate from the legislative scheme established to address such crossings.

Trans Mountain said it believes that historical practice provides a reasonable approach respecting cost sharing and cost recovery for past, current and future infrastructure development and it is reasonable for Trans Mountain to reimburse municipalities for any modifications to their existing infrastructure required to accommodate the Project. In the planning and design of the Project, Trans Mountain said it is willing to work with municipalities to accommodate reasonably foreseeable plans for municipal infrastructure including roads and utilities in the design and placement of the pipeline. Once the Project is in place, any subsequent design and development of municipal infrastructure would be completed with the pipeline in place and should modifications or relocations of the pipeline be required to accommodate new municipal infrastructure, Trans Mountain would look to the municipality for reimbursement.

Trans Mountain committed to working cooperatively with municipalities in the development of the Project. This would include:

- minimizing potential impacts to existing municipal infrastructure;

- generating inventories of municipal sub-surface infrastructure crossings;
- paying for reasonable costs to inspect or relocate municipal infrastructure;
- developing traffic control plans; incorporating traffic-related requirements of B.C. Ministry of Transportation and Infrastructure, Alberta Transportation and other municipalities; and
- entering into water and waste use agreements.

11.3.2 Housing, accommodations, and work camps

Trans Mountain said that existing commercial accommodations would house the Project workforces, to the extent practical, for the construction of the pipeline, pump stations and terminals. Temporary construction camps would be deployed to house workers on three construction spreads where local accommodation is not sufficient.

Trans Mountain said that while the use of local hotels and rental units would be considered positive by hotel and apartment owners, housing price inflation, even if short-term, could have negative effects for people on fixed incomes or not experiencing the income-related benefits associated with the Project. In smaller construction hubs, this could contribute to short-term increased demand for accommodations, such as hotels, motels, rental suites and campgrounds.

The Village of Valemount and Regional District of Fraser-Fort George expressed concern regarding the impact of temporary workers in the Valemount region, particularly with respect to the management of solid waste due to Valemount's solid waste transfer station being at maximum capacity, and impact on local housing costs.

Trans Mountain committed to develop and implement a worker accommodation strategy with contractors and local municipalities which would consider a range of potential issues, including local housing market development, accommodation capacity, transportation of workers, water supply capacity, waste management, camp security and preferences of host communities.

11.3.3 Protective and social services

Trans Mountain said that construction of the Project could increase demands on regional protective and social services due to direct Project activities, unforeseen or accidental events during construction, and the indirect demands of the temporary construction workforce. Trans Mountain identified several communities experiencing capacity constraints with regard to RCMP, fire and ambulance services.

Fraser Valley Regional District expressed concern that Trans Mountain defined a construction spread break in the middle of its Electorate Area D, and that this split would increase the workload imposed on it by having to work with two separate engineering consultants and construction contractors, as well as potential discrepancies between engineering and construction standards. Trans Mountain confirmed that a single point of contact approach would be established and would remain consistent. It confirmed that all of Fraser Valley Regional District is currently envisioned to be undertaken by a single contractor.

Trans Mountain committed to a range of measures to reduce the potential indirect socio economic effects due to construction activities, including developing a Code of Conduct for employees and contractors, communicating with local protective and social service authorities on the timing and activities of the Project, and consulting with governments, municipalities, local/regional service providers and Indigenous communities to develop and implement an issues tracking process to monitor Project-related socio-economic issues.

11.3.4 First responder services

Trans Mountain said that in the event of a large spill, demands are likely to be placed on local, municipal, regional and independent emergency responders (fire, police, ambulance and disaster agencies), hospitals, clinics, social service and relief organizations, and local, municipal, regional and federal government officials and staff. However, actual effects would depend on the size and nature of a spill, the number of people potentially affected and the availability of proper equipment and trained personnel.

Several intervenors and commenters raised concerns regarding the impact a spill would have on local, municipal and regional government staff and resources. The City of Vancouver cited its recent experience with the MV/Marathassa oil spill as demonstrating that a relatively small volume oil spill can place significant demands on municipal staff and resources.

The issue of emergency management and emergency response is covered in more detail in Chapter 9.

11.3.5 Cumulative effects

Trans Mountain said that the potential cumulative effects on transportation infrastructure, decrease in land available for future linear infrastructure planning, an increased demand on regional infrastructure and services may emerge as the Project acts in combination with existing activities and reasonably foreseeable developments. It noted the impact balance is both negative and positive, since the Project may contribute to increased pressure on and select disturbance of infrastructure and services, but it may also contribute to commercial opportunities for service provision.

Views of the Board

Portions of Trans Mountain's proposed corridor traverse congested urban environments that contain many constraints, including highways and other utility infrastructure. The Board acknowledges the concerns expressed by several municipalities regarding the additional burdens the proposed pipeline could have on their utilities, including the incurrence of additional costs as a consequence of future infrastructure development. A number of these intervenors requested that the Board impose specific conditions to address what they suggested are the impacts associated with having the pipeline interfere with and restrict their ability to accommodate future municipal infrastructure plans. Many of the proposed conditions related to ongoing communications between the intervenor and Trans Mountain, construction scheduling, crossing agreements and compensation for future costs.

Section 75 of the NEB Act requires companies to do as little damage as possible and make full compensation for all damages sustained by persons as a result of the companies' exercise of their powers under the NEB Act. Further, as described earlier in this chapter, sections 88 to 103 of the NEB Act set out processes for negotiation and arbitration to settle compensation matters, and these matters are handled by the federal Minister of Natural Resources. As set out in these sections, when a landowner and a pipeline company cannot agree on compensation for lands that the company has acquired or damaged, either party may apply to the Minister of Natural Resources to receive the services of a negotiator, or to have the dispute settled by arbitration.

With respect to highway crossings, the effect of section 112 of the NEB Act and the NEB's *Pipeline Crossing Regulations* outline the statutory and regulatory requirements for anyone planning to work, excavate or build on or near NEB-regulated pipeline rights-of-way. Activities within the RoW are governed by the NEB Act, the *Pipeline Crossing Regulations*, and agreements negotiated between the landowner and the pipeline company. The focus of these provisions is the safety of the public which is of paramount importance to the Board.

A party wishing to construct a facility across a pipeline either must obtain permission from the owner of the pipeline or may obtain leave of the Board. The *Pipeline Crossing Regulations* provide for timely response by pipeline companies to requests for leave applications should they be brought before the Board.[100]

It is the Board's view that both the company and people planning activities near pipelines have a role in preventing damage to pipelines. The company is responsible for the safety and security of the pipeline, the protection of the environment, and the safety of the people who live and work in the area around the pipeline. Landowners and persons living or working near pipelines also have an important role to ensure that their activities near pipelines are conducted safely. The Board also has a role of regulatory oversight to satisfy itself that companies it regulates, as well as individuals, follow the requirements of the NEB Act and regulations that are created to ensure the safe operation of the pipeline and safety of the public in relation to pipeline operations.

Several intervenors expressed concerns with what they perceived as limitations in the current compensation process as well as the crossings requirements. The Board notes that several municipalities questioned the adequacy of the NEB Act in dealing with compensation-related issues. The City of Surrey suggested that the NEB Act should be amended in a manner similar to what they say some other federal and provincial utility regulators have done. Compensation matters were not in scope in this hearing and the Board makes no assessment of the adequacy of the process to address compensation matters when the company and owner of lands cannot agree pursuant to sections 88 to 103 of the NEB Act. Such matters fall under the authority of the Minister of Natural Resources, and may be reviewed by the Minister if the Minister is of the view that the legislation requires amendment.

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[100] The *Pipeline Safety Act*, which received royal assent on 18 June 2015, amends the NEB's regulation-making authority for damage prevention in the NEB Act, therefore requiring that new regulations be in place by 19 June 2016. The NEB's proposed regulations for the Pipeline Damage Prevention will replace the Board's *Pipeline Crossing Regulations*. The proposed regulations continue to prescribe the responsibilities of those wishing to conduct an activity near a pipeline, and the conditions they must meet, including that they must obtain company consent and must follow company safety measures and technical requirements. The proposed regulations also continue to have similar provisions to the current regulations respecting applications for authorizations, in that if consent cannot be obtained from the pipeline company, or conditions cannot be followed, application may be made to the Board. At the time of this Report, the new regulations are not yet in effect, and the final regulations may be revised from what was proposed.

The Board is encouraged by Trans Mountain's commitment to continue its engagement with municipal representatives through the formation of technical working groups. The Board supports the creation of such groups as a potentially effective mechanism to collaboratively address issues of interest to the company and affected municipalities, including concerns relating to the pipeline's location and the potential impacts and future costs on a municipality's long-term plans. The Board is of the view that collaboration between municipalities and Trans Mountain in the design phase of the Project will help to ensure current and future municipal utility infrastructure is considered and properly addressed to minimize potential impacts to municipalities. As set out in Chapter 4, the Board would impose Conditions 14 and 49 requiring Trans Mountain to file with the Board terms of reference for the technical working groups, as well as reports of the meetings of the technical working groups.

Trans Mountain has committed to collaborate with potentially affected municipalities to consider each other's project plans through technical working groups. Trans Mountain has also committed to create a Community Benefit Program which would provide opportunity for municipalities to further offset potential future infrastructure or service costs. The Board is of the view that these factors, combined with the Project's likely positive economic effects, including increased tax revenues to the municipalities and regions the pipeline crosses, as further set out in Section 11.5, adequately address the potential burdens that could result from the Project. Such outcomes, in the Board's view, may depend on the level of commitment from all parties to find mutually agreeable solutions.

The Board recognizes that issues can arise when underground infrastructure is located in close proximity to a pipeline. In order to facilitate the resolution of any potential conflicts, the Board would impose Condition 103 requiring Trans Mountain to file with the Board a list of all underground infrastructure utilities to be crossed by the Project, and to confirm that necessary agreements or crossing permits for those facilities to be crossed have been acquired or will be acquired prior to construction. The Board is of the view that this would ensure that Trans Mountain has identified and finalized the exact location of all underground infrastructure that would be crossed by the Project.

With regard to intervenors' requests and concerns regarding information pertaining to construction scheduling, the Board notes that Trans Mountain has already made commitments with respect to these during the course of this hearing. Therefore, the Board is of the view that further specific conditions relating to construction scheduling are not required. Part of the Board's consideration of the Project includes the commitments made by Trans Mountain and how these address particular areas of concern. In order to facilitate a transparent and publically available record of the commitments made by Trans Mountain, the Board would impose Condition 6 requiring Trans Mountain to file with the Board a commitments tracking table listing all commitments made by Trans Mountain during hearing.

The Board recognizes that the Project would be constructed along numerous local highways and municipal roads. In order to ensure that impacts to local infrastructure, communities and emergency access is minimized, the Board would impose Condition 73 requiring Trans Mountain to submit its Traffic Control Plans to the Board prior to the start of construction, including evidence of consultation with all appropriate government authorities, potentially affected Indigenous groups, and affected landowners and tenants.

The Board notes that Trans Mountain is still in discussion with local authorities for the development of an appropriate housing strategy for its Project construction workers, including locations where temporary closed construction camps would be used. To ensure potential effects that could result from the presence of construction workers for the Project are effectively addressed, the Board would impose Condition 59 requiring Trans Mountain to file its Worker Accommodation Strategy with the Board. The Board is of the view that Trans Mountain's commitments to use construction camps and to develop and enforce camp policies can effectively minimize the Project's potential negative effects on the infrastructure and services of local communities.

Trans Mountain has committed to liaise with local and regional social services, police and local governments, to identify and address issues related to the potential negative effects of the Project on housing, utilities, and the delivery of social services in local communities during construction within the Project area. In addition to the company's commitments, the Board would impose Condition 13 requiring Trans Mountain to file a Socio-Economic Effects Monitoring Plan. In the Board's view, this plan would ensure that potential adverse socio-economic effects resulting from construction activities are identified, and that measures to reduce or eliminate adverse effects are effectively implemented within the timeframes for which effects might occur.

The Board finds that Trans Mountain appropriately identified potential emergency and medical services issues that would result from a large spill from the Project, and has committed to work with external emergency response services in a pre-planning capacity. As discussed further in Chapter 9, the Board would impose several conditions to ensure Trans Mountain enhances the existing emergency management program and takes into account capacity limitations of local and regional first responders (Conditions 89, 90, 117, 118, 119, 120, 123, 124, 125, 126, 136 and 153). The Board finds that Trans Mountain's extensive evidence regarding emergency planning and response is credible and sufficient for this stage in the lifecycle of the regulatory process.

The Board is of the view that, with Trans Mountain's commitments and the Board's recommended conditions, the Project's potential adverse effects on the infrastructure and services of communities in proximity to the Project, including the Project's contribution to cumulative effects, can be effectively addressed.

11.4 Social and cultural well-being

Trans Mountain said that a sense of social and cultural well-being of a community or region is dynamic and influenced by multiple factors, and may be experienced differently by different people. Its assessment of Project effects on social and cultural well-being examined changes in population due to temporary workers, effects on community assets and values, changes in income patterns, and the potential for interactions between Project workers with local and Indigenous communities.

Trans Mountain said that, although some positive indicators of wellness are used, including income and increased educational training, many of the indicators used in its assessment described undesirable social conditions. It said that issues identified by stakeholders included effects related to increased traffic and traffic safety, the presence of temporary workers in smaller communities, indirect social effects, pressures on infrastructure and services, as well as potential disruption to specific community assets and events.

11.4.1 Change in population and demographics

Trans Mountain estimated that the influx of temporary workers during construction would range from a low of approximately 515 construction workers in the Edmonton Region, to a high of approximately 2,900 construction workers in the Fraser-Fort George/Thompson-Nicola Region. Temporary population influx related to major projects can result in a number of issues for host communities, due to community-worker interactions and increased pressure on services and infrastructure.

Trans Mountain committed to a number of measures to maximize regional employment and procurement, and limit the effects of the Project on population change. These measures included:

- developing and implementing a program to enhance awareness of construction and operations jobs and career opportunities in cooperation with business, industry, community and education and training organizations; and
- creating an online employment communications tool where potential workers who are interested in employment can register to receive regular updates giving first consideration for employment opportunities to regional and Indigenous residents with appropriate skills and qualifications, where possible.

Trans Mountain committed to the development of a Worker Accommodation Strategy to address a range of potential issues and identify opportunities and mitigation measures related to worker accommodation through ongoing engagement with local municipalities and stakeholders.

11.4.2 Changes in community life

Trans Mountain said that an increase in temporary workers during construction could have direct and indirect effects on community life. While the presence and influx of temporary workers most notably can result in substantial economic benefits for communities due to spending of income, some undesirable social outcomes may also occur. These include income spent on drugs, alcohol or gambling and the subsequent contributions to social problems in communities, as well as direct negative Project interactions with communities.

Trans Mountain identified a number of key community assets and events that have the potential to be negatively affected by the Project. Physical disturbance to community amenities, such as recreational facilities, golf courses, camping areas, cemeteries and community trails, may result in community members being unable to use them for specific periods of time, which could disrupt community life to some degree. Construction of the Project could negatively impact certain community events that coincide with construction.

Trans Mountain committed to implement a range of measures to reduce the Project's potential negative impacts on community life. These included:

- avoiding important community features and assets during RoW finalization by narrowing the RoW in select areas, where possible;
- scheduling construction to avoid important community events, where possible;
- ongoing consultation and engagement of construction schedules and plans with local and Indigenous governments, as well as community officials;

- implementing a Code of Conduct for workers, including community awareness training in work orientation sessions;
- establishing a mechanism for communities to register construction-related complaints;
- developing a detailed Worker Accommodation Strategy that would co sider camps in locations where local communities do not have adequate housing capacity; and
- providing recreational and leisure facilities for workers within the camps.

Trans Mountain committed to establishing a Community Benefit Program, which it said would create a positive net benefit for communities along the pipeline corridor. It said that these initiatives would be in addition to compensation for access and potential impacts to community lands, and in addition to any environmental mitigation for the Project. Trans Mountain said that priority areas for the Community Benefit Program would be identified through input from local governments and stakeholders, and could be environmental or socio-economic in nature. The Community Benefit Program could include local emergency management enhancements, improvements to community parks and infrastructure, as well as support for events and educational programs.

Trans Mountain said that potential socio-economic effects of large spills will vary depending on the exact location and nature of the incident, however, large hydrocarbon spills may adversely affect the sense of individual and community well-being by affecting cultural and heritage resources and psychological well-being. Trans Mountain said pipeline spills could also potentially damage homes resulting in costs for individuals.

Views of the Board

The Board acknowledges that the Project has the potential to impact the quality of life within affected communities, as well as the well-being of individuals as a result of potential changes in population and community life. The Board notes Trans Mountain's commitments to implement a Code of Conduct for workers, and to develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and operation of the Project. In order to ensure that the potential negative socio-economic effects of Project construction can be effectively addressed by Trans Mountain, the Board would impose Condition 13 requiring Trans Mountain to file with the Board a plan for monitoring the potential adverse socio-economic effects resulting from construction activities. This would ensure that measures to reduce or eliminate adverse effects are effectively implemented within the timeframes for which effects might occur.

Trans Mountain has committed to create a Community Benefit Program. The Board finds that such as program would provide a positive net benefit for communities along the pipeline corridor. The Board encourages such initiatives, and views discussions with affected stakeholders as a positive mechanism for enhancing existing relationships and providing net benefits for communities. To inform the Board and all parties about the progress made toward the outcomes of the Community Benefit Program, the Board would impose Condition 145 requiring Trans Mountain to file with the Board progress reports on its Community Benefit Program for the first five years after commencing Project operations.

Based on Trans Mountain's commitments and the Board's recommended conditions, the Board is of the view that the Project's potential effects on the social and well-being of communities can be effectively addressed.

11.5 Employment and economy

Trans Mountain said that the Project will contribute substantially to economic growth. The effect would be long term since the economic effects are related to both construction and operations, and the Project is considered to have significant, positive residual socio-economic effects on provincial and national economies.

Trans Mountain said that it considered employment and economic effects related to provincial and national economies, regional employment, municipal economic benefits, training and capacity development, procurement and contracting, as well as the possibility of business or livelihood disruption. Trans Mountain's conclusions were outlined in a report prepared by the Conference Board of Canada quantifying four economic effects of the Project, including direct, indirect, induced and fiscal effects.

The capital cost of the Project is expected to be approximately $5.5 billion (2012 dollars), with the expenditures taking place over a seven-year period. The bulk of the spending activity is expected to take place during construction. Trans Mountain said this spending will generate direct impacts in the construction sector, supply chain impacts associated with the inputs needed to complete the Project, and induced effects, which occur when the wages that employees earn from the direct and supply chain effects are spent.

Trans Mountain estimated the construction phase would generate a total of $1.2 billion in federal ($646 million) and provincial ($568 million) government revenues. It said that the largest fiscal impacts associated with the construction phase are found in personal income taxes ($559 million), indirect taxes such as sales taxes ($335 million), and corporate income taxes ($184 million). B.C. ($394 million) and Ontario ($307 million) will experience the largest combined federal and provincial fiscal effects. Other regions of the country, such as Alberta ($239 million), Quebec ($166 million) and the Prairies ($58 million) will also experience fiscal benefits.

Trans Mountain said that the construction phase would support over 58 000 person-years of direct and indirect employment generated across Canada, with approximately 36 000 person years in B.C. and 15,000 in Alberta. Construction would require approximately 400-600 workers per spread and vary over the construction period. Construction at the tank terminals requires between 60 and 370 workers, and approximately 95 workers will be required for construction at the WMT.

Trans Mountain assessed the economic and fiscal benefits of the operational phase over its first 20 years of service. The operations phase is expected to generate $3.3 billion in combined federal and provincial revenues over this period, with B.C. experiencing the largest combined federal and provincial impact (34.8 per cent), followed by Ontario (24.3 per cent), Alberta (18.4 per cent), and Quebec (13.8 per cent).

Trans Mountain said that the municipalities, counties/regional districts, and First Nations Reserves crossed by the Project would accrue aggregate property tax increases of approximately $3.4 million annually in Alberta and approximately $23.2 million annually in B.C. It said that the total forecasted increase in municipal taxes across Alberta and B.C. would be over $26.5 million per year.

Trans Mountain said that the Project would directly support 443 jobs per year over the first 20 years of operations. The majority of these positions would be found in B.C., which accounts for 313 jobs per year (71 per cent of the total), with the rest being located in Alberta. In total, direct, supply chain and induced effect employment during operations would support 65 184 person-years during the first 20 years of operations, with 60 per cent of the jobs being created in B.C., 20 per cent in Alberta and the remainder in other regions of the country.

Trans Mountain said that it contributes to initiatives in communities where it operates and has initiated discussions with local governments and organizations to explore additional community benefit opportunities related to its priority areas of community investment, environment and ecological offsets, and education.

Trans Mountain said that, through its public engagement activities, concerns were raised about employment opportunities, as well as how Trans Mountain would work with trade schools on skill development. Numerous Indigenous groups expressed an interest in employment and procurement opportunities, as well as assistance with training to provide the required skills.

Some Indigenous groups said that they were concerned that substantial benefits were only being offered through mutual benefit agreements (MBAs), through which a First Nation consents to the Project and its impacts.

Metro Vancouver raised concerns about Trans Mountain's use of input-output models, and said that these models do not, in themselves, indicate the magnitude of the benefits and costs, or whether the Project is desirable from a public or social viewpoint. Metro Vancouver said that the Government of Canada, through the Treasury Board Secretariat, had released guidelines for regulatory appraisal that recommends cost-benefit analysis as the appropriate method of evaluation, and that maximizing net benefits to Canadian society as a whole should be the metric used. Tsawout First Nation Upper Nicola Band and Living Oceans Society said that the Conference Board of Canada report provided by Trans Mountain was deficient in a number of areas, including the benefit-cost analysis.

Catherine Douglas and the Pro Information Pro Environment United People (PIPE UP) Network submitted a study on the economic costs and benefits of the Project for B.C. and Metro Vancouver. They concluded that the benefits of the Project were very small and significantly overstated by Trans Mountain.

A number of intervenors raised concerns about the Project's potential impact on property values. NS NOPE said that a spill in the Burrard Inlet would affect property values of residences opposite the WMT. The City of New Westminster suggested that Trans Mountain conduct property value analyses for residential homes located near the pipeline, including an analysis of the economic impacts resulting from potential spills.

Unifor said that it opposed approval of the Project because it would undermine investment in a value-added, diversified and more stable oil and gas sector, and posed very serious risks to the B.C. commercial fishery and the livelihoods of those who depend upon it.

A number of participants expressed their support for the Project. B.C. Building Trades said that the Project was good for their members and good for B.C. The Edmonton Chamber of Commerce said that the contribution of the Project to Canada's long-term balance of trade and the wealth of its citizens was overwhelmingly positive.

To support employment and economic opportunities for the Project, Trans Mountain said that it would take active steps to maximize regional, Indigenous, provincial and Canadian contracting and procurement, and give first consideration to qualified regional suppliers of goods and services. It said that regional employment clauses would be included in all Project contracts and General Contractors would be required to report the number of hires from Project area Indigenous residents and other regional residents.

Trans Mountain said that its Employment and Training strategy would be informed by local and regional skill gaps for participation in employment opportunities for construction of the Project. Trans Mountain said that its targets for training and education initiatives include providing:

- support for Project-relevant training programs for Indigenous participants for the construction of the pipeline;
- support for training in construction readiness, orientation, safety and certification, trades introduction and administrator training;
- support training to employment initiatives that focus on skills related to the construction of the pipeline and facilities;
- support Project-relevant training programs pre-certificate, such as trades orientation, foundations/life skills programs and short term training that provide immediate opportunities like camp cooks and surveying; and,
- training programs that enhance the Indigenous communities' ability to participate in the contracting opportunities on the Project.

Trans Mountain said that it would maximize the hiring of on-reserve and off-reserve Indigenous community members, and had developed a Training Policy for Indigenous Peoples to create initiatives that increase the long- term capability for Indigenous people to participate in the Project. Trans Mountain committed to collaborating with communities, educational and training institutions, industry and government to increase the opportunities available to communities, providing timely labour market information, and evaluating its training and employment initiatives on an ongoing basis to develop best practices for effective programs.

Trans Mountain said that it worked collectively with Indigenous communities to provide procurement, employment, and workforce development opportunities, and to consider MBAs. It said that it was actively working to connect with Indigenous businesses offering services or products relevant to Project construction or operation. As of 31 May 2015, it had worked with 32 Indigenous groups to obtain capacity information and complete a workforce analysis. Where new investment in oil spill preparedness and response capacity was required, Trans Mountain said that it would seek to maximize the benefit to Indigenous communities along the pipeline and marine corridor.

Trans Mountain said that it considered as many alternatives as it could to maximize benefits to the Indigenous communities it affects, including the possibility of equity. It said that equity was ultimately ruled out as it required a substantial upfront investment by Indigenous communities in return for uncertain returns as equity holders, and that many of the Indigenous communities consulted prefer more certain economic benefits.

Trans Mountain said that property values are affected by numerous market forces, and there was no known or widely accepted cause and effect relationship between the presence of oil pipelines and property values in the Alberta and B.C. context. Trans Mountain said that proximity to an oil pipeline is not associated with lower transaction prices for single-family properties or for adjacent and nearby properties. It was not the presence of a pipeline easement that affected prices but the effect of the type of land use on which there is an easement.

Views of the Board

The Board acknowledges the potential benefits to local, regional and national economies associated with the Project. The Board considered the evidence provided by Trans Mountain and by intervenors, and is of the view that construction and operation of the Project would likely result in positive economic effects, including revenues to various levels of government, and employment for local, regional and Indigenous individual and businesses. Positive economic effects are likely to continue for at least the 20 initial years of operation.

The Board notes the economic analysis provided by Trans Mountain, and the report filed by C. Douglas and PIPE UP Network questioning the benefits of the Project. The Board finds the methodology used by Trans Mountain to estimate the Project's potential economic effects to be based on generally accepted methodologies. The Board is of the view that the use of input-output models to estimate general economic effects can provide a general understanding of the potential economic effects that can result from the construction and operation of large infrastructure projects. The Board is the view such projections represent broad estimates only, and that the actual economic effects of the Project would only be apparent once the Project is constructed and brought into operation. The Board is of the view

that while providing general projections, these methodologies are acceptable for estimating a project's potential economic effects.

The Board acknowledges Trans Mountain's commitments to provide local economic and educational opportunities, and to develop the capacity of local and Indigenous individuals, businesses and groups. The Board is of the view that a company's activities and initiatives that can support the development of business and skill capacity are most effective when appropriately timed and initiated prior to commencement of Project construction. In order to facilitate the appropriate timing and further development and implementation of Trans Mountain's measures to support local and Indigenous employment opportunities, the Board would impose Condition 11 requiring Trans Mountain to file with the Board an Indigenous, local and regional skills and business capacity inventory at least six months prior to construction to report the results of its efforts to support business and skill development.

The Board views employment and training opportunities associated with the Project as key benefits at the local and regional levels, and as potentially providing particular benefits for Indigenous individuals, communities and businesses. The Board therefore encourages Trans Mountain to continue to work with Indigenous, local and regional communities to develop training, employment and procurement opportunities for the Project. In order to provide information to the Board, local communities and Indigenous groups about the final development and implementation of such initiatives, the Board would impose Condition 12 requiring Trans Mountain to file with the Board a training and education monitoring plan, and to report on Indigenous, local and regional training and education measures and opportunities for the Project (Condition 58). In addition, the Board would impose Condition 107 requiring Trans Mountain to file a report on Indigenous, local and regional employment and business opportunities for the Project throughout the construction period.

11.6 Heritage resources

In reaching its recommendations regarding the potential environmental effects of the Project on heritage resources, including with respect to Indigenous peoples, the Board considered all related evidence provided by Trans Mountain and hearing participants. With respect to the effects of the Project, including with respect to Indigenous people, and consistent with the CEAA 2012, the Board considered the potential environmental effects of the Project on physical and cultural heritage, and on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. The Board's approach to its environmental assessment is described in Chapter 10.

Trans Mountain conducted heritage resources assessments to evaluate the potential Project effects on heritage resources related to the terrestrial components of the Project. The spatial and temporal boundaries used for the heritage resources are described in Appendix 11.

Trans Mountain said that heritage resources include historical, archaeological and palaeontological sites, In Alberta, heritage resources are administered under the *Alberta Historical Resources Act*, and palaeontological resources are recognized as a heritage resource. In B.C., archaeological resources are administered under the *British Columbia Heritage Conservation Act*, and there is no provincial legislation providing protection for palaeontological sites. Trans Mountain committed to meeting the legislative requirements of both provinces.

Trans Mountain said that it conducted a Historical Resources Impact Assessment for the Alberta portion of the proposed pipeline, and an Archaeological Impact Assessment for the B.C. portion of the proposed pipeline corridor. Trans Mountain said that fieldwork for both the Alberta Historical Resources Impact Assessment and the B.C. Archaeological Impact Assessment were ongoing through the 2015 fieldwork season. As of August 2015, Trans Mountain had identified 32 previously unknown archaeological sites and approximately 50 previously unknown historic sites in Alberta, and 55 previously unknown archaeological sites in B.C.

Trans Mountain said that the proposed pipeline corridor crosses 25 quarter-sections in Alberta that are listed as having high probability of palaeontological resources. In B.C., despite the proposed pipeline corridor crossing lands that have high potential for encountering palaeontological sites (including Valemount through the Monashee Mountains, the North Thompson River Valley to Kamloops, Kamloops to Hope, and Hope to Vancouver), a desktop overview assessment, helicopter overflight and a ground reconnaissance survey had not identified any previously designated or new palaeontological sites within the proposed pipeline corridor.

Trans Mountain said that potential effects to heritage resources from Project activities include disturbance to known or previously unidentified historical, archaeological and palaeontological sites during the Historical Resources Impact Assessment, Archaeological Impact Assessment, or construction-related activities. Once disturbed, the resource may be altered or lost.

Trans Mountain said that heritage resources could also be affected by a spill. Product released from the pipe, and associated cleanup activities, could interfere with the ability to interpret, date and analyze artefacts and preserved organic remains resulting in permanent loss of critical information.

Gunn Métis Local 55 expressed concerns about heritage and cultural sites around Lac Ste. Anne and Wabamun Lake, including burial sites and historical trails along the Edmonton to Hinton segment of the proposed pipeline corridor.

Samson Cree Nation's traditional land and resource use (TLRU) study identified sacred archaeological sites within the Project area. Samson Cree Nation expressed concern that, in additional to those identified, there would be unknown or secret burials and important historical resources in the study area due to historical use by their ancestors and transfer of intergenerational knowledge.

Upper Nicola Indian Band identified archaeological and cultural heritage sites, including burial sites and historical trail systems. They expressed concern that the Project would lead to erosion of these sites from construction and operations, as well as opening these areas up to others who do not respect these sites.

The Stó:lō Collective conducted a Cultural Heritage Overview Assessment of the Project, including the proposed pipeline corridor from KP 969-1147. In addition to archaeological sites protected under B.C.'s *Heritage Conservation Act*, it identified a number of cultural site types defined by the Stó:lō Collective but not recognized under this act, including:

- lyoqthet (transformation) sites;
- Halq'eméylem place names;
- Sxwôxwiyádm / cultural landscape features;
- Xá:Xa (sacred or taboo places) sites; and
- Sxwó:yxwey - places in the landscape related to the origin of the Sxwó:yxwey mask.

The Stó:lō Collective also raised concerns that one of their important spiritual and burial sites called Lightning Rock was in close proximity to a staging area Trans Mountain identified for the Project.

Trans Mountain said that it made opportunities available to potentially affected Indigenous communities, based on their proximity to the Project or their assertion of traditional and cultural rights to the land, for participation in archaeological field studies conducted for the Project. The field program was designed to provide Indigenous community members with the opportunity to provide Traditional Ecological Knowledge information to the ESA. Trans Mountain said that Indigenous communities were engaged in identifying culturally modified tree sites through participation in Traditional Ecological Knowledge and TLRU studies. Pre- and post-1846 culturally modified tree sites were also identified by qualified archaeologists during the Historical Resources Impact Assessment and Archaeological Impact Assessment.

Trans Mountain said that the primary mitigation measure for protecting heritage and paleontological resources is avoidance, and secondarily, site-specific mitigation developed in consultation with appropriate provincial regulatory authorities, and approval by these authorities in fulfillment of permit obligations may also be used. Trans Mountain said that resource-specific mitigation measures have been identified for key areas of archaeological potential along the Project's proposed pipeline corridor. In the unlikely event that an archaeological, historical or palaeontological site is discovered during construction, the Heritage Resources Discovery Contingency Plan will be implemented, and construction activities may resume only with the permission of the provincial regulatory authority upon review and approval of any mitigation to compensate for the disturbance.

In addition, Trans Mountain committed to construction monitoring by a qualified archaeologist or palaeontologist in areas of high archaeological and palaeontological potential.

Views of the Board

Paragraphs 5(1)(c)(ii) and (iv), and 5(2)(b)(ii) and (iii) of the CEAA 2012 require consideration of the environmental effects that are likely to result from the designated project on physical and cultural heritage, or any structure, site or thing that is of historical, archaeological and paleontological or architectural significance, including with respect to Indigenous people. In its evaluation, the Board has considered the effects of the Project on heritage resources to include all of the effects described in section 5 of the CEAA 2012. The Board also considered the effects of accidents and malfunctions that may occur in connection with the Project.

The Board recognizes the value of heritage resources preservation to Indigenous communities, and acknowledges the information and knowledge shared by Indigenous groups regarding historical, cultural, archaeological and paleontological sites that are of significance and value to them. This knowledge helps to ensure that potential environmental effects of the Project on heritage resources are identified, and that the final Project design and associated mitigation measures adequately protect identified and unidentified heritage resources that may be impacted by the Project.

The Board acknowledges the concerns raised by Indigenous groups regarding the potential effects of the Project on physical and cultural heritage resources, as well as the recommendations made to the Board by a number of Indigenous groups. These included, among other things, recommended requirements for collaboration, review or approval by Indigenous groups related to heritage resource site identification, reporting and monitoring during construction.

The Board considered all of the evidence provided, and finds that the work that Trans Mountain has already completed, including the identification of potential sites of concern and its commitment to avoid all sites whenever possible, is sufficient at this point in the lifecycle of the regulatory process. The Board notes that the management of archaeological and heritage resources is the responsibility of provincial governments in the Project area. Before construction can begin, Trans Mountain must obtain clearances from the relevant provincial agencies with respect to archaeological and heritage resources. Any permits issued by the provinces may identify any conditions of approval or mitigation measures that Trans Mountain would be required to meet. The Board is therefore of the view that, given the limited number of sites identified through the impact assessments done by Trans Mountain, the measures and commitments made by Trans Mountain to avoid all sites where possible and to implement its Heritage Resources Discovery Contingency Plan in the event resources are encountered during construction, the evidence and traditional knowledge identifying potential sites of concern provided by Indigenous groups, and the regulatory oversight of provincial authorities that issue final clearances for lands involved for the Project, the potential effects of the Project on physical and cultural heritage resources would be confined to the Project footprint and the Westridge Marine Terminal site boundary, would be short to long term, reversible to permanent, and of low to moderate magnitude.

To ensure that the Board and all parties, including affected Indigenous groups, are aware of any approvals or conditions imposed by provincial authorities for the Project, the Board would impose Condition 100 requiring Trans Mountain to file confirmation that all archaeological and heritage resource permits and clearances have been obtained from the relevant provincial ministries prior to commencing construction. The Board also encourages Indigenous groups to continue to share information with Trans Mountain, and to consider their potential participation in monitoring activities during construction. In order to facilitate the potential participation of Indigenous groups interested in participating in construction monitoring, the Board would impose Condition 98 requiring Trans Mountain to file a plan to address the potential participation of Indigenous communities in construction monitoring.

The Board finds that, with Trans Mountain's obligation to meet provincial requirements, its commitments and the Board's recommended conditions, the construction and operation of the pipeline facilities and the WMT are not likely to cause significant adverse environmental effects on heritage resources, including with respect to Indigenous people.

The Board finds that in the event of a credible worst-case spill, environmental effects to heritage resources could be adverse and significant. However, as discussed in Chapter 9 the Board is the view that, should the Project be designed, constructed and operated according to the fulfillment of its certificate conditions and Trans Mountain's commitments, the probability of such an event is very low. Therefore, the Board recommends that there are not likely significant adverse effects for the purposes of the CEAA 2012.

The Board has incorporated the potential consequences of a spill into its discussion on Spill Risks in Chapter 1 and considered them in its overall weighing of the benefits and burdens of the project in Chapter 2.

11.7 Traditional land and marine resource use

The Project route traverses land and water areas in Alberta and B.C. that Indigenous groups use for traditional activities, uses and practices and for exercising various potential or established Indigenous and treaty rights. Trans Mountain assessed the potential Project effects on traditional land and resource use (TLRU), traditional marine resource use (TMRU) as it relates directly to the WMT, and related interests. Trans Mountain said TLRU refers to the current use of lands by potentially affected Indigenous communities for traditional purposes.

11.7.1 Trans Mountain's assessment of potential effects on traditional land and marine resource use

For the Project overall, Trans Mountain said that through the implementation of mitigation measures, Project construction and operations would not result in significant adverse effects on the ability of Indigenous groups to continue to use lands, waters, or resources for traditional purposes. Trans Mountain also concluded that the residual effects of construction and operations activities of the WMT on TMRU indicators would not be significant.

11.7.2 Scope and methodology

The company said its assessment of TLRU examined anticipated effects related to the terrestrial components of the Project as a whole (e.g., pipeline, temporary facilities, pump stations, tanks and the WMT), since the communities and regions in

which the Project occurs will experience Project-related activities in a combined manner. The spatial and temporal boundaries used for the TLRU assessment are described in Appendix 11.

The TLRU indicators and measurements used by Trans Mountain in its assessment were:

- subsistence activities and sites (including hunting, trapping, fishing, plant gathering, trails and travel ways, and habitation sites); and
- cultural sites (including gathering places and sacred areas).

For potential marine impacts associated with the WMT, Trans Mountain used TMRU (including subsistence activities and sites, and cultural sites) as its TLRU indicator and measurements. Trans Mountain said that TMRU is a unique indicator for the assessment of the effects for the WMT since the only marine interface related to the Project occurs at the WMT. The TMRU assessment also considered air emissions, acoustic environment, marine fish and fish habitat, marine mammals and marine birds. The potential effects of Project-related marine vessel traffic on TMRU are discussed in Chapter 14.

Trans Mountain said the indicators used for its assessment were selected based on feedback from Indigenous communities and the professional experience of the assessment team, and were refined to reflect the components valued by traditional resource users that are often holistic in nature and span both the biophysical and social disciplines. Trans Mountain said potential Project-related effects on TLRU are linked to issues related to biophysical elements (including, fish and fish habitat, wetland loss or alteration, vegetation, and wildlife and wildlife habitat) and some socio-economic elements (such as, employment and economy through the effects of wage employment on traditional lifestyle, social and cultural well-being, navigation and navigation safety and community health).

As part of its assessment, Trans Mountain prepared and submitted an initial TLRU technical report. The report provides the results of the desktop analysis, literature review, and the results of engagement with Indigenous community representatives and TLRU and TMRU studies conducted for the Project.

Trans Mountain also filed supplemental TLRU and TMRU reports incorporating information from traditional land and marine resource use reports and related evidence filed directly with the Board by Indigenous intervenors, or that were provided directly to Trans Mountain subsequent to the completion of its earlier technical reports. Trans Mountain stated that the TLRU and TMRU results and concerns raised by these Indigenous communities are summarized in these reports.

At the time of the submission of its evidence, Trans Mountain said that Project-specific studies were completed by 52 Indigenous communities and that two non-Project specific TLRU studies were provided to Trans Mountain for baseline information. It said that Indigenous communities participated in the Indigenous field program that accompanied biophysical surveys. During studies for the Project, each participating Indigenous community was asked to identify potential subsistence activities and sites including hunting, trapping, fishing, plant gathering, trails/travelways, habitation sites and cultural sites including gathering places and sacred areas. Indigenous groups were also provided the opportunity to request mitigation for identified sites that would be affected by the Project.

Trans Mountain said that it reviewed all of the information and that the results from the studies were used to inform its assessment by identifying traditional land use sites and resources potentially affected by the Project. It said that the information also contributed to the development of mitigation measures to address these effects.

11.7.3 Baseline conditions

Trans Mountain described the existing baseline conditions for TLRU in relation to the Project. Trans Mountain said existing conditions of TLRU encountered by the Project were determined through a review of publicly available harvest data, Indigenous Traditional Knowledge and TLRU reports, the results of engagement with Indigenous community representatives, the collection of Traditional Ecological Knowledge during biophysical field study participation and TLRU studies conducted with potentially affected Indigenous communities for the Project.

Trans Mountain said existing baseline conditions represent the current use of lands and resources by Indigenous peoples for traditional purposes prior to construction of the Project and provide a reference point against which future conditions are compared to assess Project-specific and cumulative effects.

11.7.4 Project effects - pipeline

Trans Mountain identified in its initial TLRU technical report the following TLRU sites within the proposed pipeline corridor requiring mitigation:

- 19 trails and travelways;
- 5 habitation sites;

- 43 plant gathering sites;
- 14 hunting sites;
- 7 fishing sites;
- 2 trapping sites;
- 5 gathering places; and
- 14 sacred areas.

Trans Mountain also filed supplemental TLRU reports incorporating information from TLRU reports and related evidence filed directly with the Board by Indigenous intervenors, or that were provided directly to Trans Mountain subsequent to the completion of its earlier technical reports. Trans Mountain detailed the types of sites identified in each of the reports filed by Indigenous intervenors, including trails and travel ways, habitation sites, plant gathering, hunting, fishing, trapping, gathering places, and sacred areas. These sites and associated activities were noted for each Indigenous group that filed TLRU reports and related evidence directly with the Board, or provided these to Trans Mountain.

Based on its assessment, Trans Mountain identified the following potential residual socio economic effects on TLRU indicators associated with the construction and operations of the Project:

11.7.4.1 Disturbances of trails, travelways and habitation sites during construction, and site-specific maintenance

This is anticipated to result from short-term physical disturbance of land and access limitations that may affect the practice of traditional activities by Indigenous communities. Traditional land and resource users may be unable to use, or be deterred from using, certain areas at times during construction and periods of site-specific maintenance.

Trans Mountain stated these effects would be of short-term duration, periodic during construction and site-specific maintenance, reversible in the short-term, and of medium magnitude. Trans Mountain said the effects were determined to be not significant.

11.7.4.2 Alteration of subsistence resources

This effect could manifest itself through changes to local harvesting locales, behavioural alteration or sensory disturbance of environmental resources or increased public access to traditional harvesting areas and increased pressure on environmental resources. The operation of the proposed Project will affect subsistence resources primarily due to temporary disturbances related to maintenance activities. Changes to the distribution and abundance of resources could in turn result in loss or alteration of harvesting areas, which could result in indirect effects such as harvesters having to spend more time and money to travel further for subsistence activities.

Trans Mountain stated these effects would be of short-term duration and periodic during construction and site-specific maintenance activities. Effects would be reversible in the long term as the effects of disturbance to traditionally harvested resources will be dependent on each target species' sensitivities and could extend greater than 10 years following decommissioning and abandonment. Trans Mountain stated the effects would be of medium magnitude, as the effects assessment results for fish and fish habitat, wildlife and wildlife habitat, vegetation, wetlands indicates that effects to traditionally harvested resources may be detectable and is dependent on each target species' sensitivities. Trans Mountain said the effects were determined to be not significant.

11.7.4.3 Disruption of subsistence activities during construction and site-specific maintenance

In the event that subsistence hunting, fishing, trapping and plant gathering activities are disrupted by the construction or operations of the Project, the interruption could mean that the traditional resource user misses the harvest opportunity or that their participation is curtailed. The company stated disruption of subsistence activities also refers to the possibility that traditional resource users could be prevented from accessing key harvesting areas resulting from limited access or increased public access to traditional harvesting areas. The operations of the proposed Project will affect subsistence activities primarily due to temporary disturbances related to site-specific maintenance.

Trans Mountain stated these effects would be of short-term duration and periodic during construction and site-specific maintenance activities. Effects would be reversible in the long term as changes to preferred harvesting locales could result in indirect effects such as harvesters having to spend more time and money to travel further for subsistence activities, and

could extend greater than 10 years following decommissioning and abandonment. Trans Mountain stated the effects would be of medium magnitude. Trans Mountain said the effects were determined to be not significant.

11.7.4.4 Disturbance of gathering places and sacred areas during construction and site-specific maintenance

The disturbance of gathering places and sacred areas is a potential residual effect of interactions between traditional resource users with the short-term physical disturbance of land, and access limitations that may affect the practice of traditional activities by Indigenous communities. Traditional land and resource users may be unable to use, or be deterred from using, certain areas at times during construction and periods of site-specific maintenance. Several gathering places and sacred areas were identified within the proposed pipeline corridor during the TLRU studies for the Project.

Trans Mountain stated these effects would be of short-term duration, periodic during construction and site-specific maintenance activities, reversible in the short-term, and of medium magnitude. Trans Mountain said the effects were determined to be not significant.

11.7.4.5 Combined effects on subsistence activities and sites

This considers those combined residual socio-economic effects that are likely to occur, including disturbance of trails and travelways, disturbance of habitation sites, alteration of subsistence resources, disruption of subsistence activities, sensory disturbance from nuisance air emissions and noise, and change in land use. Trans Mountain said the combined effect on the subsistence activities and sites indicator is considered to have a negative net impact balance. Although the spatial boundary of the interaction is likely to occur within the Project Footprint, indirect effects may be felt throughout the Regional Study Area (RSA).

Trans Mountain said the duration of the event is short-term, over the life of the Project, and the frequency is periodic. Trans Mountain stated the magnitude is medium. While the proposed pipeline corridor is located adjacent to existing disturbances for 89 per cent of the length, Indigenous communities continue to practice traditional activities within and adjacent to the proposed pipeline corridor and on Crown lands along the existing TMPL and throughout the RSA. The effects to traditionally harvested resources may be detectable and are dependent on each target species' sensitivities. Trans Mountain said the effects were determined to be not significant.

11.7.4.6 Combined effects on cultural sites

This considers those combined residual socio-economic effects that are likely to occur, including disturbance of gathering places, disturbance of sacred areas, sensory disturbance from nuisance air emissions and noise, and change in land use patterns. The company said the combined effect on the cultural sites indicator is considered to have a negative net impact balance. Although the spatial boundary of the interaction is likely to occur within the Project Footprint, indirect effects may be felt throughout the TLRU RSA.

Trans Mountain said the duration of the event is short-term, limited to the construction phase or site-specific maintenance, and the frequency is periodic. Trans Mountain stated the magnitude is considered to be medium. While the proposed pipeline corridor is located adjacent to existing disturbances for 89 per cent of the length, Indigenous communities continue to practice traditional activities within and adjacent to the proposed pipeline corridor and on Crown lands along the existing TMPL and throughout the RSA. Trans Mountain said the effects were determined to be not significant.

Trans Mountain concluded that there are no situations for TLRU indicators that would result in a significant residual socio-economic effect. Consequently, it said it concluded that the residual socio-economic effects of Project construction and operations on TLRU indicators will be not significant.

11.7.5 Project effects – WMT

Trans Mountain described the potential effects of the construction and operations of the WMT on marine-based traditional resource use. Trans Mountain said terrestrial (onshore) activities associated with the construction and operations of the WMT and its effect on TLRU is included in its assessment of effects on TLRU for the Project as a whole.

Trans Mountain stated that for the marine component of the WMT, the spatial boundary of the marine TLRU LSA encompasses and extends beyond the footprint to include the zones of influence of air emissions, acoustic environment, marine fish and fish habitat, marine mammals and marine birds since TLRU is dependent on these resources. The company said the marine TLRU LSA is the area where there is a reasonable potential for localized Project-related effects to affect existing uses of the land for traditional purposes. The potential effects of the Project are primarily assessed within the footprint and the marine TLRU LSA.

Trans Mountain said that subsistence activities, sites and supporting resources at the WMT would likely be physically disturbed during the construction phase of the Project at particular locations and specific times. Trans Mountain said potential residual effects of the WMT expansion include alteration of subsistence resources relating to marine mammals, marine birds, and marine fish. All existing activities and marine traffic, reasonably foreseeable development and future marine traffic in the WMT area, would interact with Project-related activities to contribute to the potential for cumulative changes on traditionally harvested resources during the construction phase of the Project.

Trans Mountain said the impact balance of this residual effect is considered negative. The spatial boundary ranges from permanent loss of marine fish habitat within the footprint to sensory disturbances that extend into the Marine TLRU RSA. Trans Mountain said the anticipated loss of marine fish and fish habitat will be offset through the construction of compensation/offset habitat. Specific compensation/offset measures will be determined in consultation with DFO, Indigenous communities, local stewardship groups and other interested parties during the permitting phase of the Project. Trans Mountain said the duration of the event causing the effects to marine resources that support traditional harvesting activities are expected to extend throughout the operational life of the WMT.

Trans Mountain assessed the combined effects on TMRU, which considered Project-related marine effects on TMRU related to changes in marine access and use patterns, sensory disturbances and alterations of subsistence resources. The impact balance of the combined residual effect is considered negative. The company said the combined residual effect is considered to be reversible in the long term (as it will continue through the operations phase due to the extension of the dock and increased presence of moored tankers) and of low to medium magnitude given that the effects to traditionally harvested marine resources may be detectable and are dependent on each target species' sensitivities. The expanded dock complex will become a permanent feature of the inlet and long-term traditional resource use patterns will likely adapt over time.

Trans Mountain stated there are no situations for TLRU that would result in a significant residual socio-economic effect. Consequently, the company said it concluded that the residual socio-economic effects of construction and operations activities of the WMT on TLRU indicators will be not significant.

11.7.5.1 Spills

Trans Mountain said that accidental spills could affect traditional lands, culture, and practices by causing short- to medium-term disruption to trail systems, waterways, landmarks and gathering areas or sites within or downstream of the spill area. Credible worst-case and smaller spills could also result in mandated or voluntary interruption of subsistence trapping, hunting and gathering activities as a result of real or perceived changes in the quality of berries, medicinal plants, fish, and wildlife. A spill could also damage or affect use of spiritual and burial sites and sacred landscapes. Trans Mountain said that it did not adopt a more quantitative approach for predicting effects on traditional activities, since no widely accepted method exists for predicting oil spill effects on such indicators due to the inherent complexity resulting from the role of human interpretation and its influence on individuals' experiences of social effects and their ability, willingness and confidence to respond to change.

11.7.5.2 Mitigation

In each of its TLRU and TMRU technical reports, Trans Mountain provided detailed descriptions of mitigation measures that would be implemented to address the identified potential project effects for each of the indicators and site types. Trans Mountain also included in its technical reports detailed summaries of all of the mitigation requests made by participating Indigenous groups, and the company's mitigation responses to each of the concerns or mitigation requests recorded.

Trans Mountain said that mitigation measures were principally developed in accordance with Trans Mountain standards, industry and provincial regulatory guidelines, current industry accepted best practices, engagement with Indigenous communities, experience gained from other pipeline projects and professional judgment.

Trans Mountain said that the finalization of the footprint would avoid disturbance of known sacred areas to the greatest extent practical, and that the construction RoW would be narrowed at key locations to avoid known sacred areas. It said that the amount of land disturbed would be reduced by using previously disturbed areas, where possible. Trans Mountain said that in order to protect and avoid sensitive sacred sites, it would ensure that all personnel working on the construction of the Project were informed and sites clearly marked before the start of clearing. In the event that previously unidentified sacred sites were discovered during clearing or construction, measures from the Traditional Land Use Sites Discovery Contingency Plan or Heritage Resources Discovery Contingency Plan would be implemented.

Trans Mountain stated that sensitive resources identified in the Environmental Alignment Sheets and environmental tables within the immediate vicinity or the RoW will be clearly marked before the start of clearing. The company stated that if additional TLRU sites are identified prior to Project construction, the sites will be assessed and appropriate mitigation

measures will be determined and applied. Access will be managed, where required, along the Project where new temporary and permanent access is created for the construction and operation of the pipeline.

Trans Mountain said that it made extensive commitments regarding environmental compliance for the life of the Project. It said that it would implement a comprehensive suite of mitigation measures to reduce the effects of the Project on the environment and, in turn, on the use of those lands and resources for traditional purposes. EPPs and contingency plans have been developed to ensure disturbance is mitigated and minimized. Although some of the residual effects are long term, Trans Mountain said that this did not preclude Indigenous groups from continuing to use lands, waters or resources for traditional subsistence purposes.

Trans Mountain said that it will implement a Reclamation Management Plan that includes construction reclamation measures to stabilize and revegetate affected lands that, in time, achieve land productivity along the RoW equivalent to the adjacent land use, and ensure the ability of the land to support various land uses. As part of its Traffic and Access Control Management Plan, Trans Mountain said that it would work with TLRU users to define locations where access control is necessary to mitigate environmental effects associated with increased access.

Trans Mountain described additional measures to reduce residual effects on TLRU, including notification regarding construction schedules and pipeline route maps, installing signage notifying of construction activities in the area, and working with Indigenous communities to develop strategies to most effectively communicate the construction schedule and work areas to its members.

Trans Mountain committed to obtaining *Fisheries Act* authorizations when these are required, which would include measures to offset residual serious harm, as well as potential specific monitoring requirements. Trans Mountain noted that any Fish and Fish Habitat Offset Plans would be designed in consultation with regulators, fisheries managers, Indigenous groups and other stakeholders.

Trans Mountain said that Indigenous monitors will play a role in environmental compliance, and that the company would provide opportunities for Indigenous monitors to work onsite through the construction to commissioning of the Project, providing traditional knowledge to ensure protection of the environment, traditional sites and resources, and to monitor mitigation success.

Trans Mountain committed to consulting with affected Indigenous communities to identify mutually acceptable in-kind or replacement measures to replace or offset impacts directly related to and caused by a spill.

11.7.5.3 Cumulative effects

Trans Mountain said that the Project is likely to interact with existing and reasonably foreseeable developments causing cumulative effects on subsistence resources through habitat alteration and availability, changes to wildlife movement, and increased mortality risk. Most of the reasonably foreseeable developments occur outside the proposed pipeline corridor within the wider TLRU areas. These developments would not overlap spatially with the Project, but rather contribute to cumulative disturbances in traditional use areas and resources at a regional scale.

Trans Mountain said that the marine component of the cumulative effects assessment is specifically associated with the potential cumulative effects resulting from construction and operation of the WMT in combination with existing activities and reasonably foreseeable developments.

Trans Mountain assessed both the total cumulative effects and the Project contribution to these effects on TLRU and TMRU indicators. Trans Mountain said for potential effects on TLRU and TMRU indicators, the total cumulative effect significance ratings are estimated to range from low magnitude (within relatively intact areas) to high magnitude (in highly developed areas). Trans Mountain said existing cumulative effects risk is primarily associated with agriculture, forest harvest, roads and other transportation infrastructure, communities, quarries and mines, and oil and gas development. Trans Mountain stated these could be considered to range from not significant to significant. Trans Mountain stated that the application of best management practices to reasonably foreseeable developments would minimize their contribution to total cumulative effects on TLRU and TMRU indicators at the RSA scale.

Trans Mountain stated the strategy of paralleling and expanding existing facilities is the best approach to minimize the Project contribution to existing cumulative effects. Trans Mountain acknowledged the importance of continuing to work with Indigenous communities to identify measures that avoid or minimize effects on TLRU and TMRU. Trans Mountain concluded the Project's contribution to total cumulative effects on TLRU and TMRU is rated as medium magnitude and not significant.

11.7.6 TLRU and TMRU interests and concerns provided by Indigenous groups

Indigenous intervenors that submitted written evidence in the hearing raised their use of lands, waters and resources for traditional purposes within their submissions to the Board. They stated that they continue to use the lands, waters and resources throughout their traditional territories in the exercise of their rights and their traditional activities. A total of 35 Indigenous groups and individuals also provided oral traditional evidence (OTE) to the Board during the hearing. In their OTE, groups described aspects of their use of the lands, waters and resources, and provided views on how the Project could affect their ability to exercise their asserted and established rights relating to their traditional activities. Appendix 8 refers to information and evidence sources provided by Indigenous groups that participated in the hearing. The Board notes that identifying and referring to specific passages within the record can lead to other direct and indirect references being overlooked. Therefore, anyone wishing to fully understand the context of the information and evidence provided by Indigenous groups should familiarize themselves with the entire record of the hearing.

A number of concerns were raised by Indigenous groups about the Project's potential effects on their continued use, for traditional purposes, of the lands, waters, and resources in the Project area. Specifically, concerns were raised about Trans Mountain's assessment methodology, the Project's potential effects on harvesting and cultural practices, the potential effects of spills, as well as the adequacy of mitigation measures and cumulative effects on TLRU and TMRU.

11.7.6.1 Assessment methods

Many Indigenous groups raised concerns about the methodology used by Trans Mountain to assess the Project's potential effects on traditional use. Some said that a full assessment of adverse effects to environmental components of value specific to each group was required. A number of Indigenous groups expressed concerns about the conclusions reached by Trans Mountain on the significance of potential effects. Some groups said that Trans Mountain had not comprehensively considered Indigenous rights and title, and TLRU impacts to their territories.

The Stó:lō Collective said that Stó:lō technical and cultural experts were not involved in Project mitigation and EPP development, emergency response planning, or environmental survey work. The Stó:lō Collective was concerned that Trans Mountain was not committed to addressing issues and concerns raised in their Integrated Cultural Assessment.

11.7.6.2 Harvesting

Many Indigenous groups said that they rely heavily on food gathered from the land and have a high consumption of subsistence foods in their traditional territories.

Some Indigenous groups said that hunting activities continue to be impacted by development, and expressed concerns about the fragmentation of lands, loss of access to hunting and trapping areas, encroachment of developments, and loss of natural habitat. Some Indigenous groups expressed concerns with the fragmentation of lands, loss of access to hunting and trapping areas, encroachment of developments and loss of natural habitat. Indigenous groups said that although community members may not hunt as a basis for the survival of their family, it is still tied to tradition, bonding with their community, ancestors, and family, and creates a sense of place and rootedness.

A number of Indigenous groups had concerns with increased access to traditional areas. Stk'emlupsemc te Secwepemc Nation said that they were concerned that increased access would threaten wildlife, increase fishing pressure and crowding, establish invasive plants, and increase waste. Some Indigenous groups said that they were also concerned with increased competition for berry harvesting, as Project-related road construction would result in increased access to areas previously difficult to access.

Numerous Indigenous groups expressed concerns with impacts to traditional fishing activities and fish and fish habitat for Project. Shxw'ōwhámel Indian Band is concerned that with construction occurring during the fishing season, and remediation impacts, there will be a loss of access to waterways, staging areas, and fishing sites, leading to a loss of fish. Matsqui First Nation said that while members still accrue substantial physical health benefits from harvesting and consuming Fraser River salmon, their ability to catch and preserve enough salmon to meet their dietary, ceremonial and social needs throughout the year has been severely affected by the devastation of fish stocks caused by commercial fishing practices and habitat destruction.

Indigenous groups also said that harvesting, processing, and consuming wild foods, particularly salmon, also provide financial benefits. Fresh and canned salmon are staple sources of food, substantially offsetting the cost of purchasing groceries. Indigenous groups said this economic benefit of wild foods is important to all but it is of critical importance to those who are poorer and who depend on wild food in order to live on limited income.

Many groups were concerned about their ability to continue to harvest plants, including medicinal plants, for traditional uses. Some Indigenous groups said they had concerns with vegetation clearing, contamination of plants and loss or

alteration of traditional use subsistence sites for plant gathering. Coldwater Indian Band said there are a lot of plants that help them through the year, and they gather berries, roots and plants to stay healthy. Neskonlith Indian Band said that some medicines can be harvested only in certain places throughout Secwepemcul'ecw, and that their members use a lot of the medicines directly and share knowledge of them with younger people. Samson Cree Nation said the land is their pharmacy, and Elders say that they cannot go pick medicine or do ceremonies as they once could. Michel First Nation said they use the land for their treaty rights. They also said that, in the location of their former reserve, they pick Saskatoon berries, chokecherries, raspberries and blueberries.

11.7.6.3 Cultural impacts

Many Indigenous groups said that the Project would accelerate a process by which youth and successive generations would lose their spiritual connection with the land. Sunchild First Nation described how lands in their traditional territory have historically been, and are presently used, as ceremonial and teaching grounds, and support hunting, fishing, trapping, and gathering of medicinal herbs. Matsqui First Nation, Shxw'ōwhámel First Nation, and other groups said that harvesting activities, consumption practices, rituals, and ceremony are important aspects of exercising and passing on to their children traditions, skills, and practices of their culture.

During TLRU studies, Indigenous groups identified sacred sites, burial grounds, and places of cultural and spiritual significance where community gatherings can often take place. Indigenous groups expressed concerns with regard to access to these areas, as well as disruption. Many Indigenous groups expressed concerns with unmarked burial sites that could be impacted by construction.

The Stó:lō Collective raised specific concerns regarding Trans Mountain's plan to place a Project staging area on one of their important spiritual and burial sites called Lightning Rock. Stó:lō Collective strenuously objected to this plan.

11.7.6.4 Spills

Many Indigenous groups expressed concerns about the potential for an oil spill and the adequacy of spill response procedures. Some groups said that a spill would have a catastrophic effect on the resources that they traditionally harvest, and were of the view that the low probability of a spill was not sufficient reason to determine the effects of a spill are not significant. Gunn Métis Local 55 said Lac Ste. Anne has hundreds of active harvesters, that the pipeline's proposed site is close to the waters of Lake Wabamun, and that their community members have many concerns about a potential spill.

Tsawwassen First Nation said that their primary concern was the potential for oil spills and subsequent effects on their constitutionally protected fishing and harvesting rights. Tsawwassen First Nation said that a TLRU study was not critical because Tsawwassen has established modern day treaty rights pursuant to the *Tsawwassen First Nation Final Agreement Act.* Tsawwassen First Nation said that their treaty right to fish and aquatic plants extends to all fish and aquatic plants for which there are harvesting opportunities within the Tsawwassen Fishing Area and Intertidal Bivalve Fishing Area.

A number of Indigenous groups expressed concerns about potential impacts to the Fraser River. Tsleil-Waututh said that a spill in the Fraser River, or in the vicinity of the Fraser River estuary, would affect the ability to harvest sockeye and spring/Chinook salmon, and that they would have no access to safe marine foods within their territory. Musqueam Indian Band said that their concerns about the Project were based on the many valued resources that originate from the Fraser River, which are fundamental to their society, culture, and subsistence.

11.7.6.5 Mitigation

Many Indigenous groups said that they had concerns regarding mitigation measures proposed by Trans Mountain. Many said that they wanted to participate in monitoring activities, and that they wanted community members or Elders to be present during construction and involved in reclamation work, to ensure that mitigation measures are completed. Some Indigenous groups expressed concerns about the reclamation of culturally important plants, watercourse crossings, and cultural heritage sites. The Lower Nicola Indian Band said that they are concerned with the alteration of culturally important and native vegetation species, and that proper and effective mitigation is required for their ability to practice Indigenous rights. Many groups requested involvement in the development of mitigation measures and management plans to ensure that post-construction conditions can support their TLRU practices.

11.7.6.6 Cumulative effects

A number of Indigenous groups expressed concerns about cumulative effects on TLRU and TMRU. During OTE presentations, groups shared their observations of changes to the land and waters in their traditional territories as a result of development. Indigenous groups said that these changes have affected their ability to practice TLRU and TMRU activities, such as hunting, plant gathering, fishing, and trapping, as well as cultural ceremonies and gatherings. Some groups expressed concerns about the effects of existing development on the health of the ecosystems and resources harvested, as well as the effects on their cultural and spiritual well-being, and the potential effects of the Project in addition to these existing effects. Kwantlen First Nation said that they have concerns about the pressure the Fraser River is under and that Sockeye salmon, the most important of fish in their view, has been suffering a long decline.

Several Indigenous groups raised concerns about how Trans Mountain conducted its cumulative effects assessment. Many groups felt that Trans Mountain's assessment was inadequate to assess the effects of the Project on their rights and interests. Many expressed the view that group specific cumulative effects assessments specific to them or their areas of interest should have been conducted.

Tsleil-Waututh Nation said that it conducted an effects assessment, according to the *Tsleil-Waututh Stewardship Policy*, and concluded that the Project would add to negative cumulative effects, undermine Tsleil-Waututh Nation's ability to harvest, and eat safe marine foods from the Burrard Inlet, and prevent recovery of the subsistence economy.

In response to the concerns raised by Indigenous groups, Trans Mountain stated that it reviewed the findings of the supplemental TLRU studies in the context of the ESA and determined that the significance conclusions with regard to TLRU remained unchanged for both Project-related effects and the Project's contribution to cumulative effects.

Trans Mountain acknowledged that the Project may have potential adverse effects on opportunities to participate in traditional harvesting associated with direct Project effects on the land and wild food supplies (i.e., wildlife, fish, plants), and that subsistence activities may be disrupted by construction or operations of the Project and the interruption could mean that the traditional resource user misses the harvest opportunity or that their participation in the traditional activity is curtailed. Trans Mountain concluded that there will be no significant adverse impacts to the biophysical resources used by Indigenous communities during construction and routine operations of the proposed pipeline and facilities (including the land-based portion of the WMT).

With respect to effects on plants and reclamation activities, Trans Mountain said final reclamation measures, including opportunities to return culturally important plants to certain areas, and the Weed and Vegetation Management Plan, will be presented for discussion and input from Indigenous groups at the EPP workshops.

Trans Mountain said it acknowledges the importance of the Fraser River and salmon to Indigenous groups. Trans Mountain said it has developed a comprehensive suite of mitigation measures designed to protect the environment so that Indigenous groups will be able to continue with their cultural practices and subsistence lifestyle. Trans Mountain said an entire suite of mitigation measures are found in the Pipeline EPP and the Westridge Marine Terminal EPP, and that with the implementation of these mitigation measures, the construction and operations of the proposed pipeline and facilities is not expected to have a significant effect on fish and fish habitat. The company said that while there will be temporary disruption to the ability of Indigenous groups to access fishing locations during construction, the effect on fishing is expected to be short-term and therefore not significant.

With respect to cumulative effects, Trans Mountain said the methodology applied in the ESA is appropriate for considering the variability in total cumulative effects risk between regions, areas and segments, and how these differences should inform design and selection of technically and economically feasible mitigation measures that avoid, mitigate, or compensate for any residual Project contribution to cumulative effects. Trans Mountain said it applied a number of complementary approaches to balance the influences of setting and project specifics when conducting the cumulative effects assessment.

In response to the specific concerns of the Stó:lō Collective regarding Lightning Rock, Trans Mountain stated it adjusted the Project footprint at the proposed staging area, so activities are proposed to take place on the existing 18-metre-wide easement with an additional 7 metres of temporary work space required for construction (reduced from the original 42 m width). However, Trans Mountain noted that no Project- specific archaeological work has been completed at the site and, as such, a field assessment is required in advance of Project construction to confirm the site boundary. Trans Mountain stated it is committed to working with the Stó:lō Collective during this field work and, if a conflict is confirmed, Trans Mountain stated it will aim to avoid the site through further localized reduction in temporary workspace, and work with Stó:lō on any necessary mitigation.

Views of the Board

Paragraphs 5(1)(c)(iii) and (iv), and 5(2)(b)(ii) and (iii) of the CEAA 2012 require consideration of the environmental effects that are likely to result from the designated project on the current use of lands and resources for traditional purpose, as well as physical and cultural heritage, or any structure, site or thing that is of historical, archaeological and paleontological or architectural significance with respect to Indigenous people. In its evaluation, the Board has considered the effects of the Project to include all of the effects described in section 5 of the CEAA 2012. The Board also considered the effects of accidents and malfunctions that may occur in connection with the Project.

The Board recognizes the importance that Indigenous groups place on being able to continue their traditional uses and activities within the entire area of their traditional territories. In their written evidence and in their oral traditional evidence presented to the Board, Indigenous groups explained how they continue to use the lands, waters and resources within their traditional territories for a range of activities, including hunting, trapping, fishing, gathering of resources on the land, and to continue to access sites and locations of cultural and spiritual importance. Groups also described the significant role that these activities and locations on the landscape have within their cultures and societies. They described how the transmission of cultural knowledge relies on the continued ability to access resources, sites and locations for traditional purposes. The Board acknowledges the strongly held views expressed by Indigenous groups about the relationships between their use of the lands, waters, and resources and the importance of these within each Indigenous society.

Some Indigenous groups expressed concerns about Trans Mountain's approach to identifying the Project's potential effects on traditional land and resource use (TLRU), and the company's proposed mitigation measures. Concerns were expressed about how the Project's potential effects were assessed, the criteria used for determining the significance of these effects, and Trans Mountain's approach to assessing the Project's cumulative effects.

The Board has considered the evidence provided by Indigenous groups and Trans Mountain about the nature and extent of the traditional land and marine use that is carried out by Indigenous groups within the Project areas, and the potential effects of the Project on these traditional activities. The Board also considered all of the relevant information regarding potential Project effects on the biophysical elements and the ecosystems that support these, including vegetation, wildlife, fish and fish habitat, and freshwater resources, which are addressed in Chapter 10. The Board notes that Trans Mountain's approach took into account all components of the biophysical environment that support the land base, the habitat conditions essential to the practice of traditional activities, and considered all the information that the company received from Indigenous groups, to inform its assessment of resources potentially affected by the Project and the development of mitigation measures to address these effects.

The Board notes that Trans Mountain provided detailed responses to the information about TLRU and TMRU that was filed in evidence by Indigenous intervenors who submitted reports on the Board's record. This included site-specific locations related to hunting, trapping, fishing, plant gathering, as well as areas of concern and interest relating to traditional use identified by these Indigenous groups. Some groups were critical of Trans Mountain's assessment of the Project's potential effects on their ability to continue to use the lands, waters, and resources within the project area for traditional purposes, including the project's cumulative effects. The Board finds Trans Mountain's approach, including its methodology, for assessing the Project's potential effects on the current use of lands and resources for traditional purposes by potentially affected Indigenous groups was appropriate. The Board also finds that Trans Mountain adequately considered all the information provided on the record by Indigenous groups regarding their traditional uses and activities. In the Board's view, Trans Mountain provided comprehensive responses and descriptions of mitigation for each of the specific sites and activities filed in the TLRU and TMRU reports on the record.

As noted in the section in this chapter regarding lands and land requirements for the Project, 89 per cent of the proposed RoW for the Project will be contiguous with existing disturbance. The Board is of the view that Trans Mountain's proposal to locate the Project to the greatest extent possible adjacent to existing disturbance greatly reduces the potential effects of the Project by reducing requirements for new disturbance.

The Board acknowledges that some Indigenous groups have outstanding concerns about the potential effects of the Project on TLRU and TMRU. The Board notes that Trans Mountain has committed to continued engagement with all potentially affected Indigenous groups to address issues and concerns. In order to inform the Board about any outstanding concerns, the Board would impose Conditions 96 and 146 requiring Trans Mountain to file with the Board reports on its ongoing consultations with potentially affected Indigenous groups, including any issues and concerns raised, and any required mitigation measures both, during construction and the first five years of operations.

The Board views the final design of a project, including the finalization of mitigation measures and plans for environmental and socio-economic protection, to be an iterative process, and that these can be appropriately finalized after a final determination on the Project has been made. In this regard, the Board views the ongoing dialogue between

Trans Mountain and potentially affected Indigenous groups to be an important component in the finalization of those plans and measures. The Board expects that Trans Mountain will continue to consult with potentially affected Indigenous groups, and encourages affected Indigenous groups to engage in ongoing discussions with the company so that appropriate information can be incorporated into the Project design and follow-up programs. In order to inform the Board about the conclusions from this ongoing work, the Board would impose Condition 97 requiring Trans Mountain to file for approval, prior to construction, a report on outstanding TLRU and TMRU investigations.

Trans Mountain committed to provide Indigenous groups with opportunities to be actively involved in monitoring activities during construction and reclamation. The Board encourages those Indigenous groups that wish to have a role in monitoring the Project's potential effects during construction and reclamation to discuss such opportunities with Trans Mountain. To facilitate the participation of Indigenous groups in construction monitoring, the Board would impose Condition 98 requiring Trans Mountain to file a plan for the participation by Indigenous groups in construction monitoring. In addition, the Board would impose conditions requiring Trans Mountain to report to the Board on its consultations with Indigenous groups for the development of the Project's environmental protection plans.

The Board acknowledges the significant concerns raised by the Stó:lō Collective regarding the Project's potential impacts on Lightning Rock. The Board accepts the views expressed by the Stó:lō Collective about the importance of Lightning Rock as a site of cultural significance. The Board acknowledges Trans Mountain's commitment to continue to work with the Stó:lō Collective to conduct further assessment at the site in order to define the site's boundaries more clearly and to identify and address any potential impacts the Project may have. In order to inform the Board of the outcomes of these further assessments, the Board would require Trans Mountain to file a report outlining the conclusions of a site assessment for Lightning Rock, including reporting on consultation with the Stó:lō Collective (Condition 77).

The Board acknowledges the concerns raised by Indigenous groups about the potential effects of a spill on their continued use of lands, waters and resources. Trans Mountain has, in the event of a spill, committed to consulting with affected Indigenous communities to identify mutually acceptable in-kind or replacement measures to replace or offset impacts directly related to, and caused by, the spill. The Board would require Trans Mountain to identify Indigenous groups to be included in its consultation plan for review of the Project's Emergency Management Program. In the event of a spill from the pipeline or at the WMT, the Board finds that, depending on the extent and location of the spill, response time and the effectiveness of response measures, there could be significant adverse environmental effects to the use of lands, waters and resources for traditional purposes. However, the Board is the view that, should the Project be designed, constructed and operated according to the fulfillment of its certificate conditions and Trans Mountain's commitments, an accident or malfunction that could result in significant adverse environmental or socio economic effects is not a likely event.

The Board is of the view that the ability of Indigenous groups to use the lands, waters and resources for traditional purposes would be temporarily impacted by construction and routine maintenance activities, and that some opportunities for certain activities such as harvesting or accessing sites or areas of TLRU will be temporarily interrupted. The Board is of the view that these impacts would be short term, as they would be limited to brief periods during construction and routine maintenance, and that these effects will be largely confined to the Project footprint for the pipeline, associated facilities and the on-shore portion of the WMT site. The Board finds that these effects would be reversible in the short to long term, and low in magnitude.

For the TMRU activities directly affected by the WMT, the Board finds that these effects would persist for the operational life of the Project, as TMRU activities would not occur within the expanded water lease boundaries for the WMT. The Board finds that while the effects would be long term in duration, these would be reversible in the long term. The Board notes that the anticipated loss of marine fish and fish habitat will be offset through compensation or offset habitat, and that specific compensation measures will be determined in consultation with DFO and affected Indigenous communities. The Board acknowledges the concerns expressed by Indigenous groups about the effects on harvesting and traditional user vessel movements in the vicinity of the WMT, but notes that the dock and associated vessel movement have been present for many years. Indigenous groups would likely be able to adapt to the expanded water lease boundary. Therefore, the Board finds that for the WMT, the Project's effects on TMRU are low in magnitude.

With respect to the total cumulative effects on TLRU and TMRU, the Board finds existing cumulative effects associated with agriculture, forestry, transportation, roads and other infrastructure could be significant in certain areas of high development. Given Trans Mountain's suite of mitigation measures to address effects on the biophysical resources that support TLRU and TMRU activities, Trans Mountain's specific mitigation measures for addressing potential effects on TLRU and TMRU, the Boards finds that the Project's contribution to cumulative effects is not significant.

The Board is therefore of the view that during construction and routine operations, the Project is not likely to cause significant adverse environmental effects on the lands, waters or resources used for traditional purposes by Indigenous groups, and is not likely to cause significant adverse effects on the ability of Indigenous groups to utilize lands, waters or resources for traditional purposes.

The Board finds that in the event of a credible worst-case spill, environmental effects to the lands, waters or resources used for traditional purposes by Indigenous groups would be adverse and significant. However, as discussed in Chapter 9 the Board is the view that, should the Project be designed, constructed and operated according to the fulfillment of its certificate conditions and Trans Mountain's commitments, the probability of such an event is very low. Therefore, the Board recommends that there are not likely significant adverse effects for the purposes of the CEAA 2012.

The Board has incorporated the potential consequences of a spill into its discussion on Spill Risks in Chapter 1 and considered them in its overall weighing of the benefits and burdens of the project in Chapter 2.

11.8 Human health

Trans Mountain undertook a variety of human health risk assessment (HHRA) studies that estimated the Project's potential effects on human health. It said that it followed a conventional risk assessment approach, focusing on the identification of the potential pathways by which people might be exposed to chemicals of potential concern (COPC), and quantifying the potential health effects. Trans Mountain completed screening level and qualitative risk assessments of the pipeline and marine terminal facilities, as well as detailed risk assessments for the WMT and for pipeline spill scenarios. It said construction-related health impacts were not included, due to the short-term nature of the emissions associated with construction activities. The Project's potential effects on human health associated with increased marine transportation are discussed in Chapter 14.

Trans Mountain identified the exposure pathways by which chemical emissions might 'travel' from the Project to the people living near the Project's facilities, to those who might frequent the area for recreation or other purposes, as well as how age, gender or health status may affect people's vulnerability to potential effects. Since the COPC would be emitted directly into the air, the primary exposure pathway is via inhalation (i.e., breathing in chemicals). Exposure through other pathways was also examined, including by ingestion of foods and direct skin exposure.

Trans Mountain said that specific consideration was given to Indigenous peoples because of the unique opportunities for chemical exposures that might occur through traditional Indigenous practices, including the consumption of traditional foods such as game meat, fish, beach food and wild plants. Trans Mountain said that it used exposure limits to assess the potential health effects that could result from short-term and long-term exposure to the various chemical emissions associated with the Project. Reliance was placed on exposure limits developed or recommended by regulatory authorities or reputable scientific authorities for the protection of human health. These included, among others, those available from Health Canada, the British Columbia Ministry of the Environment (B.C. MOE), the United States Environmental Protection Agency (US EPA), and the World Health Organization (WHO).

11.8.1 Pipelines and facilities

11.8.1.1 Pump stations

Trans Mountain said that all new pumps will be electrically driven and would not be a direct source of chemical emissions. Trans Mountain said overall, the opportunity for exposure to chemical emissions from the pump stations would be limited largely due to the low potential for pump station emissions to disperse off-site.

11.8.1.2 Edmonton, Sumas, and Burnaby tank terminals

Trans Mountain said that for the Edmonton, Sumas and Burnaby tank terminals, the maximum predicted levels of exposure to COPCs (acting either singly or in combination) for both short term and chronic exposure remained below levels of exposure that would be expected to cause health effects. Adverse health effects would therefore not be expected among residents or area users from exposure to the emissions from the additional tanks at the Edmonton, Sumas and Burnaby tank terminals.

11.8.1.3 Pipeline spill scenarios

Trans Mountain assessed the potential health effects associated with simulated pipeline oil spill scenarios involving the spillage of oil onto land, within Metro Vancouver, as a result of third party damage to the pipeline. Trans Mountain assessed spilled oil volumes of 1 012 m^3 and 1 558 m^3, which took into consideration factors such as the expected response time for initiation and completion of valve closure, and the distance between valve locations.

Trans Mountain's assessment focused on short-term inhalation exposures during the early stages of an incident, as well as direct physical contact. Potentially affected people included members of the general public along the pipeline corridor within Metro Vancouver, as well as emergency responders. Trans Mountain acknowledged that people may be especially responsive to chemical exposures, and therefore reliance was placed on the use of health-based exposure limits developed by reputable scientific and regulatory authorities.

Trans Mountain said that, for both scenarios, exceedances of exposure limits were predicted for the aliphatic C1-C4 and C5-C8 groups, benzene and toluene. Average concentrations were predicted to exceed exposure limits at distances ranging from 50 m to approximately 1 km directly downwind from the surface of the pooled oil.

Trans Mountain said that, although the assessment revealed exceedances of the exposure limits, the interpretation of these exceedances required consideration of the conservative assumptions incorporated into the assessment. Trans Mountain said that the referenced guidelines used by Trans Mountain correspond to exposure levels that are well below those known to cause adverse health outcomes. An exceedance of an exposure limit does not necessarily indicate an imminent health risk, but implies some prospect for health effects to occur, and requires further analysis. Trans Mountain said that it also relied on the use of Acute Exposure Guideline Levels (AEGLs) and Emergency Response Planning Guidelines (ERPGs) in its assessment, since these were intended specifically for assessing the potential health effects that might occur from exposure to relatively high concentrations of chemicals for short duration under rare, accidental circumstances.

Trans Mountain concluded that the weight of evidence showed no obvious prospect for people's health to be seriously adversely affected during the early stages of the spill events, and that overall, people in the area would not be expected to experience health effects other than minor transient sensory or non-sensory effects. Examples of these effects include minor discomfort, mild irritation of the eyes, nose, or throat, mild cough, and symptoms such as mild headache, light headedness, minor vertigo, dizziness, or nausea. Odours may be apparent to some individuals.

11.8.1.4 Westridge Marine Terminal (WMT)

Trans Mountain said that, for short-term (acute) exposure, the maximum predicted air concentrations of chemicals resulting from the expansion of the WMT are lower than the corresponding exposure limits, with one exception – the combined exposures to the respiratory irritants mixture (composed primarily of NO_2 and SO_2). Trans Mountain said that this is largely produced by emissions from the existing tugs and main engines of the existing tankers. This was predicted to exceed the exposure limit for area users at one location within the perimeter of another industrial facility, where public access would be restricted. Trans Mountain said that predicted concentrations were otherwise below exposure limits for Indigenous peoples, urban dwellers and area users and concluded the potential health risks were therefore negligible or low, and that adverse health effects would not be expected. Trans Mountain stated that exceedance for the respiratory irritants mixture is not predicted to change under the Application Case or Cumulative Case, and that this indicates that the incremental changes as a result of the Project and the reasonably foreseeable increases in all other marine vessel traffic are essentially negligible, and that the Project will have very little, if any, impact on the Base Case health risks associated with short-term exposure to the respiratory irritants mixture.

Trans Mountain said that for long-term (chronic) exposure risks, in all cases, the maximum predicted annual air concentrations of non-carcinogenic chemicals and for each carcinogenic COPC are lower than the corresponding exposure limits. Trans Mountain concluded that long-term health risks were therefore considered negligible or low, and that adverse health effects are not expected as a result of the WMT expansion.

Trans Mountain evaluated the potential health risks associated with short-term exposure to chemical emissions resulting from failures of the vapour combustion unit (VCU) and the vapour recovery units (VRUs) at the WMT. Trans Mountain stated that for the purpose of the assessment, the modelling incorporated a number of conservative assumptions corresponding to credible 'worst-case' conditions with a low probability of occurrence. Specifically, the VCU was assumed to fail during the simultaneous loading of three vessels, a loading scenario which is expected to occur less than 5 per cent of the time.

Also, it was assumed that 30 minutes would be required to identify a problem with the VCU or one of the VRUs, discontinue vessel loading, and isolate the vessel being loaded and the vapour recovery system. The company said it was assumed that

each of the upset scenarios occurred despite the low probability and without regard for the numerous safety and monitoring measures that will be implemented as part of the Project.

Trans Mountain predicted exceedance of the acute inhalation exposure limit for benzene under both of these upset scenarios. These exceedances were predicted to occur within the terminal boundary, over water within the water lot lease boundary, and in the vacant lands to the southeast of the terminal. Trans Mountain said that the likelihood that members of the public would be present at these locations and exposed to the benzene concentrations would be low. It said that the maximum predicted one-hour air concentration in the assessment likely overstates the actual risks to public health as this concentration is associated with infrequent and unusual meteorological conditions. The company said the likelihood of achieving this maximum concentration is low, since an upset scenario (already an improbable event) is unlikely to take place at the exact time when such "worst-case" meteorological conditions may occur.

Trans Mountain said no exceedances were predicted to occur at the closest residences, elementary schools or assisted living complexes, or within any of the neighbouring communities surrounding the WMT, the risks to public health from short-term inhalation exposure to benzene were considered to be low, and that adverse health effects are not expected.

Trans Mountain said that for the credible worst-case spill scenario for the WMT, (160 m^3 of spilled oil), exceedances of the acute exposure limits were predicted to occur for the following COPC: aliphatic C1-C4, aliphatic C5-C8, and aromatic C9-C16 groups, benzene, toluene and xylenes. Trans Mountain said the exceedances indicate the possibility that people exposed to each of these COPC during the early stages of the spill incident could potentially experience adverse health effects.

Trans Mountain said that the exceedances were predicted to occur over water only, with the spatial extent either confined to an area within the Westridge containment boom (i.e., smaller size spill) or an area in close proximity to the tanker berths (i.e., credible worst-case spill). Exceedances of the acute exposure limits were predicted to occur over the first one-to-two hours following the start of the smaller spill scenario. For some COPC (aromatic C9-C16 group and benzene), the exceedances were predicted to occur for up to 13 hours after the start of the spill under the credible worst-case spill scenario.

Trans Mountain said that a comparison of the predicted maximum one-hour average airborne concentrations of the COPC against the corresponding one-hour AEGL and ERPG guidelines revealed the predicted concentrations were consistently lower than these guidelines, indicating that people in the area would not be expected to experience health effects other than mild, transient sensory and/or non-sensory effects. Trans Mountain noted examples of these: discomfort, irritability, mild irritation of the eyes, nose or throat, mild cough, and symptoms consistent with nominal central nervous system involvement such as mild headache, light headedness, minor vertigo, dizziness or nausea. Trans Mountain said these effects would likely resolve quickly when exposure ended, with no lingering after-effects.

Trans Mountain said the absence of significant adverse health effects applied whether the COPC were assessed on an individual basis or as part of mixtures.

Several intervenors raised concerns about the methodology used by Trans Mountain to assess the Project's potential human health effects. Concerns raised by Metro Vancouver, the City of Vancouver and Living Oceans noted apparent deficiencies in the assumptions used in Trans Mountain's air dispersion models, how these may significantly underestimate the impacts of the Project, and that certain exposure pathways and activities were excluded from the assessment. Living Oceans said that while Trans Mountain's assessment followed a conventional HHRA paradigm, it was based on misleading and non-comparable scenarios.

Concerns were expressed about the selected spill scenario location (within Metro Vancouver) and the methods and assumptions used to assess potential human health effects associated with a pipeline oil spill. Living Oceans Society raised a number of specific concerns regarding Trans Mountain's pipeline spill scenario. Living Oceans Society said that Trans Mountain's scenarios do not represent worst-case credible conditions for emissions, concentrations and human health risks. It said that Trans Mountain's own evidence show a maximum outflow volume within Metro Vancouver of approximately 3 100 m^3, and there are numerous locations where the estimated outflow volumes exceed 2 500 m^3, which are all credible spill volumes that were not analyzed. Living Oceans Society also said the meteorological conditions used do not follow US EPA guidance for the Risk Management Program, and that the use of appropriate worst-case meteorological parameters would very substantially increase concentrations (e.g., by a factor of 10), and would result in much larger hazard zones where concentrations exceed exposure limits.

The City of Vancouver made a number of recommendations to address these deficiencies, including the provision of revised detailed HHRA reports which include all plausible pathways and routes of human exposure.

Trans Mountain said that the assumptions and parameters used in the dispersion modelling followed the Guidelines for Air Quality Dispersion Modelling in British Columbia (British Columbia Ministry of Environment (B.C. MOE) 2008), which is an established industry and government standard. It said that the outcomes of the pipeline spill scenarios assessment were

considered representative of the types of health effects that might be experienced by people living in smaller communities, including Indigenous and rural communities located along the pipeline route.

Trans Mountain said that the spill volume of 1 558 m^3 is consistent with a credible worst-case spill scenario as it corresponds to a reasonable upper bound estimate (95th percentile) of the volume of oil that might be spilled on land in the unlikely event of third party damage to the segment of the proposed pipeline running through Metro Vancouver. Trans Mountain said the credible worst-case scenario was based on the development and analysis of estimates of potential spill volumes that could occur at more than 2,000 locations along this pipeline segment, taking into the consideration the distance between emergency shut-down valves, valve closure times, and drain-down volumes between valve locations.

Trans Mountain also said that with respect to on-land oil spills at the Burnaby, Edmonton and Sumas terminals, it believes that the simulated pipeline oil spill can be considered representative of a tank terminal spill scenario and the potential health effects from exposure to hydrocarbon vapours in the event of an oil spill at any of the terminals

A number of concerns raised by intervenors focused on potential air quality health impacts resulting from routine operations, as well as potential accidents. Concerns were raised about the Project's potential human health effects in the vicinity of the WMT. Metro Vancouver and Health Canada raised concerns about the potential health effects of ground-level ambient ozone. Metro Vancouver said that there is no known safe level for ambient ozone concentrations and the sensitive Lower Fraser Valley airshed continues to experience occasional episodes where applicable objectives and standards for ambient concentrations of ground-level ozone may be exceeded.

In response, Trans Mountain said the U.S. EPA concludes that, based on the weight-of-evidence, there is no clear health effects threshold for ozone, however there is some uncertainty in the lower end of the concentration-response evaluations for ozone (i.e., below 20 ppb) due to data limitations. Because the observed ozone concentrations in Metro Vancouver already exceed this level, any increase in regional ozone concentrations could be associated with adverse health effects. For the Project, and in accordance with current provincial and federal guidance, the management of ozone in relation to potential human health effects will be focused on the monitoring of precursor emissions, such as NO_x and VOCs. An emissions management plan for the precursor compounds will help mitigate potential ozone-related health risks in the area.

Several letters of comment were submitted by people expressing their concerns about how increased emissions from the WMT would potentially affect their health or the health of families and residents in the area because of existing health conditions such as asthma, chemical sensitivities or chronic obstructive pulmonary disease (COPD). Other participants raised concerns about the Project's potential impact on air quality, including the potential health effects of benzene in the vicinity of the WMT, and the potential health effects of a major fire at the Burnaby Tank Terminal.

Specific concerns of intervenors included potential effects from Project-related particulate matter (including diesel particulate matter, $PM_{2.5}$ and PM_{10}), 1,3-Butadiene, and potential exceedances of exposure limits for benzene.

11.8.1.5 Benzene

BROKE, North Shore No Pipeline Expansion (NS NOPE), Living Oceans Society, and Metro Vancouver expressed concerns over potential human health effects associated with short-term and long-term exposure to benzene. Specifically, concerns were raised that maximum predicted ground-level air concentrations of benzene, including in Burrard Inlet, would exceed Alberta's one-hour Ambient Air Quality Objective (AAQO). Health Canada expressed concern regarding benzene concentrations at the Edmonton Terminal.

Trans Mountain said it used the acute health-based exposure limit developed by the Texas Commission on Environmental Quality (TCEQ) for benzene. By virtue of the manner in which it was derived, the reference value confers a very high degree of protection. Trans Mountain noted that Alberta's one hour AAQO for benzene was not selected for use in the HHRAs as it did not satisfy the requirement for adequate supporting documentation. As a result, Trans Mountain was unable to comment on the scientific merit of this limit, and can make no assertions as to the adequacy of the study upon which it may be based.

Trans Mountain said that, based on its assessment, in all cases the potential health risks associated with short-term and long-term inhalation of benzene were below the corresponding exposure limits. This applied whether benzene was assessed on an individual basis or as part of a mixture such as immunotoxicants and hematotoxicants.

Trans Mountain committed to meeting the lowest applicable AAQO established in B.C. or Alberta at each terminal, including Alberta's one-hour AAQO for benzene. It said that it was in the process of evolving and refining the vapour control designs of its terminals, with the goal of ensuring sufficient recovery and destruction efficiencies to meet these objectives.

11.8.1.6 Particulate matter

The City of Burnaby, Living Oceans Society, the City of Vancouver, FVRD, Metro Vancouver and B. Miller expressed concern regarding the potential health risks associated with exposure to particulate matter emitted from routine operations and at the WMT, including potential cancer risks. Concerns included the potential health effects associated with exposure to $PM_{2.5}$ and PM_{10}, and diesel particulate matter (DPM).

Metro Vancouver said that the incremental emissions associated with the Project and cumulative scenarios would result in maximum DPM concentrations and associated cancer risks that exceed Health Canada's 10 per million screening level by a considerable margin.

Metro Vancouver requested that the Board reject Trans Mountain's analysis and conclusions regarding DPM cancer risk. Metro Vancouver recommended that Trans Mountain be required to establish additional ambient air quality monitoring in the WMT area for $PM_{2.5}$, and to establish a continuous improvement program that targets reductions in emissions from vessels loading at WMT, including DPM.

Trans Mountain said that it fully recognizes that there is general consensus among regulatory agencies that diesel exhaust, including DPM, is carcinogenic, but that considerable uncertainty exists with respect to the actual dose-response relationship of DPM. It said that neither Health Canada nor the U.S. EPA has developed a cancer-based exposure limit for DPM.

In response to the concerns raised by FVRD and Metro Vancouver with respect to DPM, Trans Mountain provided an explanation for its approach and conclusions regarding its assessment of DPM risks in its reply evidence. Trans Mountain said that it used a scientifically defensible approach for assessing the potential health risks for DPM. It said there is low confidence in the California Office of Environmental Health Hazard Assessment unit risk value that FVRD and Metro Vancouver used to characterize the potential carcinogenic risks associated with DPM. Trans Mountain said that Metro Vancouver's evidence incorrectly concluded DPM is the dominant risk factor for lung cancer in the region and exaggerated the actual DPM-related cancer risks in the region. It said that its predicted 24 hour and annual air concentrations were compared to exposure limits developed by the U.S. EPA, and that Project-related excess cancer risks for DPM were less than 1 in 100 000 (i.e., 0.8 in 100 000), which is the benchmark that Health Canada and the British Columbia Ministry of the Environment use to assume that any level of long-term exposure to carcinogenic chemicals is associated with some hypothetical risk of cancer.

In response to concerns raised about the health impacts of particulate matter, Trans Mountain noted that additional air dispersion modelling was completed for the WMT expansion in response to the Lower Fraser Valley Air Quality Coordinating Committee and that the updated modelling presents predicted peak 24-hour and maximum annual concentrations for $PM_{2.5}$ and PM_{10} under the Base and Application cases that are lower than those assessed in the HHRA for the WMT.

Trans Mountain said that in all cases, the potential health risks associated with short-term and long-term exposure to $PM_{2.5}$ and PM_{10} were below the benchmark risk estimate of 1.0, indicating that predicted exposures were less than the corresponding exposure limits, and that the contribution of the Project to cumulative $PM_{2.5}$ and PM_{10} exposures was negligible.

11.8.1.7 1,3-butadiene

BROKE, the City of Burnaby, the City of Vancouver, and NS NOPE expressed concern over the potential human health effects associated with short-term and long-term exposure to 1,3-butadiene emitted from the Project.

Trans Mountain said 1,3-butadiene was not detected in either the bulk liquid analysis or the vapours of Cold Lake Winter Blend, which served as the basis for the fugitive or uncontrolled emissions inventory for the Project. Trans Mountain said that, in all cases, the maximum predicted short-term and long-term exposures to 1,3-butadiene were below the corresponding exposure limits, indicating that adverse health effects would not be anticipated.

11.8.1.8 Fire

The City of Burnaby raised concerns about the potential health effects that could result from a major fire at the Burnaby Tank Terminal, including release of toxic smoke plumes. It said that the potential health impacts are most likely to harm those with pre-existing chronic respiratory conditions, may increase rates of asthma and cardiovascular illness, and may present undetermined effects on longer term illness such as cancer. The City of Burnaby concluded that the Burnaby Mountain Terminal expansion is not appropriate given these, among other risks and its location.

Trans Mountain said that its proposed emergency and spill response measures (discussed in detail in Chapter 9) will be taken as part of a coordinated action to contain and recover spilled oil and to mitigate potential health and environmental

impacts, and that these measures will further prevent fires from occurring. The coordinated action will determine the need for and types of measures required to protect people's health if public health or safety were threatened.

11.8.2 Groundwater

Trans Mountain identified the Project's potential groundwater quality and quantity effects, the spill scenarios (including pathways) through which oil could enter surface water or ground water sources, and described the company's recommended mitigation measures.

The measures identified by Trans Mountain to address effects on groundwater include:

- notifying landowners with water wells before blasting is carried out, and assessing groundwater conditions and risks;
- monitoring all registered or known potable water wells located within 200 m of any blasting prior to and following blasting;
- re-establishing or replacing a potable water supply if water wells located within 30 m of the construction RoW are damaged (i.e., diminishment in quantity and/or quality); and
- using spill prevention practices that protect wells and aquifers.

A number of Indigenous groups, municipal and provincial governments, and federal authorities raised concerns about the potential impacts of the project on groundwater quality and availability, including potential impacts related to a spill or accident.

The Coldwater Indian Band said that it relies entirely on groundwater from the aquifer beneath IR No.1 for drinking water, and other purposes including farming, and that Trans Mountain's proposed east alternative and modified east alternative routes will be located upslope and east of the Coldwater IR No.1. It recommended installation of independent monitoring wells to monitor aquifer yields, sustainability and quality in perpetuity for the proposed east routes. Trans Mountain said that it believes there is no opportunity for the existing or proposed pipeline to undermine the physical hydrogeology in the area of the Coldwater Indian Band that would create any concerns with respect to groundwater flow and aquifer sustainability or yield.

The Province of British Columbia raised concerns about long-term groundwater quality monitoring, particularly in high consequence areas (HCAs) where community drinking water is obtained from highly vulnerable aquifers.

The City of Vancouver recommended more ground-truthing of well locations and use prior to the construction of the pipeline, and the establishment of monitoring wells adjacent to or within vulnerable aquifers.

Health Canada said that impacts on drinking water during normal operations will be low, but that this is contingent on the effective implementation of spill control measures to limit dispersion of oil into drinking water sources. Health Canada recommended that high consequence areas be identified to take into account the use of these by Indigenous people as sources of drinking water, for cultural and spiritual purposes, and that appropriate priority be given to these areas in spill response plans. Natural Resources Canada raised concerns about potential impacts on surface water or groundwater sources used by Indigenous groups for drinking, cultural, spiritual, traditional or agricultural purposes.

Trans Mountain committed to work with communities that have specific concerns related to the protection of municipal water sources, and to discussions on potential groundwater modelling and reviews of maintenance policies and programs. Trans Mountain acknowledged the need for special consideration of aquifers and surface watercourses in close proximity to Indigenous communities. The company committed to work with the leadership of Indigenous communities to understand the manner and extent of use of the water sources, and to collectively determine the appropriate measures to be taken to protect Indigenous people's health.

Trans Mountain committed to incorporating a list of potential drinking water sources for Indigenous communities into its updated EMP. The list of potential drinking water sources would be used to issue an immediate drinking water advisory in the event of a spill contaminating a watercourse or aquifer used for drinking water purposes. It would also ground-truth the exact sources of drinking water affected by a spill by attempting to meet with Indigenous communities, landowners, municipalities, etc. and then refining the drinking water advisory with the results of the ground-truthing activities. If a drinking water advisory were to be issued as a result of a spill, Trans Mountain committed to working with the leadership of the Indigenous community to identify surplus capacity from other drinking water sources in the area, while suitable replacement alternatives are established and implemented.

11.8.3 Community health

Trans Mountain evaluated the potential effects of the project on key community health issues, including:

- socio-economic health effects, including mental well-being, and alcohol and drug misuse;
- infectious diseases;
- environmental health effects, including stress and anxiety related to the perception of contamination; and
- Indigenous health, including diet and nutritional outcomes.

Trans Mountain said that the Project is likely to have both beneficial and adverse effects on socio-economic health outcomes. It said that socio-economic health effects are linked largely to project construction, and would primarily affect those communities that act as construction hubs, communities that have limited mental health and addictions services, or communities where the level of stress about the Project is high. Trans Mountain said that the possibility of a spill or other malfunction, the presence of the pipeline itself, or perception of contamination can cause stress and anxiety.

Trans Mountain said that the Project has the potential to contribute to dietary change away from a traditional subsistence diet by Indigenous people. It predicted that there would be residual effects to animal habitat, animal movements, and increased mortality risk for wildlife along the corridor, and that some subsistence food sources will be affected by Project activities. Some community members may avoid eating subsistence foods due to fears of contamination, and that the degree to which this would occur is unknown.

Several Indigenous groups expressed concerns about the Project's potential direct or indirect effects on community health, particularly in the event of a spill, through impacts on cultural activities, traditional food resources, or through increased anxiety and perception of contamination. The Upper Nicola Band raised concerns about the ability to continue traditional land use activities, and resulting effects on the physical and psychological health of community members.

Matsqui said that adverse short-term and long-term health impacts resulting from a spill event affecting Matsqui reserve lands, the Fraser River or Burrard Inlet are of particular concern, and were rated as "extremely significant." Matsqui First Nation provided an assessment of potential impacts based on spill scenarios (including pipelines ruptures near Hope, McLennan Creek, and a marine spill in the Strait of Georgia). In each of these scenarios, Matsqui said that the predicted impacts on physical health are characterized as severe, including outcomes such as lethargy, low energy (from limited time/activity outdoors after a spill), higher rates of illness (from lower nutrition due to limited consumption of fish after a spill), high stress (from a more sedentary lifestyle), and reduced pre-natal health and youth development (from diminished nutrition during critical developmental periods).

Health Canada said that the health risk assessment for consumption of country foods by Indigenous residents, urban dwellers and area users in the vicinity of the Burnaby and WMTs indicates that there will be little Project-related effects due to contamination of these food sources during normal operations. Health Canada said that consideration should be given to the potential impacts of a spill on the availability and potential contamination of terrestrial and marine country foods consumed by Indigenous communities.

Trans Mountain said that it proposed mitigation measures described in the Pipeline EPP to protect the biophysical environment and provide for ongoing monitoring, and that communication with stakeholders is particularly important in minimizing any adverse effects on environmental health, public safety and the health of Indigenous people.
Trans Mountain's key mitigation measures include:

- developing site-specific traffic access and control management plans;
- developing a Worker Accommodation Strategy;
- ensuring construction camps meet all provincial health and safety requirements;
- developing a Code of Conduct to guide appropriate worker/community interactions; and
- developing an issues-tracking process to monitor community health and socio-economic issues and opportunities that may emerge during construction and reclamation.

Trans Mountain said that although some subsistence food sources will be affected by Project activities over the short-term, and anxiety around potential contamination may lead some Indigenous community members to avoid eating subsistence foods, the residual effect on Indigenous community health will not be significant, as the magnitude of changes to traditional food sources is negligible to low.

Views of the Board

Assessment methodology

A number of participants raised concerns and presented opposing evidence, views and conclusions about specific aspects of Trans Mountain's methodology, such as air dispersion modelling, and predictions of risk based on chemical exposures. The Board is of the view that Trans Mountain followed a generally acceptable risk assessment paradigm, and that its assessment adequately identified and evaluated the Project's potential effects on human health. The Board accepts Trans Mountain's reliance, primarily, on the use of exposure limits developed or recommended by authorities such as Health Canada and the US EPA. The Board finds this approach acceptable, as these guidelines are broadly protective of human health. The Board is of the view that additional assessment, as recommended by some intervenors, is not required.

Facilities

The Board accepts Trans Mountain's conclusion that for the construction of the Project and for routine operation of the pipeline, pump stations and Edmonton, Burnaby and Sumas tank terminals, adverse health effects would not be expected. This is because there would be limited potential emissions during construction, the predicted short term and chronic levels of exposure to chemicals of potential concern at the tank terminals are below levels of exposure that would be expected to cause health effects, and because the pump stations will be electrically driven and would not be a direct source of emissions available for dispersion beyond the stations' boundaries. The Board therefore finds that these elements of the Project are not likely to cause significant adverse effects on human health, including the health of Indigenous people.

The Board acknowledges the concerns raised by Indigenous groups, municipalities, provincial governments and federal departments about existing air quality in the vicinity of the Westridge Marine Terminal (WMT) (and the lower mainland in general). The Board notes in particular those concerns regarding how the Project's potential emissions from the operation of the WMT, including particulate matter, could affect human health. The Board acknowledges the general consensus that $PM_{2.5}$ and diesel particulate matter (DPM) have known negative health effects.

The Board considered these concerns, the evidence provided by Trans Mountain, and all evidence on the record regarding the proposed expansion of the WMT. The Board notes the predicted exceedance for the respiratory irritants mixture during routine operations of the WMT. The Board is of the view that the Project contribution to this exceedance will have inconsequential impact on any incremental health risks associated with short-term exposure resulting from operations at the WMT, and therefore is not likely to cause significant adverse effects on human health, including the health of Indigenous people.

The Board acknowledges that a number of people expressed their concerns about how they believed increased emissions from the WMT would potentially affect their health or the health of families and residents in the area because of existing health conditions such as asthma, chemical sensitivities or COPD. The Board is of the view that Trans Mountain's assessment of potential long-term health effects associated with the operation of the WMT follows a generally accepted risk assessment paradigm and is based on the use of exposure limits developed or recommended by Health Canada and other reputable authorities. The Board finds that, based on the generally accepted methodologies used by Trans Mountain, the potential health risks associated with long-term inhalation of chemicals, such as benzene, were below the corresponding exposure limits, and that this applied whether benzene was assessed on its own or as part of a mixture of chemicals. The Board therefore finds that for long-term exposure risks associated with the operation of the WMT, the maximum predicted concentrations of carcinogenic and non-carcinogenic chemicals, including benzene, $PM_{2.5}$, and 1.3-butadiene, are likely to be lower than the corresponding exposure limits that were examined, including those exposure limits developed by Health Canada and other authorities, and are not likely to cause significant adverse effects on human health, including the health of Indigenous people.

Metro Vancouver requested that the Board reject Trans Mountain's analysis and conclusions regarding DPM cancer risk. The Board acknowledges that there is a degree of uncertainty in all predictive assessments, including human health risk assessments. The Board also acknowledges the consensus that DPM is a potential carcinogen. The Board has considered all the evidence presented on this matter and is not persuaded that Trans Mountain's analysis and conclusions with respect to DPM risks should be rejected. The Board finds that Trans Mountain has undertaken a scientifically defensible approach for assessing the potential health risks for DPM. The Board finds that Trans Mountain, in its reply evidence, provided sufficient and detailed explanation for its approach and conclusions regarding potential DPM risks. The Board finds that Metro Vancouver's evidence relating to its estimations of the DPM cancer risks assign a potentially disproportionately high level of lung cancer risk to DPM in the lower mainland, and the Board therefore questions the potential value of the conclusions reached in this evidence. Based on the balance of the evidence, the Board therefore finds that long-term emissions exposure associated with the operation of the WMT is not likely to cause significant adverse effects on human health, including the health of Indigenous people.

The Board acknowledges intervenors' interest related to monitoring air emissions, including the recommendations made by Metro Vancouver for additional monitoring of particulate matter emissions. In the Board's view, monitoring air emissions serves as a valuable tool in verifying and validating the results of predictive air emissions modelling, including those used to predict potential effects on human health. To this end, the Board would require Trans Mountain to develop and implement air emissions management plans for the WMT and for the Edmonton, Sumas and Burnaby Terminals (Conditions 52 and 79). These plans are intended to protect both the environment and human health, and would require monitoring of contaminants of potential concern, including particulate matter, nitrogen oxide, sulphur dioxide, and volatile organic compounds at the WMT.

The Board would require Trans Mountain to include with the filed plans a summary of its consultations with appropriate government authorities and any potentially affected Indigenous groups. In its summary, Trans Mountain must also provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plans.

The Board's assessment of the Project's environmental effects of air emissions, and the Board's views on these, is provided in Chapter 10.

With respect to the potential health risks associated with short-term exposure to chemical emissions resulting from failures of the vapour combustion unit (VCU) and the vapour recovery units (VRUs) at the WMT, the Board notes Trans Mountain predicted exceedance of the acute inhalation exposure limit for benzene under both of these scenarios. The Board also notes these exceedances were predicted to occur within the terminal and water lot lease boundaries, within adjacent vacant lands, and that the likelihood that members of the public would be present at these locations and exposed to the benzene concentrations would be low. The Board finds that, although there would be risks to public health from short-term inhalation exposure to benzene in these scenarios, the scenarios presented are low probability, the geographic and temporal extent of the potential exceedance would limited, and the potential for human exposure would be low and therefore of low magnitude and not likely to cause significant adverse effects on human health.

The Board acknowledges the concerns raised regarding Trans Mountain's assessment of potential health impacts resulting from a pipeline spill, including concerns regarding the assumptions used in selecting and assessing the spill scenarios. The Board has considered these concerns as well as Trans Mountain's assessment and evidence. The Board is of the view that Trans Mountain has presented a credible worst-case scenario for the purposes of assessing the potential effects on human health that could result from a pipeline spill. Trans Mountain's scenario was based on the analysis of potential spill volumes that could occur at more than 2 000 locations along the pipeline, and took into account factors such as distances between emergency shut-down valves, valve closure times, and drain-down volumes between valve locations. The Board finds this an acceptable approach for the purposes of assessing potential human health effects.

The Board notes Trans Mountain's conclusions regarding the Project's potential effects on human health that may result from a spill or accident would be largely limited to mild and transitory effects. The Board finds that, based on the evidence presented, there would likely be potential adverse effects on human health for those people in the vicinity of a spill, but that these effects would be limited in duration and magnitude and therefore these are not likely to cause significant adverse effects on human health.

The Board's views on Trans Mountain's measures to address emergency prevention and response, and air quality are discussed in Chapters 9 and 10 respectively. The Board is of the view that its requirements relating to emergency preparedness and response are also protective of human health. The Board would require Trans Mountain to prepare a number of plans relating to emergency response and air quality, including an Emergency Response Plan for the pipeline and the Edmonton, Sumas and Burnaby terminals, and an Emergency Response Plan for the WMT (Conditions 125 and 126).

The Board shares the concern raised by participants about water quality for Indigenous communities that utilize groundwater resources. The Board acknowledges the importance of water use for Indigenous communities, for consumption, agricultural and municipal use, and as sources associated with traditional uses and values.

The Board notes the concerns raised in this regard by the Coldwater Indian Band and Health Canada. The Coldwater Indian Band stated the draft conditions proposed by the Board fail to address their concerns regarding impacts and risks posed by the proposed Project, and will not result in the avoidance of impacts and risks to Coldwater's water supply. They recommended that the proposed requirement for a water well inventory must also identify the location and extent of aquifers transected, and that the Board's proposed condition for consultation on protection of municipal water sources does not stipulate whether measures have to be taken to mitigate risks or put in place protections to protect water sources.

Trans Mountain made a number of commitments to address the concerns raised by governments and Indigenous groups. These included commitments to discuss how groundwater modelling and monitoring could be undertaken to help address concerns, and to work with Indigenous communities to collectively determine appropriate measures to protect people's health. However, Trans Mountain has not conducted a hydrogeological study at the Coldwater Reserve that could more precisely predict any potential interactions from the proposed pipeline and the aquifer relied on by the Coldwater Indian Band. The Board finds that Trans Mountain has not sufficiently substantiated in its evidence that there is no potential interactions with the aquifer underlying Coldwater IR No. 1 and the proposed project route. The Board would therefore impose Condition 39 requiring Trans Mountain to file a hydrogeological study to more precisely determine the potential for interactions and impacts on the aquifer at the Coldwater IR 1, and to assess the need for any additional measures to protect the aquifer, including monitoring.

The Board is of the view that its proposed conditions, along with the commitments by Trans Mountain, can effectively address any effects on human health via potential Project impacts to groundwater. The Board would therefore impose a number conditions, including requirements for Trans Mountain to file with the Board a Pipeline Environmental Protection Plan (Condition 72), a water well inventory (Condition 93), consultation reports for protection of municipal water sources (Condition 94) a Groundwater Seepage Management Plan (Condition 87) and a Groundwater Monitoring Program (Condition 130).

Community health

Indigenous groups, as well as federal departments, raised concerns about potential impacts to the social health of Indigenous communities, and in particular, effects associated with any potential reductions in access to and consumption of traditional country foods. The Board accepts the evidence and comments provided by many Indigenous groups that they rely on, and have a preference for, eating traditional foods. The Board notes the views of both Trans Mountain and Indigenous groups regarding the potential feelings of stress and anxiety that could be associated with the construction and operation of the Project, and in particular, as a result of the prospect of a potential spill or accident. The Board notes the evidence provided by Matsqui describing the specific impacts it suggests would occur in the event of a spill, including higher rates of illness (from lower nutrition due to limited consumption of fish after a spill), high stress (from a more sedentary lifestyle), and reduced pre-natal health and youth development. The Board accepts the evidence of both intervenors and Trans Mountain that perceptions of contamination could have a negative effect on traditional harvesting and food consumption.

However, as described in Chapter 9 of this report, the Board is of the view that the probability of a credible worst-case spill from the pipeline is very low. While feelings of anxiety related to potential spills are concerns for many individuals, communities and Indigenous groups, the Board is of the view that, should the Project be designed, constructed and operated according to the fulfillment of its certificate conditions and Trans Mountain's commitments, the probability of an accident or malfunction that could result in significant adverse environmental or socio-economic effects is very low. With respect to perceptions of contamination that could have a negative effect on traditional harvesting and food consumption, the Board has assessed both the potential environmental effects of the Project on biophysical resources relied on by Indigenous groups for traditional harvesting and land use, as well as the effects of the Project on those uses. The Board concurs with Trans Mountain's conclusion that during construction and routine operations some subsistence food sources will be affected by Project activities over the short-term, but that the effect is likely to be temporary, and of low magnitude. The Board is of the view that any residual effect is likely to be limited to the period during construction, restricted primarily to the Project footprint, and is therefore low in magnitude.

The Board notes Trans Mountain's commitments to develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and operation of the Project. In order to ensure that the potential negative socio-economic effects of Project construction can be effectively addressed by Trans Mountain, the Board would impose Condition 13 requiring Trans Mountain to file with the Board a plan for monitoring the potential adverse socio-economic effects resulting from construction activities. This would ensure that measures to reduce or eliminate adverse effects are effectively implemented within the timeframes for which effects might occur. The Board also encourages Indigenous groups to consider their potential participation in monitoring activities during construction. In order to facilitate the potential participation of Indigenous groups interested in participating in construction monitoring, the Board would impose Condition 98 requiring Trans Mountain to file a plan to address the potential participation of Indigenous communities in construction monitoring.

The Board is of the view that with Trans Mountain's proposed measures and commitments, and with the Board's conditions, the construction and routine operations of the pipeline and the WMT facilities are not likely to cause significant adverse effects on community health, including the health of Indigenous communities.

The potential effects of spills into the marine environment are addressed in Chapter 14.

12.0 Need for the Project and economic feasibility

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.) and to replace "Aboriginal" with "Indigenous," the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report.

In making a recommendation on an application under section 52 of the NEB Act the Board considers the need for and the economic feasibility of a proposed pipeline. Paragraphs 52(2)(a), (b), and (c) of the NEB Act specifically allow the Board to have regard to:

a) the availability of oil, gas or any other commodity to the pipeline;

b) the existence of markets, actual or potential;

c) the economic feasibility of the pipeline.

These factors are directly relevant to the need for, and the continued use of, a project. The purpose of the Board's analysis in this regard is for the Board to come to a conclusion whether a project will be sufficiently used over its lifetime.

In this regard, the Board requires the applicant to provide economic information that must include details on:

- Supply - indicating that there is or will be adequate supply to support the use of the pipeline, taking into account all potential supply sources that the applied-for facilities could access over their expected economic life;
- Transportation - indicating that the volumes are appropriate for the applied-for facilities and that the proposed facilities are utilized at a reasonable level over their economic life;
- Markets - indicating that adequate markets exist for the increased volumes available to the marketplace as a result of the applied-for facilities; and
- Financing - showing the applicant's ability to finance the proposed facilities, the method of financing, and any changes to the financial risk of the company, the impact of the proposed facilities on the applicant's abandonment cost estimate, and the toll impact.

As part of its evidence, Trans Mountain commissioned Mr. Neil Earnest of Muse Stancil (Muse) to provide an opinion on the outlook for oil market supply and demand, and related issues. As well, Mr. John Reed (Mr. Reed), of Concentric Energy Advisors, Inc., provided evidence on the economic and energy industry benefits of the Project. A study of the economic benefits of the Project for Canada and its regions was provided by Mr. Glen Hodgson of the Conference Board of Canada (Conference Board). Intervenors also submitted evidence on these issues; Living Oceans Society and Conservation Foundation, Tsawout First Nation, and Upper Nicola all submitted a report authored by Dr. Gunton, Dr. Broadbent, Dr. Joseph, and Mr. Hoffele, dated May 2015, entitled "Public Interest Evaluation of the Trans Mountain Expansion Project" (Gunton Evaluation), and the City of Vancouver submitted a report by Dr. Harrison.

12.1 Need for the Project

12.1.1 Broader public interest

Trans Mountain said that the Project is required from a broader public interest perspective to ensure that producers and governments obtain the highest value for their petroleum resources. In Trans Mountain's view, Canadians are the ultimate owners of petroleum resources. Oil markets are continually subject to changing market conditions, refinery shutdowns, supply interruptions and other events. Trans Mountain's view is that sufficient pipeline capacity to alternative markets is required for Western Canadian producers to access the highest value markets. Trans Mountain said that its replacement evidence reinforces this key principle: market efficiency is in the public interest because, as part of the Board's regulatory framework, one of the Board's goals is that Canadians benefit from efficient energy infrastructure and markets.

Trans Mountain submitted evidence on the economic benefits and socio-economic impacts of the Project. Intervenors also submitted evidence in response. This topic is fully addressed in Chapter 11.

The Independent Contractors and Businesses Association of British Columbia (ICBA) said that the approval of this Project through a robust and predictable regulatory process, a process that could and should balance economic and environmental issues, is critical to Canada's (and B.C.'s) long-term interests. The ICBA said that safe, efficient and responsible movement of oil and other energy products to domestic and export markets is a time-tested cornerstone of the Canadian economy. According to a Natural Resources Canada briefing prepared for a 2012 conference of Canada's Energy and Mines Ministers, the natural resource sector, including oil production, accounts for 15 per cent of national gross domestic product and is a key contributor to the high standard of living enjoyed by Canadians.

Canadian Oil Sands, Cenovus, Devon, Husky Oil, Imperial Oil, Statoil, Suncor, Tesoro and Total (TMX Shippers) said that it is in the best interest of Canadians to diversify the markets for its oil exports by providing enhanced access to tide water. The TMX Shippers also said that it is in the best interest of Canadians to maximize the prices received for Canadian crude oil production. As well, the TMX Shippers said that petroleum industry is a significant driver of the Canadian economy.

The Explorers and Producers Association of Canada said that it strongly supports the Project and believes it is in the national interest.

The City of Burnaby said that Trans Mountain's application and related evidence provides a distorted and unrealistic picture of the economic impact and economic feasibility of the proposed Project. In its view, Trans Mountain has misinformed the Board, obfuscated issues and withheld from the hearing record pertinent financial and economic information. It said that the burdens of the Project far outweigh its benefits. A number of other intervenors made similar points regarding the benefits and burdens.

12.1.2 Marketplace need

Trans Mountain said the marketplace has demonstrated the need for the Project. The demand for transportation services exceeds the current Trans Mountain Pipeline (TMPL) system capacity and results in the need to apportion the available capacity. According to Trans Mountain, the degree of apportion[101] and the willingness of shippers to pay large bid premiums to secure access to transportation service on TMPL to the Westridge Marine Terminal (WMT) are clear indicators of the value shippers place on obtaining access to west coast and offshore markets.

The Project is underpinned by firm commitments of approximately 112 300 m^3/d (707,500 b/d), or 80 per cent of the nominal capacity on the expanded system, from 13 shippers that have signed 15 or 20 year contract commitments. Trans Mountain said that these contracts demonstrate that the Project could expect to be utilized at a high rate.

[101] When shippers nominate more volume than the pipeline can transport then each shipper's nominated volume is apportioned or reduced by the same percentage.

Muse said that oil is a global commodity with a well-established transportation infrastructure and, as a result, global benchmark prices are usually identical once adjustments for quality and transportation costs are taken into account. Muse said that this has not been the case in recent years with North American benchmark prices lagging considerably behind their global peers. Muse said that this situation has had significant negative economic and fiscal consequences for Canada, particularly in its oil producing regions.

In 2012 and 2013, Muse said that Canadian heavy crude oil producers intermittently struggled with severe market imbalance. In Muse ' s professional opinion, this imbalance was primarily due to a lack of market diversification for Canadian crude oil producers. Muse said that projects such as the Trans Mountain Expansion Project offer Canadian crude oil producers precisely the diversification lacking in 2012 and 2013.

The Muse Stancil evidence was challenged by the Gunton Evaluation, which concluded there is no need for the Project because:

- Trans Mountain has underestimated the amount of pipeline capacity that will be in place and the Project will only create excess capacity;
- Trans Mountain has overestimated the likely growth in crude oil production; and
- Trans Mountain demonstrated upward bias in its oil price forecasts.

Some intervenors and commenters said that the Project was not needed and that it would be better to invest in clean non-polluting energy projects. Ms. Douglas said that in due course, low oil prices would increase demand and reduce supply. Therefore, it would be better to concentrate on research and development, and waste less on expensive technologies that were unlikely to be cost competitive. Ms. Douglas said that they should be treated for what they are, stranded assets.

Mr. Senichenko said that Kinder Morgan and the industry should be investing in clean, non-greenhouse gas-polluting energy projects. Mr. Senichenko said that it would be irresponsible and unethical to continue allowing new fossil fuel extraction and transportation projects, such as the Trans Mountain Expansion Project.

The Graduate Student Society at Simon Fraser University said that renewable energy is increasingly competitive with crude oil on price, reliability and environmental impact. The students said that the need for the proposed Project could not be objectively assessed without considering competition from wind, solar and other forms of renewable energy, and the impact that these would have over the lifetime of the proposed Project.

Other intervenors, such as Ms. Markle, said that there was no demonstrated need for the Project other than to increase the profits of the oil companies and the oil pipeline. Ms. Markle said that most of the potential commercial impacts would accrue to Alberta and the oil companies. B.C., on the other hand, would stand to lose the most if there were a problem.

The Government of Alberta, relying on the expert evidence of Trans Mountain, said that improved market access for Canada's oil and gas industry will substantially increase corporate income taxes, benefitting all of Canada. In addition, improved market access significantly increased employment opportunities across the country. The Government Alberta said that this important pipeline infrastructure will support an integrated energy economy in Canada that will be more attractive to investors, which in turn will generate more economic activity Canada-wide.

The British Columbia Chamber of Commerce said that the infrastructure is critical to both the B.C. and Canadian economies with the ability to transform Canadian oil producers from price takers to price makers in international markets.

The Edmonton Chamber of Commerce said that demand by shippers to move oil through the existing pipeline already exceeds capacity. Shippers dispatching product from Edmonton today face increasing uncertainty about having adequate access to existing Trans Mountain pipeline capacity on a month-to-month basis.

Muse said that the Project will greatly enhance the Canadian crude oil producers' access to new markets. The Project would be a major addition to the crude oil distribution infrastructure in North America, particularly to the sizeable Asia-Pacific market, and would give Canadian crude oil producers a significant alternative to their historical markets within North America.

Muse's evidence did not assess the impact on the Canadian economy of higher crude oil prices, nor did Muse include any impacts on the refining sector.

Mr. Reed said that Canadian oil is exported almost exclusively to U.S. markets. With U.S. oil production increasing, Mr. Reed was of the view that developing another market for Canadian oil was vital to ensure that Canadian oil producers receive full value for their production and, in turn, ensure that Canadians receive maximum benefits from the development and sale of these natural resources.

Muse said that the key analytical assumptions regarding supply, demand, competition and transportation costs are:

- Supply – Western Canadian crude oil supply is the Canadian Association of Petroleum Producers (CAPP) June 2015 forecast. This forecast considers the drop in crude oil prices in the latter half of 2014;
- Transportation Options – Ample rail loading and unloading capacity to enable Western Canadian crude oil to reach the North American and overseas markets; and
- Demand – The Northeast Asia demand potential.

These assumptions are discussed in more detail in the following sections.

12.2 Supply

In support of its Application, Trans Mountain submitted evidence on the crude oil supply outlook in Western Canada. In its replacement evidence, Trans Mountain included a report by Muse, as well as the 2015 CAPP supply forecast. Muse used the 2015 CAPP supply forecast through 2030, and then extrapolated it to the end of 2038. Muse's justification for using the CAPP 2015 supply forecast was that it is public; it is the most current forecast available; it reflects the current crude oil price environment; and it is reasonably corroborated by the most recent NEB and Alberta Energy Regulator (AER) Canadian crude oil forecasts. Muse considered the CAPP estimates to be reasonable.

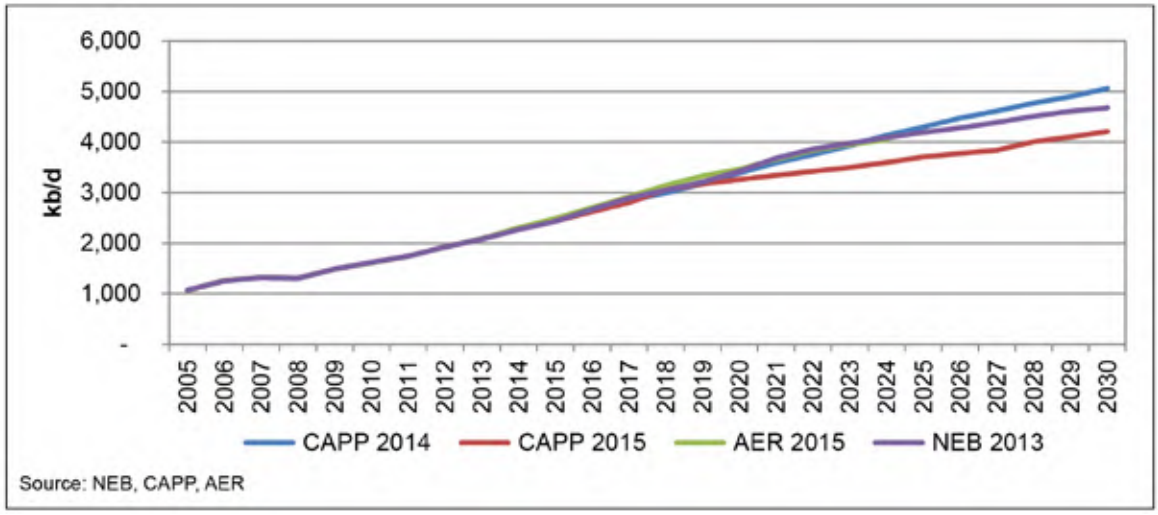
Muse said that the 2015 CAPP supply forecast, reflecting the current crude oil price environment, anticipates that total oil production would grow at a slower pace than was forecast in 2014. However, Muse said that CAPP's forecast still projects that Western Canadian crude oil supply will increase by 328 000 m^3/d (2.1 million b/d) from 2015 to 2030. For 2031 to 2035, Muse took the annual rates of change (either positive or negative) in the individual crude oil categories provided by CAPP for 2025 to 2030 and applied that average annual rate of change over the 2031 to 2035 period. For 2036 to 2038, the rates of change were halved and applied to the extrapolated 2035 volume estimates. The individual crude oil categories used were Light and Medium Conventional, Conventional Heavy, Upgraded Light (Synthetic), and Oil Sands Heavy. Muse further disaggregated the Oil Sands Heavy category into Western Canadian Select, Cold Lake Blend, Athabasca Diluent blended bitumen, Athabasca synthetic bitumen, and sour synthetic.

Trans Mountain said that Western Canadian total crude oil supply is forecast to grow from 635 000 m^3/d (4.0 million b/d) in 2015 to 1.01 million m^3/d (6.9 million b/d) in 2038. Total light oil supply is forecast to grow from 254 000 m^3/d (1.6 million b/d) in 2015 to 328 000 m^3/d (2.1 million b/d) in 2038, and total heavy oil supply from 381 000 m^3/d (2.4 million b/d) in 2015 to 762 000 m^3/d (4.8 million b/d) in 2038.

Muse also compared CAPP's 2015 forecast with CAPP's 2014 forecast, the AER's 2015 forecast and the NEB's 2013 Energy Futures forecast for Western Canadian Bitumen Production, as shown in Figure 22. All forecasts show that Western Canadian heavy crude oil supply is anticipated to grow through to 2030.

Muse said that although the NEB, CAPP and AER forecasts differ in the details, they broadly communicate the same message – the forward outlook for Western Canada is one of significant increases in heavy crude oil supply.

Figure 22: Western Canadian bitumen production



The CAPP 2015 supply forecast stated that the Oil and Gas Journal reports Canada's proven oil reserves at 173 billion barrels, including the oil sands' 167 billion barrels of oil reserves. Muse forecasts total Western Canadian production from 2015 to 2038 to be 7.8 million m^3 (49.3 billion barrels).

The Gunton Evaluation said that Muse did not and should have also performed its analysis using what it called CAPP's 'low growth' supply forecast. (The analysis in the Gunton Evaluation used both 'low growth' and 'high growth' CAPP supply forecasts). The Gunton Evaluation said that the difference in supply between the two CAPP forecasts is over 158 730 m^3/d (1 million b/d) by 2030, the difference in modelling results from using the low and high range would be significant, and Muse's use of only CAPP's higher growth forecast results in inaccurate conclusions in regard to the need and benefits of the Project.

Trans Mountain said that while CAPP does not provide an assessment of the likelihood of the two forecasts, the CAPP Growth Forecast is their expected or most likely case. CAPP stated that its 2015 supply forecast does not present 'low' and 'high' supply cases but rather simply provides a breakdown of oil sands production growth into those projects operating and in construction and those projects that are expected to be constructed later.

Kathryn Harrison (on behalf of City of Vancouver) said that the Muse report was flawed because it relies on a CAPP production forecast that is not constrained by a lack of transportation infrastructure, therefore overestimating the supply of crude oil that would be produced in the absence of the Project. Dr. Harrison also said that including this additional production in the Muse model would overstate the transportation constraints on crude oil shipped from Edmonton, decreasing the Edmonton price of crude oil in the Base Case Scenario and, in turn, artificially increasing the apparent benefits of constructing the Project. In sum, Dr. Harrison said reliance on a scenario that presumes construction of new pipelines overstates the economic benefits of the Project.

Trans Mountain said that Dr. Harrison's assumption that CAPP's production forecast would increase the production forecast of the producers is reasonable; however, she provided no evidence regarding the extent to which this assumption influenced the CAPP crude oil supply forecast. Producers that assumed more export pipelines would be built would likely have higher crude oil production forecasts than those that assumed fewer pipelines would be built, all else equal.

CAPP said that its forecast shows the need for more pipeline capacity. CAPP also said that the current drop in oil prices changes the rate of supply growth but it does not change the fact that supply is growing and needs increased market access.

12.3 Transportation

The Trans Mountain Pipeline system began transporting crude oil in 1953. Between 1957 and 2013, the capacity of the TMPL system gradually increased from 23 800 m^3/d (150,000 b/d) to 47 600 m^3/d (300,000 b/d). The existing TMPL system is approximately 1 147 km in length extending from Edmonton, Alberta to Burnaby, B.C. It transports crude petroleum and refined products to multiple locations in B.C., including refined product deliveries to Kamloops and Port Moody, crude petroleum deliveries to Burnaby, the WMT for offshore export; and Sumas for deliveries on the Trans Mountain Pipeline, (Puget Sound) LLC Pipeline to Anacortes, Ferndale, and Cherry Point in Washington State.

Trans Mountain said that as part of the Project, it would build one new dock complex, with a total of three Aframax- capable berths, as well as a utility dock (for tugs, boom deployment vessels, and emergency response vessels and equipment) at the WMT. This would be followed by the deactivation and demolition of the existing berth.

The existing TMPL facilities, combined with the facilities proposed in this Application, would result in two parallel pipelines:

- Line 1 would have a sustainable capacity of 55 640 m^3/d (350,000 b/d) and transport refined products and light crude oils, with the capability of transporting heavy crude oils; and
- Line 2 would consist of three new pipeline segments and two reactivated existing segments and would have a sustainable capacity of 85 850 m^3/d (540,000 b/d) and transport heavy crude oils as well as light oils.

Trans Mountain said that future cargoes would be crude oil, primarily diluted bitumen. Of the 141 500 m^3/d (890,000 b/d) capacity of the expanded system, up to 100 200 m^3/d (630,000 b/d) could be delivered to the WMT.

Muse said that the Project would not act as a price setting mechanism for Western Canadian crude oil prices because it would not transport the marginal or incremental barrel of Western Canadian crude oil. For most of the forecast period under the Project Scenario,[102] the incremental crude oil barrel would be transported from Western Canada by rail rather than pipeline.

[102] The Project Scenario adds only the Project to the transportation modes available in the Base Scenario.

The ICBA, in support of the Project, said that Canada is a world expert in moving energy products safely to market. The ICBA submitted that, according to the Canadian Energy Pipeline Association, pipelines safely transported 99.9995 per cent of liquid products between 2002 and 2013. Three million barrels of crude oil is transported via pipeline each day.

The ICBA said that a modern, federally regulated oil pipeline expansion project therefore aligns with Canada's short-and long-term economic and social interests. The ICBA said that it would be in Canada's interest to see the Project approved and built.

British Columbians for Prosperity said that Canada receives a discounted price for its oil, in part due to stagnant and declining demand by its only customer, the U.S., and in part due to a bottlenecked transportation system. To expand its markets, Canada requires pipeline capacity. British Columbians for Prosperity believe that the best contingency plan for transporting oil would be by pipeline rather than by rail or truck.

The Association of Consulting Engineering Companies of B.C. (ACEC-BC) said that the Project is a long-term infrastructure investment that would open new markets for an important Canadian natural resource product.

CAPP said that Western Canadian producers face a pipeline capacity shortfall. This shortfall, CAPP said, is not affected by the current lower rate of growth in crude oil supply. CAPP said that Trans Mountain, in the Muse report, addresses such claim, and demonstrates the need for the capacity that the project would provide.

12.3.1 Canadian crude oil export pipeline utilization

Muse said that the Project is forecast to operate at its effective crude oil capacity of 133 500 m^3/d (804 kb/d) for the entire forecast period. Muse said that the Project would provide access to the sizable Asia-Pacific market and give Canadian crude oil producers a significant alternative to their historical markets within North America.

Muse evaluated two scenarios using the Crude Oil Market Optimization Model for each year of the forecast period: the Base Scenario, which incorporates the transportation modes that are available today, or expected to be available by 2018 to the Canadian crude oil producers; and the Project Scenario, which adds only the Project to the transportation modes available in the Base Scenario.

Muse said that the only model input that differed between the Base Scenario and the Project Scenario was the commissioning of the Project. Since all model input variables were the same, all differences predicted in the Canadian crude oil prices and transportation flows could be attributed to the Project.

For the Base Case, all of the major crude oil pipelines in North America were modeled. Muse assumed that certain U.S. pipeline projects would be commissioned, as well as the integrity related Enbridge Line 3 Replacement Project. Barge and rail volumes were also included.

Muse said it did not include Energy East, Keystone XL and Enbridge Northern Gateway in its Base Scenario or the Project Scenario. Muse said that there was considerable information asymmetry between the Trans Mountain Expansion Project and these potential projects regarding the tolls, the commissioning timing, and, in the case of Energy East, the delivery locations. Inclusion of these projects required the analyst to forecast permitting dates, commission dates and tolls, and make other assessments. Muse said no analyst using public information could rigorously quantify these key input variables required by the optimization model.

The City of Vancouver said that Mr. Earnest's decision to exclude all other transportation capacity but the Project from his analysis raises serious doubt about the reliability of the other opinions and conclusion expressed in the Muse Report. The City of Vancouver also argued that there were differences in assumptions made by Mr. Earnest in the Muse report compared to his evidence in past hearings.

The Gunton Evaluation said that the decision by Muse to omit three proposed pipelines (Energy East, Keystone XL and Enbridge Northern Gateway) is inconsistent with the evidence Muse submitted to the NEB and to the Minnesota Public Utilities Commission on behalf of Enbridge's Line 3 replacement, in which Muse included all three pipelines in its analysis. The Gunton Evaluation noted Muse omitted any consideration of the Project in the Enbridge Line 3 evidence.

Trans Mountain said that it had no obligation under the relevant NEB guidelines to demonstrate that its Project would be utilized in the hypothetical circumstances where other pipelines are constructed, and the NEB did not evaluate projects on a comparative basis.

Calgary Economic Development (CED) said that as Alberta's oil producers move ahead with plans to expand oil sands production and their customer base, additional pipeline capacity and greater access to markets is needed to support global pricing structure. CED was of the view that the Alberta energy sector is one of Canada's key economic drivers and would carry this responsibility for the foreseeable future. The Project would provide infrastructure and an opportunity for innovation that is critical to the industry's future growth in Canada.

Mr. Reed said that some level of optionality in capacity markets promotes economic efficiency, reflects the likelihood of future additional demand, and does not detract from the economic feasibility of the Project. Mr. Reed's view was having transportation infrastructure that accommodates shifts in market preferences provides the option and ability to redirect flows as markets change.

Muse said that having some excess pipeline capacity enables crude oil producers to access the highest value markets in response to continually changing market facts. Furthermore, while there may be some "deadweight" costs from excess capacity, Muse said that these costs would be offset, wholly or in part, by the flexibility benefits provided by the excess capacity.

The Gunton Evaluation said that Trans Mountain does not provide a comprehensive assessment of oil transportation capacity and demand to assess the need for the Project. The authors of the Gunton Evaluation did their own estimate of Western Canadian oil supply transportation capacity and concluded that under the low growth forecast, surplus capacity increases from 1.6 million b/d in 2020 to over 1.9 million b/d by 2047. Under the high growth forecast, surplus capacity peaks at 1.6 million b/d in 2020 and remains until 2034. The Gunton Evaluation said that these estimates of surplus capacity do not include pipeline capacity from Enbridge Northern Gateway and Keystone XL.

The Gunton Evaluation said that although some unused capacity is necessary and beneficial, the magnitude of unused capacity resulting from premature construction of the Project would impose a large cost on Canada's oil transportation sector, oil producers and the Canadian public in the form of reduced tax revenues.

CAPP argued that the authors of the Gunton Evaluation engaged in a perverse manipulation of the CAPP 2015 Forecast to suggest that the CAPP 2015 Forecast does not demonstrate a need for the pipeline capacity that the Project would provide. CAPP further said that the authors' claim that they based this conclusion on the CAPP 2015 Forecast is plainly and obviously false.

Trans Mountain said that if this was a substantive concern to industry, one could expect some industry objections to the Project. No other pipeline company or shipper has intervened to object to the Project on the grounds that it will create excess capacity.

Trans Mountain also stated that the Gunton Evaluation does not explain why all asserted costs of unused oil transportation capacity are assigned to the Project.

The TMX Shippers said that the Trans Mountain Expansion Project would not have significant commercial impacts on other participants in Canada's oil industry. In this regard, the TMX Shippers said that the owners of other Canadian pipelines did not express concern that the Project would create surplus capacity on their systems. The TMX Shippers also noted that the owners of Canadian refineries and upgraders did not express concern that the Project would impede their ability to secure feedstock for their facilities.

The Government of Alberta said that there is convincing evidence to support the Board finding that there are more than adequate crude oil reserves, as well as forecast growth in supplies and corresponding market demand to support a finding that the Project will be high utilized. The Board, the Government Alberta stated should not have any doubts in finding that Canada has more than abundant supplies of crude oil to fully utilize the additional pipeline capacity proposed by this Project.

12.3.2 Commercial arrangements

As a result of an open season process, 13 companies entered into binding 15 to 20 year transportation service agreements with Trans Mountain for a total of 112 300 m^3/d (707,500 b/d), or approximately 80 per cent of the expanded system's nominal capacity. The agreements provide for a sharing of risks between Trans Mountain and its shippers during the development stage, including the construction of the Project, and the long-term operations of the pipeline system.

Mr. Reed said that the take-or-pay provisions in the Transportation Service Agreements (TSAs) ensure that fixed charges will be paid over the first 15 to 20 years of operation. These contracts provide evidence that the market views the Project as necessary and economical. Mr. Reed said that the sizing of the Project to meet contractual demand while providing a reasonable level of uncommitted service promotes productive efficiency and limits the risk of underutilization. At the same time, the Project's firm service contracts promote allocative efficiency by awarding capacity to the shippers who value it the most, and the contract provision that allows for capacity release into the secondary market ensures that capacity would continue to be allocated to those shippers who value it most on an ongoing basis throughout the Project's life.

Living Oceans said that although the existence of take-or-pay contracts for 15 to 20 years (the "Contracts") signed by shippers are an important factor to be taken into account in the determination of need for transportation services provided by the Project, the Contracts by themselves are not sufficient evidence to confirm the need for the Project. Other factors to consider when determining the need for oil transportation services include the overall oil transportation supply and demand balance; the economic impact of the excess transportation capacity provided by the Project on the transportation system;

the oil and gas sector; the Canadian government and the Canadian public; and the environmental effects, risk and uncertainties.

Living Oceans was of the view that there are several specific reasons why the Contracts do not confirm the need for the Project. One reason was that the Contracts were negotiated from the fall of 2011 to January 2013 and, subsequent to the negotiation of these Contracts, there has been a material change in energy markets that has significantly reduced demand for oil transportation services.

Trans Mountain said the current price environment has no impact on the long-term financial commitments shippers have made to the Project. In response to the Board's questioning, Trans Mountain stated that the financial commitments are binding and shippers do not have the option of walking away because of market changes, including short term price volatility.

BP Canada Energy Group ULC (BP Canada) said that it is a shipper on the Trans Mountain Pipeline system, which connects directly to BP Canada's Cherry Point Refinery in the Puget Sound area of Washington State, and that it supports the Application. BP Canada said it has made a firm commitment by executing a TSA for 20 years and that the current lower-price environment had not altered its long-term financial commitment as a committed shipper to the Project. BP Canada said that the Project continues to be important to BP Canada, providing enhanced security of supply of Canadian crude for its Cherry Point refinery and greater optionality for Canadian crude oil.

The TMX Shippers said that they became Firm Service shippers so that they would have access to new markets and to diversify the markets where they sell their oil. The TMX Shippers said that the current lower price environment would have no impact on the long-term financial commitment made to the Project.

12.3.3 Alternatives (the use of rail instead of pipeline)

Muse said that in all years, the Project would reduce the volume of rail traffic in Canada, as well as in the U.S., and in the first few years, would largely eliminate the need to use rail in Western Canada.

In its report, Muse said that total effective Western Canada rail loading capacity in 2018 was 87 400 m^3/d (550 kb/d), growing to 615 300 m^3/d (3,870 kb/d) by 2038. Muse said that prior to about 2024, the Project would greatly reduce the need to transport sizable volumes of Western Canadian heavy crude oil via rail to market. The combination of the market expansion to Northeast Asia with the reduction of supply to North America and avoidance of comparatively expensive rail transport would considerably improve the overall netbacks for the Canadian heavy crude oil producers. Muse noted that the Project would also increase the access of the Canadian light crude oil producers to the Puget Sound, California, and Northeast Asia markets by about 15 900 m^3/d (100 kb/d). In subsequent years, rail transport would be required to transport a portion of the Western Canadian crude oil production even with the Project, according to Muse.

Trans Mountain said pipeline transportation is far more efficient and less costly than transport by rail. Shippers will use pipeline capacity when it is available because rail is generally not a cost effective option, except in unique situations.

12.4 Markets

Muse said that the primary markets for crude oil shipped on the expanded Trans Mountain Pipeline are the Burnaby/Puget Sound area (which encompasses the Chevron Burnaby refinery and five refineries in Washington State) and Northeast Asia, with secondary markets in California and Hawaii. Muse said that the single Canadian refinery located on the west coast, the Chevron Burnaby refinery in the Vancouver area, processes Canadian light and medium crude oils, and is possibly supplemented by rail deliveries of Bakken crude oil.

Muse said that in the early years of the forecast period, the improved market access provided by the Project is predicted to increase the prices of both Canadian light and heavy crude oils significantly, shifting to mostly increasing the heavy crude oil prices in the latter years. Muse said that the higher Western Canadian crude oil prices prior to about 2024 are attributable to two factors: the Project would largely eliminate the need for rail transport of Canadian crude oil; and the Project would reduce the volume of Canadian crude oil that otherwise would be forced into the finite North American crude oil market.

British Columbians for Prosperity said that Canada is losing a huge economic opportunity by continuing to sell oil only to the U.S. at discounted prices. U.S. domestic oil production will eclipse Saudi Arabia by 2020, resulting in a loss of demand for Canadian oil by our only customer. British Columbians for Prosperity was of the view that Canada must expand its markets and, according to the IEA, Asia is the expanding market.

CAPP stated the world needs oil, and it needs large amounts of it. Demand, particularly in Asia, as demonstrated by the Muse report will continue to grow. Canada has a wealth of oil and can contribute to the supply that will meet this growing demand. That is what Canadian oil producers seek to achieve. It makes no sense for Canada to refuse to participate in the global oil economy. Other countries would supply what Canada does not. An economic opportunity would be lost and nothing gained.

12.4.1 Primary markets

12.4.1.1 Puget Sound (Washington)

Muse said that there are five refineries in Puget Sound with a combined capacity of 100 410 m³/d (632 kb/d), all capable of receiving crude oil by tanker. Four of the five refineries receive Western Canadian crude oil via the Trans Mountain Pipeline, and the fifth receives Western Canada crude oil via barge from the WMT in the Vancouver area. Western Canada provides over 84 per cent of the total imports, with the balance from Russia and Angola.

Muse said that the Puget Sound is an attractive, but volume-limited market for shippers on the Trans Mountain Expansion Project.

12.4.1.2 Northeast Asia

Muse said that the Northeast Asia market is regarded as the most prospective one for Canadian crude oil producers due to its size, the installed capability of the regional refineries, and its physical proximity to the west coast of Canada. In fact, China and Japan are the second and third largest oil markets in the world, followed only by the U.S. Muse said that Northeast Asian refiners are interested in alternatives supplies of crude oil. According to Muse, supply diversification provides opportunities to acquire lower cost crude oil, optimize refinery operations, and reduce the refiner's exposure to geopolitical risk in the Middle East and elsewhere.

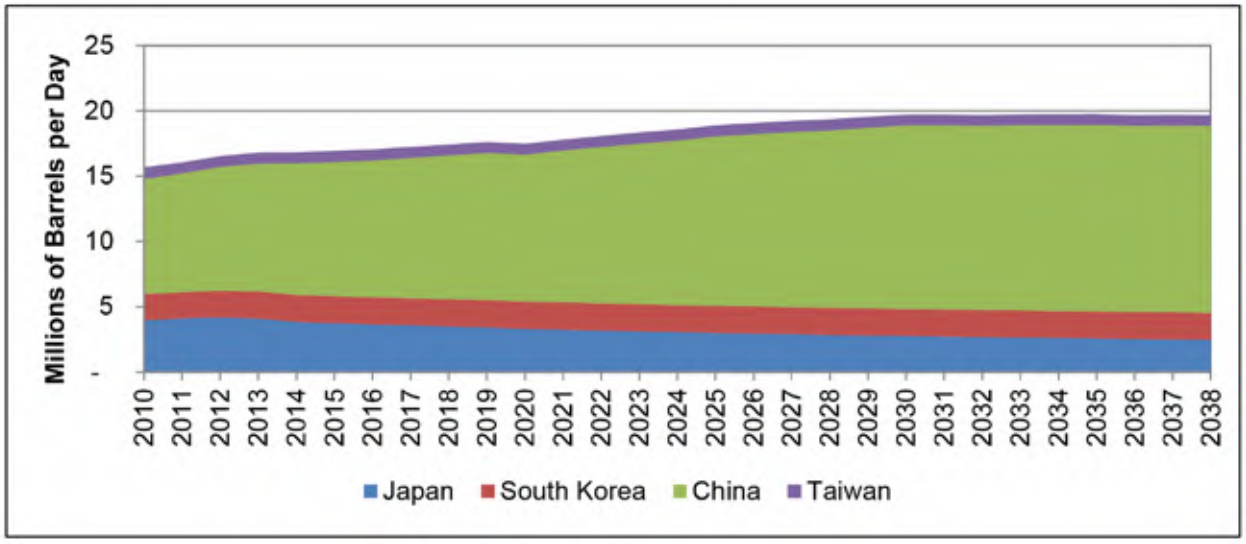
Muse said total potential demand exceeds 369 700 m³/d (2,330 kb/d) and that Northeast Asia has one of strongest projected oil demand growth rates in the world, as shown in Table 16. Due to its size and proximity, Northeast Asia is expected to be a very important market for the shippers on Trans Mountain Expansion Project. In 2014, crude oil imports into China, Japan, South Korea, and Taiwan totaled 2 072 900 m³/d (13,038 kb/d).

Table 16: Total northeast Asia potential demand

Total Northeast Asia Potential Demand		
Country	**m³/d**	**kb/d**
Japan	93,500	590
Northern China	129,800	820
Southern China	38,400	240
South Korea	78,300	490
Taiwan	29,700	190
Total	**369,700**	**2,330**

Muse said that, according to the IEA Bridge Scenario, the rate of oil demand growth in China through 2030 would be 1.7 per cent per annum and in the overall Asia-Pacific markets, 1.1 per cent per annum, as shown in Figure 23. Muse said that an economic slowdown in Northeast Asia would not materially affect the market prospects for Canadian crude oil due to the small market share attributable to the Project.

Figure 23: Northeast Asian oil demand



Muse said that the distance from WMT to Northeast Asia is between 65 to 85 per cent of that from the region's supply sources in the Middle East, and less than half the distance from West Africa, as shown in Table 17. Muse said that this means the relative proximity of WMT to the Northeast Asia market would provide an important long-term structural competitive advantage for the Western Canadian crude oil producers seeking to supply this market and ensure the Trans Mountain Pipeline would be fully utilized.

Table 17: Waterborne voyage distances

Waterborne Voyage Distances (Nautical Miles, Round Trip)			
Destination	**Westridge**	**Load Port Arabian Gulf**	**Nigeria**
China (Shanghai)	10,253	11,994	20,649
Japan (Yokohama)	8,604	13,277	21,931
South Korea (Ulsan)	9,249	12,546	21,201

12.4.1.3 Japan

Muse said that Japan is the second largest importer of crude oil in Northeast Asia, after China, and that it is the closest major Asian market to the west coast of Canada. Total crude oil imports in 2014 totaled 547 100 m^3/d (3,441 kb/d). Muse said that about 83 per cent of Japanese crude oil imports were from the Middle East in 2014, and Middle Eastern imports have been the primary supply source for Japanese refiners for many years. Japanese refiners are concerned about this degree of reliance upon the Middle East, and have been seeking to diversify their crude oil sources in recent years. Muse said that most Middle Eastern crude oils are in the medium sour category and, accordingly, the average sulphur and gravity of the Japanese imported crude oil basket is reflective of a medium sour grade.

According to Muse, the Japanese industry is a strong potential customer for Canadian synthetic crude oils, particularly the premium synthetic crude oil grades that feature better distillate properties. Muse said that, overall, the potential market size for Canadian crude oil producers in Japan is estimated to be about 93 800 m^3/d (590 kb/d. Muse based this market size estimate on an assessment of the capacity and capabilities of the individual Japanese refineries, which was translated into the potential demand estimate for Canadian light and heavy crude oils.

12.4.1.4 China

Muse said that China has perhaps the most diversified array of crude oil sources in all of Northeast Asia. China is the only country in Northeast Asia for which the share of Middle Eastern crude oil imports is as low as about 50 per cent. According to Muse, Chinese imports have been growing at an annualized rate of 10 per cent since 2008. Total crude oil imports in 2014 totaled 982 900 m^3/d (6,182 kb/d).

Muse said that over 90 per cent of the northern Chinese refining industry is assessed to have a high or medium capability to process heavy, high sulphur crude oils. The total capacity of the northern Chinese refineries is approximately 799 700 m^3/d (5,030 kb/d).

According to Muse, the current potential market size for Canadian crude oil producers in China is estimated to be approximately 168 500 m^3/d (1,060 kb/d), and the market potential is estimated to be growing at a rate of about 5 per cent per year.

Muse said that its analysis did not consider regional environmental policies as these could change over time; however, it did take into account regional environmental policies with regard to fuel specifications. It was Muse's view that changes in North American environmental policies could make the Northeast Asian markets relatively more attractive for the Canadian crude oil producers. Accordingly, Muse's assessment was that there is a very low probability that the utilization of the Project would be significantly influenced by changing Northeast Asian environmental policies.

Dr. Harrison said that the Muse Report failed to consider the impact of future changes in public policy on either supply or demand for Western Canadian crude oil. Dr. Harrison said that recent developments in Chinese climate policy were particularly noteworthy given the Muse Report projection of almost all of the Project's capacity, roughly 79 365 m^3/d (500 kb/d), would be exported to that country from 2025 on. Dr. Harrison said that Muse did not consider the implications of Canada's own changing policies for the costs of production and competitiveness of Canadian crude oil from the oil sands.

12.4.1.5 South Korea

Muse said that South Korea imported 404 000 m^3/d (2,541 kb/d) of crude oil in 2014 with roughly 85 per cent sourced from the Middle East. Crude oil imports from Asia Pacific tend to be various heavy sweet grades.

Muse said that South Korean refining capacity totals 472 000 m^3/d (2,969 kb/d) and, accordingly, there is a strong potential for Canadian crude oil sales to South Korea. The overall potential market size for Canadian crude oil is estimated to be approximately 77 900 m^3/d (490 kb/d).

12.4.1.6 Taiwan

Muse said that total Taiwanese crude oil imports were 137 400 m^3/d (864 kb/d) in 2014, with 83 per cent sourced from the Middle East. Taiwanese refineries predominately process a mix of light sweet and medium sour crude oils.

According to Muse, Taiwanese refining capacity totals 208 300 m^3/d (1,310 kb/d). The overall potential market size for Canadian crude oil is estimated to be approximately 30 200 m^3/d (190 kb/d).

12.4.2 Secondary markets

12.4.2.1 California

Muse said that there is strong demand for heavy crude oil in California; however, its analysis indicated that Canadian heavy crude oil sales into the Northeast Asian markets are more attractive than sales to California.

Muse said that the central California crude oils share many, but not all, of the characteristics of the Canadian heavy crude oil grades and there is a reasonable degree of inter-substitutability. However, the economics of processing most grades of Canadian synthetic and heavy crude oil in California are hampered by the state's Low Carbon Fuel Standards, which impose a relatively high CO_2 emission rating to Canadian synthetic and heavy crude oils.

12.4.2.2 San Francisco area

Muse said that there are five fuel refineries in the San Francisco area with a total capacity of 132 390 m^3/d (833 kb/d). Crude oil imports account for almost half of the total crude oil processed with the balance consisting of Alaska North Slope (ANS) and California crude oils. It was Muse's view that crude oil imports from Canada were not material.

12.4.2.3 Los Angeles area

There are six fuels refineries in the Los Angeles area with a total capacity of 159 630 m³/d (1,004 kb/d). Muse said that total crude oil imports are estimated to be half of the total crude oil processed, with the balance consisting of ANS and California crude oils. In Muse's current assessment, the potential market size for Canadian crude oil producers is in excess of 39 700 m³/d (250 kb/d). Muse said that crude oil imports from Canada were not material.

12.4.2.4 Hawaii and Alaska

There are two fuels refineries in Hawaii with a total capacity of 23 440 m³/d (48 kb/d), and a single refinery in Alaska with a capacity of 10 330 m³/d (65 kb/d). Muse said that an estimated 52 per cent of total Hawaiian imports are from non-U.S. sources, with the balance from Alaska. In Muse's current assessment, the potential market size for Canadian crude oil producers is estimated to be approximately 11 900 m³/d (75 kb/d).

Mr. Robert McCandless said that more pipeline capacity assumes a significant increase in demand for bitumen shipments to Pacific markets, or that Alberta bitumen will compete with, or even displace, product obtained from Middle Eastern or southwest Pacific sources. Mr. McCandless asks the Board to consider the conclusions of Dr. Piketty in his book Capital in the Twenty-First Century noting that if they prove correct and there is little global economic growth, expanding the pipeline's capacity might prove uneconomic.

12.5 Project financing

Trans Mountain said that the expected capital cost for the Project is approximately $5.5 billion. Financing would be arranged by Trans Mountain's parent company, Kinder Morgan Energy Partners, L.P. (KMP).

Trans Mountain said that KMP is one of the largest midstream energy companies in North America with an enterprise value of more than $48 billion U.S. The company typically finances growth projects using a mix of 50 per cent debt and 50 per cent equity. Funding sources could include a combination of the issuance of long-term debt securities, bank financing, and the issuance of public equity at KMP.

The C$5.5 billion capital cost estimate (exclusive of the firm service fee credit) for the Project was included in NEB Decision RH-01-2012. The cost estimates shown below in Table 18 are generally consistent with the categories indicated in the NEB Filing Manual.

Table 18: Project cost estimates

Item	Estimate (M$)*
Project Management	192.3
Engineering, Survey, and Environment	252.6
Pipeline Materials	674.7
Right-of-way and Other Land Costs	370.0
Pipeline Construction and Reactivation • New Construction • Reactivation	2,267.6 2,217.7 49.9
Facilities Materials and Construction • Pump Stations • Terminals • Other Facilities	1,332.2 440.6 861.2 30.4
Other	94.6
Subtotal	5,184.0
AFUDC	322.3
Total	**5,506.3**

Trans Mountain said that the success of a pipeline project and its related financing depends upon the economics of linking a supply basin with a major market region and the resulting transportation agreements between the pipeline carrier and shippers. As discussed in Sections 12.2 and 12.4, at one end the Project will have access to the large reserves and growing crude oil production from the Western Canadian Sedimentary Basin (WCSB). At the other end, it will provide access to one

of the largest petroleum markets in the world in the Pacific Rim region. The financial market recognizes that Canadian oil producers need to diversify their markets.

Trans Mountain said that it had received long-term financial commitments from a group of shippers that are significant players in the energy industry with investment grade or better credit ratings. It is Trans Mountain's view that this provides further assurance regarding the cash flow to be generated by the Project and its ability to support the long-term financing requirements. Taking into account the financial capacity and credit quality of KMP, the value that the Project brings to the market, and the term, size, and quality of the long-term shipper commitments, Trans Mountain said that it does not anticipate KMP will face any significant challenges in securing the funds required to finance the Project.

A number of intervenors, including the City of Burnaby argued that Trans Mountain has misled the Board in four material ways:

i. KMP was downgraded by all three credit rating agencies in November 2014 was delisted from the New York Stock Exchange and ceased to be a Master Limited Partnership. KMP has not provided updates to its application.

ii. KMP ceased being able to issue long-term debt in November 2014 and thus cannot provide long-term debt to the Project as claimed. The purchase of KMP has resulted in KMI as the sole surviving entity with the ability to issue debt. All future short-term and long-term debt for Kinder Morgan will be issued at KMI. All the existing debt at the operating subsidiaries will be refinanced (by KMI) as it matures.

iii. KMI, KMP's and Trans Mountain's new 100 per cent owner, is the intended source of financing for the project but KMI has been unsuccessful in gaining an enhanced credit rating in line with KMP's pre-November 2014 rating. KMI's credit standing is BBB- from Standard and Poor's, Baa3 from Moody's and BBB-from Fitch. The agencies identified KMI's vulnerability to a downgrade (in November 2014).

iv. Despite KMI entering into cross-guarantees with virtually all its subsidiaries in November 2014 in an attempt to enhance security for its lenders, credit rating agencies have put financial markets on alert regarding KMI's financial exposure—the Kinder Morgan entities are far from having a sound, reconfirmed standing with the credit agencies. Standard and Poor's explained that notwithstanding the cross-guarantees KMI is 'highly leveraged' and has aggressive financial policies, namely high financial leverage and the reliance on the capital markets to fund large discretionary cash flow deficits.

12.6 Benefits and costs of the pipeline Project

Muse said that there were essentially three sources of benefits from the Project:

- first, it would remedy the current situation in which access to the Pacific Basin markets is almost non-existent, thus providing desirable diversification and optionality benefits to the Canadian crude oil producers;
- second, it would lessen the amount of Western Canadian crude oil that otherwise would be forced into the North American crude oil markets, thereby generating a price lift for all producers; and
- third, in the initial years of the Project's operation, the need for more expensive rail transportation would be largely eliminated and transportation savings would flow back to the Canadian crude oil producers in the form of higher prices.

Trans Mountain said that, if approved, the Project would generate economic and fiscal benefits in three key areas. The first would be when the Pipeline is being developed and built. The second would occur during the operational period of the Project, through the economic impacts associated with running and maintaining the pipeline. The third would come from the expectation that the Project would lead to higher netbacks for producers of heavy oil in Western Canada.

Mr. Reed said that the Project would provide the following benefits to Western Canada Sedimentary Basin (WCSB) oil producers and to federal, provincial and local governments:

- enhanced quality and value of service for the Project's firm shippers;
- enhanced access to Northeast Asia markets, providing essential market diversification for Canadian oil producers;
- higher prices/netbacks to Canadian oil producers as quantified by Muse;
- the reduction in the likelihood of recurring price discounts for Canadian crude, based on the existence of paths to multiple markets, and flexibility to target the highest netback markets;
- enhancement in secondary market competition to serve uncommitted volumes;
- promotion of competition among oil pipelines;

- increased flexibility and optionality in the entire oil pipeline transportation system;
- the promotion of economic efficiency in pipeline transport markets; and
- macroeconomic benefits in local, provincial and federal economies.

Mr. Reed said that the Project would allow Canada to maximize the benefits it derives from the development of natural resources, and provide a feasible and efficient means of addressing the asymmetrical risk of too much or too little capacity. Mr. Reed said that the Project's development did not hinge on the success or failure of any other planned oil pipeline projects; the shipper commitments were not contingent on what happens with other projects, and shippers provided clear and convincing support for the development of this expanded path to high-value markets. According to Mr. Reed, the Board can, and should, place considerable weight on the willingness of 13 major producers and the Project sponsor to underwrite the cost of the Project for up to 20 years. Mr. Reed believed that these facts, taken together, provide a compelling case for concluding that the Project is financially and economically feasible, and highly beneficial.

Muse estimated that in its Project Scenario vs. its Base Scenario higher prices for Western Canadian crude oil production would provide total producer benefits of $73.5 billion on an undiscounted basis, and a present value of approximately $38 billion attributable to the market access provided by the Project (CAD$2012) for the forecast period 2017–2037.

Muse said factors that could reduce the "netback" differential between shipping via the Project versus the alternative were lower rail transportation costs, lower crude oil prices in the Pacific Basin versus the Atlantic Basin, and higher Project tolls. Viability for the Project would be determined by the payment of fixed charges by firm shippers, which would be assured by the signed Firm Service Agreements (FSAs) in effect at the commencement of service.

Muse said that producers of crude oil in Western Canada would pay all additional royalties and corporate income taxes. These additional royalties and corporate income taxes would be the result of new market access the Project would provide.

It was Trans Mountain view that, of the estimated total federal and provincial benefits projected to be $23.7 billion, 100 per cent were related to the direct operation of the pipeline (excluding benefits resulting from activity such as extraction, domestic processing, and exports to markets outside Canada), and not related to the extraction and domestic processing or crude oil (upstream economic activities) or sale of exports to markets outside of Canada (downstream activities).

There are numerous comments for and against the Project. Those supporting the Project include the Edmonton Chamber of Commerce, Lake Cowichan First Nation, O'Chiese First Nation, Pauquachin Nation, Burnaby Board of Trade, British Columbians for Prosperity, and the Calgary Chamber of Commerce.

The Government of Alberta urged the Board to place substantial weight on all of Trans Mountain's filed economic need and benefit evidence in considering whether to recommend approval of the project to Federal Cabinet.

The Edmonton Chamber of Commerce said that the Project is demonstrably positive for Canada, for Alberta and B.C. The Edmonton Chamber of Commerce said that the contribution of this Project to Canada's long-term balance of trade and the wealth of its citizens is overwhelmingly positive. It was of the view that the Project should be approved on the basis of its economic merits, and the Applicant's extensive commitments to safe and responsible pipeline construction and operation.

The Lake Cowichan First Nation, O'Chiese First Nation and Pauquachin Nation were of the view that there would be positive effects as a result of the Project.

The Burnaby Board of Trade commented that it believes in the imperative transition to sustainable energy sources but recognizes that the country still relies on oil for energy and for economic activity. In addition, the contributions Canada's oil resources make to provincial and national economies is significant and cannot be discounted. The Burnaby Board of Trade said that as producers gain market access, they will be able to sell their product for higher prices. The Burnaby Board of Trade was of the belief that all Canadians will benefit from the Project, but it did not think that the economic benefits of this Project flow to the jurisdiction assuming the most risk.

British Columbians for Prosperity commented that the Project would yield access to additional markets, greater competition for Canadian exports, and an escape from the 'single customer' monopoly that has resulted in heavily discounted 'netback' prices for Canadian producers.

The Calgary Chamber of Commerce commented that by increasing market diversity, and thereby, increasing the netbacks received by oil producers, the Project would result in a very significant net positive economic impact for Canadians.

Trans Mountain said that the Project would provide higher netbacks to producers. The approach taken by Trans Mountain to estimate these benefits is consistent with sound economic theory and the real world nature of competitive markets.

Unifor said it opposes approval of the Project because it would undermine investment in a value added, diversified and more stable oil and gas sector. Unifor said that a well-managed petroleum industry could provide good, stable jobs, and create

wealth for producing communities and all Canadians. Unifor said that the Project is proposed in the absence of a realistic and enforceable policy framework for the regulation of greenhouse gas emissions from the petroleum industry. The Board did not consider this, Unifor said, because it was not part of the List of Issues for this hearing.

The Alberta Federation of Labour (AFL) said that, if the Board did not recommend the Project, and instead required or encouraged the market to upgrade and refine in Alberta, or B.C., or Saskatchewan, the refineries would receive cheap feedstock which would allow them to increase their revenues by turning that product into useful end products for Canadians and for export.

CAPP said, when it makes good economic sense to upgrade or refine the oil in Canada, we see upgraders and refineries being built. If it made economic sense to upgrade or refine all oil then we would see that happening, but we do not.

It is Trans Mountain's view that neither the Board nor any other government entity should be engaged in protectionist policy-making designed to subsidize or give preference to domestic upgrading and refining.

In economic terms, if the Project adequately addresses the potential negative environmental and safety concerns (externalities), the costs of addressing environmental and safety issues are internalized to the Project. Therefore, there is no need to conduct an exercise that attempts to quantify these impacts because the costs associated with these externalities are already internalized to the Project costs and borne by Trans Mountain. If the Project remains economically feasible after these concerns are addressed, it will be in the public interest.

Participants said the Gunton Evaluation shows that:

- the Application fails to show that the Project meets the need and public interest criteria required for NEB approval;
- the Project will result in a net cost to Canada if the Project is built as planned; therefore, approving the Application is not in Canada's public interest; and
- if and when the Project transportation capacity is required, the Project should be evaluated as part of a comprehensive oil transportation strategy that comparatively evaluates all proposed projects from a social, economic, and environmental perspective to determine which project or mix of projects are required and best meet Canada's public interest.

Mr. David Anson said that Kinder Morgan failed to predict the consequences of higher prices for gasoline and oil products for the Canadian consumer. Therefore, in his view, the potential economic impacts of the Project were limited.

Mr. Mike Ward said that the potential commercial impacts of the proposal, such as any potential gains in terms of employment or revenue, are dwarfed by the potential risks and certain risks of this proposal. Mr. Ward said that most of the profits accrue to foreign corporations, such as Kinder Morgan, while the lion's share of the risk is passed on to local residents.

Mr. Arthur Entlich said that the Project should be rejected as he did not believe the potential risk factors justified the Project going ahead. Mr. Entlich said that he did not believe the benefits outweighed the potential negative outcomes, from an employment, economic, sociological, geopolitical, environmental or progressive point of view.

Views of the Board

The Board finds that increasing pipeline capacity for the purpose of accessing Pacific Basin markets is important to the Canadian economy and that this economic benefit of the Project is significant. As required by the legislation, the Board looks at the benefits and burdens of the Project before it and not the benefits or burdens of this Project compared to other Projects that may or may not be before the Board.

The forecast supply and market demand growth, combined with robust contractual and financial underpinnings for the Project, demonstrate that the applied-for facilities will be used and useful over their economic life. The reasons for these conclusions are detailed below.

Commercial support and project need

To obtain regulatory approval, there must be a strong likelihood that the facilities will be used at a reasonable level. There is always a degree of uncertainty in projecting the long term utilization of transportation facilities since utilization is influenced by many variables, including supply, market development and the evolution of transportation infrastructure overall. It is in this context that the Board placed significant weight on the existence of long-term firm transportation service agreements (TSA) with shippers in determining whether the facilities are needed and likely to be well utilized over their economic life. The Project has strong support from 13 shippers with firm commitments of approximately 112 300 m^3/d (707,500 b/d) in long-term contracts of 15 or 20 years. The Board finds that these contracts are a clear demonstration that the Project can be expected to be utilized at a high load factor for many years. The Board recognizes that the Project shippers' long term take-or-pay commitments demonstrate and represent the

shippers' belief that this will be a good use of their capital resources, relative to other transportation options. There was no credible evidence from intervenors that challenged the long-term firm TSAs executed by shippers. The Board does not accept the contention of Living Oceans and others that the firm commitments should be given reduced weight because of material changes in the energy markets during the time the long-term contracts were entered into. In fact, the evidence in response to Board questioning on this subject confirmed that the long term firm TSA's remain binding despite the lower crude oil price environment. While the Board accepts the evidence regarding the long-term shipper commitments, and assigns significant weight to this evidence, given the importance of the contracts to the Board's assessment of the Project, the Board would impose Condition 57, requiring Trans Mountain to file with the Board 90 days prior to construction, signed confirmation that secured agreements or contracts remain in force with shippers for a minimum 60 per cent of its total capacity of 141 500 m^3/d (890,000 bbl/d).

Unifor and Alberta Federation of Labour (AFL) opposed the approval of the Project because it would undermine investment in a value-added, diversified and more stable oil and gas sector. As well, the AFL made a similar argument saying that the Board should not recommend the Project, and instead require or encourage the market to upgrade and refine in Alberta, or B.C., or Saskatchewan. The Board is of the view that there was no persuasive evidence on the record to support that, if this Project is not approved, upgrading and refining is more likely to occur in Western Canada. If AFL and Unifor were of this view then they had an onus to provide sufficient evidence to support such a view. They did not do so.

Trans Mountain Pipeline (TMPL) has been apportioned for several years and producers have been increasingly dependent on rail. The Board is of the view that this demonstrates the need for additional capacity off the west coast of Canada that would be met by the new pipeline. While it considered evidence of forecasts for rail transportation as part of its analysis of supply, markets and transportation matters, the Board did not specifically consider benefits or burdens of this Project compared to rail transportation.

Supply, markets, and transportation matters for the oil export pipeline

The Board finds adequate supply would be available for the Project. Muse said that Western Canadian total crude oil supply is forecast to grow from 635 000 m^3/d (4.0 million b/d) in 2015 to 1.01 million m^3/d (6.9 million b/d) in 2038. This forecast is supported by crude oil reserves of 173 billion barrels, including the oil sands' 167 billion barrels of oil reserves. The Board accepts Muse's statement that this forecast is the most current available and it is the only one that specifically provides a crude oil supply outlook for Western Canada. The Board notes that this forecast is similar to those forecast prepared by the NEB and the AER. The Board concurs that the 2015 CAPP forecast is reflective of the current crude oil price environment and while this forecast is appreciably lower than the 2014 CAPP forecast, the 2015 CAPP forecast still projects that crude oil supply will increase between the years 2015 and 2030.

The Board was not persuaded by the argument of Vancouver and others that claimed the Board should be considering evidence and assumptions from past hearings provided by Mr. Earnest that are claimed to be inconsistent with the Muse evidence. The Board assigns low weight to selective citations regarding the evidence of Mr. Earnest in past hearings. Past evidence can be impacted by the passage of time and the factors at play in other hearings.

Several participants, including Dr. Kathryn Harrison, City of Vancouver and those who submitted the Gunton Evaluation said that the Project could result in excess pipeline capacity. The Gunton Evaluation concluded that under both CAPP'S low and high growth forecast, surplus capacity would exist if the Project is built. The Board finds that CAPP does not have a low supply and high supply forecast. Consequently, the Board assigns low weight to the evidence in the Gunton Evaluation on this point. The Board is of the view that determining the need for additional pipeline capacity is difficult and many uncertain variables exist; however, it accepts as reasonable that additional pipeline capacity is needed to access the Pacific Basin markets. Trans Mountain filed as part of its evidence several reports that provide a forecast of the benefits of the pipeline. The Board is of the view that even in CAPP's "Oil sands Operating and In Construction ONLY" forecast, supply would grow and pipeline capacity to the west coast of Canada would enable Canadian crude oil exports access to the large Pacific Basis market.

The Gunton Evaluation also included pipeline projects that have been approved or are before the Board in their analysis, noting that in each of the supply forecast, excess capacity would exist. As noted above, the Board, on review of the conclusions in the Gunton Evaluation, found that CAPP's 2015 forecast was misrepresented. The Board did not find the Gunton Evaluation to be compelling. The Board finds that some of the information in the Gunton Evaluation was subjective and not substantiated by facts. For example, the Board is not convinced by the evidence in the Gunton Evaluation that the pipeline is not needed, and that the Project would result in a significant net cost to Canada. The Board finds that because of apportionment on the TMPL, producers are unable to transport their crude oil to the most profitable market thereby forcing them to transport their crude oil by rail at a higher cost or by pipeline to a less profitable market.

The Board does not, in its review of a pipeline project, compare competing projects or existing pipelines to the project before it when making its assessment. Therefore, the Project will be assessed on its own merit. The Board finds that

there is no reliable evidence before it demonstrating that any excess capacity would be unmanageable by sophisticated industry parties. As well, no shippers or pipeline companies provided evidence that the Project would create excess pipeline capacity. The Board agrees with Trans Mountain that there is currently no excess capacity between western Canada and the west coast of Canada enabling access to growing Pacific Basin markets. The evidence indicates that the Pacific Basin market demand is 369 700 m^3/d (2,330 kb/d) and this could be an important export market for Canadian crude oil. The Board is of the view that all western Canadian producers are likely to benefit from the Project in the longer term, through broader market access, greater customer choice and efficiencies gained through competition among pipelines.

The Board finds that markets would be available for the Project. Muse identified Northeast Asia to be a primary market for the Project. The Board accepts that the committed shippers are seeking high-growth market alternatives for their production. The Board accepts evidence that there is likelihood that US domestic oil production will continue to increase over time thereby decreasing the need for crude oil imports. Northeast Asia has growth potential, and there is a strong likelihood that a portion of the required imports in to that market will be met by Canadian oil transported by the Project. The Board notes that no party took the position there would not be adequate markets available to absorb the volumes expected to be delivered from the pipeline expansion. The Board agrees with Trans Mountain that the Project is likely to provide producers with flexibility, diversity, the ability to manage risk associated with competing in multiple markets, and the ability to manage development and operational risk.

The Board observes that the replacement evidence did not consider the impacts of other pipeline projects (filed, recommended or approved by the Board) on the Project. Muse said all of the key variables concerning the Project were known with precision and were provided to the Board. The Board acknowledges that Muse provided the benefits of the Project in isolation of all other potential pipeline projects. The Board, when it deliberates on a pipeline application, considers the project that is before it and is of the view that the market will determine which pipeline projects are required to ensure the proper functioning of the petroleum market and which projects will provide competitive transportation service.[103]

Regarding the evidence and argument of some parties that there is no need for the Project because of likely future competition from wind, solar and other renewable energy, the Board finds such positions were not supported by credible evidence. The Board accepts renewable energy will be increasingly important in the years ahead; however, the Board is of the view that world demand for crude oil is likely to continue to increase over the next 20 years. The Board is of the view that it is possible there could be some modifications in policies around the world; however, this is not expected to materially change the continued global dependence on crude oil.

The Board is of the view that it is difficult to determine precisely the impact that a major project, such as the Trans Mountain Expansion Project, may have on netback prices. Despite the uncertainty surrounding the quantitative impacts, the Board finds that the Project would contribute to the realization of full market value pricing over the long term. More specifically, the Board finds that by allowing Western Canadian crude to be sold to multiple markets, rather than relying solely on the U.S. market, there will be a reduction in the likelihood of price discounts to Canadian crude. The Project will also increase the flexibility and optionality for shippers. These are all benefits of the Project and to some extent, these benefits may accrue to market participants beyond those shippers who have contract capacity on the Project.

Many people and parties voiced their opinion about the economic benefits and costs of the Project. The Board is not persuaded by the evidence in the Gunton Evaluation that Muse's use of the higher growth forecast results in an inaccurate conclusion in regard to the need and benefits of the Project. Muse in its evidence, does not use a higher growth forecast, as asserted in the Gunton Evaluation, rather the forecast Muse uses in its analysis is called the "Operating & In Construction + Growth." This forecast as mentioned is comparable to those provided by AER and the NEB. Further, the Board is not persuaded by Dr. Harrison's evidence that the Muse report was flawed because it relied on a CAPP production forecast that is not constrained by a lack of transportation infrastructure, therefore overestimating the supply of crude oil that would be produced in the absence of the Project. The Board is of the view that the CAPP supply forecast considers the impacts of available and projected transportation infrastructure. However, the Board does not believe that producers make decisions on production purely based on infrastructure developments.

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[103] The Board took a similar approach in its Reasons for Decision in TransCanada Keystone Pipeline GP Ltd., OH 1 2009, page 33 and 34, where it was not persuaded by an argument that Keystone XL was not in the public interest because there might be other potential options that could be developed in the future. In that instance, the Board also assigned significant weight to long-term commercial contracts.

Economic feasibility

Some intervenors argued that Trans Mountain had mislead the Board by not providing it with market-related evidence that demonstrates significant changes to Trans Mountain's source of financing, financing structure and KMI's financial position, stability or ability to finance the Project. The Board is not persuaded by the arguments put forth by the City of Vancouver and others that KMI would not have the ability to finance the Project. With the necessary TSAs in place, the Board finds that KMI would be able to finance the Project.

Given the Board's view on crude oil supply, markets and contracts, the Board is satisfied that the Project would likely be used at a reasonable rate over its economic life and that the tolls would be paid.

13.0

Financial matters

With the exception of administrative adjustments (e.g., section/chapter cross-references, footnote numbering, etc.) and to replace "Aboriginal" with "Indigenous," the content of this chapter remains as it was in the Board's May 2016 OH-001-2014 Report.

13.1 Introduction

In this chapter, the Board analyzes evidence submitted on the appropriateness of Trans Mountain's business structure and the financial assurances Trans Mountain has provided to pay for a spill from the Project. In the case of a potential malfunctions, accidents, and failures during operation, a pipeline operator must have the financial means necessary to implement its emergency response plans and cover all the costs of cleanup, damages, remediation, and liabilities. This includes the ability to pay for the costs of large oil spills originating from the oil pipeline and tank and terminal facilities connected to the pipelines, including credible worst-case spills. Trans Mountain's financial assurances must be in place for the entire life of the Project to ensure the safe operation.

This chapter discusses the financial assurances that are directly related to facilities and activities regulated by the Board under the *National Energy Board Act* (NEB Act). This includes the Project's terrestrial pipelines and terminals, such as the expanded Westridge Marine Terminal (WMT). Chapter 14, Section 14.12 contains information relating to financial assurances related to marine shipping.

Under paragraph 52(2)(d) of the NEB Act, in making its recommendation, the Board shall have regard to all considerations that appear to it to be directly related to the pipeline and to be relevant, and may have regard to, among other things, the financial responsibility and financial structure of the applicant. On 18 June 2015, the *2015 Pipeline Safety Act – An Act to amend the National Energy Board Act and the Canada Oil and Gas Operations Act* (*Pipeline Safety Act*) became an Act of Parliament and the provisions are to come into force within 12 months of 18 June 2015, or days to be fixed by the order of the Governor in Council.

For companies that have the capacity to transport at least 250,000 barrels of oil per day, such as Trans Mountain Pipeline ULC (Trans Mountain), the *Pipeline Safety Act* establishes the absolute liability limit at no less than one billion dollars. Absolute liability means that a pipeline operator, like Trans Mountain, must pay for any spill up to one billion dollars, regardless of whether there is proof of its fault or negligence. If a pipeline operator's fault or negligence causes a spill or unintended release, there is no limit to liability. In other words, if a pipeline operator causes a spill, even if the cost to clean up and remediate a spill exceeds one billion dollars, the pipeline operator must pay the full cost.

The *Pipeline Safety Act* also requires any company authorized to construct or operate an oil pipeline that can transport at least 250,000 barrels of oil per day to maintain at least one billion dollars of financial resources. The Board may increase the amount of financial resources required.

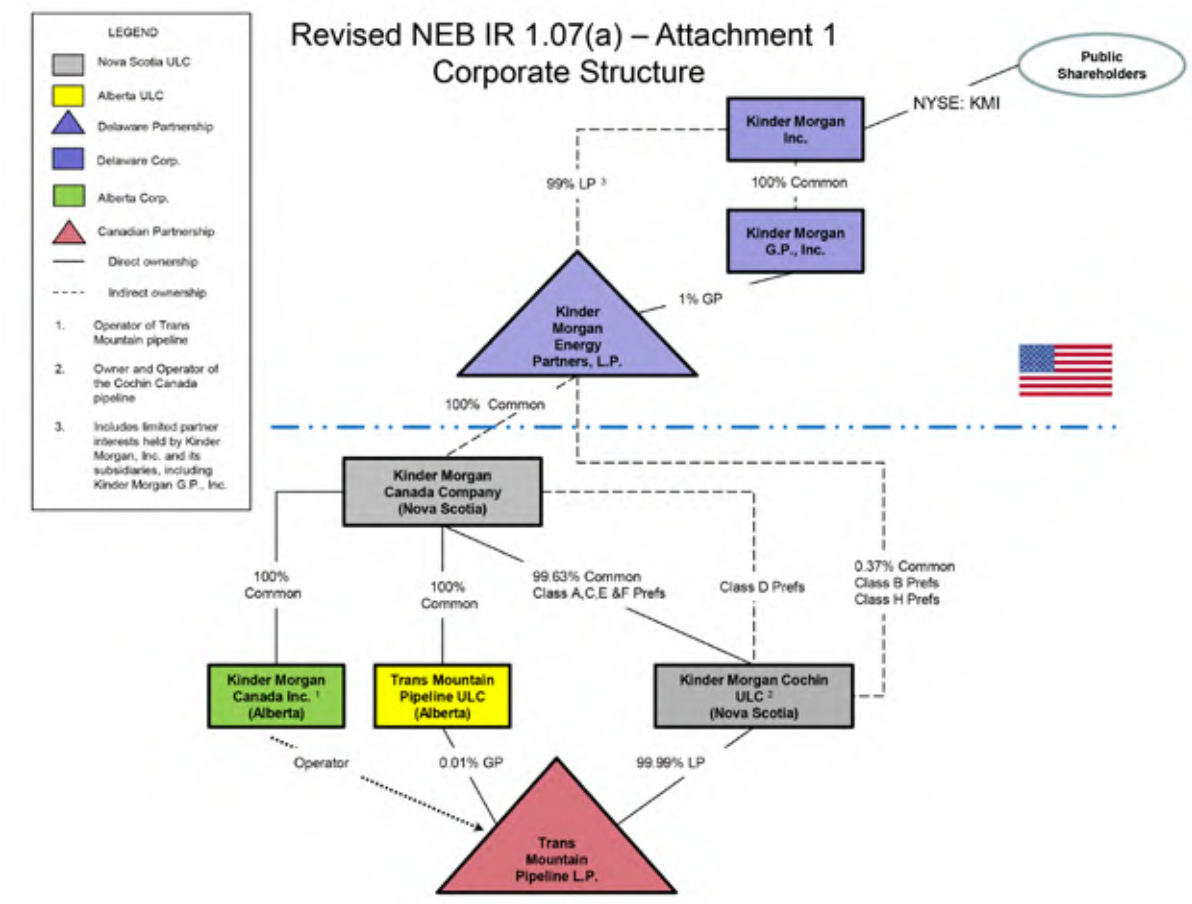
13.2 Business structure

According to Trans Mountain, it is an Alberta unlimited liability corporation, and the general partner of Trans Mountain Pipeline L.P., holding 0.01 per cent partnership interest. Trans Mountain is the corporate entity that will hold the Certificate of Public Convenience and Necessity (CPCN), should it be issued. Trans Mountain Pipeline L.P., a limited partnership registered in the province of Alberta, is the entity that owns the existing Trans Mountain pipeline assets. Kinder Morgan Canada Inc. operates the Trans Mountain pipeline.

Some participants expressed concerns about the corporate structure of Trans Mountain and the adequacy of its financial resources in the case of an oil spill.

Trans Mountain said that given its corporate structure, Trans Mountain Pipeline ULC, as general partner, has unlimited liability for the liabilities and obligations of Trans Mountain L.P. Kinder Morgan Cochin ULC, as the limited partner of Trans Mountain Pipeline L.P., would not be liable to creditors of Trans Mountain L.P. because the liability of the limited partner is limited to any amount of its required capital contributions that remain unpaid.

Figure 24: Trans Mountain corporate structure diagram



Views of the Board

The Board heard concerns from participants about the corporate structure of Trans Mountain and the adequacy of its financial resources in the case of an oil spill. In the case of an oil spill, Trans Mountain is responsible for cleaning up the environment and compensating affected parties.

There are many reasons why a particular organization chooses a particular corporate legal structure, including tax reasons. The Board regulates Trans Mountain as the operator of the Project, and the Board can impose conditions on the operator of the Project. As discussed in more detail in this chapter, the Board would impose Condition 121 requiring Trans Mountain to maintain $1.1 billion of financial assurances.

To comply with this condition, Trans Mountain must prove that, as the operator, it has $1.1 billion of financial assurances. When the Board evaluates Trans Mountain's financial assurances plan, it will take into account its partnership distribution policy, or other structural or legal characteristics of the limited partnership. With this condition in place, the Board finds the limited partnership structure of which Trans Mountain is the general partner to be acceptable.

13.3 Financial assurances

Financial assurances are used to demonstrate that a pipeline operator has sufficient financial means or financial instruments in place to cover the costs of cleanup, damages, remediation and liabilities that may arise from potential malfunctions, accidents and failures during the operation of the pipeline. This comprises all large oil spills originating from the oil pipeline and tank and terminal facilities connected to the pipelines, including credible worst-case spills.

13.3.1 Cost of an oil spill

Trans Mountain filed an expert report by Dr. H. Jack Ruitenbeek assessing the potential spill costs of seven hypothetical spills, ranging in size from a leak of 4.8 m^3 to a large 4 000 m^3 spill (30 bbl to 25,160 bbl) on the Trans Mountain pipeline.

To calculate the cost of a spill, Dr. Ruitenbeek analyzed the costs directly attributable to the spill. He excluded passive use values, which are a category of values associated with ecosystem goods and services that are experienced by some parts of the population even though they do not directly use these ecosystem goods and services. Dr. Ruitenbeek said that these values cannot be credibly measured and the loss of such values is not explicitly compensated in any jurisdiction.

Dr. Ruitenbeek used a Basic Oil Spill Cost Estimation Model (Spill Cost Model) developed by Dr. Dagmar Etkin for the cleanup cost algorithms to determine the total spill cleanup and damage costs.

Dr. Ruitenbeek determined that the costs per barrel to cleanup and compensate for damages ranged from $6,390 (2013$) for a large spill in a non-high consequence (NHCA) area to $85,203 per barrel for a leak. The highest estimated spill cost for the Trans Mountain pipeline was $340 million for a 4 000 m^3 (25,160 barrels) spill in a high consequence area (HCA) with $10,000 per barrel damage costs and $3,532 per barrel cleanup costs.

Trans Mountain submitted a report, Simulations of Hypothetical Oil Spills from the Trans Mountain Expansion Project Pipeline (Line 2) by Mr. Chris Galagan, Mr. Jeremy Fontenault and Ms. Jenna Turner (Galagan Report). The Galagan Report simulated hypothetical spills occurring along the proposed corridor of the Project and then determined the overland and downstream pathways of the spills using volumes provided by Trans Mountain. The volumes ranged from minimum of 3,026 bbl (481 m^3) to a maximum of 29,146 bbl (4 634 m^3). The maximum volume of oil estimated to enter rivers and lakes along the pipeline route were 26,367 bbl (4 191 m^3) and 25,920 bbl (4 120 m^3) respectively. The details of Dr. Ruitenbeek's analysis are summarized in Table 19:

Table 19: Estimated cost of oil spills from the Project

Scenario	Leak		Rupture		Terminal Loading
Spill size(bbl)	30	715	12,580	25,160	648
Location	non HCA	non HCA	HCA	HCA	HCA
Cleanup cost (per bbl)	$ 34,081	$ 11,076	$ 3,532	$3,532	$ 11,000
Damage cost (per bbl)	$ 51,122	$ 16,615	$ 5,298	$10,000	$ 9,350
Total Cost (per bbl)	$ 85,203	$ 27,691	$ 8,830	$13,532	$ 20,350
Total Cost of Spill	$ 2,556,090	$19,799,065	$111,081,400	$340,465,120	$ 13,186,800

Tsawout First Nation, Upper Nicola Band and Tsleil-Waututh Nation submitted a report by Drs. Thomas Gunton and Sean Broadbent, entitled "An Assessment of Spill Risk for the Trans Mountain Expansion Project" (the Gunton Report), that assessed potential spill cleanup and damage costs. The Gunton Report used three methods to estimate the cost of a spill along the pipeline. All costs are in 2014 Canadian dollars.

The Gunton Report first calculated two scenarios using the Spill Cost Model, stating that Dr. Ruitenbeek's interpretation resulted in a range of potential estimates associated with heavy oil spill costs that was too low. The Gunton Report evaluated two scenarios using the Spill Cost Model: the first, a lower bound estimate, uses the minimum values for all cost modifiers for response, socio economic and environmental costs; and the second, the upper bound estimate, uses the maximum values for all cost modifiers. Total costs range from $3,022 per bbl for the largest spill size category, spills greater than 23,800 bbl, to $167,244 for smaller spills between 24 and 238 bbl.

Second, the Gunton Report used data collected from January 2010 to November 2014 by the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation to calculate an estimated cost of an oil spill. In this dataset, pipeline operators reported average costs of approximately $3,188 per bbl for leaks and $30,750 per bbl for ruptures.

Third, the Gunton Report proposed using the cost of the Enbridge Line 6B rupture, which released 3 192 m^3 (20,074 bbl) of diluted bitumen into a wetland in Marshall, Michigan in 2010, as an upper bound pipeline spill costs. The Gunton Report said that the total cost of the Line 6B rupture are $1.21 billion, resulting in a per barrel cost of $60,177.

Table 20: Drs. Gunton and Broadbent per barrel cost for oil spill cleanup and damage costs using different methodologies (2014$)

Methodology	Leak	Rupture
Spill Cost Model	$5,341 - $167,244[104]	$3,022 - $35,950[105]
Pipeline and Hazardous Materials Safety Administration	$3,188	$30,750
Enbridge Line 6B Rupture	N/A	$60,177

Of the three methodologies examined, the Gunton Report concluded that the Enbridge Line 6B spill was the most reliable estimate of a pipeline spill cost in a high consequence area because of the high profile nature of the spill, the explicit cleanup and remediation requirements, and Enbridge's obligation to provide an accurate assessment of the total costs of the rupture in its financial filings. However, the Gunton Report said that these cost estimates omit a number of costs, including passive use values, and therefore, the costs reflect a conservative estimate of the total cost of an oil spill.

The Gunton Report provided a review of potential passive use damages. Passive use values reflect the worth that people ascribe to the protection or preservation of natural resources and the environment that they may not directly use. They estimated a lower bound value of $1.4 billion and an upper bound of $21.1 billion.

Intervenors Catherine Douglas, North Shore No Pipeline Expansion, and Pro Information Pro Environment United People Network submitted the report Economic Costs and Benefits of the Project for B.C. and Metro Vancouver by Mr. Ian Goodman and Ms. Brigid Rowan. As part of this report, Mr. Goodman and Ms. Rowan evaluated the cost of a bad to worst-case onshore spill from the Trans Mountain pipeline.

Drs. Goodman and Rowan disputed Trans Mountain's approach of evaluating the cost of a worst-case scenario by multiplying the per barrel cost of damage and cleanup by the volume spilled because, in their opinion, Trans Mountain underestimated both the per barrel cost and the potential spill volume. Instead, Drs. Goodman and Rowan proposed relying on real-world examples of costs related to oil and gas accidents.

To determine the potential cost of a worst-case scenario on the Project, they reviewed the cost of four disasters:

- oil spill from Enbridge's Line 6B in Marshall, Michigan in 2010;
- train derailment of oil tanker cars in Lac-Mégantic, Quebec in 2013;
- natural gas pipeline explosion and fire in the San Francisco metropolitan area in 2010; and
- crude oil pipeline rupture, explosion and fire in Qingdao, China in 2013.

From their evaluation of these incidents, Drs. Goodman and Rowan concluded that a worst-case spill could cost between $1 billion and $5 billion U.S. dollars. They also said that given their results, they have concerns about Trans Mountain's financial

[104] This cost range is for spills up to 23,800 barrels.

[105] This cost range is for spills greater than 23,800 barrels.

capability, responsibility, and willingness to mitigate and compensate for all the potential damages for spills costing $1 billion or more.

Other participants commented on the amount of financial assurances that should be required, without relating them specifically to the cost of an oil spill. Alan James recommended that the Board require at least $10 billion of financial assurances from Trans Mountain. David Anson expressed concern that Trans Mountain's estimates downplay the cost of a large oil spill and noted that the cost of the Enbridge Line 6B spill exceeded the worst-case scenario submitted by Trans Mountain's consultant.

13.3.2 Financial tools

Trans Mountain proposed a layered approach to financial assurances. First, it would use accessible cash to pay for any damages. Next, Trans Mountain would access its insurance coverage through the Kinder Morgan corporate insurance program. Finally, if required, it would use a parental guarantee from Kinder Morgan Energy Partners, L.P.

Trans Mountain identified the following financial resources that it would use in the case of a spill to pay the full cost of cleaning up, remediating the environment and compensating affected parties:

- $750 million of spill liability insurance;
- $3.2 billion of equity upon Trans Mountain expansion completion;
- parental guarantee from Kinder Morgan Energy Partners, L.P.; and
- $140 million, the equivalent to 60 days of operating cash flow, immediately available to accommodate payments within the first 10 business days following an incident.

13.3.2.1 Insurance

Trans Mountain currently has $750 million of spill liability insurance in place and it plans to keep its insurance at this level once the Project is operating. Kinder Morgan, Inc. holds the insurance policies and Trans Mountain Pipeline ULC, on behalf of Trans Mountain Pipeline L.P. and Kinder Morgan Canada Inc., are named entities insured under the insurance policies. Trans Mountain's insurance is made up of to two components (see Table 21).

Table 21: Trans Mountain insurance

General Liability insurance policy	General / Excess Liability policy
· $150 million. · Covers all the current operations of Kinder Morgan in Canada. · 10 unique insurance providers.	· $600 million. · Covers all of Kinder Morgan's operations located in Canada, United States and Mexico. · 25 unique insurance providers. · Omnibus insurance program covering Kinder Morgan's legal liabilities arising from all wholly owned operations, all operations where Kinder Morgan has a contractual obligation to provide insurance, and to the extent of Kinder Morgan's ownership interest, those legal liabilities arising from joint venture operations.

In the case of an incident, Trans Mountain said that the first $2 million of Trans Mountain's insurance policy is covered by self-insurance. It said that the $750 million limit is both a per occurrence and an annual coverage limit. Trans Mountain said that claims made against the $750 million limit are on a "first in, first out" basis; that is, any claim made reduces the amount of insurance available for subsequent claims. It said that, if a specific claim within a policy year results in significant erosion of the $750 million limit, Kinder Morgan would attempt to go out to the insurance market with a request to reinstate limits. However, a full reinstatement may not be possible, as the additional premium may be so high that it may economically prohibit a full reinstatement of the limits, or the capacity of the insurance market simply would not be available to achieve a full reinstatement. In this case, Trans Mountain may choose to use other financial means to backstop the reduced amount of insurance available. Trans Mountain added that its insurance does not cover some events, such as damage from gradual seepage. Trans Mountain said that the exclusions of an insurance policy are not static from one policy year to the next and that it is unable to confirm that the exclusions in place today will remain in effect for the life of the Project.

Trans Mountain said that during construction, it will have a stand-alone liability policy of at least $20 million, and that any third-party construction contractors involved in Project construction would be required to have their own separate insurance coverage.

If a spill occurred, Trans Mountain said it would make a payment when the obligation for payment was identified and then, after the payment was made, Trans Mountain would submit a claim to its insurance provider. Trans Mountain said that while it has no pre-set priority for the payment of claims, payment of claims would likely mirror the phases of a response to a spill; that is, the safety of people and assets first, with containment, clean-up and remediation to follow.

13.3.2.2 Parental guarantee

While no formal financial backstopping arrangement currently exists between Trans Mountain and Kinder Morgan Energy Partners, L.P., Trans Mountain said that, if the Board required a parental guarantee as a condition of approval, it would comply. However, Trans Mountain said that Kinder Morgan Energy Partners, L.P. would not isolate the funds associated with the parental guarantee from day-to-day operating and capital accounts. This is because Kinder Morgan Energy Partners L.P. has access to significant sources of liquidity, rendering such a requirement unnecessary and economically inefficient.

13.3.2.3 Immediate cash

Trans Mountain committed to ensuring that, either through cash reserves or through credit facilities, it will have immediate access to cash in the case of an incident. Trans Mountain projected that approximately $140 million, the equivalent to 60 days of operating cash flow, would be available in cash to accommodate payments within the first 10 business days following an incident.

13.3.2.4 Abandonment

Trans Mountain did not submit a preliminary abandonment plan due to the Project not having sufficient engineering details available at the time. Instead, it substituted a proposed update of the Physical Plan with abandonment methodology for a preliminary abandonment plan. Trans Mountain said that this would serve two purposes. One is to update abandonment cost estimates. This would include a re-evaluation of current infrastructure and the addition of the Project. The second purpose of the Physical Plan is to inform the abandonment planning process at the time of abandonment, which would include an application for abandonment. Trans Mountain submitted a conceptual abandonment cost estimate, including insurance, taxes and contingency, of $602.7 million.

13.3.2.5 Other financial tools

Participants proposed other financial tools for Trans Mountain to use to prove that it has sufficient financial assurances in place to address an incident.

The City of Vancouver analyzed risk transfer mechanisms that could be purchased by Trans Mountain to provide compensation for those economic impacts of an oil spill and recommended a catastrophe bond. Catastrophe bonds are risk-linked securities that transfer a specified set of risks from a sponsor to investors. A bond issue would provide an advantageous interest rate in the event that the triggering event, like an oil spill, did not occur. If the event did occur, the bond sponsor uses the capital provided by the investors to pay for losses resulting from the triggering event.

Commenter Bud Smith recommended using a captive insurer under British Columbia's *Insurance (Captive Company) Act* to establish an industry-supported fund to pay for immediate clean-up, as well as long term remediation and loss from an accident.

Views of the Board

The Board heard from many participants who said that they expected Trans Mountain to operate the Project safely and with as little risk as possible to the environment or property. Some participants expressed concerns that Trans Mountain would be unwilling or unable to pay for the full costs of cleaning up the environment and remediating damages if a spill occurred, particularly in dense urban areas or delicate ecosystems.

Trans Mountain has committed to pay for the full cost to clean up any spill from the Project, and has agreed to pay the full costs of a spill, even if it exceeds Trans Mountain's insurance. In the case of a spill, malfunction or incident from the Project, Trans Mountain must pay for the full cost of cleaning up and remediating any damages caused.

The Board is of the view that an undertaking the size of the Project must operate in a way that minimizes risks to people, the environment and property. Trans Mountain, as the operator, is responsible for the safe operation of the Project at all times and, in the case of damages, the financial consequences of losses and liabilities to third parties. To determine the appropriate amount of financial resources the company must hold, the Board reviewed the potential costs of a large spill from the Project. The Board finds that Trans Mountain must have sufficient financial resources in place to cover up to $1.1 billion for the costs of liabilities for, without limitation, clean-up, remediation, and other damages caused by the Project during the operations phase.

This chapter only discusses the potential spill costs and damages that are directly related to activities regulated by the Board under the *National Energy Board Act.* The *Marine Liability Act* establishes the framework for marine liability and compensation in Canada, and is implemented by the Government of Canada. The *Marine Liability Act* also establishes the Ship-source Oil Pollution Fund that provides funding for spills from all classes of vessels in Canadian waters. For more details on financial responsibility, liability and insurance related to marine shipping, see Chapter 14, Section 14.12.

Trans Mountain and some participants differed in their estimates of the probability of spills during the lifetime of the Project. The Board is of the view that, while it is Trans Mountain's responsibility to minimize the chance of a spill, it is not useful to evaluate the probability of spills when determining the appropriate amount of financial assurances. There is sufficient evidence that a large spill may occur at some point during the Project's operations. Such a spill would require Trans Mountain to have the financial resources to fully cleanup, repair damages and compensate affected third parties. Given this, the Board would impose a condition requiring Trans Mountain to have sufficient financial resources to address the cost of a large spill in a high consequence area. The condition requires Trans Mountain to maintain at least $1.1 billion dollars of financial assurances to address the costs of a spill over the lifetime of the Project. (The amount is based on a large spill with clean-up, damage and remediation costs, totaling $1.1 billion.) At least $100 million must be in the form of ready cash to cover costs, including compensation to third parties for losses and damages, in the near term while insurance claims are being processed. For the remaining $1 billion, Trans Mountain must submit a portfolio of multiple financial instruments, describing how they meet stipulated requirements in the condition. Condition 121 describes, in detail, the requirements for the Financial Assurances Plan required by the Board to ensure that Trans Mountain has sufficient financial resources over the course of the Project to address the costs of a major spill.

The Board calculated the cost of a major spill by multiplying the estimated quantity of a large oil spill by the unit cost to address a spill. The unit cost includes the estimated costs for spill cleanup, remediation and other damages caused by the Project facilities during the operations phase.

Trans Mountain and intervenors submitted evidence that was orders of magnitude apart with respect to costs of an oil spill along the pipeline right-of-way. The Board reviewed all evidence from intervenors discussing the size of other incidents and their costs. The Board found costs from incidents that may occur on the Project to be the most useful. For example, evidence submitted on the Enbridge Line 6B spill was relevant in the assessment because this evidence demonstrated the actual cost of a large oil spill into a river and wetlands. The Board is of the view that the Enbridge Line 6B spill represents a real-world example of a large spill with severe consequences because of the magnitude of the spill and the high consequence nature of the spill location. Its inclusion in the Board's assessment is appropriate to evaluate the potential financial consequences of the Project.

In the same vein, evidence submitted on the costs of cleaning up oil spills in Canada is also useful as it reflects the costs of oil spill cleanup and remediation given the Canadian legal context. However, evidence submitted on the costs of incidents involving the cost of natural gas pipeline explosions was not helpful to the Board in assessing the potential costs of an incident on the Project, as the Project is not a natural gas pipeline.

The Board finds that the passive use values and option values do not provide meaningful information to determine the amount of financial assurances necessary in the case of an oil spill or other incident. Passive use values, as described in the Gunton Report, are often inappropriate when evaluating the significances of the environment or natural resources to Indigenous people and other stakeholders. In addition, in the case of an incident, it is unclear how financial assurances set aside for passive use values would be practically distributed to those harmed, or whether, with sufficient clean-up and restoration of the environment, these passive use values would return on their own.

The Board finds that financial assurances must be grounded in actual costs that would be incurred to clean up and remediate the environment, as well as to compensate those individuals with demonstrable losses to income or private property.

Participants and Trans Mountain proposed segregating the costs of a spill into a number of different categories. Providing these categories are data-based, the Board has no concerns and recognize that different methodologies will categorize costs differently. For the purposes of determining the potential cost of a major spill, the Board considers the best estimates to be the ones based on the cost of oil spills in high consequence areas that have been fully remediated.

Dr. Ruitenbeek for Trans Mountain proposed a number of spill sizes, the largest being 4 000 m^3 (25,160 bbl). This is a spill along the pipeline or in the terminal while loading, rather than a tanker spill. The Galagan Report for Trans Mountain simulated hypothetical spills occurring along the proposed corridor of the Project and determined a maximum spill size of 4 634 m^3 (29,146 bbl). This range of spill sizes, from 4 000 m^3 (25,160 bbl) to 4 634 m^3 (29,146 bbl) exceeds the size of the Enbridge Line 6B rupture as described in the Gunton Report, which was 3 192 m^3 (20,074 bbl).

No evidence offered by participants provided credible reasons for considering larger spills along the pipeline right-of-way for this Project.

As previously noted, the above spill sizes are based on credibly large spills along the pipeline right-of-way or from the terminal, and are not based on marine spills from tankers. The Board's findings on marine spills can be found in Chapter 14. Based on evidence submitted, the Board finds that largest credible spill along the pipeline right-of-way or from the terminal in evidence is 4 634 m^3 (29,146 bbl).

The Board finds that a total unit cost of $235,890 per m^3 ($37,500 per barrel) to clean up a spill and remediate environmental damage is an appropriate estimate. This is slightly higher than the midway between the differing costs per barrel proposed by participants and Trans Mountain. Dr. Ruitenbeek for Trans Mountain proposed an upper limit of $85,111 per m^3 ($13,532 per barrel) for a rupture while the Gunton Report submitted by Tsawout First Nation, Upper Nicola Band and Tsleil-Waututh Nation said that the Enbridge Line 6B spill cost $378,489 per m^3 ($60,177 per barrel). However, the other two methodologies used in the Gunton Report result in upper limits of spill costs for $193,405 per m^3 ($30,750 per barrel), based on data from the Pipeline and Hazardous Materials Safety Administration, and $226,111 per m^3 ($35,950 per barrel), based on the Dr. Etkin's Spill Cost model which was also used by Trans Mountain. These other two methodologies result in a mid-point between Dr. Ruitenbeek's evidence and other methodology used in the Gunton Report.

Using these spill volumes and cost per barrel cleanup in the calculation below, the Board estimate the total cost of a large spill to be $1.1 billion.

Total Cost of a Spill = 29,146 barrels x $37,500 per barrel

= $1.093 billion or $1.1 billion rounded up

The Board based the financial assurance requirements for Trans Mountain on a spill that is estimated to cost $1.1 billion. The Board would impose a condition requiring Trans Mountain to develop a Financial Assurances Plan made up of two components that total $1.1 billion. First, Trans Mountain must have ready cash of at least $100 million to cover immediate costs of a spill. Second, Trans Mountain must have core coverage of $1 billion to cover the costs of cleaning up a spill, remediating the environment and compensating affected third parties. This core coverage must be a portfolio of financial instruments. At least one financial instrument must be funds readily accessible to Trans Mountain.

The Board would require Trans Mountain to file a Financial Assurances Plan with the NEB for approval, at least 6 months prior to applying for leave to open. The Project may not receive leave to open without an approved Financial Assurances Plan in place, as the Board finds it to be in the public interest to ensure that Trans Mountain has sufficient resources to address the costs of a major spill. The full details of the requirements of the Financial Assurances Plan can be found in Condition 121.

In Condition 121, the Board outlines the criteria for acceptable instruments. For example, any letter of credit that forms part of the Financial Assurances Plan must be unconditional and irrevocable, segregated from Trans Mountain's day-to-day business activities, and be dedicated to providing funds to cover the costs of liabilities for, without limitation, cleanup, remediation, and other damages.

The Financial Assurances Plan must be filed on the public record. It must also be filed with a report from an appropriate third party that has assessed the Financial Assurances Plan and its key components. The report must summarize the key features of each financial and insurance instrument proposed for inclusion in the Financial Assurances Plan.

The Board is a lifecycle regulator and Trans Mountain has financial obligations for the duration of the pipeline's life. Trans Mountain's Financial Assurance Plan must be in place for the duration of the pipeline's operation. Therefore, each year after its leave to open application is approved, Trans Mountain must file a letter on the public record by 31 January signed by an officer of the company verifying that all components of the Financial Assurances Plan remain complete and as the NEB approved.

The Board will review the Financial Assurances Plan annually to ensure it complies with Condition 121.

If Trans Mountain wishes to change its Financial Assurances Plan, it must publically file a letter requesting approval from the Board at least 60 days prior to any intended changes. This letter must describe the intended changes and how the changes provide the same or greater level of protection.

If Trans Mountain accesses any component of the Financial Assurances Plan for any reason, it has 30 days to publically file a report detailing the component accessed, the reason for accessing it, and Trans Mountain's plan to ensure that it continues to meet the requirements of its NEB-approved Financial Assurances Plan.

The Board finds that some of Trans Mountain's proposed financial instruments may not be appropriate for use as financial assurances. In the event a CPCN is issued, the Board views it as critical that Trans Mountain, as the company holding the CPCN, has access to immediate cash in the case of any incident. Trans Mountain must ensure that its corporate structure does not impair its ability to access at least $100 million immediately in the case of an incident. Trans Mountain's proposal to use operating cash flow to address the immediate costs of an incident calls into question how operating expenses will be paid during this time period. Immediate cash cannot serve more than one purpose. The Board recognizes that the immediate cash or other instruments that allow access to immediate cash can be costly for Trans Mountain. As part of this recognition, the Board does not require all of Trans Mountain's financial assurances to be in a segregated, immediate cash form. Meaningful credit facilities may also serve the purpose of immediate cash. Trans Mountain is responsible for satisfying the Board that its Financial Assurance Plan complies with the condition the Board would impose.

As noted in the introduction, details of the regulations are unknown at this time. However, when the regulations become law, Trans Mountain will be required to comply with whichever requirement is stricter: the requirements of the future regulations or the financial condition the Board would impose with this recommendation.

The Board also notes that Trans Mountain discussed its plan to refile its Abandonment Cost Estimate for Board approval. In the Set-Aside and Collection Mechanisms hearing (MH-001-2013), the Board ordered Trans Mountain to establish a trust to satisfy its obligations relating to the abandonment, decommissioning, and deactivation of its pipelines. With any substantive changes to its pipeline system, Trans Mountain must refile its Abandonment Cost Estimate with the Board for approval.

The Board is of the view that the Project would constitute a substantive change to the pipeline system. The Board has a process developed for the review and approval of abandonment cost estimates and so takes no stance on the conceptual abandonment cost estimate described in this Application. Once Trans Mountain is ready to abandon its pipeline, it must first seek leave of the Board.

14.0

Project-related increase in shipping activities

The views in Chapter 14 are those of the Reconsideration Panel. The Reconsideration Panel assessed the relevant OH-001-2014 evidence, all of which was brought forward onto the Reconsideration record, and new and updated evidence related to the Reconsideration List of Issues. To the extent that any of the wording in the current views is similar to the OH-001-2014 views it is because the Board adopted those views based on its review of the record.

14.1 Overview

The environmental assessment of Project-related marine shipping under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) is the focus of this Reconsideration. On 30 August 2018, the Federal Court of Appeal set aside the Governor in Council's (GIC) Order directing the Board to issue the Certificate for the Project. As a result, on 20 September 2018, the GIC referred aspects of the Board's OH-001-2014 Report for the Project back to the Board for Reconsideration through Order in Council P.C. 2018-1177 (OIC). In particular, the OIC required the Board to take into account the environmental effects of Project-related marine shipping in view of the requirements of the CEAA 2012, and the adverse effects of Project-related marine shipping on species at risk in view of any requirements of section 79 of the *Species at Risk Act* (SARA). After considering comments from the public, the Board decided, on a principled basis, to include Project-related marine shipping between the Westridge Marine Terminal (WMT) and the 12-nautical-mile territorial sea limit in the "designated project" to be assessed under the CEAA 2012. As a result, the Board conducted a comprehensive environmental assessment of Project-related marine shipping under the CEAA 2012 and in accordance with the requirements of the SARA. This is in keeping with the OIC, Tsleil-Waututh Nation Court decision, Issue No. 5 on the List of Issues for the OH-001-2014 hearing and the List of Issues for the MH-052-2018 hearing, generally (both are found in Appendix 1).

The Board's regulatory oversight of the Project reaches from Edmonton to Burnaby, up to and including the WMT. The Board does not have regulatory oversight of marine vessel traffic. Other Federal Departments and Agencies, including Transport Canada, Vancouver Fraser Port Authority, Pacific Pilotage Authority and the Canadian Coast Guard have authority over a broad and detailed regulatory framework governing safety, security and environmental protection in relation to marine shipping, which would cover tankers associated with the Project. Trans Mountain also does not own or operate Project-related marine vessels. While Trans Mountain exercises initial control at WMT, it has very limited control over tankers once they leave the WMT.

During the OH-001-2014 and MH-052-2018 hearings, the Board heard concerns from many participants related to marine shipping, navigation and safety. Many participants expressed concerns regarding increased spill risk as a result of increased

Project-related tanker traffic, and the environmental and socio-economic effects that would result from spills. The Board also heard from Trans Mountain and some participants, including government departments, regarding the existing protections they said were already in place with respect to marine vessel traffic.

As a component of the CEAA 2012 environment assessment in the Reconsideration, the Board assessed the environmental effects of the routine operation of Project-related marine shipping, including cumulative environmental effects. The Board finds that Project-related marine vessels are not likely to cause significant adverse environmental effects on air emissions, marine fish and fish habitat, marine mammals (other than Southern resident killer whale (SRKW)), marine birds, socio-economic conditions (including marine commercial, recreational and tourism use), heritage resources, traditional marine and resource use (other than those associated with the SRKW), and human health.

However, the Board finds that greenhouse gas emissions from Project-related marine vessels would result in measurable increases and, taking a precautionary approach, are likely to be significant.

In addition, the Board finds that the routine operation of Project-related marine vessels are likely to cause significant adverse environmental effects on SRKW, and traditional marine and resource use associated with the SRKW. The SRKW population has crossed a threshold where any additional adverse environmental effects would be considered significant. Project-related marine shipping would overlap SRKW critical habitat along the shipping route, and add to both underwater noise and the risk of strikes throughout that route. While the effects from Project-related marine shipping will be a small fraction of the total cumulative effects, and the level of traffic is expected to increase with or without the Project, the increase in marine vessels associated with the Project would further contribute to cumulative effects that are already jeopardizing the recovery of SRKW. The Board recognizes the stated cultural importance of the SRKW to certain Indigenous groups.

The Board also assessed the environmental effects of malfunction or accidents (i.e., spills) that may occur in connection with Project-related marine shipping. This included consideration of air quality, shoreline and near shore habitats, marine fish, marine birds, marine mammals, marine commercial, recreational and tourism use, heritage resources, community well-being, traditional marine resource use, and human health. The Board finds that the environmental effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and type of product(s) spilled, location of the spill, response time, the effectiveness of containment and clean-up, the valued components that are impacted, and the weather and time of year of the spill. The Board is of the view that although impacts from a credible worst-case spill would probably be adverse and significant, natural recovery of the impacted areas and species would likely return most biological conditions to a state generally similar to pre-spill conditions. Such recovery may be as quick as a year or two for some valued components, or may take as long as a decade or more for others. Valuable environmental values and uses could be lost or diminished in the interim. For some valued components, including certain SARA-listed species, recovery to pre-spill conditions may not occur.

The Board finds that the robust marine shipping regulatory framework, safety measures including Trans Mountain's commitment to support and adopt the TERMPOL Review Committee's findings and recommendations, expert pilotage, and enhanced tug escort all play a significant role in spill prevention. The Board gave significant weight to this evidence from the Pacific Pilotage Authority, BC Coast Pilots Ltd., Trans Mountain, and Federal Departments and Agencies. The fact that pilots on the west coast of Canada have moved crude oil carriers without incident for over 50 years supports a conclusion that Project-related marine shipping can be conducted safely. Additional evidence that pilots can safely handle increased volumes reinforces this view. The Board also notes that the TERMPOL Review Committee had not identified any regulatory concerns, associated with Project-related tankers, for the tankers, tanker operations, the proposed routes, navigability, other waterway users and the marine terminal operations. The Committee said that implementation of its findings and recommendations, in conjunction with Trans Mountain's commitments, would provide for a higher level of safety for tanker operations commensurate with the increase in traffic. The Board remains of the view that although a large spill from a tanker associated with the Project would result in significant adverse environmental and socio-economic effects, such an event is not likely.

In the unlikely event of a spill, the Board finds that Trans Mountain's marine emergency preparedness and response planning is adequate in light of the existing marine spill response regulatory framework, Trans Mountain's enhanced oil spill response regime, and other improvements from federal departments and agencies, including the Canadian Coast Guard. The Board also notes that there is an existing regulatory regime in place related to marine financial liability and compensation to address a spill event.

The Board set out conditions regarding Project-related marine shipping that it considers necessary or desirable in the public interest, should the Project be approved by the GIC. Conditions include technically and economically feasible mitigation measures to eliminate, reduce, or control the adverse environmental effects of Project-related marine shipping in accordance with CEAA 2012. The Board also provided recommendations for measures to mitigate, avoid, or lessen the effects of Project-related marine shipping that are within the authority of the GIC, but beyond the scope of the Board's regulatory authority and Trans Mountain's control. Furthermore, the Board considered measures that would avoid or lessen

any adverse environmental effects of Project-related marine shipping on all SARA-listed species and their critical habitat, and to monitor them under subsection 79(2) of the SARA.

A summary of mitigation measures, regulatory requirements, current initiatives, and additional recommended measures considered by the Board is set out in Table 23. The Board took into account mitigation measures specific to Project-related vessels and regulatory requirements in its CEAA 2012 significance evaluation and under section 79 of the SARA. The current and additional initiatives and other recommended measures in Table 23 were not taken into account in the Board's significance evaluation, but may still be relevant to the justification analysis under the CEAA 2012 and the requirements of the SARA.

The Board considered other factors required under section 19 of the CEAA 2012, including comments from interested parties, purpose of the designated project, effects of the environment on Project-related marine shipping, requirements of follow-up programs, as well as community knowledge and Indigenous traditional knowledge. The Board also finds that Trans Mountain provided an adequate assessment, of technically and economically feasible alternative means of carrying out Project-related marine shipping, such as alternative marine terminal locations, alternate marine shipping routes, and alternate mitigation options to reduce effects.

The table below identifies the various topics and the corresponding section numbers where the evidence and the Board's views on each topic can be found in this chapter.

Section	Topic
14.1	Overview
14.2	Description of Project-related marine shipping
14.3	Regulatory framework
14.4	Public consultation
14.5	CEAA 2012 and SARA requirements
14.6	Purpose of the Project and alternative means
14.7	Environmental effects assessment (routine operations)
14.8	Socio-economic effects assessment (routine operations)
14.9	Environmental effects of malfunctions or accidents (spills)
14.10	Socio-economic effects of malfunctions or accidents (spills)
14.11	Spill prevention, risk analysis, and emergency preparedness
14.12	Financial responsibility, liability, and insurance
14.13	Other CEAA 2012 Factors

14.2 Description of Project-related marine shipping

As described in Chapter 1, the Project would result in the looping (or twinning) of the existing 1 147 km TMPL system between Edmonton and Burnaby with about 987 km of new buried pipeline. The Project would increase the capacity of the existing TMPL system from 47 690 m^3/d (300,000 bbl/d) to 141 500 m^3/d (890,000 bbl/d) of crude petroleum and refined products. Currently, Panamax tankers (less than 75,000 metric tonnes deadweight tonnage (DWT)) and Aframax tankers (75,000 to 120,000 metric tonnes DWT) call at the WMT. The existing WMT typically loads five tankers per month. The proposed expanded system associated with the Project would increase the WMT's loads to approximately 34 Aframax class vessels per month, with actual demand driven by market conditions.

14.2.1 Description and extent of the existing, future, and Project-related shipping activities

As set out in the OH-001-2014 Report, Trans Mountain said that it does not own or operate the vessels associated with existing marine shipping operations, nor will it directly own or operate those associated with the Project. Trans Mountain said that all large vessels destined for the Port of Vancouver, including those that would be associated with the Project, use existing shipping routes (Figure 25). It said that these routes are suitable for safe transit by current and future Project-related tankers. The route is approximately 160 nautical miles (296 km) in total between the WMT and the 12-nautical-mile limit off the west end of the Strait of Juan de Fuca. The passage takes approximately 14 to 15 hours to navigate, including about 8 hours transit time from the pilot boarding station near Victoria, B.C. to the WMT. The vessel speed would vary between 6 to 14 knots, depending on the route segment and on whether the tankers are empty or laden. Trans Mountain said that such speeds have proven to be both safe and efficient over many years of operating practice.

Trans Mountain provided a summary of the existing and future vessel movements at five locations in the Regional Study Area (RSA)[106] (Table 22). Trans Mountain said that future marine vessel movements in the RSA were projected to have a growth rate of two per cent per annum through to 2030 for marine tankers, including oil tankers, chemical tankers and liquefied natural gas (LNG) carriers. It said that cargo carriers and container ships were projected to grow at one per cent per annum through to 2030 and that the projected growth rate for all other marine vessels (e.g., tugs, barges, government vessels, passenger vessels and all other vessels) was also one per cent per annum over the same time period, with the exception of fishing vessels, which were projected to have a zero per cent growth rate. Trans Mountain identified multiple proposed development projects (e.g., Roberts Bank 2 Expansion Project, Fraser Surrey Docks and Gateway Pacific Terminal) and said, if approved, these developments are expected to contribute to the increase in commercial marine vessel traffic in Burrard Inlet, the Strait of Georgia, Haro Strait and Strait of Juan de Fuca. Trans Mountain also said that proposed parks and other recreational areas in the RSA that include marine components may also contribute to future increases in marine use by recreational and tourism users.

Trans Mountain said that Panamax tankers (less than 75,000 metric tonnes DWT) and Aframax tankers (75,000 to 120,000 metric tonnes DWT) call at the WMT.

[106] For the marine transportation component, the RSA extends from the WMT to the 12-nautical-mile limit and is of variable width extending from the marine shipping lanes, depending on the indicator.

Table 22: Trans Mountain's summary of existing and future vessel movements at five locations in the Regional Study Area

Location of cross-section[1]		Vessel movements by vessel type in 2012 (#/yr)									Project-related vessel movement[10] (#/yr)			Project-related tanker contribution to 2012 vessel traffic (%)	Project-related tanker and tug contribution to 2012 vessel traffic (%)	Estimated increase in non-Project vessel movements by 2030 (#/yr)	Estimated total vessel movements in 2030 (#/yr)	Project-related tanker contribution to total projected future vessel traffic (%)	Project-related tanker and tug contribution to total projected future vessel traffic (%)
Name	**Description**	**Tankers[2]**	**Cargo/Carriers[3]**	**Tugs[4]**	**Service[5]**	**Passenger[6]**	**Fishing[7]**	**Other[8]**	**Unknown[9]**	**Total**	**Tanker**	**Tug**	**Total**						
Burrard Inlet	North-south across Burrard Inlet just west of the WMT	263	108	5,631	473	68	25	261	29	6,858	720	2,160	2,880	9.5	29.6	1,401	11,139	6.5	25.9
English Bay	North-south from Point Atkinson in West Vancouver to Point Grey area in Vancouver	384	3,170	5,755	682	477	192	1,244	337	12,241	720	720	1,440	5.6	10.5	2,453	16,134	4.5	8.9
Strait of Georgia	Northeast across southern Strait of Georgia, from Delta near Tsawwassen to Active Pass area	385	5,301	3,237	1,316	5,634	459	672	590	17,594	720	720	1,440	3.9	7.6	3,450	22,484	3.2	6.4
Haro Strait	Northeast from Victoria area east to San Juan Island	391	4,506	975	850	506	300	907	461	8,896	720	720	1,440	7.5	13.9	1,777	12,113	5.9	11.9
Strait of Juan du Fuca	Southeast from Victoria to Port Angeles area	1,197	7,695	2,294	2,189	2,146	742	1,409	831	18,503	720	720	1,440	3.7	7.2	3,762	23,705	3.0	6.1

Source: TERMPOL 3.2 (Volume 8C, TR 8C-2)

Notes:

1 Cross-sections were placed across the shipping lanes to characterize the movements of vessels in the area that may be travelling in or adjacent to the shipping lanes.

2 Tanker traffic includes all chemical and petroleum products.

3 Cargo/carrier includes bulk carriers and general cargo carriers.

4 Tug traffic includes all tug movements, such as tugs engaged in towing and barging activities and harbour assist tugs.

5 Service vessels include: law enforcement/patrol vessels, military vessels, pilot vessels, pollution control vessels, research/survey vessels, dredges, and others.

6 Passenger includes ferries and cruise ships. While cruise ships operate in the summer months, most ferry services are year round. Strait of Georgia passenger vessel movements may be biased due to placement of the cross-section parallel to major ferry routes and may include more than one instance per ferry crossing. Due to the fact that the passenger vessels category combines ferry and cruise ship traffic, ferry movements were estimated as 1 per cent per annum from 2012 to 2030.

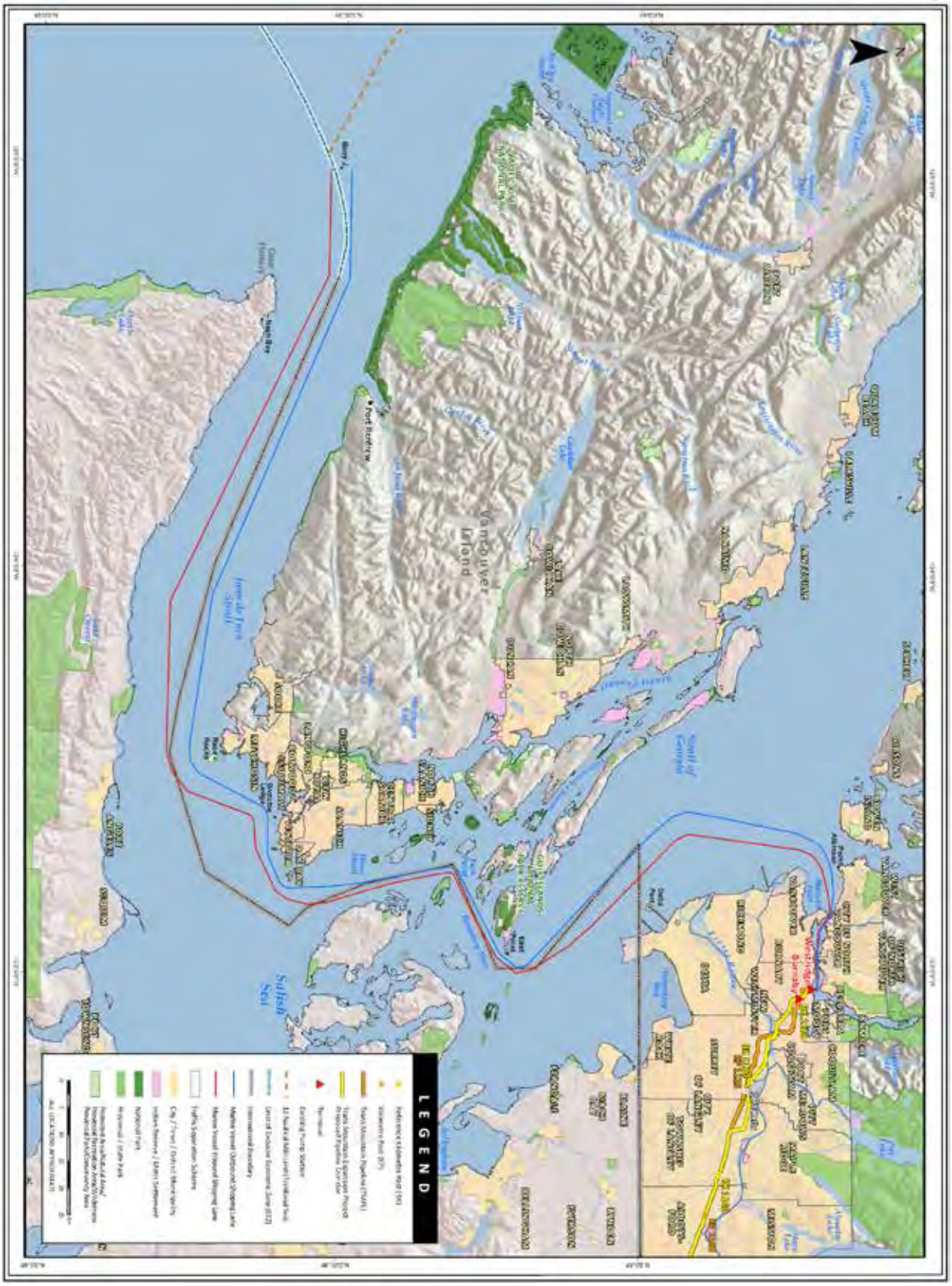
7 Fishing: only fishing vessels greater than 24 m in length and 150 gross tonnes are required to call in to VTS. Smaller vessel movements are not captured.

8 'Other' category may include pleasure craft greater than 30 m in length (required to call into VTS).

9 'Unknown' category is likely to include private recreational vessels and all vessels smaller than 30 m that are not required to call into VTS.

10 Tanker numbers calculated as: 30 vessels/month ×12 months/yr × 2 transits/vessel (inbound + outbound). Tug numbers calculated assuming 3 escort tugs for outbound tankers in Burrard Inlet and 1 escort tug for outbound tankers along the remainder of the shipping lanes. Tug numbers include outbound trip (i.e., while escorting tanker) and inbound trip (i.e., returning to point of origin).

Figure 25: Shipping lanes to and from the Westridge Marine Terminal



Trans Mountain said the existing WMT typically loads five tankers per month. The expanded system associated with the Project would require approximately 34 Aframax class vessels per month, with actual demand driven by market conditions. Aframax vessels would be the maximum size of vessel accessing WMT.

Trans Mountain said that if the Project was approved, the Project-related increase in marine traffic within Burrard Inlet would represent approximately 16.4 per cent of total marine traffic volume, compared to the current 3.0 per cent. It also said that within the Strait of Juan de Fuca, Project-related tanker traffic would increase to about 6.6 per cent of total marine traffic volume as compared to the current 1.1 per cent.

Ms. Michelle Baudais said that Project-related tanker traffic east of the Second Narrows bridge would account for an even higher percentage of total large vessel traffic as compared to consideration of large vessel traffic within Burrard Inlet overall.

MH-052-2018 hearing

NS NOPE, BROKE and others said that the increase in tanker traffic due to Project-related marine shipping is understated by Trans Mountain, and is much larger than the seven-fold increase as described by Trans Mountain. NS NOPE filed a report noting Trans Mountain's claim that WMT currently serves on average five tankers per month is inaccurate, and that from 2011 to 2017 the figure has ranged from just over one per month in 2016 to four per month in 2012 and 2013, with an average of less than three per month. The report said that three berths should not be required to accommodate the increased tanker traffic at WMT. Relying on the same report, BROKE said that with the proposed pipeline capacity and number of tanker berths, the Project could result in at least a 20-fold increase in tanker traffic between 2015 and 2017 as compared to the 7-fold increase described by Trans Mountain.

Trans Mountain said that the amount of vessel traffic can fluctuate month to month based on market conditions and other factors. Trans Mountain said it carried out extensive analysis in the OH-001-2014 hearing of projected berth utilization under different conditions and determined that three berths are necessary in order to conduct the daily maximum transfer smoothly without placing undue pressure on anchorages within the Port of Vancouver. It said Project-related tankers will anchor at anchorage locations that have been established within the jurisdiction of the Vancouver Fraser Port Authority (VFPA) and have been utilized by various types of vessels, including tankers, in the past. It said that it is expected that tankers will anchor at the three anchorages east of Second Narrows, and pressure on anchorages will be reduced by holding tankers at the dock whenever a berth is available, even if cargo transfer is not planned immediately. Trans Mountain said this is an advantage of having three berth locations available. VFPA said it does not anticipate the number of anchorages will have to be increased to service Project-related tanker traffic.

The Vancouver Fraser Port Authority said that from 2015 to 2017, there has been a 4 per cent total increase in foreign vessel arrivals in Burrard Inlet. Vancouver Fraser Port Authority said that at present, about 3,160 vessels call the Port of Vancouver each year, which is about nine ships per day. Based on its 2016 analysis, Vancouver Fraser Port Authority forecasts the number of vessel calls to the Port of Vancouver may increase to about 12 ships per day by 2026. It also said that the Port of Vancouver sees about 30 to 50 crude oil tankers per year. With the Trans Mountain pipeline expansion project, this number could increase to about 400 tankers per year, or about 11 per cent of total vessel traffic.

Views of the Reconsideration Panel

The Board, in its reasons related to the List of Issues for the MH-052-2018 hearing, noted that the existing Westridge Marine Terminal typically loads five tankers per month and that the expanded system associated with the Project would require approximately 34 Aframax class vessels per month, with actual demand driven by market conditions. The Board also heard evidence during the OH-001-2014 hearing that actual tanker numbers could vary depending on whether Panamax or Aframax class tankers were used. The Board reiterates that Project-related variations in incremental tanker shipments above the base/current project tanker shipments has been addressed in its OH-001-2014 Report. The Board accepts Trans Mountain's evidence regarding projected increase in tanker traffic due to Project-related marine shipping and is of the view that Trans Mountain's estimates are reasonable. In any event it is the Project-related marine shipping total of approximately 34 Aframax vehicles per month which has been the focus of the Board's analysis, as it was during the TERMPOL process. The Board recognizes there will be variation in the actual increase in vessels depending on which time periods the increases are measured from and what actual market demand will be. The Board gives considerable weight to the fact that the variation in tanker numbers within the range noted by NS NOPE and BROKE does not materially affect the results of the marine shipping quantitative risk analysis as discussed in Section 14.11.2 and related Views of the Board.

In regard to projected berth utilization, the Board is of the view that utilizing three berths would reduce undue pressure on existing anchorages as also noted by Trans Mountain. The Board finds that this issue was also considered in the OH-001-2014 hearing and the TERMPOL Review Committee did not find any concerns with the berth layout and design. The Board accepts that Trans Mountain will minimize the demand for anchorages by increasing berth use,

specifically by keeping vessels alongside in circumstances when they would typically use an anchorage. Therefore, the Board finds Trans Mountain's projected berth utilization reasonable.

14.3 Regulatory framework

14.3.1 Overview of existing regulatory framework for marine shipping

As set out in the OH-001-2014 Report, the Board's regulatory oversight of the Project reaches from Edmonton to Burnaby, up to and including the WMT. The Board does not have regulatory oversight of marine vessel traffic. However, evidence filed by many participants, including Trans Mountain, Transport Canada, Vancouver Fraser Port Authority, Pacific Pilotage Authority and the Canadian Coast Guard sets out a broad and detailed regulatory framework governing safety, security and environmental protection in relation to marine shipping, which would cover tankers associated with the Project. A summary of the framework is provided here.

International

Transport Canada said that regulations and standards that govern shipping operations are implemented through international agreements. It said that countries negotiate their governments' approved positions on international standards for the safety, security and environmental performance of international shipping, and, once agreement has been reached, member countries, like Canada, must create regulatory frameworks for the shipping industry that reflect the agreement. Transport Canada said there are over 50 International Maritime Organization (IMO) conventions covering a range of topics. Canada is a member state and signatory to most conventions. The conventions are reflected in Canada's marine safety and security system, including the *Canada Shipping Act, 2001*. Canadian maritime laws apply to all vessels operating in Canadian waters, and to Canadian vessels worldwide.

In addition to the IMO conventions, Canada and B.C. have other cooperative agreements and working relationships in place with the United States regarding spill prevention and response.

Some of the major conventions and agreements include:

International Convention / Agreement	Highlights
International Convention for the Safety of Life At Sea (SOLAS)	· how a vessel is constructed, its required safety equipment and establishes security requirements
International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)	· the competencies of a vessel's crew
International Convention for the Prevention of Pollution from Ships (MARPOL)	· limits on a vessel's operational discharges and sets detailed technical standards for: · carrying and handling oil; · carrying and handling noxious liquid substances in bulk; · carrying packaged dangerous goods; and · managing vessel sewage discharges, garbage and air emissions
International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC)	· measures for dealing with pollution incidents, including oil pollution, either nationally or in co-operation with other countries
Maritime Labour Convention, 2006	· standards for protecting the rights of seafarers
United Nations Convention on the Law of the Sea (UNCLOS)	· sovereign rights that a coastal state can exercise in these areas of the sea · the rights that other countries can exercise when they wish to undertake activities in these areas of the sea
International Maritime Organization's 2011 Guidelines for the Control and Management of Ship's Biofouling	· voluntary guidelines that encourage the ship-owners to adopt practices to control and manage biofouling
International Convention on the Control of Harmful Anti-fouling Systems	· prohibits, and/or restricts the use of harmful anti-fouling systems
Pacific States/British Columbia Oil Spill Task Force	· emphasizes working together to reduce the likelihood of a transboundary spill occurring and to improve spill response

International Convention / Agreement	Highlights
Canada-United States Joint Marine Pollution Contingency Plan	· Canadian Coast Guard and United States Coast Guard agreement to provide a coordinated system for planning, preparedness and responding to pollution incidents in contiguous Canadian and US waters.
Transboundary exercises and mutual aid agreements	· CCG and United States Coast Guard hold joint planning and response exercises in the Strait of Juan de Fuca on an annual basis · in the event of a cross-border oil spill, a mutual aid plan for the members of the Pacific States-British Columbia Oil Spill Task Force would be activated in order to coordinate the movement of mutual aid resources · Western Canada Marine Response Corporation (WCMRC) participates in annual joint exercises, and cross border mutual aid exercises with partners in Washington and Alaska · Transboundary cooperation is described in more detail in Section 14.11.3

National

Trans Mountain said that Transport Canada is responsible for Canada's transportation policies and programs that promote safe, secure, efficient and environmentally responsible transportation.

Participants filed evidence to show the role that federal departments have in regulating marine shipping activities or in marine spill response. Highlights are provided here:

Department	Legislation / Program	Highlights
Transport Canada	*Canada Shipping Act, 2001*	· Part 4, which covers safety; · Part 5, which covers navigation services; · Part 8, which covers environmental preparedness and response, and is the foundation of Transport Canada's programs that certify Response Organizations and inspect oil handling facilities. Transport Canada requires response plans for Response Organizations to be based on regulations and planning standards set out under the Response Organizations Standards TP 12401 · Part 9, which prohibits discharge of prescribed pollutants, requires vessels to have pollution emergency plans and grants the Minister of Transport the authority to direct vessels that have discharged or are likely to discharge pollutants; and · Part 11, which relates to oversight and enforcement.
Transport Canada	*Ballast Water Control and Management Regulations*	· vessels must have a ballast water management plan before arriving at the port · regulations outlines measures and procedures for safe and effective ballast water management
Transport Canada	*Marine Transportation Security Act* (MTSA)	· provides for the security of marine transportation
Transport Canada	*Marine Liability Act* (MLA)	· establishes the Ship-Source Oil Pollution Fund and provides funding for spills from all classes of vessels in Canada · MLA is discussed more in Section 14.12.
Transport Canada	TERMPOL review process	· focuses on the marine transportation components of a project and examines the safety of tankers entering Canadian waters, navigating through channels, approaching berthing at a marine terminal and loading or unloading oil or gas · TERMPOL report is discussed more in Sections 14.11.1 and 14.11.2.
Fisheries and Oceans Canada (DFO) / Canadian Coast Guard (CCG)	*Fisheries Act*	· CCG, as a Special Operating Agency of DFO, provides maritime services related to navigation, spill response, communication, security, and search and rescue · for a spill, CCG assumes role of on-water federal lead agency, monitoring the overall effort of the response organization to ensure it is timely, effective, and appropriate to the incident · within Canadian waters and the Exclusive Economic Zone, CCG is responsible for providing aids to navigation and waterways management services, and providing marine communication and traffic services

Department	Legislation / Program	Highlights
Environment and Climate Change Canada (ECCC)	National Environmental Emergencies Centre (NEEC)	· provides ECCC's technical and scientific environmental advice and assistance to the Lead Agency in the event of an environmental emergency · uses a mapping application and data viewing portal, enabling quick identification of the location of an incident, its geographical context, and environmental concerns and protection priorities · consolidates geospatial data for the purpose of delivering expert advice in a variety of formats – maps, reports and other associated documentation are delivered to the lead agency and others that assist on environmental emergencies. · NEEC conducts post-emergency assessment, provides specialized advice on shoreline cleanup assessment technique, and provides advice on ecosystem recovery objectives.
ECCC	*Sulphur in Diesel Fuel Regulations*	standard setting the allowable sulphur levels in marine diesel fuel available for large ships

Provincial

While the federal government has constitutional authority for navigation and shipping, both the provincial and federal governments have shared authority over the environment. The province also has authority for the management of provincial lands and natural resources.

Province	Program	Highlights
Province of British Columbia	*Environmental Management Act*	· Managing discharge of pollutants · Environmental Emergency management · Cost recovery from a spiller (polluter pays)
Province of British Columbia	*Wildlife Act*	· Protection of wildlife
Province of British Columbia	*B.C. Emergency Program Act*	· Environmental Emergency management

Regional

There are also regionally-focused bodies and organizations that have a role in regulating marine shipping activities or in marine spill response. Highlights are as follows:

Agency / Authority	Authorization	Highlights
Western Canada Marine Response Corporation (WCMRC)	*Canada Shipping Act, 2001*	· ensure emergency preparedness and response capacity in the event an oil spill occurs in the marine environment on the west coast of B.C. · WCMRC is discussed further in Section 14.11.3.
Vancouver Fraser Port Authority	*Canada Marine Act*	· facilitate trade, ensuring goods are moved safely, while protecting the environment and considering local communities · responsible for the operation and development of the assets and jurisdictions of the former Fraser River Port Authority, North Fraser Port Authority and Vancouver Port Authority, which were amalgamated in 2008 · responsible for managing over 16,000 hectares of water, over 1,000 hectares of land and assets along hundreds of kilometres of shoreline
Pacific Pilotage Authority (PPA)	*Pilotage Act*	· mandate is to provide a safe, reliable and efficient marine pilotage service on the west coast of Canada · pilots are a resource to the master and bridge team providing them with expert local knowledge, and are responsible to the master for the safe navigation of the vessel while it is in British Columbia pilotage waters · provides added level of safety to the vessel by placing a pilot on the vessel meaning at least one member of the bridge team has in-depth knowledge of local dangers, is not fatigued, and is a knowledgeable resource · according to PPA, a robust pilotage is one of the tools used by governments to reduce a human error-based vessel incident.

Agency / Authority	Authorization	Highlights
BC Coast Pilots Ltd.	*Pilotage Act* *Canada Shipping Act, 2001*	· provides service to the Pacific Pilotage Authority · pilots have to meet rigorous levels of knowledge and experience requirements, and then be examined and licensed by the Pacific Pilotage Authority training program

In the MH-052-2018 hearing, Trans Mountain said that since the beginning of the Project in 2012, it has also maintained regular and consistent engagement and communications with United States regulatory authorities responsible for marine spill response and prevention at the federal, state, and local level to ensure they have Project information.

The Chamber of Shipping said that most of the marine shipping-related challenges being considered in the MH-052-2018 hearing are already being addressed through actions implemented by the proponent, the Government of Canada through the Oceans Protection Plan, and the marine industry itself in collaboration with governments in Canada and the United States. The Chamber of Shipping submitted that non-regulatory approaches can be equally or more successful than a regulatory approach as they are adaptive in nature and can leverage lessons learned quickly.

The Board's Marine Technical Advisor said that he was of the view that the current regulatory regime provides an effective framework governing safety, security and environmental protection in relation to marine shipping. This view was based on his assessment of international and domestic regulatory requirements, proposed improvements under the Oceans Protection Plan, use of pilots, the continual decline in tanker incidents on a global basis, and the use of double hull tankers and escort tugs.

14.3.2 Federal improvement initiatives

World-class Tanker Safety System

In 2013, the Tanker Safety Expert Panel submitted their report, A Review of Canada's Ship-source Oil Spill Preparedness and Response Regime — Setting the Course for the Future, to the Minister of Transport. The review and report focused on the Ship-source Oil Spill Preparedness and Response Regime south of the 60th parallel as it was in 2013. Generally, the Tanker Safety Expert Panel found that "the foundational principles of the Regime have stood the test of time, but that there are a number of areas that could be improved to enhance Canada's preparedness and response to ship-source oil spills."

The Tanker Safety Expert Panel made 45 recommendations for action by the federal Government and by federal departments, including Transport Canada, the Canadian Coast Guard, ECCC and Fisheries and Oceans Canada. Among the recommendations are:

- Transport Canada should require Response Organizations to have in place the arrangements for cascading resources and mutual assistance agreements necessary to address a worst-case discharge in their Areas of Response.
- The Government of Canada should implement a risk-based Area Response Planning model to prepare for ship-source oil spills.
- Transport Canada should regularly review and update the national Risk Assessment for Marine Spills in Canadian Waters and make these results public.
- Using a consistent methodology, Transport Canada should perform regional risk assessments for each Area of Response and make the results public.
- The Canadian Coast Guard should invite other stakeholders who are involved in oil spill preparedness and response to participate during the planning process. The Area Response Plans should be made publicly available.

Transport Canada outlined its roles and responsibilities as part of the World Class Tanker Safety System (WCTSS) initiative. It said that:

- the WCTSS is a comprehensive, multiyear strategy for all of Canada and that it is independent of any energy infrastructure project;
- implementation of the WCTSS measures was already underway; and
- WCTSS initiatives take into consideration the advice of the Tanker Safety Expert Panel, stakeholder input and other analyses.

The Canadian Coast Guard said that Canada's marine navigation system was being modernized through investments related to the WCTSS. It said that it was investing in state-of-the-art navigational services and technologies, and working with Transport Canada to examine current Automated Information System carriage requirements.

The Canadian Coast Guard said that it would be establishing the Incident Command System across the organization as part of the WCTSS. It said that this system allows multiple stakeholders to participate in important decision-making processes simultaneously and allows for effective planning and response initiatives to address all marine pollution and all-hazard incidents in a predictable and structured fashion.

The Canadian Coast Guard also said that in conjunction with other partners, it would develop Area Response Plans, to gain a common understanding of the key planning elements, and to further improve the decision-making process. Partners engaged would include local stakeholders and representatives from Indigenous communities, industry, other federal government departments and other levels of government. It noted that the Area Response Plans would be improved through scientific research on pollutants and how they behave in water. The southern portion of B.C. was identified as pilot area for implementation of area response planning.

ECCC also outlined its role in informing preparedness and response decisions (e.g., providing scientific information to inform response), as well as its role in research (e.g., behaviour of transported substances) in relation to the World Class Tanker Safety initiative.

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Legislative Changes

The federal departments and agencies said that amendments to the *Canada Shipping Act, 2001* and the *Marine Liability Act* have been introduced as Bill C86. This bill received Royal Assent on 13 December 2018. These amendments:

- Allow the Minister of Transport to issue an interim order if immediate action is required to address a risk to the marine environment or marine safety, including on a pre-cautionary basis.
- Enhance the ability of the GIC, on the recommendation of the Minister of Transport, to make or temporarily amend regulations to protect the marine environment from the impacts of shipping and navigation activities.
- Clarify when a pollution response by the Canadian Coast Guard can begin by removing ambiguity around when the Canadian Coast Guard can provide direction to avoid a pollutant from reaching the water in the first place.
- Provide immunity from liability to external parties that the Canadian Coast Guard works with when conducting a response that have additional knowledge or expertise required to respond to a pollution incident, such as industry contractors, scientists, local experts, and Indigenous groups.
- Provide the Canadian Coast Guard with additional access authority for private property when conducting marine pollution prevention and response.
- Enhance deterrence and enforcement provisions under the *Canada Shipping Act, 2001* by raising the maximum potential administrative monetary penalty for contraventions of marine safety and environmental requirements from $25,000 to $250,000 per violation.
- Enable the Minister of Transport to provide time-limited exemptions from regulatory requirements and standards for the purpose of promoting research and innovation to enhance marine safety or the protection of the environment.

Transport Canada said the final report to the Minister of Transport regarding the *Pilotage Act* Review was publicly released in 2018. The report outlines 38 recommendations for improvements. Transport Canada has consulted on the report and its recommendations, and intends to introduce legislation by June 2019 to enable improvements in the effectiveness, efficiency and accountability of Canada's pilotage system.

Transport Canada said that it is reviewing the regulations and standards that govern Canada's oil spill response organizations, including the 1995 Response Organization Standards. To support this work, a discussion paper was prepared and released in May 2018. Feedback is being solicited from all interested stakeholders and Indigenous groups in response to this discussion paper.

The Oceans Protection Plan

The federal government intervenors discussed the Oceans Protection Plan (OPP) that was announced by the federal government on 7 November 2016. The objective of this $1.5 billion initiative is to improve marine safety and responsible shipping, protect Canada's marine environment, and offer new possibilities for Indigenous and coastal communities. The objective of the OPP is delivered by Transport Canada, ECCC, Natural Resources Canada, DFO, and the Canadian Coast Guard. The OPP's initiatives are grouped in four pillars:

- Improve responsible shipping and protect Canada's waters, including measures to prevent incidents and accidents, while enabling rapid response actions in the event of a spill;
- Restore and protect the marine ecosystems and habitats, using new tools and research, as well as taking measures to address abandoned boats and wrecks;
- Strengthen partnerships and launch co-management practices with Indigenous communities; and
- Invest in oil spill response research and methods to ensure that decisions taken in emergencies are evidence based.

Transport Canada said that the OPP is independent of the Project although, as detailed below, the OPP will have direct application to the Project's marine shipping components. The federal departments and agencies noted that in addition to directly responding to marine safety concerns raised through previous public consultations, including those on the Project, specific OPP initiatives apply to the Project's marine shipping components, such as those regarding:

- Enhanced Maritime Situational Awareness;
- Modern Hydrography and Charting in Key Areas;
- Cumulative Effects of Marine Shipping;
- Coastal Environmental Baseline Monitoring Program;
- Marine Environmental Quality Initiative;
- Whale Collision and Avoidance Initiative; and
- Coastal Restoration Fund.

The federal government intervenors also noted that the federal government is developing national frameworks, or proposing legislative changes that will apply to the Project area. These initiatives include Proactive Vessel Management; *Pilotage Act* Review; Places of Refuge; and Proposed Legislative Changes.

Transport Canada said that OPP initiatives are being implemented over the course of five years and the results in this period will inform the ongoing implementation beyond five years. Results will vary based on each initiative and several factors, such as the results of the first five years of implementation and the Indigenous codevelopment processes.

Additional discussion on regulatory framework improvement initiatives since the Board's OH-001-2014 hearing and related Views of the Board are provided throughout this chapter.

14.4 Public consultation – MH-052-2018 hearing

Trans Mountain provided an update of its stakeholder engagement and communications conducted on matters related to marine transportation. Trans Mountain reported that, from 1 July 2015 through to 30 September 2018, it held a total of 152 engagement events with individual stakeholders or stakeholder groups, including government authorities, marine trade industries, coastal communities, and commercial and recreational marine waterway users. The engagement activities were comprised of meetings, presentations or site tours, and other events involving updates through attendance and participation in multi-stakeholder events.

Trans Mountain said that meetings were held with stakeholders to proactively anticipate their key issues regarding marine transportation, to inform NEB condition compliance reports, as well as to maintain relationships with stakeholders, share information on Project progress, and keep track of new developments in shipping safety and environmental best practices. Trans Mountain noted that engagement on marine transportation typically involved the following key themes (most are associated with regulatory conditions of approval): marine safety, navigation safety, marine mammals; marine birds, boating safety for recreational vessel traffic, fate and behaviour of oil/spill response, and greenhouse gas emissions.

Trans Mountain said that it will continue to communicate with stakeholders regarding marine transportation.

Views of the Reconsideration Panel

The Board finds that Trans Mountain has continued to engage with stakeholders on matters related to marine transportation by providing timely, appropriate, and effective opportunities for all potentially affected parties to learn about Project-related marine shipping, provide their comments and concerns, and to discuss how Trans Mountain could address them. Given Trans Mountain's ongoing engagement activities with respect to Project-related marine shipping, the Board's views from the OH-001-2014 Report remain the same. Given all the public consultation opportunities provided, the Board finds that Trans Mountain has continued to develop and implement a broadly based public consultation program, offering numerous venues and opportunities for the public, landowners, governments, and other stakeholders to learn about the Project and Project-related marine shipping, and to provide their views and concerns to the company. The Board continues to be of the view that, with Trans Mountain's commitments and the Board's recommended conditions, Trans Mountain can continue to effectively engage the public, landowners, and other stakeholders, and address issues raised throughout the Project's operational life. Information about Trans Mountain's consultation with Indigenous communities is found in Chapter 5.

14.5 CEAA 2012 and SARA requirements

In the OH-001-2014 hearing, the Board assessed the potential environmental and socio-economic effects of the increased marine shipping resulting from the designated project as part of its public interest determination under the NEB Act, and not under the CEAA 2012. The Board at that time followed an approach similar to the environmental assessment conducted under the CEAA 2012 as described in Chapter 10, to the extent it was appropriate, to inform the Board's public interest determination.

When the Board established the List of Issues for the OH-001-2014 hearing, it included Issue 5 – The potential environmental and socio-economic effects of marine shipping activities that would result from the proposed Project, including the potential effects of accidents or malfunctions that may occur. The Board stated that this would be considered under the NEB Act.[107] On 10 September 2013, the Board issued filing requirements[108] specific to the issue of the potential effects of Project-related marine shipping activities to complement the Filing Manual. These additional filing requirements were related to consultation, description and extent of increase in marine shipping activities, effects assessment including but not limited to, an assessment of credible worst-case spill scenarios, and navigation and safety and mitigation measures. The Board said that it did not intend to duplicate the work being undertaken by the TERMPOL[109] Review Committee.[110]

[107] NEB letter of 2 April 2014, Trans Mountain Expansion Project, Factors and Scope of Factors for the Environmental Assessment, pursuant to the CEAA 2012 (Scoping Document).

[108] This document was titled: Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project

[109] "Technical Review Process of Marine Terminal Systems and Transhipment Sites." TERMPOL is an extensive yet voluntary review process that proponents involved in building and operating a marine terminal system for bulk handling of oil, chemicals and liquefied gases can request. It focuses on the marine transportation components of a project.

[110] Transport Canada chairs a TERMPOL Review Committee for this Project. The following agencies and organizations have been involved in the TERMPOL Review Process: Transport Canada; Fisheries and Oceans Canada; the Canadian Coast Guard; Environment and Climate Change Canada; the Canadian Hydrographic Service; Pacific Pilotage Authority Canada; British Columbia Coast Pilots; and Port Metro Vancouver.

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As noted in Chapter 1 of this report, a 30 August 2018 decision of the Federal Court of Appeal set aside the GIC's Order directing the Board to issue the Certificate for the Project. As a result, on 20 September 2018, the GIC referred aspects of the Board's OH-001-2014 Report for the Project back to the Board for Reconsideration through Order in Council P.C. 2018-1177 (OIC). In particular, the OIC required the Board to take into account the environmental effects of Project-related marine shipping in view of the requirements of the CEAA 2012, and the adverse effects of Project-related marine shipping on species at risk in view of any requirements of section 79 of the SARA.

On 26 September 2018, the Board specifically sought public comments on:

- whether, "on a principled basis, Project-related marine shipping should be included in the "designated project" to be assessed under the CEAA 2012; and
- a draft Amended Factors and Scope of the Factors for the Environmental Assessment pursuant to the CEAA 2012 (Amended Factors Document), and a draft List of Issues to be considered in the MH-052-2018 hearing.

In its letter dated 12 October 2018, the Board decided, on a principled basis, to include Project-related marine shipping between the WMT and the 12-nautical-mile territorial sea limit in the "designated project" to be assessed under the CEAA 2012. On the same date, the Board released the confirmed List of Issues that includes issues related to factors described in paragraphs 19(1)(a) through (h) and subsection 19(3) of the CEAA 2012, such as mitigation measures, alternative means, and requirements of any follow-up program, each in relation to Project-related marine shipping. It also includes issues related to section 79 of the SARA, such as measures to avoid or lessen adverse effects of Project-related marine shipping on species at risk.

On 12 October 2018, the Board also issued a letter to Trans Mountain describing additional Filing Requirements for Trans Mountain that the Board required for the Reconsideration.[111] In addition, the Board also issued a letter, pursuant to paragraph 20(a) of the CEAA 2012, to request specialist or expert information or knowledge in the possession of each of DFO, ECCC, Transport Canada, Vancouver Fraser Port Authority, Pacific Pilotage Authority, Health Canada, Parks Canada, and Natural Resources Canada in relation to the Reconsideration.

This section focuses on the Board's responsibilities under the CEAA 2012 and the SARA, and environmental and socio-economic methods.

[111] NEB letter of 12 October 2018 to Trans Mountain, Filing requirements for Trans Mountain

14.5.1 Responsibilities under the CEAA 2012

CEAA 2012 requires the Board to assess the environmental effects of the Project-related marine shipping by taking into account the factors described in section 19 of the CEAA 2012.

On 26 September 2018, the Board issued the Amended Factors and Scope of the Factors for the Environmental Assessment pursuant to the CEAA 2012 to reflect the inclusion of Project-related marine shipping in the "designated project" to be assessed under the CEAA 2012. This document is included as Appendix 10.

Specifically, for the MH-052-2018 hearing, the Board considered issues (described in the List of Issues) related to the factors described in paragraphs 19(1)(a) through (h) and subsection 19(3) of the CEAA 2012, and as detailed in the table below.

Section / paragraph of the CEAA 2012	Reference to chapter / section / subsection in the MH-052-2018 Report
19(1)(a) the environmental effects of the designated project, including the environmental effects of malfunctions or accidents that may occur in connection with the designated project and any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out	Sections 14.7 and 14.8 of this chapter discusses the environmental and socio-economic effects of Project-related marine shipping (routine operations of the tankers), including any cumulative effects under each valued component. Sections 14.9 and 14.10 of this chapter discusses the potential environmental and socio-economic effects of malfunctions and accidents.
19(1)(b) the significance of the effects referred to in paragraph (a)	Sections 14.7 and 14.8 of this chapter sets out the significance tables relating to operational effects from Project-related marine shipping. Appendix 12 provides the common ratings for each criterion, and basic definitions for each rating. Appendix 12 also provides the Board's definitions of "likely to be significant" and "not likely to be significant." In general, Project effects are considered "likely to be significant" when effects are either of "high magnitude," or "long-term, permanent, and of regional or global extent."
19(1)(c) comments from any interested party — that are received in accordance with this Act	The comments regarding the environmental assessment of Project-related marine shipping raised by the public, including intervenors and commenters, are addressed throughout this chapter.
19(1)(d) mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project	The Board has discussed these measures under each valued component in various sections of this chapter. The Board's approach to mitigation is discussed in Sections 14.7 and 14.8 of this chapter. Table 23 contains a summary of measures (including mitigation measures specific to Project-related vessels, regulatory requirements, current initiatives, and recommended measures) considered by the Board in the MH-052-2018 hearing as part of its CEAA 2012 assessment.
19(1)(e) the requirements of the follow-up program in respect of the designated project	Section 14.13 of this chapter discusses the Board's consideration of a follow-up program for Project-related marine shipping. Chapter 10 also discusses the follow-up program for the overall Project
19(1)(f) the purpose of the designated project	Section 14.6 of this chapter discusses the purpose of the Project.
19(1)(g) alternative means of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alternative means	Section 14.6 of this chapter discusses alternative means of carrying out Project-related marine shipping. The Alternative means of carrying out the Project is also discussed in Chapter 11.
19(1)(h) any change to the designated project that may be caused by the environment	Section 14.13 of this chapter discusses the effects of the environment on Project-related marine shipping.
19(1)(i) the results of any relevant study conducted by a committee established under section 73 or 74	The Board is not aware of any study that is relevant to Project-related marine shipping conducted by a committee established under section 73 or 74 of the CEAA 2012.
19(1)(j)) any other matter relevant to the environmental assessment that the responsible authority requires to be taken into account	There are no additional matters relevant to the environmental assessment that the Board as responsible authority requires to be taken into account.
19(3) The environmental assessment of a designated project may take into account community knowledge and Aboriginal traditional knowledge	The Board's environmental assessment of Project-related marine shipping has incorporated community knowledge and Indigenous traditional knowledge throughout this chapter and Chapter 5.

Paragraph 29(1)(b) of the CEAA 2012 requires a follow-up program. Section 14.13.2 of this chapter discusses the follow-up program for Project-related marine shipping.

The Board must also make its recommendations under subsection 30(4) of the CEAA 2012 regarding significant adverse environmental effects, justification, and applicable mitigation measures.

14.5.2 Responsibilities under section 79 of the SARA

Chapter 10, Section 10.1.4 describes the Board's responsibilities under section 79 of the SARA. As noted in Chapter 10, on 23 April 2014, the Board notified the Ministers of Environment and Climate Change Canada (ECCC), DFO, and Parks Canada Agency that the Project, if approved and constructed, may affect a number of species listed on Schedule 1 of the SARA (SARA-listed species) and/or their habitat. This notification included the species that may be affected by the Project-related marine shipping.

For the MH-052-2018 hearing, on 14 November 2018, pursuant to subsection 79(1) of the SARA, the Board notified the Minister of Environment and Climate Change and the Minister of Fisheries, Oceans and the Canadian Coast Guard that the Project, if approved and constructed, may affect additional species listed on Schedule 1 of the SARA and/or their habitat.

Pursuant to subsection 79(2) of the SARA, the Board is required to identify the adverse effects of projects on each SARA-listed wildlife species and its critical habitat. The Board must also ensure that measures are taken to avoid or lessen those effects, and to monitor them.

The Board's previous assessment in the OH-001-2014 hearing considered adverse effects of Project-related marine shipping on SARA-listed marine fish, marine mammal, and marine bird species, and their critical habitat. For the MH-052-2018 hearing, the Board focused its assessment of adverse effects primarily, but not exclusively, on any species that have been newly listed or have seen a change to their designation since the issuance of the Board's report and could be affected by Project-related marine shipping. In the Reconsideration, the Board also considered measures that would avoid or lessen any adverse environmental effects of Project-related marine shipping on all SARA-listed species (including the newly listed ones) and their critical habitat, and to monitor them. The Board undertook this analysis regardless of whether the adverse effects are significant or not.

In addition, the Board considered how these measures are consistent with any applicable recovery strategy or action plan, and how the Board could ensure that these measures are undertaken.

The Court in *Tsleil-Waututh Nation* found that the Board had not substantially complied with its obligations under subsection 79(2) of the SARA in the OH-001-2014 hearing.[112] Although the Board could not regulate marine shipping, "it was nonetheless obliged to consider the consequences at law of its inability to "ensure" that measures were taken to ameliorate the Project's impact on the Southern resident killer whale."[113] The Board also applied this to other SARA-listed wildlife species that will likely be affected by Project-related marine shipping. To comply with subsection 79(2), the Board is providing GIC with an exposition of all technically and economically feasible measures that are available to avoid or lessen the Project's effects on SARA-listed wildlife species that are within the authority of the federal government.[114]

Section 14.5.4 of this MH-052-2018 Report discusses the measures the Board considered pursuant to section 79 of the SARA. Some measures are within the regulatory authority of the Board and the control of Trans Mountain. These measures are technically and economically feasible and will avoid or lessen the adverse effects of Project-related marine shipping on SARA-listed species. The Board can ensure that such measures are in place if the project is carried out, through the enforcement of its conditions and lifecycle oversight. For example, Trans Mountain's commitment to participate in initiatives to protect marine mammals.

Other measures are outside of Trans Mountain's control and the Board's regulatory authority, but within the authority of the federal government. The Board does not regulate marine shipping and while Trans Mountain exercises initial control at WMT, it has very limited control over tankers once they leave the WMT. Therefore, the Board made recommendations to GIC in relation to these measures. These include measures to avoid or lessen the effects of Project-related marine shipping on SARA-listed species (i.e., Recommendations 5 and 6 regarding offsets) and measures to monitor them (i.e., Recommendation 2 regarding public reporting).

Some intervenors suggested that the Board's recommendations should be turned into enforceable conditions in the CEAA 2012 decision statement to "ensure" the measures are taken. Under subsection 31(5) of the CEAA 2012, the decision

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[112] *Supra* note at paras 451-456.

[113] *Ibid* at para 455.

[114] This approach is consistent with *ibid* at para 456.

statement is considered to be part of the certificate issued under section 54 of the NEB Act. The Board would not be in a position to enforce such conditions, since it does not have the jurisdiction to impose binding requirements on GIC. Furthermore, paragraph 31(b)(ii) of the CEAA 2012 indicates that the conditions in a decision statement must be complied with by the proponent in relation to the designated project. Therefore, the Board is addressing accountability to the best of its ability through Recommendation 2 regarding annual public reporting by GIC on the progress of initiatives, measures and Board recommendations, as well as other recommendations that include reporting and consultation.

Living Oceans and Raincoast argue that measures under subsection 79(2) of the SARA must not be merely hypothetical, should in fact mitigate the effects of the Project, and precede the approval of a project (i.e., conditions precedent). The Board notes that the development of numerous government initiatives such as the OPP, Whales Initiative, and ECHO Program have made significant headway since the OH-001-2014 hearing, with various aspects in different stages of progress. Furthermore, the Board's recommendations do not merely rely on these Government initiatives, but provide further details on specific measures the GIC should implement. For example, a regional cumulative effects management plan, offsets, marine bird monitoring program, mandatory enhanced tug escort, etc. Although most of the Board's recommendations would have broader implications on marine shipping generally, they are all still relevant to avoiding or lessening the adverse effects of Project-related marine shipping.

The Board finds that the Federal Court in *Pembina Institute for Appropriate Development v. Canada (Attorney General)*[115] is also informative. Section 79 of the SARA was raised in relation to the Yellow Rail bird in the context of an environmental impact assessment of the Kearl Oil Sands Project. The Joint Review Panel made various recommendations in relation to the Yellow rail including, that in the next two years Alberta Environment in collaboration with ECCC, coordinate a regional review of the cumulative impacts on the Yellow rail in the oil sands region, using appropriate regional nocturnal surveys in areas of potentially suitable habitat and that this initiative should determine the mitigation options to minimize impacts on the Yellow rail. The Court found that further studies of the Yellow rail population do not constitute mitigation measures. However, the Court determined that the Joint Review Panel adopted an approach that was consistent with the dynamic nature of the assessment process; it highlighted concerns and made recommendations consistent with the information before it. The Court found the approach employed to manage the existing uncertainty to be reasonable.[116]

Accordingly, the Board is taking an approach consistent with the dynamic nature of the environmental assessment process. The Board is highlighting its concerns about various SARA-listed species and in addition to the measures proposed in its conditions, it is also making recommendations consistent with the information before it, even though they may not constitute immediate mitigation measures. The Board also relied on applicable recovery strategies and action plans to help determine if its measures were sufficient to meet the requirements of subsection 79(2) of the SARA. For example, Recommendations 5 and 6 recommend a suite of measures to offset the additional underwater noise and strike risk created by Project-related marine shipping, which are two threats identified in the Recovery Strategy and Action Plan for SRKW, as well as in recovery documents for a number of other SARA-listed species.

The Board notes that the Court in *Pembina* did not take issue with the fact that the regional review was recommended to take place in the next two years, rather than preceding the approval of the project. This suggests flexibility in the timing of measures under subsection 79(2) of the SARA. The final decision regarding the timing and implementation of recommendations rests with GIC.

14.5.3 Environmental and socio-economic assessment methods

For the MH-052-2018 hearing, in assessing the environmental and socio-economic effects of the Project-related marine shipping under the CEAA 2012, the Board considered the environmental and socio-economic setting, interactions between the valued components, potential effects on valued components (both environmental and socio-economic), the adequacy of Trans Mountain's proposed mitigation measures to address them, federal government initiatives taken to date or currently being planned, environmental concerns or issues raised by intervenors and commenters, as well as the adequacy of Trans Mountain's own environmental and socio-economic assessment. The Board also considered its responsibilities under the CEAA 2012, and section 79 of the SARA, as described above in Sections 14.5.1 and 14.5.2.

The Board evaluated and accepted the spatial and temporal boundaries for each valued component as defined by Trans Mountain, for both Project-related marine shipping effects and cumulative effects. The spatial boundaries (or study areas) are described in Appendix 11. The marine shipping lanes are defined to include the normal tanker transit patterns from the WMT to the 12-nautical-mile limit, including transit within Burrard Inlet in the internationally designated marine shipping

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[115] 2008 FC 302 [*Pembina*].

[116] *Ibid* at para 69.

lanes. The time frame of the assessment includes the operation phase of the Project-related marine vessels (i.e., the time during which increased marine vessel traffic operations are expected to occur, or more than 50 years).

In addition, the Board considered transboundary effects under paragraph 5(1)(b) of the CEAA 2012. For example, the Board assessed any potential effects of Project-related marine shipping in US and Canadian waters as the shipping lanes in the Strait of Georgia, Haro Strait, and the Strait of Juan de Fuca are located on either side of the international boundary for much of the Marine RSA. The Board expects very similar types of effects in US and Canadian waters. Further, although the Board concluded that Project-related marine shipping between the WMT and the 12-nautical-mile territorial sea limit is part of the designated Project, the Board also took into account the effects of Project-related marine shipping that occur outside of the territorial sea limit in the EEZ or elsewhere outside of Canada. The Board notes that some effects are far-ranging, such as effects of spills or underwater noise on an endangered species with a large geographical range.

Where any effects (whether significant or non-significant) were predicted to remain after proposed mitigation is applied (i.e., residual effects), the Board assessed cumulative effects. This involved considering the residual effects associated with the Project in combination with the residual effects of other past, current and future (i.e., reasonably foreseeable) physical facilities and activities, and that have effects within the temporal and spatial boundaries and ecological context adopted for the Project assessment.

Incorporation of public comments and community knowledge, and Indigenous traditional knowledge

The Board considered comments from the public in its environmental assessment (e.g., assessing the concerns and issues raised directly by intervenors and commenters, and the mandated consultation performed by Trans Mountain). The comments raised by the public, including intervenors and commenters, are addressed throughout this chapter.

The Board also considered community knowledge and Indigenous traditional knowledge in its environmental assessment (e.g., assessing the concerns and issues raised directly by intervenors and commenters, the oral traditional evidence provided by Indigenous peoples, and the mandated consultation performed by Trans Mountain). The Board's environmental assessment has incorporated community knowledge and Indigenous traditional knowledge throughout this chapter and Chapter 5, one example being the information provided by Indigenous communities regarding the importance of SRKW, as noted in Sections 14.8.3 and 14.10.5.

Indicator-based approach and species at risk

Trans Mountain in the Application for the OH-001-2014 hearing, used an indicator-based approach to assess the potential environmental and socio-economic effects of the Project-related marine shipping for both operational effects and spills. For the assessment of operational effects, the Board required Trans Mountain to complete species-specific effects assessments for all marine fish, marine bird, and marine mammal species on Schedule 1 of the SARA that have the potential to be affected by Project-related marine transportation.

In the MH-052-2018 hearing, Trans Mountain identified two newly listed marine bird species (Western grebe and Horned grebe) and conducted an assessment of potential residual effects resulting from an increase in Project-related marine vessel traffic using an indicator-based approach. Several intervenors raised concerns about using an indicator species-based approach for assessing operation of Project-related marine shipping, and of the effects of spills.

Upon Board's request, for operational effects Trans Mountain provided species-specific assessment for the additional species, mitigation measures to avoid or lessen effects, and information about monitoring effects, including taking into account the requirements of section 19 of the CEAA 2012 and section 79 of the SARA.

Views of the Reconsideration Panel

Similar to Board's views in Chapter 10, the Board finds that given the potential for the Project-related marine shipping to affect various SARA-listed species, their residences or their critical habitat, and considering their at-risk status and potential sensitivity to further adverse effects, the Board considered it appropriate, in general, to assess the operational effects of Project-related marine shipping on each of those species individually. The Board recognizes the importance of conducting species-specific assessments for operational effects of Project-related marine shipping, since these effects are more predictable and likely.

This approach provided the Board with greater certainty that effects are appropriately identified, addressed and effectively mitigated, taking the particularities of each species at risk into account. Therefore, the Board has applied this approach to its assessment of species at risk. Although effects and mitigation have been considered for each individual species at risk separately, the Board only provided a species-specific discussion if it was deemed to be necessary (i.e., if a species was likely to be impacted from the Project-related marine shipping) in addition to its more general discussion.

The issue of using an indicator species-based approach for assessing the effects of spills is discussed in Section 14.9.1 of this chapter, along with the Board's corresponding views.

Cumulative effects

The Board used the same cumulative effects methodology that was discussed in Chapter 10. The Board considered any cumulative effects that are likely to result from Project-related shipping, in combination with environmental effects arising from other current or reasonably foreseeable marine vessel traffic, within the temporal and spatial boundaries (element-specific RSA) and ecological context adopted for the Project assessment. In considering the environmental effects of existing and future physical activities, the Board considered whether the potential environmental effects of the designated project on the selected valued components of the designated project interact with effects of other physical activities that have been or will be carried out.

Trans Mountain considered specific terminal expansions in Vancouver harbour area, projected growth rates of vessel movements in the Marine RSA, and existing and future vessel movements at five locations in the Marine RSA, as shown in Table 22 of this chapter.

During the MH-052-2018 hearing, some intervenors raised concerns regarding the cumulative effects methodology.

Barkley Sound Stewardship Alliance described two other proposed projects (Kwispaa LNG and Port Alberni Transshipment Hub [PATH]) in the region that would add up to an additional 6540 large vessel passages through the area, and that the total cumulative effects should be taken into account. It said that, if the Trans Mountain Expansion Project, Kwispaa LNG, and PATH proceed as planned, there would be up to an additional 6540 large vessel passages through the area. The scale of each of these operations is large enough to merit an individual impact assessment but the total combined effects are too large to not apply a cumulative impacts assessment methodology.

Trans Mountain said it did not consider these two proposed projects in its cumulative effects assessment during the OH-001-2014 hearing, because at the time of submission of Trans Mountain's application in December 2013, neither the Kwispaa LNG project nor the PATH project had been proposed. It has since reviewed publicly available information on the two proposed projects and has concluded that even if it were to re-do its cumulative effects assessment from the OH-001-2014 hearing, neither of the proposed projects meets the requirements for inclusion in a cumulative effects assessment for Project-related marine transportation. Trans Mountain referred to the *Operational Policy Statement: Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*, and said that the following two conditions (among others) must be met to scope any future project or activity into a cumulative effects assessment: the future project or physical activity is certain or reasonably foreseeable; and the residual environmental effects of the future project or physical activity will overlap with the predicted residual effects of the designated project.

Trans Mountain said that proposed PATH project is not considered reasonably foreseeable. It said that while a pre-feasibility study was completed in June 2014, the project proponent (Port Alberni Port Authority) for this project has not yet publicly disclosed its intention to seek the necessary regulatory approvals to proceed. Trans Mountain said that the proposed Kwispaa LNG project is considered reasonably foreseeable, however, based on the project description submitted to Canadian Environmental Assessment Agency on 16 October 2018, vessel traffic associated with the Kwispaa LNG project would not overlap with Project-related vessel traffic. Trans Mountain concluded that given the spatial separation of vessel traffic, the residual effects associated with the Trans Mountain Expansion Project would not be expected to overlap with potential residual effects associated with the Kwispaa LNG project.

Tsartlip First Nation said that Board should take into account the cumulative effects from other projects including the Roberts Bank Terminal 2 Project as this project would also be increasing their tanker traffic. It said that community leaders are concerned that regulators are doing little to support the development of regional marine cumulative effects plans, and failing to consider all currently proposed and reasonably foreseeable vessel increases into their assessment of the Project.

Trans Mountain said that Roberts Bank Terminal 2 Project is specifically identified as a contributor to future vessel traffic increases and was fully addressed in its cumulative effects assessment in the OH-001-2014 hearing.

Views of the Reconsideration Panel

The Board's Filing Manual requires proponents to provide clear reasoning, with supporting rationale, for selecting the other existing and future physical facilities or activities to be included within the cumulative effects assessment. The Filing Manual states that when identifying other physical facilities or activities, include those physical facilities or activities likely to take place as opposed to those not reasonably foreseeable or hypothetical.

The Board agrees with Trans Mountain that the two proposed projects namely, Kwispaa LNG project, and the PATH project does not meet the requirements for inclusion in the cumulative effects assessment for Project-related marine transportation. In Board's view, the proposed Kwispaa LNG project is not considered as reasonably foreseeable as this

project is not publicly disclosed yet. In regard to the Kwispaa LNG project, Trans Mountain said that based on the project description submitted by the proponent to the Canadian Environmental Assessment Agency, the residual effects associated with the Trans Mountain Expansion Project would not be expected to overlap with potential residual effects associated with the Kwispaa LNG project. The Board notes that Trans Mountain followed the guidance provided in "*Operational Policy Statement: Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012,"* and finds Trans Mountain's explanation for not including the two projects suggested by Barkley Sounds Stewardship Alliance, as reasonable.

The Board confirms that Roberts Bank Terminal 2 was considered as a contributor to future vessel traffic increases, and was addressed in Trans Mountain's cumulative effects assessment in the OH-001-2014 hearing.

Mitigation measures and significance determination

In order to determine whether the effects of Project-related marine shipping are likely to cause significant environmental effects, the Board, pursuant to paragraph 19(1)(d) considered any information or knowledge concerning the potential effectiveness, safety, and technical and economic feasibility of each of the potential mitigation measures, including how each could be implemented and monitored. The Board required Trans Mountain to provide this information by including this topic in the Filing Requirements for Trans Mountain, and requested similar information from Federal authorities pursuant to paragraph 20(a) of the CEAA 2012. The Board also asked several Information Requests to the participants during the MH-052-2018 hearing regarding the potential mitigation measures.

The Board has provided a discussion of mitigation measures[117] that would mitigate any adverse environmental effects of the designated project under each valued component in this chapter. Generally, to determine if a measure qualifies as mitigation, and to determine the extent to which to rely on it as a means to mitigate adverse environmental effects, the Board looks at whether there is sufficient confidence in each of the following:

a) *Effectiveness*: will the measure eliminate, reduce or control the adverse environmental effects?

b) *Feasibility*: is the measure technically and economically feasible?

c) *Reliability*: will the measure be effectively implemented?

In cases where there is a lack of full certainty, the Board considers the potential for enforcement, monitoring and adaptive management.

Mitigation measures include Trans Mountain commitments and conditions imposed by the Board. The Board took the mitigation measures specific to Project-related vessels and regulatory requirements into account as mitigation measures in its CEAA 2012 significance evaluation and under section 79 of the SARA. The Board's evaluation of the likely significance of adverse effects takes into account the implementation of mitigation measures, and is presented in a tabular format for most key valued components (or indicators within those components). The significance tables also include a summary of cumulative effects. For these specific mitigation measures that are relied on in the significance evaluation, the Board requires that they are confirmed as being in place prior to Project operation.

The Board recognizes that some Board conditions and recommendations do not meet the criteria for a mitigation measure, but may result in future mitigation. Conditions and recommendations that do not meet the criteria for a mitigation measure were not taken into account in the Board's significance evaluation. However, they may still be relevant to the justification analysis under the CEAA 2012 and a reasonable approach to manage uncertainty in light of the dynamic nature of the assessment process.

For example, the federal government is undertaking several regional-level multi-stakeholder initiatives, and if implemented, these measures may reduce or offset the effects of Project-related marine shipping. The Board has not considered them as mitigation measures since the Board cannot be certain they will be effectively implemented as they are outside of the Board's regulatory authority. Instead, the Board has made recommendations to the GIC in relation to them. Further, since the Board is not relying on these recommendations in its significance evaluation, it is not necessary for them to be in place prior to the project's approval. However, this is not to suggest that longer term measures that cannot be confirmed as being effective, feasible, or reliable at this time should be discouraged. To the contrary, current mitigation measures combined

[117] Mitigation measures is defined by CEAA 2012 as "measures for the elimination, reduction or control of the adverse environmental effects of a designated project, and includes restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means."

with broader recommendations and adaptive management all play an important role in the protection and recovery of species under the SARA.

Precautionary principle and adaptive management

The Board recognizes the important role of the precautionary principle under the CEAA 2012. The mandate of the CEAA 2012 explicitly references the precautionary principle in subsection 4(2). The purposes of the CEAA 2012 also refer to the consideration of designated projects in a careful and precautionary manner. Section 1.5.6 contains detailed views of the Board regarding the precautionary principle and adaptive management, including how the Board applies the precautionary principle in conducting its environmental assessments and its significance determinations.

14.5.4 Summary of measures to mitigate adverse environmental effects considered in the MH-052-2018 hearing

Table 23 sets out a summary of measures (including mitigation measures specific to Project-related vessels, regulatory requirements, current initiatives, and recommended measures) considered by the Board in the MH-052-2018 hearing as part of its CEAA 2012 assessment and under section 79 of the SARA. Details on each measure and how the Board considered them are discussed under each valued component in various sections of Chapter 14.

Generally, to determine if a measure qualifies as mitigation, and to determine the extent to which to rely on it as a means to mitigate adverse environmental effects, the Board looks at whether there is sufficient confidence in each of the following:

a) *Effectiveness*: will the measure eliminate, reduce or control the adverse environmental effects?

b) *Feasibility*: is the measure technically and economically feasible?

c) *Reliability*: will the measure be effectively implemented?

In cases where there is a lack of full certainty, the Board considers the potential for enforcement, monitoring and adaptive management.

The Board took the mitigation measures specific to Project-related vessels and regulatory requirements (Table headings A and B) into account as mitigation measures in its CEAA 2012 significance evaluation and under section 79 of the SARA.

The current initiatives and additional recommended measures (Table headings C to E) were not taken into account in the Board's current significance evaluation. However, these measures could result in future mitigation and may still be relevant to the justification analysis under the CEAA 2012 and the requirements of the SARA. The Board is of the view that the recommended measures for implementation (Table heading D) are technically and economically feasible. The recommended measures for further consideration (Table heading E) require additional study and examination. Although these current initiatives and recommended measures have broader implications on marine shipping generally, they are all still relevant to avoiding or lessening the adverse effects of Project-related marine shipping. Other potential mitigation measures raised by participants in the hearing are not included in Table 23, where the Board did not find them to meet the criteria for mitigation above, or did not have enough evidence to warrant further examination.

Table 23: Summary of measures to mitigate adverse environmental effects considered in the MH-052-2018 hearing

Measures	Relevant Board condition(s) or recommendation(s) to GIC	Marine air / GHG emissions	Marine mammals[118]	Marine fish[119]	Marine birds[120]	Marine commercial, recreational, and tourism use	Traditional marine resource uses, cultural practices and activities	Human health	Accidents and malfunction (spills)[121]
A – Mitigation measures specific to Project-related vessels [122]									
Enhanced tug escort between the Westridge Marine Terminal and Buoy J (included in Trans Mountain's Vessel Acceptance Standard (VAS))	Conditions 91, 133, 134, 144, Recommendation 8					ü	ü		ü
Enhanced marine spill response regime	Conditions 91, 133, 144								ü
Age limit for tankers (included in Trans Mountain's VAS)	Condition 134	ü						ü	
Education regarding vessel effects on marine mammals (information included in Trans Mountain's VAS and Westridge Marine Terminal Regulations and Operations Guide)	Conditions 2, 134		ü				ü		
Hull and propeller not fouled excessively (included in Trans Mountain's VAS)	Conditions 2, 134		ü	ü			ü		
Participate in the initiatives to protect marine mammals	Condition 2		ü				ü		
Consider underwater noise when selecting escort tug(s)	Condition 2		ü	ü			ü		
Support and adopt TERMPOL Review Committee Findings and Recommendations	Condition 2					ü	ü		ü
Request vessel operators to reduce the amount of exterior deck lighting wherever possible.	Condition 2				ü			ü	
Minimize the use of anchorages by holding tankers at the WMT dock whenever a berth is available	Condition 2						ü	ü	

[118] Measures were considered for marine mammals including each of the following potentially affected SARA-listed marine mammal species: Humpback, Fin, Sei, Grey, Blue, and North Pacific right whales; offshore, transient, Northern resident and Southern resident killer whales; Harbour porpoise; Steller sea lion; and Sea otter.

[119] Measures were considered for marine fish including each of the following potentially affected SARA-listed marine fish species (including marine invertebrates and reptiles): Basking shark, Bluntnose sixgill, Longspine thornyhead, Northern abalone, Olympia oyster, tope, Yelloweye rockfish (outside and inside population), Rougheye rockfish type I and type II, Green sturgeon, and Leatherback sea turtle.

[120] Measures were considered for marine birds including each of the following potentially affected SARA-listed marine bird species: Marbled murrelet, Pink-footed shearwater, Red knot (*roselaari* type), Short-tailed albatross, Ancient murrelet, Black-footed albatross, Great blue heron, Long-billed curlew, Western grebe, Horned grebe.

[121] Accidents and malfunctions reflects measures related to spill prevention, emergency response and preparedness measures which will decrease the likelihood of a spill and resulting consequences on valued components.

[122] These include Trans Mountain commitments and Board conditions that apply specifically to Project-related vessels.

Measures	Relevant Board condition(s) or recommendation(s) to GIC	Marine air / GHG emissions	Marine mammals[118]	Marine fish[119]	Marine birds[120]	Marine commercial, recreational, and tourism use	Traditional marine resource uses, cultural practices and activities	Human health	Accidents and malfunction (spills)[121]
B – Regulatory Requirements[123]									
Canada Shipping Act, 2001 - vessel safety and navigation requirements						ü	ü		ü
Vessel Pollution and Dangerous Chemicals Regulations		ü						ü	
Ballast Water Control and Management Regulations			ü	ü			ü		
Sulphur in Diesel Fuel Regulations		ü						ü	
Vessel Pollution and Dangerous Chemicals Regulations - Energy Efficiency Design Index and Ship Energy Efficiency Management Plan requirements		ü						ü	
Tier III Emissions for NO_X in North American Emission Control Areas (International Convention for the Prevention of Pollution from Ships Annex VI)		ü						ü	
Amendments to the *Canada Shipping Act, 2001* and the *Marine Liability Act* – Ship-Source Oil Pollution Fund and compensation									ü
Pilotage Act									ü
Canada Marine Act - VFPA Port Information Guide (practices and procedures)						ü	ü	ü	ü
Marine Mammal Regulations			ü				ü		
C – Current Regional, Federal and International initiatives[124]									
Enhancing Cetacean Habitat and Observation (ECHO) Program (e.g., Haro Strait slowdown, Strait of Juan de Fuca lateral displacement)	Recommendation 2		ü	ü			ü		
Whale watching guidelines			ü				ü		

[123] Regulatory requirements that apply to all vessels can mitigate not only potential adverse effects from Project-related vessels, but also potential cumulative effects from all vessels.

[124] Current Regional, Federal and International initiatives have broader implications on marine shipping generally, but are still relevant to avoiding or lessening the adverse effects of Project-related marine shipping and associated cumulative effects.

Measures	Relevant Board condition(s) or recommendation(s) to GIC	Marine air / GHG emissions	Marine mammals[118]	Marine fish[119]	Marine birds[120]	Marine commercial, recreational, and tourism use	Traditional marine resource uses, cultural practices and activities	Human health	Accidents and malfunction (spills)[121]
Oceans Protection Plan, including Enhanced Maritime Situational Awareness Cumulative Effects of Marine Shipping Coastal Environmental Baseline Monitoring Program Whale Collision and Avoidance Initiative Marine communications and traffic services improvements Coastal Situational Awareness Portal	Recommendations 1, 2 & 13		ü	ü	ü	ü	ü		ü
Whales Initiative and additional October 2018 federal government commitments	Recommendation 2		ü				ü		
Coastal Restoration Fund, Pacific Salmon Treaty, 2018-2022 Implementation Plan under Canada's Wild Salmon Policy				ü			ü		
2014 IMO Guidelines for the Reduction of Underwater Noise			ü	ü			ü		
2011 IMO Guidelines for the Control and Management of Ships' Biofouling, and associated IMO review			ü	ü			ü		
Proposed amendments to *Navigation Safety Regulations* for extension of automatic identification system requirements	Recommendation 13					ü	ü		
Indigenous Advisory Monitoring Committee	Recommendation 11		ü	ü	ü	ü	ü		ü
Inclusion of Indigenous People in Oil Spill Planning and Response by Canadian Coast Guard and WCMRC									ü
WCMRC initiatives including training opportunities, geographic response strategies, capacity building and employment, and coastal response program									ü
Ongoing Research Informing Spill Response Planning	Recommendation 7								ü
Review of 1995 Response Organization Standards	Recommendation 7								ü

Measures	Relevant Board condition(s) or recommendation(s) to GIC	Marine air / GHG emissions	Marine mammals[118]	Marine fish[119]	Marine birds[120]	Marine commercial, recreational, and tourism use	Traditional marine resource uses, cultural practices and activities	Human health	Accidents and malfunction (spills)[121]
Actively support international implementation of GHG reductions for vessels, such as low carbon alternate fuels, use of energy efficient technologies (such as engine and propulsion upgrades and hull modifications) and market-based measures	Recommendation 10	ü							
D – Additional Recommended Measures for Implementation									
Cumulative effects management plan	Recommendation 1		ü	ü	ü	ü	ü	ü	
Annually report on progress on all measures, how they work together, and monitoring results	Recommendation 2	ü	ü	ü	ü	ü	ü	ü	ü
Marine bird monitoring and protection program	Recommendation 3				ü				
Expedite feasibility study of Southern Strait Georgia National Marine Conservation Area Reserve	Recommendation 4								
Offset Program to offset additional underwater noise and strike risk from Project-related vessels	Recommendation 5		ü	ü			ü		
Review of federal marine shipping oil spill response regime	Recommendation 7								ü
Inclusion of Indigenous People in Marine Safety System, Oil Spill Planning and Response	Recommendations 7 and 11								ü
Continued engagement and awareness activities targeting coastal communities and users (including information on Project-related vessel timing and scheduling)	Recommendation 12					ü	ü		
Develop a formal complaint resolution program for vessels located at VFPA managed anchorages	Recommendation 16	ü				ü	ü	ü	
E – Additional Recommended Measures for further consideration									
Slowdowns in each section of the marine shipping route	Recommendation 6	ü	ü	ü			ü		
Potential limits on the activities of whale watching boats to limit their impacts	Recommendation 6		ü				ü		
Reduce underwater noise from regularly operating ferries	Recommendation 6		ü	ü			ü		
Identification of specific	Recommendation 6		ü	ü			ü		

Measures	Relevant Board condition(s) or recommendation(s) to GIC	Marine air / GHG emissions	Marine mammals[118]	Marine fish[119]	Marine birds[120]	Marine commercial, recreational, and tourism use	Traditional marine resource uses, cultural practices and activities	Human health	Accidents and malfunction (spills)[121]
foraging, congregation and migration areas of the SARA-listed species and consideration of mitigations in those areas									
Further incentives and requirements for quiet vessel design and refits to address underwater noise	Recommendation 6	ü	ü	ü			ü		
Canada/United States Transboundary Vessel Traffic Risk Assessment	Recommendation 9								ü

14.6 Purpose of the Project and alternative means

14.6.1 Purpose of the Project

In accordance with paragraph 19(1)(f), the Board took into account the purpose of the designated project. Trans Mountain said that the primary purpose of the Project is to provide additional transportation capacity for crude oil from Alberta to markets in the Pacific Rim including B.C., Washington State, California, and Asia. Trans Mountain also said the provision of enhanced access to growing Pacific Rim markets will provide a critical alternative market to Canadian crude oil producers. Trans Mountain said the additional capacity is required to meet both the needs of Trans Mountain's long-term contractual shippers and the general growth in demand for transportation service by all shippers.

14.6.2 Alternative means

As required under the CEAA 2012, paragraph 19(1)(g), the Board considered alternative means of carrying out the designated project, including Project-related marine shipping. Chapter 11 discusses the alternative means of carrying out the Project, including alternative pipeline corridor locations, and alternative marine terminal locations based on the evidence the Board heard in the OH-001-2014 hearing. During the MH-052-2018 hearing, the Board considered alternative means of carrying out Project-related marine shipping, and the environmental effects of such alternative means under Issue # 3 in the List of Issues (Appendix 1). The Board considered options such as alternate marine shipping routes, marine terminal locations, and alternate mitigation options to reduce the effects. A discussion of alternate shipping routes and mitigation options are discussed throughout this chapter.

Tsleil-Waututh Nation raised the concern that significant adverse effects cannot be justified if the project could be built using a different marine terminal location and / or different marine shipping routes that are economically viable. Tsleil-Waututh Nation did not provide any new evidence about specific alternative marine terminal locations. Commenter Mr. Priaro suggested an alternative route for the expansion, namely to twin the existing Trans Mountain Pipeline only to the Sumas, B.C. pump station and then twin the existing Puget Sound Pipeline from there to cross the border to the refineries and the Cherry Point Marine Terminal on Washington State's Puget Sound.

BC Nature and Nature Canada (BC Nature) submitted a report by EnSys Energy & Systems Inc. that analyzed different scenarios in which the additional crude oil would be diverted to refineries and export terminals in Puget Sound, rather than exported from the WMT as proposed. Squamish Nation said that neither Trans Mountain nor Canada have put forward alternative locations or routes for carrying out the Project-related marine shipping, despite the significant risk to Squamish Nation of the location and route proposed.

Trans Mountain said that during the initial Project scoping process, it considered six alternative marine terminal locations, including two locations in Washington State. Trans Mountain said that it assessed information about these locations in the OH-001-2014 hearing, and explained that the Washington locations were eliminated from future consideration early in the planning process because they would require a longer pipeline and would pose complex regulatory issues including additional permits required by Washington State and the United States federal government.

Views of the Reconsideration Panel

With respect to the CEAA 2012, paragraph 19(1)(g) requires the Board to consider "alternative means" of carrying out the designated project[125].The Board's Filing Manual describes the Board's guidance which is reflective of the Board's view of the appropriate considerations that ought to be taken into account in considering alternative means.

For the reasons below, the Board is of the view that Trans Mountain has provided an adequate assessment, of technically and economically feasible alternative means of carrying out Project-related marine shipping.

In the OH-001-2014 hearing, the City of Burnaby raised the concern that Trans Mountain did not provide an assessment of the risks, impacts and effects of the alternate marine terminal locations at Kitimat, B.C., or Roberts Bank in Delta, B.C.

The Board required Trans Mountain to elaborate on each of the criteria listed above for considering the various marine terminal locations. The Board also required Trans Mountain to provide a rationale for choosing Westridge Marine Terminal as the preferred alternative. Trans Mountain said that it considered both northern and southern route alternative, but favoured expansion of the existing system south over northern lateral and terminal due to greater technical challenges, increased footprint and potential impact, and greater costs and uncertainty. Trans Mountain also provided reasoning for eliminating alternative southern locations.

For the MH-052-2018 hearing, the Board considered the additional evidence submitted by intervenors and commenters related to technical and economic feasibility of alternative marine terminal locations. In its reasons for scoping the MH-052-2018 hearing, the Board stated that:

> The Board is of the view that the technical and economic feasibility of alternative terminal locations was extensively considered in the OH-001-2014 hearing. That evidence will be used by the Board in its consideration of the issues relevant to the Reconsideration. As noted at the bottom of the List of Issues, Parties are expected to restrict their submissions to new and updated evidence only."

Accordingly, the Board focused on whether there was sufficient new or updated evidence that would change the Board's original conclusion about alternative marine terminal locations.

The Board, in its Information Request, asked Trans Mountain to discuss the comparative environmental effects of using the Cherry Point Marine Terminal on Washington State's Puget Sound, as proposed by Mr. Priaro. Trans Mountain, in its response, relied on the evidence from OH-001-2014 hearing.

The Board finds that the selection of general areas considered by Trans Mountain as alternatives in each of the northern-leg and southern-leg options for the Project was reasonable. The Board accepts Trans Mountain's reasons for eliminating alternative northern locations (e.g., pipeline length, capital costs, technical challenges, greater environment footprint and potential impact, and opportunities to benefit from existing operations and infrastructure). The Board is of the view that Trans Mountain's reasons for eliminating alternative southern locations from further assessment were also satisfactory (e.g., feasibility of pipeline access, location of storage facilities, pipeline length, water depth for tanker access, footprint, and environmental effects). The Board considers that some of the detail about alternative means that intervenors were expecting is unreasonable and not supported by the Board's filing requirements. The Board considers that some of the detail about alternative means that intervenors were expecting is unreasonable and the Board does not expect that alternative means need to be supported by the same level of detailed filings as would be prepared for the Project application itself.

The Board notes that EnSys examined scenarios for alternative locations of the marine shipping terminal. Evidence on alternative marine terminal locations was filed as part of OH-001-2014 and reviewed by the Board as part of that hearing.

The Board reviewed the EnSys Report, as well as argument by intervenors, like the City of Burnaby, who argued that Trans Mountain did not discuss the "complex regulatory issues" or explain why an expansion to Washington State was not technically or economically feasible. The Board accepts that concerns about the complexity of regulatory issues and a considerably longer pipeline are valid reasons for eliminating the two locations in Washington State's Puget Sound from consideration. In fact, EnSys identified a number of complex regulatory issues associated with diverting 590,000 bpd of Project-related crude to Puget Sound, including the cross-border permits for an expansion of the Puget Sound pipeline, as well as potential modifications to marine terminals or existing refineries. As it stands, the

[125] Alternative means considered in an environmental assessment for carrying out a designated project must be technically and economically feasible. Alternatives means should be considered by the proponent as early as possible in the planning process, see CEAA Guidance updated March 2015 https://www.canada.ca/en/environmental-assessment-agency/news/media-room/media-room-2015/addressing-purpose-alternative-means-under-canadian-environmental-assessment-act-2012.html

Project would be largely contiguous to existing disturbances including the existing pipeline and a longer pipeline that is less contiguous would be expected to raise many additional issues. As stated above, the Board has sufficient detail in its consideration of alternative means and requiring detailed studies on these points is not considered worthwhile.

The Board is of the view that Trans Mountain has provided an adequate assessment, including consideration of technical, socio-economic and environmental effects, of technically and economically feasible alternative marine terminal locations. The Board finds that Trans Mountain's assessment is consistent with the Board's Filing Manual and Canadian Environmental Assessment Agency guidance relating to alternatives means.

14.7 Environmental effects of increased marine shipping (routine operations of the tankers)

This section focuses on the changes to the environmental and socio-economic setting caused by the routine operation of the Project-related marine vessels. The environmental effects of the spills from marine shipping are discussed in Section 14.9 of this chapter.

14.7.1 Operational air and greenhouse gas emissions from tankers

This section focuses on operational air and greenhouse gas emissions from tankers in transit, at anchor and underway. Air and GHG emissions from tankers at berth are discussed in Chapter 10.

Several participants raised concerns about the impacts of Project-related marine shipping on air quality. Participants, such as BC Métis Federation and Living Oceans Society, said that tankers are a primary source of greenhouse gas emissions and contribute substantially to both the local, and the global burden of greenhouse gas emissions.

Island Trust Council said that any displacement of other vessels to anchorages due to delays in transiting the Second Narrows Traffic Control Zone will also contribute to increased air pollution.

The Barkley Sound Stewardship Alliance said that it does not support the project because it will be detrimental to the climate and it will prevent Canada from meeting its GHG reduction commitments.

Trans Mountain's air quality assessment

As set out in the Board's OH-001-2014 Report, Trans Mountain conducted an air quality assessment to predict operational air and greenhouse gas emissions from Project-related marine shipping. It estimated air emissions (criteria air contaminants, volatile organic compounds, secondary particulate matter, ozone and visibility) and greenhouse gas emissions for the:

- existing conditions reflecting all projects and activities in the area, including current marine vessels associated with Trans Mountain's current operations;
- Project-related shipping effects, including the proposed increase in vessel traffic associated with the Project; and
- cumulative effects, including existing conditions, the Project-related shipping, and all reasonably foreseeable projects and activities in the area.

Trans Mountain said that combustion emissions are generated by operating tankers, barges and associated tug escorts. Combustion emissions include emissions from tankers' main and auxiliary engines and boilers. Trans Mountain said that combustion emissions are not associated with the barge itself but with the engine aboard the tugboat. Trans Mountain used the methodology adopted in Environment and Climate Change Canada's (ECCC) 2010 National Marine inventory to estimate the combustion and fugitive emissions that will be generated from Project-related marine vessels. Trans Mountain said that fugitive emissions from vessels at berth are associated with product loading activities at the WMT. Fugitive emissions could also potentially escape through tanker vents during transit.

Trans Mountain compared the total predicted annual combustion emissions from Project-related marine shipping to the existing totals in the RSA (defined in Appendix 11). It estimated an increase of 0.6 to 7.0 per cent in annual marine combustion emissions in the RSA as a result of Project-related marine shipping. Trans Mountain predicted that all modelled contaminant concentrations for the Application Case would be below applicable objectives, with the exception of the daily 1-hour 99th percentile for sulphur dioxide.

Trans Mountain said that marine transportation associated with existing operations at the WMT is estimated to represent 0.98 per cent of marine greenhouse gas emissions in the RSA, 0.30 per cent of marine greenhouse gas emissions in B.C., and 0.17 per cent of marine greenhouse gas emissions in Canada. As a result of Project-related marine shipping, Trans Mountain estimates increases of approximately 6.9 per cent in marine greenhouse gas emissions in the RSA, 2.1 per cent in marine greenhouse gas emissions in B.C., and 1.2 per cent in marine greenhouse gas emissions in Canada. Trans Mountain

estimated a total of 68,100 carbon dioxide equivalent annual marine greenhouse gas emissions from vessels in transit and at berth associated with Project expansion.

Trans Mountain said that the contribution of greenhouse gas emissions from Project-related marine vessels to B.C. and Canadian total emissions would be small, about 0.11 per cent and 0.01 percent, respectively.

MH-052-2018 hearing

In the MH-052-2018 hearing, ECCC estimated a total of 76,200 tonnes of CO_2 emissions per year of combustion greenhouse gas emissions from Project-related tankers. The Board questioned Trans Mountain to explain the differences between Trans Mountain's and ECCC's estimate of total annual greenhouse gas emissions from the Project-related marine shipping, and the rationale for the differences. Trans Mountain, in its response, said that ECCC emissions were based on CO_2 only, and were derived from the Marine Emission Inventory Tool (MEIT) 2015 version whereas Trans Mountain's emissions were estimated based on carbon dioxide equivalent tonnes (i.e., include CO_2, CH_4, and N_2O). Trans Mountain said that ECCC's estimate accounts for an additional 11,200 tonnes CO_2 for current tanker traffic to and from WMT whereas Trans Mountain's said that its estimate only includes Project-related tanker traffic. Trans Mountain also provided other reasons and assumptions for the difference in the estimate for total annual greenhouse gas emissions.

Trans Mountain submitted that, regardless of the difference in Trans Mountain's and ECCC's estimates in total annual greenhouse gas emissions from the Project-related marine shipping, the percentage increases from Project-related marine greenhouse gas emissions are very small, ranging from 5.9 per cent to 6.9 per cent relative to B.C. marine greenhouse gas emissions, and 1.2 per cent to 1.5 per cent when compared to Canada-wide marine greenhouse gas emissions.

Boiler emissions

In the OH-001-2014 hearing, ECCC said that Trans Mountain's exclusion of tankers' boiler emissions in its estimation of Project-related marine air emissions leads to multiple uncertainties regarding pollutants, such as nitrogen oxides and particulate matter 2.5 microns or less in diameter ($PM_{2.5}$). ECCC said that the boiler emissions were not included in the calculation of marine emissions on the assumption that boilers are used for preheating the heavy fuel oil, and that only distillate would be used after 2015 and the implication of the North American Emission Control Area. ECCC said that the Trans Mountain's decision to exclude boiler emissions is expected to result in a 20 per cent underestimation of Project marine-source $PM_{2.5}$ emissions.

ECCC said that main and auxiliary boilers are used for other reasons than pre-heating heavy fuel oil (e.g., ships' machinery and various services). Trans Mountain disagreed with ECCC's statement and said that neither main nor auxiliary boilers are required to operate when a tanker is at anchor or at berth. Port Metro Vancouver said that although it is unable to confirm whether both main and auxiliary boilers operate when a tanker is at anchor or at berth, it is of the view that boiler emissions should not be excluded from the assessment.

Transport Canada said that beyond setting limits on overall air emissions from vessels, it does not have a regulatory interest in whether boilers operate when a tanker is at berth and at anchor. It noted that the North American Emission Control Area (under MARPOL) puts in place the most stringent air emissions requirements for tankers. Under these standards, all tankers must either burn fuel with 0.10 per cent sulphur content or use alternative technology that results in equivalent emissions. Transport Canada said that engines fitted onto tankers after 1 January 2016 will need to meet Tier III nitrogen oxide standards for a reduction of nitrogen oxide emissions of up to 80 per cent.

MH-052-2018 hearing

In the MH-052-2018 hearing, Trans Mountain said that, since the issuance of the Board's OH-001-2014 Report in May 2016, it prepared an updated air quality assessment for the Project which conservatively assumed the inclusion of boiler emissions from Project-related marine shipping. The updated air quality assessment report notes that the assumptions include tanker boiler emissions from three berth locations, three anchorage locations, and underway vessels. Trans Mountain also filed an air quality assessment report that was prepared for Vancouver Fraser Port Authority (VFPA) that is consistent with VFPA's permit application process.

Trans Mountain said that the contribution of these boiler emissions was found to be very small. It will be further reduced starting from 1 January 2020 when the new global sulfur cap of 0.5 per cent on marine fuels will, in many cases, require that these vessels use distillate fuels instead of heavy fuel oil.

Anchorage and berth times and locations

In the OH-001-2014 hearing, ECCC said that tankers at berth and at anchorage are a source of emissions within the Westridge Local Study Area (LSA). It expressed concerns regarding Trans Mountain's assumptions on anchorage times and locations, and their impact on the air quality assessment. ECCC said that Trans Mountain's estimates indicate that the total time a tanker spends in port, including the inbound trip, the outbound trip, and the time at anchorage and berth, is about 80 hours. It said that only one anchorage location, Indian Arm, was included in Trans Mountain's assessment. ECCC said that it expects that, with the Project, the incidence of tankers using anchorages other than at Indian Arm will increase, as will the frequency at which the English Bay anchorages will be fully used.

Trans Mountain said that it will maintain high level of berth use in order to best manage its future operations. It noted that in most cases, arriving vessels will proceed directly to their assigned terminal berth. If the assigned berth is not available, vessels may anchor at one of the four designated anchorages near the mouth of Indian Arm. Port Metro Vancouver said that when a vessel requires an anchorage, the local shipping agent would request Port Metro Vancouver operations to assign an anchorage. Port Metro Vancouver said that while its role is to direct tankers to an anchorage when one is required or requested, it is not involved in scheduling berths for tankers. It said that this activity is managed by individual operators of each marine terminal.

Port Metro Vancouver said that it is satisfied with Trans Mountain's estimate for the amount of time Project-related tankers may spend at anchor east of Second Narrows and its rationale that anchorage demand will be minimized by increasing berth use. Port Metro Vancouver added that, for the purpose of calculating air emissions from Project-related tankers, the anchorage use assessment is incomplete. It raised concerns that the assessment does not include the amount of time Project-related tankers may spend at locations west of Second Narrows.

Cumulative effects

Trans Mountain assessed the potential and likely environmental residual effects associated with the increase in Project-related marine vessel traffic on marine air quality (air and greenhouse gas emissions) along with the identification of existing activities and reasonably foreseeable marine traffic that could act in combination with the increase in Project-related marine vessel traffic.

Trans Mountain said that the modelled particulate matter and sulphur dioxide concentrations for the Cumulative Case (including non-Project-related vessels) in the RSA decreased substantially relative to the Base and Application Cases. It associated this decrease with more stringent fuel sulphur regulations.

Trans Mountain predicted that nitrogen dioxide concentrations for the Cumulative Case would decrease relative to the Base and Application Cases due to the more rigorous Tier II and Tier III standards for marine vessels built on 2 January 2011 or later, and 1 January 2016 or later, respectively.

Trans Mountain said that by year 2030, more stringent marine vessel emissions requirements would be in place. As a result, sulphur dioxide and particulate matter emissions for tankers underway and at anchor are projected to decrease substantially.

Trans Mountain said that it expects carbon monoxide and volatile organic compounds concentrations to increase by almost 40 per cent and 20 per cent respectively, from the Base and Application Cases due to the growth in marine traffic.

In regard to the cumulative effect assessment of greenhouse gas emissions, Trans Mountain said that the spatial boundary of greenhouse gas emissions is international, and therefore, no cumulative effects assessments for greenhouse gas emissions is provided as it would need to include all international foreseeable future development. Trans Mountain provided per cent increases due to Project-related tanker traffic to marine greenhouse gas emissions in Marine RSA for air quality, in B.C., and in Canada.

Air and GHG emissions Regulatory framework

In the OH-001-2014 hearing, Trans Mountain said all marine vessels are required to adhere to the federal requirements including:

- Canada's *Vessel Pollution and Dangerous Chemicals Regulations* under the *Canada Shipping Act, 2001*; and
- ECCC's *Sulphur in Diesel Fuel Regulations*.

Transport Canada said that the *Vessel Pollution and Dangerous Chemicals Regulations* under the *Canada Shipping Act, 2001* requires a crude oil tanker's master or owner to ensure the implementation of a volatile organic compounds management plan that meets the requirements of the International Convention for the Prevention of Pollution from Ships.

Trans Mountain said that tugboats classified as large marine vessels will adhere to ECCC's *Sulphur in Diesel Fuel Regulations.*

In the MH-052-2018 hearing, Trans Mountain and Transport Canada said that in 2017, the IMO Member States agreed on an initial strategy for reducing greenhouse gas emissions from ships, which targets at least a 50 per cent reduction from 2008 levels by year 2050. Trans Mountain said that an internationally registered oil tanker that would call at the WMT would be subject to this IMO reduction target. Trans Mountain said that the IMO regime includes two primary measures for improving energy efficiency:

- Energy Efficiency Design Index (EEDI): Transport Canada said that in 2013, the Government of Canada implemented energy efficiency standards through the *Regulations Amending the Vessel Pollution and Dangerous Chemicals Regulations*. Transport Canada said that the EEDI requires new vessels to be 10 per cent more efficient in 2015 (Phase 1), 20 per cent in 2020 (Phase 2), and 30 per cent in 2025 (Phase 3) compared to a baseline established for new vessels constructed from 1999-2009. It said that as new more efficient vessels account for a greater share of the fleet over time, these standards help contribute to lowering greenhouse gas emissions from marine shipping.

  Transport Canada said that the Proponent could consider investigating the availability of Phase 2 and 3 EEDI compliant Aframax tankers in order to assess the feasibility of the mitigation measure. Trans Mountain said it is not responsible for sourcing or operating tankers, however it will discuss the EEDI as part of Trans Mountain's future discussions with shippers on marine issues.

- Ship Energy Efficiency Management Plan (SEEMP) – Trans Mountain said that the Energy Efficiency Operational Indicator is an example of a monitoring tool that provides owners and operators with a method of measuring the fuel efficiency of a ship in operation and to estimate the result of any changes, such as improved voyage planning or more frequent propeller cleaning.

ECCC noted that a federal Clean Fuel standard is under development and will require producers and importers of fossil fuels to reduce the carbon intensity of the fuels they produce and import. ECCC said that pending the ultimate design of these regulations, the carbon intensity of marine fuels sold in Canada could be required to be lower, resulting in greenhouse gas emissions reductions. ECCC said that proposed regulations are planned for spring/summer 2019, to be published in the Canada Gazette, Part I.

Trans Mountain said that it has set the age limits for tankers that would be acceptable to call at the WMT, and this requirement related to vessel age limits are stated in Trans Mountain's Vessel Acceptance Standards. Trans Mountain anticipates that the ongoing improvements to the global fleet with respect to emissions reduction requirements will apply to tankers that transit to and from the WMT.

Trans Mountain said that it believes the authorities that regulate marine transportation (i.e., one or more of Transport Canada, Environment and Climate Change Canada, and the Canadian Coast Guard), would be better placed to establish any requirements for greenhouse gas emissions, and to monitor and enforce such programs, for all vessels. It said that as new more efficient vessels account for a greater share of the fleet over time, these standards help contribute to lowering greenhouse gas emissions from marine shipping.

Trans Mountain said that the IMO (under MARPOL Annex VI) has established emission control areas (ECAs) to reduce emissions of SO_x, NO_x and particulate matter in designated sea areas. Trans Mountain said that for large ships like oil tankers constructed after 1 January 2016, Tier III emission standards for NO_x must be met for a vessel to operate in an Emission Control Areas such as in the Port of Vancouver. It said that relative to Tier I emission standards from year 2000, the Tier III standards are expected to provide a significant reduction in NO_x emissions by 80 per cent or a factor of five.

Measures

In the MH-052-2018 hearing, the Board received submissions on the following measures that may reduce air and greenhouse gas emissions, and are discussed below.

- Speed reduction
- Vessel design, retrofit, operational, and maintenance measures
- Alternate fuels, including LNG
- Greenhouse gas emissions carbon taxation, carbon pricing / fiscal incentives
- Data collection on fuel oil consumption

Speed reduction

ECCC said that it estimated the reduction in greenhouse gas emissions based upon speed reduction ranging from 10 per cent to 30 per cent for the entire route (except within the Burrard Inlet) as well as the effect of limiting the vessels' speeds to 10 knots for the entire route between WMT and the 12-nautical-mile limit. ECCC estimated that this could lead to between eight (8) per cent and 20 per cent reduction in greenhouse gas emissions, depending on the percentage of speed reduction achieved. Trans Mountain said that while it is supportive of greenhouse gas emissions reduction initiatives that are efficient and equitably applied, further reducing the speed of Project vessels would have limited environmental benefits, create safety concerns, and reduce the economic viability of Canadian-sourced petroleum products transported on the Trans Mountain system to compete in foreign markets.

Vessel design, retrofit, operational, and maintenance measures

Trans Mountain said that vessels are increasingly using technologies and operations strategies to reduce greenhouse gas emissions from ships, such as by undertaking propeller polishing, hull cleaning, speed reduction, and weather routing on a regular basis. It said that retrofits and upgrades to achieve waste heat reduction/recovery, higher main engine performance, and improved propeller efficiency are also likely tools in the ship owner's toolbox of available mechanisms.

Department of Justice on behalf of federal authorities said that Canada has submitted a paper to the Marine Environment Protection Committee of the IMO noting that Maersk (container shipping company) has invested in ship design retrofits for 11 of its Panamax-size container ships for the purpose of improving fuel economy, as well as a 10 per cent improvement in fuel efficiency and associated air and GHG emission reductions.

Transport Canada provided a list of currently available measures that are related to ship design, retrofits, operations, and maintenance, and that may lead to further reducing air and greenhouse gas emissions from Project- related marine shipping. Table 24 discusses the measures that are technically and economically feasible.

Table 24: List of technically and economically feasible measures to reduce air and greenhouse gas emissions

Category	Description	Application	Measures	Feasibility
Engine upgrades	Engine upgrades focus on improving the main and auxiliary engines of the ship. They improve fuel efficiency by optimizing fuel burn or by improving thermal efficiency	Ship design and retrofits	· Propulsion engine de-rating · Common rail fuel injection	· Engine upgrades that are currently available are technically feasible to be installed in newly built tankers.
Propulsion upgrades	Propulsion upgrades optimize the thrust provided by the propeller. They minimize the amount of energy that is lost to turbulence and the wake of the ship.	Ship design and retrofits	· High efficiency propellers · Contra-rotating propellers · Pre-swirl devices · Wake equalizing duct · Propeller boss cap fins · Rudder bulb · Vane vessels · Twisted rudder	· The propulsion upgrades listed are generally proven technologies. While all of these measures can contribute to improved fuel efficiency, they are best considered through the perspective of optimizing the overall hydrodynamic profile of the ship. · The payback time for many of these measures can be within a few years, particularly on newly built vessels that have considered them from conception.
Hull modification and maintenance	Hull modifications improve the flow of water across the hull and reduce waves and wake produced by the ship. Energy dissipated away from the ship in the forms of wave and wake increase exponentially with speed. Hull cleaning and coatings reduce the friction of water along the hull.	Ship design, retrofits, and maintenance	· Optimization of hull openings (e.g., for bow thrusters, side thrusters) · Optimized bilge keel · Optimized bulbous bow · Hull cleaning and coatings · Propeller polishing	· Similar to propulsion upgrades, the hull upgrades listed are proven technologies but they should be considered through the overall hydrodynamic and engine design of the ship. Also, different hull modifications are best suited for different sizes of tanker ship. · Bilge keels are best on ships under 50,000 DWT. The bulbous bow of a ship should be matched to the intended cruising speed of the ship. The payback time for these upgrades can be within a few years, however the upfront costs depends on how much of the rest of the ship requires upgrades to arrive at a holistically optimized design.

Alternate fuels, including liquefied natural gas (LNG)

Trans Mountain discussed alternative fuels to power the ships as a plausible mitigation measure to avoid or reduce the greenhouse gas emissions of Project-related marine shipping. It provided a comparison of greenhouse gas emissions for alternative fuels, including LNG, liquefied petroleum gas, methanol, biofuel and hydrogen. Trans Mountain said that there will be no sulphur oxide emissions related to it, particulate emissions will be very low, the oxides of nitrogen emissions will be lower than those of other fuel oils, and other emissions such as hydrocarbons, carbon monoxide, or formaldehyde from gas engines are low and can be mitigated by exhaust gas after treatment, if necessary. Trans Mountain said although the use of LNG as fuel for ocean going vessels, including Aframax tankers, is technically feasible, their viability for use for the Project is very limited at this time due to the present scarcity of such vessels in the international tanker fleet and the lack of globally available bunkering infrastructure necessary to support this type of vessel. It said that LNG is the most economical alternative fuel compared to other alternative fuels, but requires investments for infrastructure and storage, so the price fluctuations are different than with conventional fuel. It said that according to the Canadian Natural Gas Vehicle Alliance's feasibility study for Canada's west coast (2014), the two major barriers to widespread use of LNG as a marine fuel are a lack of familiarity with LNG in this role and the need to expand the supply chain to bring LNG to the marine market.

Vancouver Fraser Port Authority said that it is working with industry and government to facilitate the use of LNG as a marine fuel in the Port of Vancouver. In 2016, a study was conducted that suggested the port would start seeing demand for LNG as a marine fuel as early as 2020, which would increase steadily toward 2030.

Transport Canada said vessels complying with the IMO International Code of Safety for Ships Using Gases or other Low-Flashpoint Fuels may use LNG as a fuel. MARPOL Annex VI Regulation 4, also allows the use of LNG as an alternative to low-sulphur fuel.

Trans Mountain referred to Chapter 6 of the Studies on the feasibility and use of LNG as a fuel for shipping (2016), published by the IMO, where it noted that the Canadian regulations currently do not permit the use of LNG as fuel for ships and the IMO Interim Guidelines are not incorporated by reference in any Canadian regulation. Trans Mountain stated that there is work in progress in order to develop a regulatory framework to accepting the use of LNG as fuel for Canadian vessels.

Carbon taxation, carbon pricing / fiscal incentives and offsetting

Trans Mountain said based on B.C. tax guidance, the fuel that is used to power the tankers that visit the Westridge Marine Terminal may, upon registration of the owner or operator as a registered marine service, be exempted from the B.C. carbon tax as the fuel is used in a voyage between a location in B.C. and a location in another jurisdiction.

ECCC and Transport Canada said that there are no international, federal or provincial carbon pricing policies that would apply to Project-related marine shipping at this time, with the exception of the EEDI and the SEEMP, both of which are IMO requirements that have been implemented in Canada. ECCC and Transport Canada said that market-based measures are identified under the initial IMO strategy as potential measures to reduce emissions from international marine shipping. Trans Mountain said that market-based mechanisms are also being investigated by the IMO, and that the International Monetary Fund serves to provide a fiscal incentive for the maritime industry to invest in more energy efficient manner and for offsetting growing ship emissions.

ECCC said that there are no known fiscal incentives available at the international or state level for the maritime industry to invest in more energy efficient vessels or offset ship emissions. It said that ports operating such incentive programs have typically leveraged industry developed environmental rating programs, such as the Environmental Ship Index, the Clean Shipping Index, the GHG Emission Rating program or the Green Award program, in order to determine qualifying ships that may be eligible for port incentives. These environmental rating programs are voluntary for ship owners or operators, and have different requirements. The port incentive programs offer a monetary driver for ship owners or operators to participate in the environmental rating program(s) and reduce their environmental footprint (which may include improving vessel energy efficiency).

In regard to offsetting greenhouse gas emissions, ECCC said Canada continues to work with the IMO on the next steps outlined in the Initial Greenhouse Gas Emissions Strategy and if a relevant measure such as an offset system for the sector was agreed to, Canada would need to develop and introduce regulations under an appropriate domestic legislation in line with the IMO regulation.

Data collection on fuel oil consumption

Trans Mountain said that data collection system on fuel oil consumption of ships over 5,000 gross tons, which begins on 1 January 2019, will feed into a process towards adoption of a revised IMO strategy in 2023. This monitoring will provide a better understanding of actual greenhouse gas emissions for large maritime vessels to better track the intended reduction of GHG emissions via direct measurement.

Transport Canada said that it will delegate to Classification Societies the collection of fuel oil consumption data for Canadian vessels that operate internationally and are over 5000 GT, to collect the fuel oil consumption data required for the IMO data collection system. This data will then be submitted to the IMO Ship Fuel Oil Consumption Database through the IMO reporting system. The collection and reporting of the fuel oil consumption data will be done once a year as per the requirements of Regulation 22A, Annex VI MARPOL.

Transport Canada said that Project-related vessels will report to the responsible Flag State (country of vessel registration), which will then report to IMO as per the requirements of Regulation 22A, Annex VI MARPOL.

Air quality monitoring

In the OH-001-2014 hearing, ECCC said that it found several uncertainties in Trans Mountain's photochemical modelling of the formation of secondary particulate matter and ozone. It conducted a scoping analysis and provided specific recommendations in this regard. Chapter 10 provides a discussion on this issue. In light of the uncertainties related to predicting marine source combustion emissions, ECCC recommended that Trans Mountain develop an air quality monitoring, reporting, and mitigation plan in conjunction with the Lower Fraser Valley Air Quality Coordinating Committee.

ECCC said that it expects emissions from Project-related tankers to increase concentrations of nitrogen dioxide and $PM_{2.5}$ (with their associated health impacts) in the vicinity of the Tsleil-Waututh Nation reserve. It said that although Trans Mountain predicted that pollutant concentrations will remain well within ambient air quality standards, the multiple uncertainties regarding those emissions reduce confidence in that conclusion. Therefore, ECCC recommended that Trans Mountain establish a program to monitor air contaminants, including nitrogen dioxide and $PM_{2.5}$, at or adjacent to Tsleil-Waututh Nation's Burrard Inlet No. 3 reserve. ECCC said that the monitoring program should verify predicted impacts under the full range of expected meteorological conditions.

In response to ECCC's comment on Board's draft conditions, Trans Mountain said that it will consult with Indigenous groups about the possibility of undertaking an ambient survey on the Tsleil-Waututh Nation's reserve lands. Trans Mountain said that it is willing to consider and discuss the request with the interested parties, such as Tsleil-Waututh Nation and other groups, such as North Shore No Pipeline Expansion (NS NOPE), who also reside on the North Shore and expressed interest in ambient air quality measurements.

Port Metro Vancouver said that in conducting its review, it would rely on the results of the environmental assessment carried out by the Board to the extent the results satisfy its standards and requirements. Port Metro Vancouver said that its air emissions management plans do not typically address emissions from tankers at anchor. Rather, these plans focus on measures the terminal can control and influence. It added that all tankers operating at the port are expected to comply with the relevant regulations in its Port Information Guide.

MH-052-2018 hearing

In the MH-052-2018 hearing, Trans Mountain said that since the report was prepared for VFPA, the Canadian Ambient Air Quality Standards ("CAAQS") for NO_2 were announced by the Canadian Council of Ministers of the Environment (2018). Trans Mountain said that these CAAQS are intended to be objectives for ambient air quality measurements recorded at air quality monitoring stations in large urban areas or municipalities, as opposed to assessing dispersion modelling results (which are inherently conservative) at points close to the emission sources. Trans Mountain said that it has committed to monitor the ambient air quality at a new monitoring station within the fence-line of the WMT (as well as the three other Project storage terminals in B.C. and Alberta), and to comply with applicable ambient air quality objectives as noted in the Air Emissions Management Plan, in accordance with the requirements of NEB Condition 52.

Views of the Reconsideration Panel

Air emissions

The Board finds that although Project-related increase in marine shipping is expected to increase emissions in the Regional Study Area (RSA), these emissions are expected to remain below applicable objectives. The Board recognizes that volatile organic compounds and carbon monoxide in the study area are expected to increase over time as a result of the growth in marine shipping, whereas other contaminants (e.g., nitrogen dioxide, sulphur dioxide, particulate matter) are expected to decrease due to more stringent regulations.

The Board finds that Trans Mountain's predicted concentrations for both $PM_{2.5}$ and nitrogen dioxide emissions at the Tsleil-Waututh Nation's Burrard Inlet No. 3 reserve, as a result of Project-related marine shipping, are well below the applicable objectives. The Board acknowledges ECCC's concern that nitrogen dioxide concentrations are generally high in the area due to other non-Project sources and that there are uncertainties with Trans Mountain's prediction of marine-source combustion emissions. As mentioned in Chapter 10, Section 10.2.1, the Board would impose Condition 52 requiring Trans Mountain to develop an air emissions management plan at the Westridge Marine Terminal for approval by the Board. Air monitoring conducted pursuant to this plan would verify predicted emissions levels, and exceedances of criteria established within the approved plan would require Trans Mountain to implement appropriate mitigation. Trans Mountain has committed to consult with the relevant Indigenous groups about the possibility of undertaking an ambient survey on Tsleil-Waututh Nation's reserve lands. Consequently, the Board is not persuaded that a program to monitor air contaminants at or adjacent to Tsleil-Waututh Nation's reserve is warranted at this time. The Board's views around photochemical modelling are discussed in Chapter 10.

With respect to tanker boiler emissions, the Board notes that since the issuance of Board's OH-001-2014 Report in 2016, Trans Mountain has prepared an updated air quality assessment for the Project which conservatively assumed the inclusion of boiler emissions from Project-related marine shipping. The Board finds that the contribution of these boiler emissions is very small, and will be further reduced starting in 2020 when the new global sulfur cap of 0.5 per cent on marine fuels will require these vessels use distillate fuels instead of heavy fuel oil.

Trans Mountain has committed to maintain a high level of berth utilization. In the Board's view, it is difficult to estimate the amount of time spent at the anchorage locations and at berth, which, in turn, could affect any air quality assessment, as it depends on a number of factors. The Board notes that Port Metro Vancouver's role is to direct vessels to an anchorage when one is required or requested, but is not involved in scheduling berths.

In regard to the issues raised by Metro Vancouver in the MH-052-2018 hearing, the Board accepts Trans Mountain's reasoning that CAAQS are intended to be objectives for ambient air quality measurements recorded at air quality monitoring stations in large urban areas or municipalities, as opposed to assessing dispersion modelling results (which are inherently conservative) at points close to the emission sources. In the Board's view, the air quality objectives are designed to facilitate air quality management on regional scales.

The Board acknowledges that there is an existing regulatory regime governing air emissions from tankers underway or in transit. All Project-related tankers and barges are required to follow international and federal regulations, and apply best practices during operations. These tankers would carry an International Air Pollution Prevention Certificate and be required to have onboard a volatile organic compound management plan.

In the MH-052-2018 hearing, the Board received evidence from Transport Canada that suggests a number of technically and economically feasible measures available to reduce air emissions from Project-related marine shipping, as outlined in Table 23.

The Board realizes that since the issuance of the OH-001-2014 Report, more stringent emission requirements are in place for marine vessels, such as Tier III emission standards for NO_x in the Emission Control Areas for oil tankers constructed after 1 January 2016. The Board notes that Trans Mountain's implementation of programs and initiatives, such as the Energy Efficiency Design Index and Ship Energy Efficiency Management Plan, would help further reduce certain emissions. The Board notes that although Trans Mountain said it is not responsible for sourcing or operating tankers, it committed to discuss the EEDI as part of Trans Mountain's future discussions with shippers on marine issues.

Taking into consideration that Trans Mountain and Project-related vessels will be required to adhere to all federal and international emission requirements[126] to reduce emissions from Project-related marine shipping, the Board finds that the residual effects from Project-related marine shipping is not likely to cause significant adverse effects. The Board notes that Trans Mountain has set the age limits for tankers that would be acceptable to call at the WMT, which in Board's view, will improve the efficiency of the vessels resulting in reduction of air emissions. The Board notes that this requirement related to vessel age limits is stated in Trans Mountain's VAS. The Board has imposed Condition 134 which requires Trans Mountain to file an updated VAS with the Board, at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project, and thereafter on or before 31 January of each of the first five years after commencing operations. The Board notes that as new more efficient vessels account for a greater share of the fleet over time, these standards help in reduction of air emissions from Project-related marine shipping.

The Board finds that the increase in operational air emissions from the tankers is expected to be of long-term (expected to occur for the operational life of the tankers), reversible (emissions will reverse shortly once the tankers exit the RSA), low to moderate magnitude, and is expected to disperse in the RSA. In addition, the Board finds that the contribution from Project-related marine shipping to total cumulative effects on marine air emissions is not likely to be significant given that there is an existing regulatory regime that governs the air emissions from the tankers.

Significance evaluation: increase in operational air emissions from Project-related marine shipping

	Criteria	Rating	Description
Project effects	Temporal extent	Long term	Effects are expected to occur for the operational life of the tankers.
	Reversibility	Reversible	Emissions will reverse shortly once the tankers exit the RSA
	Geographic extent	RSA	Emissions are expected to disperse in the RSA.
	Magnitude	Low to moderate	The Board finds that although Project-related increase in marine shipping is expected to increase emissions in the Marine Air Quality RSA, these emissions are expected to remain below applicable objectives. The Board recognizes that volatile organic compounds and carbon monoxide in the study area are expected to increase over time as a result of the growth in marine shipping, whereas other contaminants (e.g nitrogen dioxide, sulphur dioxide, particulate matter) are expected to decrease due to more stringent regulations. The Board recognizes that Project-related vessels will be required to adhere to all federal and international emission requirements to reduce emissions from Project-related marine shipping.
Cumulative effects	The Board finds that the contribution from Project-related marine shipping to total cumulative effects on marine air emissions is not likely to be significant given that there is an existing regulatory regime that governs the air emissions from the tankers. Taking into consideration that Trans Mountain and Project-related vessels will be required to adhere to all federal and international emission requirements to reduce emissions from Project-related marine shipping, the Board finds that the residual effects from Project-related marine shipping is not likely to cause significant adverse effects. The Board notes that Trans Mountain has set the age limits for tankers that would be acceptable to call at the WMT which in Board's view will improve the efficiency of the vessels resulting in reduction of air emissions. The Board is of the view that as new more efficient vessels account for a greater share of the fleet over time, these standards help in reduction of air emissions from Project-related marine shipping.		
Recommendation	Not likely to cause significant adverse environmental effects.		

[126] Regulatory requirements include Canada's *Vessel Pollution and Dangerous Chemicals Regulations* under the *Canada Shipping Act, 2001* and ECCC's *Sulphur in Diesel Fuel Regulations*.

Greenhouse gas emissions

The Board has focused its assessment on the direct greenhouse gas emissions generated from the Project-related vessels, as opposed to assessing the global climate effects of the greenhouse gas emissions. As described in Chapter 10, Section 10.2.2 in the Board's view, attempting to determine and assess the eventual global climate effects of greenhouse gas emissions generated by the Project-related vessels is not practical in terms of meaningfully informing an environmental assessment recommendation on this Project. The Board has not provided a table for describing the significance of GHG emissions unlike for other valued components. The Board relied on the magnitude of GHG emissions (i.e., increase in GHG emissions from Project-related marine shipping) given that the GHG emissions accumulate in the global atmosphere and are permanent in nature.

The evidence indicates that the Project-related marine vessels are expected to result in an increase of approximately 6.9 per cent in marine greenhouse gas emissions in the RSA, 2.1 per cent in marine greenhouse gas emissions in B.C., and 1.2 per cent in marine greenhouse gas emissions in Canada.

The Board notes that in the MH-052-2018 hearing, ECCC estimated a total of 76,200 tonnes of CO_2 emissions per year of combustion greenhouse gas emissions from Project-related tankers as opposed to Trans Mountain's estimate of 68,100 carbon dioxide equivalent tonnes per year. The Board accepts Trans Mountain's methodology for estimating total GHG emissions from Project-related tankers and finds that ECCC's estimate included emissions from the current tanker traffic as opposed to estimating emissions from Project-related marine shipping only. The Board also notes other differences in the assumptions which in Board's view would could increase the total estimate. The Board notes that the difference in Trans Mountain's and ECCC's estimates of increases from Project-related marine greenhouse gas emissions are very small and insignificant, ranging from 5.9 per cent to 6.9 per cent relative to B.C. marine greenhouse gas emissions, and 1.2 per cent to 1.5 per cent when compared to Canada-wide marine greenhouse gas emissions.

In regards to Trans Mountain's cumulative effects assessment, the Board finds the approach reasonable. Trans Mountain provided per cent increases due to Project-related tanker traffic to marine greenhouse gas emissions in Marine RSA, in B.C., and in Canada. The Board agrees with Trans Mountain's reasoning that conducting a cumulative effect assessment of greenhouse gas emissions would need to include all international foreseeable future development, which in the Board's view is not practical. In addition, the Board notes that the Canadian Environmental Assessment Agency's guidance document "Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners" does not prescribe a certain methodology for conducting cumulative effects assessment of greenhouse gas emissions.

The Board notes that in the OH-001-2014 hearing, no mitigation measures were considered in Trans Mountain's marine greenhouse gas emissions assessment and there are currently no regulatory reporting thresholds in Canada for marine greenhouse gas emissions. The Board notes that Project-related marine vessels are required to adhere to all federal and international emission requirements, including standards for bunker fuel. The Board recognizes that new energy efficiency standards were adopted by the International Maritime Organization in July 2011, and that these standards may reduce greenhouse gas emissions from new vessels in the future.

In the MH-052-2018 hearing, the Board heard that in 2017, the IMO Member States agreed on an initial strategy for reducing greenhouse gas emissions from ships, which targets at least a 50 per cent reduction from 2008 levels by year 2050. The Board also received various submissions that discussed plausible mitigation measures to reduce greenhouse gas emissions from marine vessels. These include speed reduction, vessel design, retrofit, and maintenance measures, use of alternate fuels, carbon taxation, and carbon pricing. The Board also heard that there are no fiscal incentives available at international or state level for the maritime industry to invest in more energy efficient vessels.

The Board also received evidence around use of LNG as a fuel source for Project vessels. The Board acknowledges the argument from Chamber of Shipping that notes that the efficiency of the supply chain may be an area worthy of an increased focus for achieving potential benefits from reduced greenhouse gas emissions. The Board supports Chamber of Shipping's view and encourages the supply chain visibility efforts undertaken by VFPA and Transport Canada.

The Board notes that with the federal clean fuel standard, the carbon intensity of the fuels will be lowered, thereby reducing the GHG emissions. The Board further notes that data collection system on fuel oil consumption of ships over 5,000 gross tons, which begins on 1 January 2019, will feed into a process towards adoption of a revised IMO strategy in 2023. This monitoring will provide a better understanding of actual GHG emissions for marine vessels, and to better track the intended reduction of GHG emissions.

The Board received comments from Shackan Indian Band that the Board ought to recommend additional conditions be placed on Trans Mountain to offset the GHG emissions of Project-related marine vessels. The Board notes that

Project-related marine vessels are required to adhere to all federal and international emission requirements, including standards for bunker fuel. In addition, Trans Mountain has set the age limits for tankers that would be acceptable to call at the WMT which will improve the efficiency of the vessels resulting in reduction of GHG emissions. The Board notes that this requirement related to vessel age limits is stated in Trans Mountain's VAS. The Board has imposed Condition 134 which requires Trans Mountain to file an updated VAS with the Board, at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project, and thereafter on or before 31 January of each of the first five years after commencing operations. In regard to requiring offsets, the Board notes that Trans Mountain does not own or operate the vessels. The Board also notes ECCC's statement in regard to offsetting greenhouse gas emissions that Canada continues to work with the IMO on the next steps outlined in the Initial Greenhouse Gas Emissions Strategy and if a relevant measure such as an offset system for the sector was agreed to, Canada would need to develop and introduce regulations under an appropriate domestic legislation in line with the IMO regulation. Therefore, the Board is not persuaded to impose any additional conditions on Trans Mountain to offset the GHG emissions of Project-related marine vessels.

The Board finds that greenhouse gas emissions are a concern because of their long term accumulation in the atmosphere. The Board also finds that any incremental contribution from Project-related marine vessels would increase the burden at a global scale, regardless of how large or small the contribution.

Given that there are no regulatory reporting thresholds for marine greenhouse gas emissions in Canada and that the contribution from Project-related marine vessels to total Canadian greenhouse gas emissions would be 0.01 per cent, and taking a precautionary approach, the Board finds that greenhouse gas emissions from Project-related marine vessels are likely to be significant. The Board recommends to the GIC that it should support the development and implementation of greenhouse gas reduction measures related to marine shipping that would align with the final International Maritime Organization Strategy in year 2023 for reducing greenhouse gas emissions (Recommendation 10). These measures could include, but not be limited to facilitating the use of low-carbon alternate fuels, use of energy efficient technologies, and market-based measures, such as providing economic incentives for industry investment in the development and use of energy efficient technologies and offsetting any increases in ship emissions. The Board notes that Recommendation 2 would also be relevant in that it includes a description of the progress on each of the recommendations.

In the Board's view, if GIC implements the Board's recommendation around development and implementation of GHG reduction measures related to marine shipping that aligns with the final IMO strategy by 2023, the GHG emissions from Project-related shipping would be reduced. In addition, the Board is of the view that with the new energy efficiency standards adopted by the International Maritime Organization, and with the proposed regulations for federal clean fuel standard planned for spring/summer 2019, the GHG emissions will be further diminished.

14.7.2 Marine mammals

Trans Mountain described the marine waters of B.C. as home to a broad range of marine mammal species, including cetaceans (whales, dolphins, and porpoises), pinnipeds (seals and sea lions), and sea otters. It said that the productive straits and sounds of the RSA provide important habitat for foraging, breeding, socializing, and migration. Trans Mountain said that many species of marine mammal can be observed in the RSA year-round, and thus depend on this environment for all aspects of their life history, while other species are predominantly seasonal in their presence, coming to feed for a season or simply passing through during migration. Trans Mountain identified 10 species of marine mammals, and 4 killer whale ecotypes, that are SARA-listed and have potential to occur in the RSA (Table 25). Trans Mountain said that critical habitat for the Southern resident killer whale and the North Pacific Humpback whale has been identified in the RSA (Figure 26).

Trans Mountain said that marine mammals in the RSA face a variety of anthropogenic threats and stressors. It said that stressors vary in intensity and relative importance for individual species but, broadly speaking, include: chemical contamination from both legacy contaminants and current inputs; reductions in prey abundance or quality; physical disturbance; acoustic disturbance or injury from both acute and chronic sources; risk of collisions; risk of entanglements; and, climate change.

MH-052-2018 hearing

In the MH-052-2018 hearing, Trans Mountain referenced its previous individual assessment for each SARA-listed marine mammal species. Trans Mountain and DFO noted that in 2017, Humpback whale was reclassified under the SARA from Threatened to Special Concern.

Table 25: Species listed under Schedule I of the Species at Risk Act potentially found within the Regional Study Area

Species	Status
Humpback whale	Special concern
Fin whale	Threatened
Sei whale	Endangered
Grey whale	Special Concern
Blue whale	Endangered
North Pacific right whale	Endangered
Offshore killer whale	Threatened
Bigg's killer whale (formerly Transient)	Threatened
Northern resident killer whale (NRKW)	Threatened
Southern resident killer whale (SRKW)	Endangered
Harbour porpoise	Special Concern
Steller sea lion	Special Concern
Sea otter	Special Concern

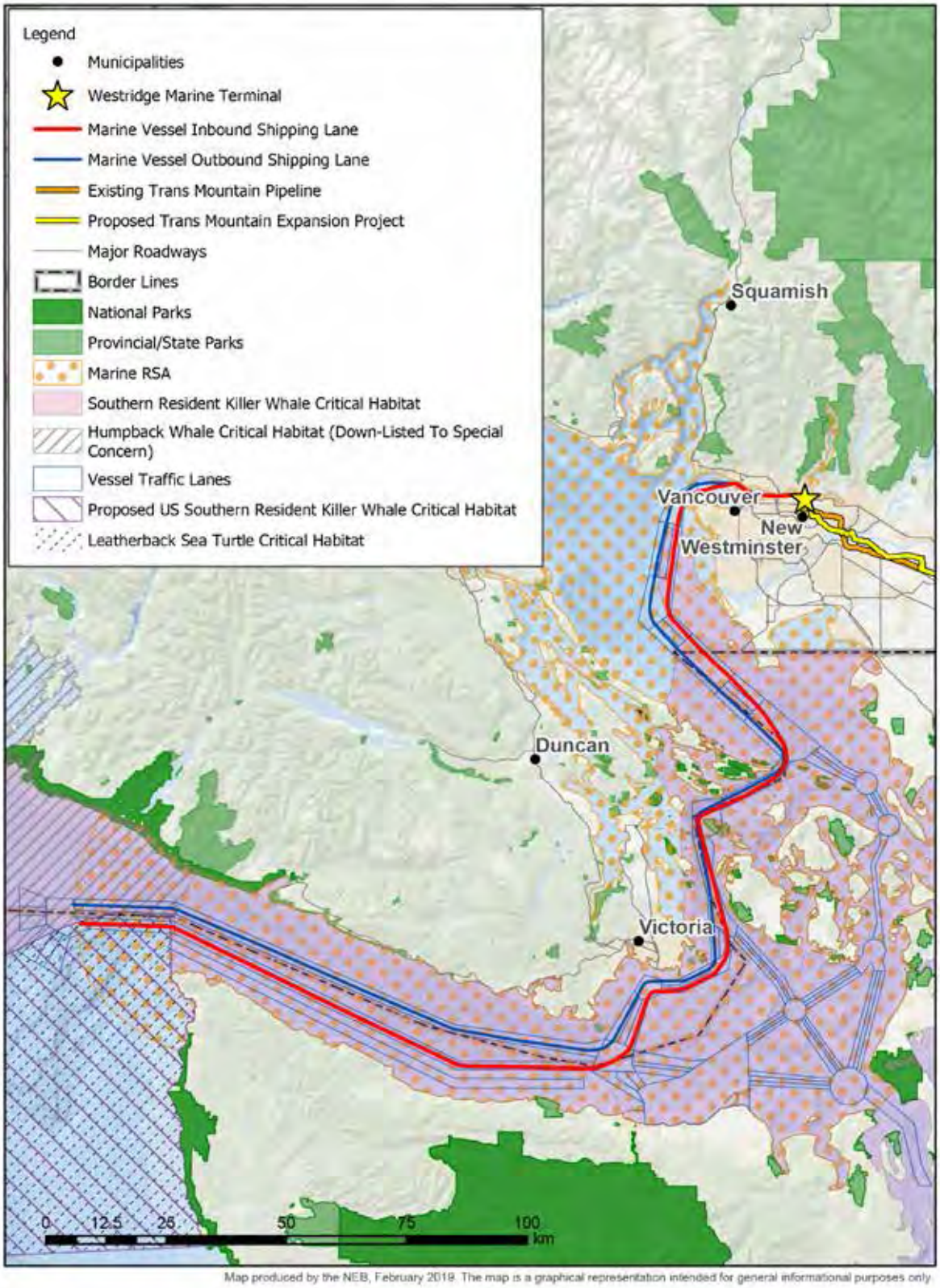
Many participants in the OH-001-2014 hearing and in this reconsideration filed evidence and raised issues related to impacts of Project-related marine vessels on marine mammals. This section focuses on the following key issues:

- permanent auditory injury, temporary auditory injury, and sensory disturbance;
- vessel strikes;
- Southern resident killer whale;
- other marine mammals; and
- mitigation.

Permanent auditory injury, temporary auditory injury, and sensory disturbance

Trans Mountain said that loud underwater noise has the potential to result in temporary or permanent auditory injury (i.e., temporary or permanent threshold shifts [TTS] or [PTS]), or cause sensory disturbance to marine mammals. To determine the potential effects of Project-related vessel-based underwater noise on marine mammals, Trans Mountain, in the absence of any Canadian legislation or guidelines, compared sound source levels from tankers and tugs, based on literature values and acoustic modelling, against thresholds predicted to cause PTS, TTS, and sensory disturbance to marine mammals. Trans Mountain said that based on these results, no PTS or TTS to marine mammals is expected as a result of Project-related marine vessel operations.

Figure 26: Southern resident killer whale and North Pacific Humpback whale critical habitat identified in the Regional Study Area



Trans Mountain said that based on the results of the acoustic modelling study, noise levels associated with an increase in Project-related marine vessel traffic within the RSA are expected to exceed thresholds for behavioral disruption. Trans Mountain said that underwater noise levels above the threshold are predicted to extend for 4 to 7 km from Project-related marine vessels and would be centered on the shipping lanes. Trans Mountain said that sensory disturbance could result in a variety of impacts, such as habitat avoidance, changes in activity states (e.g., feeding, resting, or travelling), and/or interference of communication or perception of sounds (i.e., masking). It said that the degree of sensory disturbance experienced by a marine mammal depends on numerous factors, including: the source level; frequency and duration of the underwater noise; the context (i.e., the animal's activity state at the time); and the species in question.

Trans Mountain said that while exposure of a stationary marine mammal in the RSA to a Project-related marine vessel will be intermittent, this daily exposure will occur throughout the life of the Project. It said that most studies report that marine mammal behaviour returns to normal after sound production ceases, and in consideration of only routine effects associated with the Project, it is expected that the time between vessel transits would allow marine mammals to recover from the sensory disturbance before the next transit of a Project-related marine vessel. Trans Mountain further said that while marine mammals may not encounter another Project-related marine vessel for the remainder of the day, they are very likely to encounter other marine vessels within minutes to hours of the Project-related marine vessel passing, which could conceivably approach near-continuous sensory disturbance. Trans Mountain said that shipping is not a novel activity in the RSA, and many species that use this area regularly are likely to have become 'habituated' to sounds associated with marine transportation activities.

Raincoast Conservation Foundation indicated that compensatory mechanisms (i.e., habituation) come with an energetic cost.

Participants raised concerns over potential impacts of underwater noise on marine mammals. Dr. Lance G. Barrett-Lennard commented that the impact of increased underwater noise from tankers and escort tugs would affect the behaviour, distribution and potentially the health of marine mammals.

DFO raised concerns regarding Trans Mountain's assessment methods, indicating that the locations and dataset used by Trans Mountain in its underwater noise predictive modelling may not accurately represent all locations within the assessment area, specifically in areas considered critical habitat for the Southern resident killer whale (e.g., Boundary Pass). Trans Mountain said that the four locations selected for acoustic modelling scenarios were meant to be reasonably representative of all locations within the RSA and that the addition of an extra modelling scenario location for Boundary Pass would not alter the conclusions of the assessment. DFO noted that Trans Mountain's assessment only addressed the noise produced and propagated from Project-related ships, and did not consider the potential cumulative and/or additive effects of such noise in combination with existing shipping activity.

In the MH-052-2018 hearing, the U.S. Tribes filed a 2016 paper that asserts the conclusion that larger vessels generate more noise at low frequencies (< 1000Hz) and thus the peak power in ship noise overlaps baleen whale signals. DFO filed evidence which noted that a significant part of shipping noise also extends to high frequencies used by SRKWs for social calls and echolocation clicks. Transport Canada said that while tankers and escort tugs are not as loud as other vessel classes, they are louder than most in high frequencies of critical importance to the SRKW.

In a 2018 memo from Canada to the IMO that the federal authorities filed with the Board, Canada said that there is potential for hearing damage or loss in whales that are exposed to prolonged periods of shipping noise. DFO described a modelling study which noted that because there are typically many whale-oriented boats in the vicinity of SRKWs, modelled total noise levels were found to be close to the critical noise threshold assumed to cause a permanent hearing loss over prolonged exposure.

Vessel strikes

Trans Mountain said that all marine vessels have the potential to accidently strike marine mammals. Trans Mountain indicated that the probability and resulting effect of a strike depends on a variety of factors, including the speed of the vessel, the species of marine mammals, and density of vessel traffic and marine mammals in a given area. Trans Mountain said that depending on the severity of the injury, an individual marine mammal may or may not recover from a vessel strike. It said that while the primary effects associated with being struck are blunt-force trauma or lacerations, long-term consequences may include immediate direct mortality; indirect mortality resulting from complications or infection of internal or external injuries; long-term or permanent injuries; reduced fitness or fecundity; or short-term recoverable injuries. Trans Mountain said that the magnitude of this effect may therefore range from low to high. It said that while a strike resulting in minor injuries may be low magnitude, mortality of a SARA-listed species would be considered a high magnitude effect. Trans Mountain said that at the population scale, recovery from the mortality of an individual would depend on the population in question, its generation time, and its conservation status. Whereas population-level effects for some species may be reversible in the medium- term, mortality of individuals listed as Endangered (e.g., North Pacific right whale) could have long-term or permanent population-level consequences.

Trans Mountain conducted a qualitative review of relevant literature and DFO's Marine Mammal Incident Database to support its assessment of Project-related marine mammal vessel strikes. Trans Mountain said that the overall probability of a Project-related marine vessel striking and injuring a marine mammal is considered low. It said that while ship strikes leading to marine mammal fatalities can and do occur, such occurrences are infrequent relative to the number of vessels (of all sizes and classes) on the water. DFO cautioned that the DFO's Marine Mammal Incident Database, or any database that relies on the recovery of dead whales, may not be representative of the true frequency of ship strike occurrences and may underrepresent the true frequency of marine mammal vessel strikes.

The Board requested Trans Mountain provide a quantitative study that evaluated the risk to marine mammals from Project-related marine vessel strikes. Trans Mountain developed an encounter risk model to predict the probability of Project-related marine vessels encountering various marine mammals along the shipping lanes and anywhere within the RSA, in combination with the existing and predicted marine traffic levels. Trans Mountain said that, based on the model results, the encounter risk for any particular vessel is quite small and to date, there have been no known instances of a tanker servicing the WMT having collided with a whale. As such, the potential for Project-related vessel strikes is considered to be a low probability event.

Several participants raised general concerns related to marine mammal vessel strikes. Raincoast Conservation Foundation said that Trans Mountain's encounter risk model relied on occurrence data derived from opportunistic sightings collected primarily from whale watchers and not corrected for effort. It further said that density cannot be derived from opportunistic sightings and consequently, the assessment is severely limited and unreliable for estimating ship strike risk or identifying areas of greatest risk.

Trans Mountain acknowledged the limitations of the data used to inform the encounter risk model and said that a quantitative seasonal accounting of densities is not publicly available for many of the marine mammal species considered, or for the entire RSA, and that such information would greatly improve the applicability and spatial resolution of the encounter model. Trans Mountain committed to include, as part of its Port Information and Terminal Operations, explicit guidance for reporting marine mammal vessel strikes and mammals in distress to the appropriate authorities to ensure clarity around marine mammal vessel strikes.

DFO said that although it is possible to estimate the current risk to marine mammal indicator species from ship strikes in the RSA and the additional risk that could result from Project-related vessel traffic, such estimates would likely have a high degree of uncertainty. DFO further said that high resolution spatial data on the densities of marine mammal indicator species are lacking, particularly for the Humpback whale, which is the species most likely to be affected by ship strikes. Thus, an accurate quantitative assessment of risk to Humpback whales from existing shipping traffic is not feasible at this time, nor is an estimate of the increased risk associated with Project-related vessels.

In the MH-052-2018 hearing, the Board heard there is new data on whale densities and quantitative estimates of strike risk, as described in a 2017 paper by Nichol et al., which is discussed below.

DFO noted that as water passes a large hull, it can advect a nearby whale towards the side of the ship. A 2017 paper by Nichol et al. explained that, in additional to direct strikes, large ships travelling at high speeds are more likely to collide with whales as a result of hydrodynamic draw, which can pull a nearby whale toward the vessel's hull and thus extend the lethal strike zone to 1–2 times beyond a ship's actual draft.

Southern resident killer whale

Participants noted that the Southern resident killer whale is listed as Endangered under the SARA. Trans Mountain said that according to DFO's Recovery Strategy for Northern and Southern Resident Killer Whale and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Assessment and Update Status Report on the Killer Whale, key threats to the Southern resident killer whale population include: chemical and biological contaminants; reductions in the availability or quality of prey (primarily Chinook and Chum salmon); and physical and acoustic disturbance. Trans Mountain also said that DFO has included the environment's acoustic attributes in their designation of critical habitat for Southern resident killer whales, and sources of acoustic disturbance are noted as including both high-intensity sounds, such as those produced by seismic surveys, and chronic sources such as vessel traffic.

Trans Mountain's environmental assessment concluded that even though the Project contribution to overall sensory disturbance effects is small, the potential effects of increased Project-related marine vessel traffic, and their contribution to potential cumulative effects, are determined to be significant for Southern resident killer whales. Trans Mountain acknowledged that, despite operating legally, and being proportionally small relative to the existing marine vessel traffic, the Project will contribute additional underwater noise that could affect the Southern resident killer whale population, and that this noise will act cumulatively with noise from existing and reasonably foreseeable marine vessel traffic. Trans Mountain said that past and current activities, including all forms of mortality, high contaminant loads, reduced prey, and sensory and physical disturbance, have resulted in significant adverse cumulative effects to the Southern resident killer whale population. Trans Mountain said that given the current state of knowledge, and the ability of threats to interact with one

another, it is not possible to completely partition how each threat may be affecting the population. Trans Mountain argued that the shipping lanes will continue to host marine vessel traffic with or without the Project, and that the impacts to the Southern resident killer whales will continue to exist with or without the Project.

Trans Mountain said that a Project-related marine vessel was predicted to encounter killer whales along the shipping lanes once every six days. Trans Mountain said that the return intervals only represent the frequency with which a Project-related vessel and marine mammal are expected to occur in the same place at the same time. It said that encounter risk model does not factor in any behavioural responses of the whale (i.e., movement out of the area as the vessel approaches), nor any avoidance response (e.g., dives, bursts of speed, changes of course), and that only a fraction of the encounters will result in actual physical contact between a vessel and a whale, and out of the incidences of physical contact, only a fraction will result in fatal injuries. Trans Mountain said that killer whales in particular are small, agile, and fast-moving, and that based on historical records, the percentage of encounters that ultimately lead to collisions with killer whales is expected to be low. According to strike event records obtained from DFO's B.C. Marine Mammal Incident Database (1973 to October 2012), there have been six records of strikes with killer whales that were confirmed or deemed likely to have occurred in B.C. (maximum vessel size reported for a killer whale strike was a ferry in the Strait of Georgia).

Participants provided substantial amounts of evidence in regards to the Southern resident killer whales and potential Project-related effects.

DFO supported Trans Mountain's significance conclusion, stating that overall, Trans Mountain's assessment of residual effects on the Southern resident killer whale may be accurate, given the current endangered status and the declining trend of this population in recent decades. DFO said that the poor survival and birth rates of Southern resident killer whales over the past 20 years suggest that the current habitat quality, including that of designated critical habitat within the RSA, may be insufficient to allow for recovery of this population. It further noted that due to a lack of information that is needed to quantify the impact of existing underwater noise conditions in the RSA on the Southern resident killer whale population, it is not possible to predict what further effects might be anticipated from future Project-related vessel traffic. DFO also acknowledged that the risk to Southern resident killer whales from Project-related marine vessel collision may be extremely low or negligible.

Raincoast Conservation Foundation said that the viability and conservation status of the Southern resident killer whales is adversely affected by repeated and multiple human-caused disturbances that interact and have cumulative harmful effects. It said that the main factors believed to be impeding recovery and viability of the Southern resident killer whales include physical and acoustical disturbance caused by marine traffic and other industrial activities, nutritional stress from inadequate prey availability, and exposure to environmental contaminants. Raincoast Conservation Foundation further stated that the Project-related marine vessels have the potential to exacerbate many threats facing Southern resident killer whales and that while an understanding of how the current threats may act synergistically to impact killer whales is unknown, in other species multiple stressors have been shown to have strong negative and often lethal effects, particularly when animals carry elevated levels of environmental contaminants.

Raincoast Conservation Foundation said empirical measurements of ambient sound levels (natural and anthropogenic) found that critical habitats for Southern resident killer whales have the noisiest levels of all sites sampled along the B.C. mainland coast and that the Project's proposed activities will only increase noise levels in an already noisy environment. Raincoast Conservation Foundation said that present noise levels under busy ship traffic conditions are already so high that additional ship traffic may seem to have little impact on communication space when in fact that additional noise could essentially eliminate even those few remaining opportunities for killer whales to communicate.

Raincoast Conservation Foundation said that there is a reasonable likelihood of population level and ecological consequences for Southern resident killer whales from Project-related increases in vessel noise events and the chronic deterioration of whales' acoustic habitat. Raincoast Conservation Foundation critiqued Trans Mountain's assessment methods and suggested that the Project-related marine vessel effects need to be translated into population and ecological level risks. Raincoast Conservation Foundation completed a Population Viability Analysis which modelled the future population based on current conditions with no Project, and contrasted that with a model that assumes the Project is approved. Raincoast Conservation Foundation said that modelling results indicated that if base line conditions persist, the Southern resident killer whale population will most likely remain about at its current size or continue a very slow decline. It further said that modelling shows that increased threats from Project-related effects increase the risk of extinction and accelerate decline. It said that it is abundantly clear that the population cannot withstand additional negative pressures, recover from its current endangered status, and persist. Raincoast Conservation Foundation also said that the factor with the largest effect on depressing population size and possibly leading to extinction is a reduction of Chinook prey base.

Tsawwassen First Nation indicated that the Southern resident killer whale population has declined over recent years and said that population recovery seems unlikely unless drastic changes to those factors compromising the population's demographics occur.

The Board heard substantial additional evidence on SRKW in the MH-052-2018 hearing, including the following.

Prey availability & Chinook salmon

According to the November 2018 Southern Resident Orca Task Force Report and Recommendations, SRKW diet is composed almost entirely of salmon, and about 80 per cent of their total diet comes from Chinook salmon. DFO evidence established that Chinook salmon productivity is estimated to have declined from 25-40 per cent since the early 1980s across many B.C. indicator stocks. DFO said the abundance of Fraser Chinook salmon continued to drop in 2018, and the outlook for 2019 is for continued unfavorable conditions and low productivity for these Chinook stocks. A literature review by Dr. Burnham filed by the Province of B.C. attributed the decline in natural stocks to degradation of spawning and rearing habitat, competition, loss of access to habitat due to dams, historical overfishing, and adverse environmental conditions such as strong El Niño conditions and recently by an anomalous warm water mass creating altered oceanic conditions referred to as the 'Blob'. The 2018 RKW Recovery Strategy states that climate change is affecting entire ecosystems, and it is likely that in order to survive, killer whales will have to adapt to the consequences of local changes in their prey base.

DFO pointed out that migratory routes for some Chinook salmon stocks overlap with Project shipping lanes, but there is no published source of information that identifies stocks of Chinook salmon that are impacted by marine shipping activities.

Contamination

The 2018 RKW Recovery Strategy states that there are likely thousands of chemicals to be found in the killer whales of B.C. The high contaminant levels found in SRKW may arise from consuming prey that are from industrialized areas near the B.C.-Washington border, and contaminants enter the marine environment from local, regional and international sources. These include point sources such as pulp and paper mills, municipal effluent outfalls, and petrochemical facilities, and non-point sources such as sewer overflows, urban runoff and storm-water drainage, agriculture, forestry, and aquaculture. In addition, some pollutants such as PCBs, DDT and other chemicals are transported through atmospheric processes and ocean currents, and may travel to the west coast of North America from as far away as Asia. Federal authorities said that the cities of Vancouver and Victoria currently release about 700 million litres of untreated and undertreated wastewater into the Salish Sea per day.

Disturbance / noise

An ECHO Program-commissioned desktop and modelling study filed by the VFPA estimated that overall, the time for SRKW foraging potentially lost due to behavioural responses and click masking totaled 20-23 per cent of each whale day (4.9-5.5 hours), with approximately two thirds of this time due to noise from large commercial vessels and one third due to noise from whale watching boats.

- Ferries (52-67 per cent) and tugs (12-27 per cent). The study stated that ferries undoubtedly contribute a large amount of noise due to their size, the large number of monthly ferry trips, and because their routes are widely distributed throughout the study area. Similarly tugs make a relatively large contribution due to the substantial volume of tug traffic in the study area.
- Other merchant ships (11-13 per cent). Along shipping lanes, deep sea commercial vessels were generally the largest contributors. Oil tankers, for example, contribute approximately 1 per cent of the sound regionally, but up to approximately 6 per cent in the Strait of Juan de Fuca.
- Whale watching boats contribute less than 1 per cent regionally in the summer (0 per cent in the winter) but up to 4.6 per cent in Haro Strait. Localized noise contribution from smaller vessels may therefore be important in critical habitat areas where their presence overlaps high-use areas for SRKW.

Likewise, a literature review by Dr. Burnham for the Province of B.C. said ferry routes contribute the greatest inputs into the cumulative noise maps of the Salish Sea, with additional seasonal routes added during the summer when SRKWs use the area for foraging.

A 2018 ECHO Program study stated that the commercial whale watching industry has developed into one of the fastest growing wildlife-based viewing industries in the world. DFO said that commercial whale watching in the Canadian and U.S. portions of the Salish Sea increased from a few boats in the 1970s to about 100 boats in 2016, and that SRKWs were observed to be within 400 m of a vessel most of the time during daylight hours from May through September, largely as a result of whale-watching oriented vessels approaching and following them. A 2017 paper by Lacy et al. states that, from the perspective of a foraging killer whale that emits high-frequency echolocation clicks to detect and capture salmon, high-frequency noise from small, outboard vessels that follow whales might cause a greater reduction in a killer whale's foraging success than low-frequency background noise from commercial shipping. DFO acknowledged that until further research is completed, it is difficult to quantify the relative impact of increased low frequency noise from large vessels compared to the higher frequency noise from non-AIS vessels, including whale watching boats that tend to travel much closer to the SRKW than the larger commercial vessels.

Strikes

DFO noted that its 2017 Whale Science Review identified ship strikes as an additional threat to the three main threats noted in the Recovery Strategy for SRKW. DFO said that the recent mortality of J34, a prime age male found to have died from large blunt force trauma, highlights this threat. The very small size of the SRKW population and the low numbers of prime age males and females that support the reproductive potential and genetic diversity of the population means that a threat that could remove one animal will have significant consequences.

Relative contributions to cumulative effects

Research on the cumulative effects of the multiple threats to SRKW suggests that, although prey limitation is likely the most important factor affecting population growth, both reductions in acoustic disturbance and increases in prey abundance are needed to achieve population growth. DFO said to date, the only published study comparing the relative contribution of individual anthropogenic threats on SRKW is the cumulative effects analysis of Lacy et al. (2017). DFO stated that while the model predictions have not been tested, the outcomes of its population viability analysis (PVA) model suggest that there are several configurations of threat reduction that could lead to increased population growth of SRKW. For example, Lacy et al. (2017) predicts that a 50 per cent noise reduction plus a 15 per cent increase in Chinook would allow the SRKW population to reach a 2.3 per cent growth target.

SRKW population

The Board heard that the population of SRKW has fallen to 74. DFO acknowledged there is no evidence that the SRKW population is recovering. Federal authorities noted that the competent ministers under the SARA determined in May 2018 that SRKW is facing an imminent threat to its survival and recovery.

A 2018 Threats Assessment Brief submitted by Musqueam stated there is reason to think that the current decline of SRKW since around 2010 is occurring under a unique set of conditions: the effects of climate change are stronger now than in previous decades; an increase in large commercial vessels and whale-oriented vessels has resulted in a noisier acoustic environment; major competitors on Chinook populations such as NRKW, transient killer whale, sea lions and seals have experienced significant population growth over recent decades; and there has been a dramatic increase in human population growth, development and industrialization around the Salish Sea over the past forty years. The Threats Assessment Brief said of particular concern is that the sex ratio at birth is becoming increasingly male-biased.

The evidence of Lacy et al filed by Raincoast asserts that their updated population viability analysis (PVA) for SRKW, incorporating the data from the past four years, confirmed that the population is fragile and perhaps in a slow decline, with no ability to withstand additional threats and an inability to recover unless current conditions are improved.

Raincoast said population levels of SRKW before 1960 are not known with any accuracy, but scientists estimate the minimum historical population size was about 140 animals (referencing NOAA). Commenter A.V. Walker referred to a presentation by Dr. Trites and said that, from DNA data collected, Dr. Trites does not believe that SRKW numbers have exceeded 100, at any time, in the past century.

A 2018 Threats Assessment Brief submitted by Musqueam said the abundance of the SRKW population has fluctuated over the last sixty years with a high of 98 individuals in 1995 and a low of 66 individuals in 1973. The Musqueam Brief said the current decline started around 2010, in which the number of SRKW individuals has dropped from approximately 85 to a current abundance of 74.

Contribution of Project tankers to cumulative effects

Trans Mountain asserted in its evidence that vessels calling at the Westridge Marine Terminal will continue to represent a comparatively small proportion of total marine transportation activity in the Salish Sea, travelling at speeds less than many other types of vessels in the region. As such, Trans Mountain argues that Project-related marine vessels will contribute a proportionately small component of the overall marine transportation sources of all underwater noise contributions.

Other toothed whales

Trans Mountain said that other toothed whales may be observed in the RSA, including Dall's porpoises, Harbour porpoises, Pacific white-sided dolphins and the other ecotypes of killer whales. It said that based on results of acoustic modelling, underwater noise will be detectable by toothed whales over large distances and may cause sensory disturbance within 4 to 7 km of the shipping lanes. Trans Mountain said that species, such as the Harbour porpoise, may have somewhat more pronounced responses to disturbance, but that acoustic modelling suggested that the extent of sensory disturbance is expected to be generally comparable across all toothed whale species found within the RSA. It said that in contrast to the Southern resident killer whale, Project-related residual effects will affect only localized portions of the overall North Pacific

(or Canadian) populations of toothed whales in the RSA. As such, and in consideration of the notable differences between population status, abundance, and occurrence of Southern resident killer whales versus the various other species of toothed whales in the RSA, effects of increased Project-related marine vessel traffic on toothed whales (other than Southern resident killer whales) are deemed to have a negative impact balance but are not significant. Trans Mountain also noted that no critical habitat has been identified for any species of toothed whale[127] (excluding the Southern resident killer whale) and that the RSA is considered a DFO Important Area for Harbour porpoise.

Trans Mountain said that according to strike event records obtained from DFO's B.C. Marine Mammal Incident Database (1973 to October 2012), there have been eight recorded strikes on toothed whales that were confirmed or deemed likely to have occurred in B.C.: one involved a Dall's porpoise calf; one involved a Harbour porpoise calf; and six involved killer whales with a maximum vessel size reported for a killer whale strike being a ferry in the Strait of Georgia. Trans Mountain said that killer whales are small, agile, and fast moving, and although no mathematical probabilities have been determined to calculate actual strike risk for this species, historical records suggest that the percentage of encounters that ultimately lead to collisions with killer whales is low. Trans Mountain said that DFO's Recovery Strategy for the Transient Killer Whale (Orcinus orca) in Canada recognizes collisions with vessels as a stressor with demonstrated causal certainty, but a low level of concern.

The 2018 RKW Recovery Strategy says the NRKW population has been increasing at a mean rate of 2.9 per cent per year since 2002, reaching approximately 309 individuals in 2017. The 2015 Report on Progress of Recovery Strategy Implementation for the Transient Killer Whale states that the population has been increasing since the mid-1970s when monitoring began. The 2018 Proposed Recovery Strategy for the Offshore Killer Whale in Canada includes a map of encounters showing that offshore killer whale's range is broad and includes the Salish Sea. The Proposed Recovery Strategy states that threats include chronic acoustic disturbance (e.g., from shipping traffic) and physical disturbance, both listed as medium level of concern. The Proposed Recovery Strategy states that disturbance due to vessel proximity is a concern for killer whales in B.C., especially given the growth of the commercial whale watching industry in these waters. The Proposed Recovery Strategy states the overall offshore killer whale population size appears to be stable, with high estimated survival each year, although it states that anything beyond natural mortality could jeopardize recovery.

Baleen whales

Trans Mountain indicated that the North Pacific Humpback whale is listed as Special Concern under Schedule 1 of the SARA. It said that a small portion of a much larger north pacific population of Humpback whales is found seasonally within the RSA. Trans Mountain said that activities identified by DFO's Recovery Strategy for the North Pacific Humpback Whale (Megaptera novaeangliae) in Canada as likely to destroy or degrade critical habitat include vessel traffic, toxic spills, overfishing, seismic exploration, sonar and pile driving. Trans Mountain said that no scientific study has established a causal link between increased vessel noise and population-level effects on Humpback whales. Trans Mountain said that based on results of acoustic modelling, underwater noise will be detectable by Humpback whales over large distances and may cause sensory disturbance within 4 to 7 km of the shipping lanes. Trans Mountain also identified that sensory disturbance would occur within North Pacific Humpback whale critical habitat, but said that the critical habitat within the RSA is only a small portion of the critical habitat identified in Canadian waters.

DFO said that Trans Mountain, in its assessment, did not consider the strong long-term site fidelity of Humpback whales to feeding areas within the RSA and the resulting repetitive exposure of these individuals to Project-related shipping noise levels that could result in behavioural disturbance. Trans Mountain disagreed with DFO and maintained that its assessment of effects on Humpback whales and subsequent significance determination accurately considered the localized areas of high Humpback whale abundance that occur within the RSA.

Trans Mountain and DFO both identified the North Pacific Humpback whale as the species at the highest relative risk of marine mammal vessel strike in the RSA, as the species is known to seasonally congregate in critical habitat along the western portion of the RSA. Trans Mountain said that in B.C., Humpback whales are the most commonly struck species, as reported to the B.C. Marine Mammal Response Network. Trans Mountain's encounter risk model predicted that Project-related marine vessels would encounter a North Pacific Humpback whale along the shipping lanes every 334.2 days. Trans Mountain said that only a fraction of these encounters will result in actual physical contact between a vessel and a whale, and out of the incidences of physical contact, only a fraction will result in fatal injuries.

Trans Mountain said that other baleen whales that frequent the RSA on occasion include Fin whales, Grey whales, and Minke whales. Trans Mountain said that while these other species of baleen whale are not altogether uncommon in the area, neither is considered particularly abundant, and that no critical habitat or DFO Important Areas have been identified within the RSA for any species of baleen whale other than Humpback whales. It further said that all baleen whales belong to the

[127] Potential critical habitat for transient killer whales was identified in the Regional Study Area.

same functional hearing group, and while species such as Fin whales may be somewhat more sensitive than Humpback whales to low frequency sounds associated with shipping, effects of sensory disturbance to the Humpback whale indicator are expected to be generally comparable to effects on all baleen whale species found within the RSA.

Raincoast Conservation Foundation said the increase in shipping associated with the Project creates an increased risk of ships striking marine mammals and, in particular, great whales such as Blue, Fin, Sei, Humpback, and Grey whales, as well as smaller cetaceans, such as killer whales, dolphins and porpoises. It said that many of these marine mammals are listed as species at risk in Canada, and that injury or death because of ship strikes are significant threats to recovering populations of marine mammals, posing the greatest risk to small or isolated whale populations, such as the Southern resident killer whales, where a single strike-related mortality could have population-level effects.

Trans Mountain said that based on the encounter risk model, the overall probability of a Project-related vessel encountering a Blue, Sei, Fin, or North Pacific right whale is considered very low.

New evidence filed in the MH-052-2018 hearing included the 2017 Action Plan for Blue, Fin, Sei and North Pacific right whales in Canadian Pacific Waters, which states that threats for these whales include vessel strikes and physical disturbance due to vessel presence and chronic anthropogenic noise. It states that as these whales re-inhabit Canadian Pacific waters, the likelihood of strikes is expected to increase, unless ship design and transit strategies are developed to minimize the likelihood and severity of strikes.

The evidence of Dr. Darling filed by Barkley Sounds Stewardship Alliance pointed out the highest densities of Humpback whales, up to 50-100+ animals in several square kilometres, are often found on Swiftsure Bank in the route of shipping traffic. DFO said Humpback whales, which are present primarily from May to October, aggregate in large numbers near the western entrance of the Strait of Juan de Fuca.

A 2017 paper by Nichol et al. filed by DFO states that baleen whales are at greater risk of being struck by ships because of their large body size, because they spend extended periods of time at or near the surface, and because most exhibit a limited ability to manoeuvre away from vessels, or do not attempt to avoid ships at all. Nichol et al. added that 20 Humpback whales were reported struck by vessels in B.C. during 2004-2011, representing an individual reported injured or killed approximately every 9 months, although it was noted that documented strike rates significantly underestimate the true impact of vessel collisions on whale populations. The study described in Nichol et al. predicted whale densities from the results of aerial surveys, and combined this with vessel traffic data to predict strike risk. The study concluded that the most likely areas for Humpback strikes are along the continental shelf break, the inshore approaches to the Strait of Juan de Fuca, and within the Strait itself, while Fin whales are most likely to be struck in the offshore approaches to Juan de Fuca and inside the western portion of the Strait.

Other large whales, such as Blue, Sei and North Pacific right whales, DFO noted, are seldom observed in the Salish Sea and are usually distributed more offshore to the west, northwest and southwest of the western edge of the RSA.

Thousands of migrating Grey whales have to cut across the western entrance of the Strait of Juan de Fuca, according to the evidence of DFO. Dr. Darling on behalf of Barkley Sounds Stewardship Alliance said this amounts to a very high density of whales crossing shipping routes day and night for several months. Dr. Darling said that a small number (about 200) spend time feeding around the central/south west coast of Vancouver Island including shorelines of the Strait of Juan de Fuca, and that this population is endangered. DFO said in 2017, COSEWIC reassessed the Eastern Pacific Grey whale population as three Designatable Units, two of which were assessed as endangered and under consideration for listing under the SARA.

Other marine mammals

With regard to pinnipeds, Trans Mountain's assessment said that there may be some sensory disturbance due to underwater noise, but that it would be of low magnitude and not significant. For Steller sea lion, Trans Mountain said they are expected for the most part to be habituated to regular traffic movements along the shipping lanes, a large part of the acoustic energy produced by Project-related is expected to be inaudible, individuals are likely to recover from the direct effects of sensory disturbance immediately, and large-scale disturbance around haulouts is not expected.

With regard to sea otter, Trans Mountain said it is only occasional in the area, most likely in westernmost portion of the RSA, and that although there may be some sensory disturbance due to underwater noise, it would be of low magnitude and not significant.

Mitigation: overarching considerations

Trans Mountain said that while it can actively enforce restrictions on tankers docked at the WMT to comply with its operating practices and standards, once the tanker departs from the WMT, the company has little direct control over the operating practices of the tankers or tugs as Project-related marine vessels are owned and operated by third parties. It said that marine transportation in Canadian waters is authorized and regulated through the *Canada Shipping Act, 2001*, related

legislation, and regulations administered by Transport Canada and the CCG. As such, no direct mitigation was proposed by Trans Mountain for effects associated with increased Project-related marine transportation. The Board requested a species-specific assessment for SARA-listed marine mammals that are likely to be impacted from Project-related marine transportation, which included a request for species-specific mitigation. Trans Mountain, for every species, recommended no mitigation. Trans Mountain reiterated that Project-related marine vessels are owned and operated by a third party, and marine transportation in Canadian waters is authorized and regulated through the *Canada Shipping Act, 2001* and related legislation and regulations are administered by Transport Canada and the CCG.

In the MH-052-2018 hearing, Trans Mountain observed that initiatives solely aimed at Project-related vessels would be inefficient and would have no material benefit to SRKW without also addressing the shipping industry in general. The Government of Alberta likewise argued that conditions and recommendations that apply solely to Project-related vessels will illogically subject the shipment of petroleum products from the Project to a different standard than any other commercial undertaking in the RSA, including those dealing with petroleum products unrelated to the Project or of cargoes of other potentially dangerous substances. In a VFPA letter summarizing the outcomes of an ECHO Program workshop, VFPA said workshop participants noted that a significant focus regarding potential mitigation seems to have been placed on the impact of shipping noise on the killer whales, that NOAA has undertaken much research in regards to whale watching vessels and other small boats, and workshop participants expressed a strong desire that there be equity in the distribution of responsibility for taking action to help recover the SRKW population.

VFPA noted that vessel related effects are a regional cumulative issue and the most effective way of addressing those cumulative effects is to work collaboratively with all stakeholders to better understand threats to at-risk whales, inform evidence-based solutions, and to trial and implement adaptive voluntary measures. The Chamber of Shipping said the ECHO Program navigational measures to reduce underwater noise were extremely complex to develop and implement and required a high degree of coordination with multiple federal departments in both Canada and the United States, scientific organizations, and ship owners and operators globally who call on ports in B.C. The management of commercial shipping traffic in coastal waters is complex, involves multiple jurisdictions, and deserves a deliberate approach. VFPA said ECHO Program partners and advisors have expressed a clear desire for the ECHO Program to remain the forum through which multiple parties continue to discuss the issue of managing vessel related threats to at-risk whales in this region.

Transport Canada pointed out that its paramount consideration is the safety and security of Canada's transportation system, including its waterways. It urges that identification and comprehensive assessments of measures to mitigate underwater vessel noise must consider not only the effectiveness at mitigating noise, but also navigational safety, economic and business impacts, unintended environmental consequences, and Canada-U.S. and international considerations. Further, certain navigation measures, such as modification of shipping lanes, would require adoption by the IMO before they can be fully implemented, and it should also be understood that any international adoption of measures within the Salish Sea may also first require agreement and cooperation of U.S. partners. The November 2018 Washington State Southern Resident Orca Task Force Report and Recommendations likewise highlighted the importance of coordination between Canadian and U.S. authorities.

Transport Canada commissioned a Greenwood Risk Assessment report which conducted a preliminary risk assessment of various potential mitigation measures proposed for SRKW. That report noted that two principal concerns recurred when considering certain measures: firstly, the prospect of small craft being forced into interaction with deep-sea vessels and the potential for collision, and secondly, creating circumstances where vessels not under pilotage would be forced to loiter and the potential for drifting, for example.

With regard to changes over time, DFO said the distribution of whales is highly linked to mechanisms that create local aggregations of prey. While these processes are mostly seasonal and predictable, ocean conditions, climate change and other factors influence their distributions over time and consequently areas and times where mitigation measures would be focused may also need to change over time The Chamber of Shipping likewise noted the need for an adaptive management framework to allow for mitigation modifications. It noted, however, that commercial marine shipping prefers a predictable operational and regulatory framework in order to remain competitive, so any mitigation measure(s) considered should attempt to strike a balance between being suitably adaptable with a degree of predictability.

A number of participants argued that all mitigations should be in place, and demonstrated to be successful, before Project approval or Project operations commence. The Tsleil-Waututh First Nation and Living Oceans/Raincoast argued that because of uncertainties, such as the potential effects of increased duration of underwater noise with a vessel slowdown that proposed measures do not yet qualify as mitigation. The SRKW Imminent Threat Assessment acknowledged that actions to mitigate threats and support recovery of SRKW have been underway for many years, but that these efforts have yet to result in detectable signs of recovery of the population. It also stated that current actions such as with regard to prey (e.g., managing salmon fisheries) and disturbance (e.g., slowdown trials) are relatively new and their effectiveness in promoting survival and recovery for SRKW remains to be determined.

Trans Mountain argued that although many regional initiatives are ongoing and may not be completed for some time, these initiatives do not need to be completed before the Project can commence. Trans Mountain said that if additional mitigation or monitoring measures are identified in the future through these regional initiatives, they can be applied to all marine shipping at that time, including Project-related marine shipping.

Mitigation: Trans Mountain

Trans Mountain indicated that it would be interested in supporting and participating in a joint industry-government advisory group that would be charged with determining and/ or developing effective mitigation measures to reduce potential effects of underwater noise on marine mammals in the region.

Trans Mountain committed to developing a Marine Mammal Protection Program with a purpose of outlining Project-related tanker specific measures and regional collaborative initiatives that would be implemented by Trans Mountain and other operators along the marine shipping lanes to mitigate and manage potential environmental effects on marine mammals. Trans Mountain said that one of the objectives of the Marine Mammal Protection Program would include actively encouraging and participating in multi-stakeholder or independent initiatives that contribute to Southern resident killer whale recovery strategies.

Trans Mountain indicated that one of the strategies of the Marine Mammal Protection Program is to ensure that Southern resident killer whales have an adequate and accessible food supply to allow recovery. Trans Mountain said that it remains committed to supporting wild Pacific salmon and has indicated that it is willing to support the Pacific Salmon Foundation – Salish Sea Marine Survival Project, which it believes would contribute to better conservation and increased abundance of Chinook salmon.

Trans Mountain also committed to supporting the Port Metro Vancouver led Enhancing Cetacean Habitat and Observation Program (ECHO). Port Metro Vancouver said that ECHO has been established in collaboration with government agencies, First Nations, marine industry users, non-government organizations and scientific experts, to better understand and manage the potential impacts to cetaceans from commercial vessel activities throughout the southern coast of B.C. Trans Mountain said that it would be participating in Green Marine, a voluntary environmental program for the maritime industry as a whole to reduce its environmental footprint. Trans Mountain said that its Vessel Acceptance Standards require all accepted vessels to meet all applicable international and local rules and regulations. It further said that should future guidelines or standards for reducing underwater noise from commercial vessels come into force as international and local rules and regulation, Project-related marine vessels would meet those rules and regulations.

DFO said that its review has suggested that specific mitigation measures that Trans Mountain can feasibly implement to reduce Project-related effects do not appear to be available. DFO recommended that as the Marine Mammal Protection Program is further refined and developed, Trans Mountain explore the potential for having trained marine mammal observers on-board Project-related marine vessels. These observers may be staff on-board the vessels or potentially members of the Pacific Pilotage Authority that have undergone training to help them identify risks to marine mammals and make appropriate vessel navigation alterations to reduce effects on marine mammals species.

Tsawwassen First Nation argued that what is necessary is urgent regulatory action to reduce underwater noise in the Salish Sea. Tsawwassen First Nation argued that the results of the scientific studies undertaken as part of the Marine Mammal Protection Program have no guarantee that effective mitigation will be developed.

In the MH-052-2018 hearing, Trans Mountain said that should the NEB reissue a Certificate for the Project, Trans Mountain plans to commence a process to solicit and obtain feedback and comments from Indigenous Groups on a draft version of the Marine Mammal Protection Program no later than 18 months before the commencement of Project operations.

Trans Mountain explained that its Vessel Acceptance Standard includes a Master's Declaration that requires confirmation that the vessel's hull and propeller are not fouled excessively, and that the vessel will participate in all navigation initiatives designed to protect marine mammals in the region. With regard to the first, Trans Mountain said hull cleaning would always be part of a vessel's dry-docking cycle, but since it is well known that fouling leads to reduced fuel efficiency, individual tanker operators are typically arrange for cleaning between scheduled dry-dockings (often at 6 to 9 month intervals). With regard to the second, Trans Mountain confirmed that it expects all Project-related vessels to participate in all ECHO navigation trials, including slowdown and lateral displacement trials, provided it is safe and practicable for the vessel to do so.

Trans Mountain said there are only three new plausible mitigation measures available to it to potentially reduce the effects of marine shipping:

- Routing: If there is support for it from the appropriate federal authorities, Trans Mountain said it would request Project-related vessels skirt recently designated critical habitat for SRKW and NRKW off Southwestern Vancouver island by including a Deviation Point in the vessel's passage plan, and request that they proceed at not more than

12 knots between the Deviation Point and Buoy J, safe navigation permitting and if feasible to. Trans Mountain provided a conceptual map of the special routing and speed limit, which shows this routing and speed limit are predominantly outside the 12-nautical-mile boundary. Trans Mountain said the Federal Authorities that regulate marine transportation may be better placed to establish such requirements, but it would nevertheless include the information in its Westridge Marine Terminal Regulation and Operations Guide.

- Minimize number of ships: Trans Mountain said it would work with Project shippers to explore optimizing and reducing the number of Project-related vessel shipments by maximizing tanker cargo volume. Trans Mountain said it is not possible at this time to estimate the number of reduced transits, and that it will not include a commitment by shippers to maximize cargo volume and share loads in its Vessel Acceptance Standard because doing so would remove commercial and transportation flexibility, potentially make Canadian resources less competitive in the global market, and because export destinations will vary by shipper.
- Tugs: Trans Mountain said, when selecting a provider for the Strait of Juan de Fuca Escort Tug Service in conjunction with the shippers, that it will consider a number of means to abate underwater noise effects, if practical and feasible to do so.

A number of participants suggested additional requirements be placed specifically on Project-related marine vessels, such as requirements for quiet technologies or certification. Trans Mountain said it would not be appropriate to add these as requirements in its Vessel Acceptance Standard because, in general, certain requirements could significantly reduce the flexibility and access for shippers to a sufficient supply of vessels, and that additional requirements must be applied more broadly than just Project-related marine vessels in order to be both effective and fair across the shipping community. In addition, with regard to some specific suggestions:

- Inspections: Trans Mountain said it would not require physical inspections of vessels coming to call at WMT prior to their entry into Burrard Inlet, because it would lead to logistical complications, potential delays, and additional anchoring.
- Incentives: In response to a suggestion by VFPA that Trans Mountain implement an incentive program, Trans Mountain said it does not charge a fee to vessel owners for calling at the WMT, and the key incentive for vessels is to meet the requirements under the VAS and be accepted. With regard to the Port of Vancouver's incentives for underwater noise reduction, Trans Mountain said there are no Aframax tankers that Trans Mountain is aware of that meet the criteria to benefit from the underwater vessel noise performance criteria of the EcoAction Program.
- Speed limits: In response to calls for specific speed limits on Project-related vessels, Trans Mountain said that further reducing the speed of Project vessels would have limited environmental benefits, create safety concerns, and add to the shippers' overhead cost of transportation. Trans Mountain added that the typical speed profile for an outbound laden tanker between the Port of Vancouver and Buoy J is already relatively low, between 10 and 12 knots.

Mitigation: Broad initiatives

The Federal authorities said that since the NEB's OH-001-2014 Report, the Government has advanced a comprehensive strategy to protect ocean ecosystems and to support the recovery of SRKW, which has advanced in three stages:

- under the $1.5 billion national Oceans Protection Plan (OPP) launched in late 2016;
- under the $167 million Whales Initiative launched in June 2018; and
- an additional $61.5 million for additional measures announced in October 2018 designed to further address the imminent threats to the survival and recovery of SRKW.

The Federal authorities said that various research and data collection projects are underway. These include a Coastal Environmental Baseline Program that will collect data at six pilot sites over the next four years, including in the port of Vancouver; and a national Cumulative Effects of Marine Shipping Initiative at six pilot sites, including one in South Coast B.C., which will include regional cumulative effects assessments at each pilot site and the identification of potential tools and strategies that can be applied to existing or future vessel movements.

Louis Bull Tribe recommended that a regional cumulative effects management plan for the Salish Sea should be developed.

The Board received information about a number of education and outreach initiatives, such as the Coastal Ocean Research Institute's 2016 Mariner's Guide to Whales, Dolphins, and Porpoises of Western Canada; an interactive training tutorial on the protection of at-risk whale species in Pacific Northwest waters that builds upon the Mariner's Guide; and the 'Be Whale Wise' guidelines.

Mitigation: Underwater noise

Reduce speed

A number of participants noted the potential multiple benefits of speed reductions. For example, the Board of Friends of Ecological Reserves said that reduced speed mitigates acoustic noise, GHG emissions and lowers the probability of marine mammal strikes. Washington State's Department of Ecology added that speed limits can potentially improve safety and limit air pollution. PPA said the slower speeds can reduce wash and wake effects and reduce impacts on private recreational vessels.

VFPA said between August and October 2017, the ECHO Program led a voluntary vessel slowdown trial in Haro Strait, a key summer foraging area for endangered SRKW. Commercial, piloted vessels were requested to reduce speed to 11 knots. A reported participation rate of 61 per cent for piloted vessels was achieved over the trial period. VFPA said mean speed reductions varied by vessel type from 2.1 knots for bulk/general cargo ships to as high as a 7.7 knot reduction in speed for container ships, resulting in reduced mean broadband vessel source levels of between 5.9 dB and 11.5 dB. VFPA said total ambient noise received at the near-shore Lime Kiln hydrophone was reduced by a median value of 1.2 dB, and that modelling of SRKW behavioural response indicated this could result in a 10.3-11.5 per cent reduction in affected foraging time when compared to baseline conditions. VFPA concluded that reducing vessel speeds is an effective way of reducing the underwater noise generated at the vessel source for all major deep sea vessel categories, as well as reducing total underwater noise in nearby habitats, which may in turn benefit the behaviour and foraging success of SRKW. Transport Canada said that the studies following the 2017 Haro Strait slowdown found that the total percentage of time below the noise threshold level (below which SRKW behavioural response is not anticipated) increased slightly, which suggests that the increased transit time did not increase the duration of impactful underwater noise for this trial.

VFPA said, as a result of these positive findings, in 2018 industry moved away from the concept of a trial and led the implementation of a voluntary slowdown action. A refined approach was proposed to address the reality that a single speed limit slowdown disproportionately affects faster vessel types more than slower vessels: commercial, piloted vessels were requested to slow to 15 knots or less for ships generally traveling at faster speeds (containerships, passenger/cruise ships, car carriers) and 12.5 knots or less for slower ships (bulkers, tankers, general cargo). Transport Canada said participation increased from 61 per cent in 2017 to 88 per cent in 2018. The 2018 slowdown action in Haro Strait also implemented dynamic start and end dates based on SRKW presence, commencing when SRKW were confirmed to be present in the area, and extending while SRKW were recorded each week. Analysis of 2018 data is currently underway and it is anticipated that results will be reported out in Spring 2019.

Transport Canada said the Haro Strait voluntary vessel slowdown will remain a stable, voluntary seasonal measure in the years ahead, subject to regular analysis of its effectiveness, results and socio-economic impacts. VFPA said it and its partners are intending to enter into a SARA section 11 conservation agreement with the Government of Canada for a five-year formalized commitment to maintain and build upon the current ECHO Program voluntary slowdown. Transport Canada said it is committed to providing ongoing financial support to the ECHO Program to support SRKW recovery.

A number of participants said they do not support voluntary measures as a long-term approach to managing species at risk, and they should be mandatory instead. VFPA noted a number of benefits of maintaining a voluntary approach, such as allowing for ongoing refinement and adaptation, and achieving both high participation rates and effective noise reduction measures whilst allowing for a small percentage of vessels who would otherwise experience significant economic impacts (e.g., missing a tidal window, exceeding 8 hour pilot shift time) to not participate on certain transits. Transport Canada added that current voluntary measures are in place in both Canadian and U.S. waters and with the cooperation of U.S. counterparts, whereas a mandatory Canadian measure would not be enforceable in U.S. waters and so would likely be significantly reduced. Transport Canada said should voluntary slowdowns prove ineffective, the government has tabled amendments to the *Canada Shipping Act, 2001* which would give the Minister of Transport the authority to implement mandatory measures, although additional analysis and efforts at coordination with the U.S. would need to be undertaken.

Lyackson First Nation said it is concerned that the ECHO slowdown did not encompass or identify future slowdown procedures for the Strait of Georgia and Boundary Pass. Transport Canada said based on the analysis of the 2018 slowdown and pending the outcome of safety and economic considerations, the 2019 slowdown will include consideration of an extension of the slowdown zone into Boundary Pass, which it noted is the only additional speed reduction location under consideration at this time. The Board heard there are a number of potential challenges with expanding the slowdown, including:

- *Some vessels get louder:* DFO said the broadband noise reduction is typically found to be between 0.5 and 1.5 dB per knot across all vessel classes, but there is significant variability between vessels, and that some ships (e.g., ferries with variable-pitch propellers) do not get quieter with reduced speed, and may actually show an increase in noise.
- *Safety considerations:* Transport Canada said that challenging navigational conditions and the impact of weather in certain areas will make effective implementation difficult, depending on speeds considered.

- *Unintended environmental side-effects:* DFO pointed out the need to account for potential vessel accelerations in other locations to maintain the shipping schedule, which could result in an overall increase in sound exposure and in ship strike risk for other whale species in other areas of the vessel route.
- *Cost and Port competitiveness:* VFPA said expanding the geographic extent of the slowdown will increase a vessel's transit time through that larger area, increasing the overall time delay and the potential for a vessel operator to experience operational and economic challenges, which could in turn result in an overall reduction in voluntary participation rates. VFPA said that increased time on water due to vessel slowdowns could also put increased pressure on pilots, and perhaps an overall requirement for more qualified pilots.

Dynamic slowdowns

A JASCO report filed with the Board suggested that dynamic speed limits based on real-time visual or acoustic detections of whales near shipping lanes could be an effective way to implement mitigations with less impact on schedules and less cost to the shipping industry. A number of potential ways that whales might be detected, and some the challenges involved, were identified to the Board in this reconsideration:

- *Whale report alert system:* VFPA said in 2018, the ECHO Program and Prince Rupert Port Authority partnered with Ocean Wise Coastal Ocean Research Institute to use the sightings reports obtained through the B.C. Cetacean Sightings Network to develop a system that will provide near-real time alerts of whale presence to select vessel operators on B.C.'s coast. Federal authorities said that Ocean Wise has completed an initial pilot of its Whale Report Alert system and Transport Canada will be providing funding to support further development and deployment.
- *Marine mammal observers (MMOs):* DFO Science Branch said that trained marine mammal observers (MMOs) or video monitoring systems could be posted on the bows of ships, but are likely to be useful only when sighting conditions are good (low sea state, low swell, no fog, daylight sufficient to detect surfaced or barely-submerged animals, large or highly-visible target species).
- *Detection technology:* The federal authorities said that DFO researchers are developing and testing various acoustic and imaging technologies able to detect the presence of whales in near real-time. DFO said that technologies to detect marine mammals under low visibility conditions (e.g., at night, in fog) have undergone limited testing and have generally been found to perform poorly except for detecting large cetaceans at distances of several kilometres in calm sea states.

Transport Canada said there may be many circumstances when a master or pilot is able to take an action (slow down or alter course) in response to whale presence that will reduce the impact of physical and acoustic disturbance. A paper by Williams et al. filed by Trans Mountain states that ships are unlikely to be able to make rapid adjustments to course and speed in response to real-time whale detections. The authors state that the notion of a rapid response seems impractical in the confined waters of the Salish Sea, given navigational safety concerns, and they suspect that notices to mariners may be useful on the scale of a day (e.g., whales have or have not been seen on that day).

Likewise VFPA said some advance notice (on the order of 12-16 hours) would be required for implementation to alleviate shore-side impacts or pilotage timing, and that immediate action would be very challenging. The Chamber of Shipping also pointed out that ship owners and operators do require some degree of predictability, so advance notice would increase the probability of compliance in a voluntary framework. This could be as little as 96 hours but longer would be preferable for vessels with additional constraints, such as draft.

Reroute shipping

In its evidence, DFO identified the direct potential advantage of altering shipping routing is to decrease noise exposure levels and duration by increasing the distance between the vessels creating the noise and the whales occupying a given habitat, although such rerouting will result in an increase in the noise exposure levels in the area surrounding the new routing location.

Two different routes were discussed:

- *Rosario Strait:* Transport Canada said that the risk associated with redirecting traffic through Rosario Strait was found to be high as a result of the narrowness of the passage and its hydrography; that the Strait is entirely within U.S. waters; and that Transport Canada does not consider this particular rerouting a feasible mitigation measure. Trans Mountain noted the route is approximately 16 nm (30 km) longer, and it intersects with other traffic to and from the Port of Seattle.

- *North:* PPA said another alternative could be the Inside Passage north through Seymour Narrows and Johnstone Strait, but said this passage is subject to extreme currents, a number of unmarked dangers and a number of narrow passages, no radar coverage along the Inside Passage, extremely tight turns, and due to these many identified hazards there is a guideline restriction on tankers through this area. Trans Mountain added that while this route avoids the areas that have been identified to date as SRKW critical habitat, it passes through critical habitat for NRKW and past other environmentally sensitive areas.

PPA argued that, in its view, compared to alternatives, the present routing through Boundary Pass and Haro Strait is the safest and most practical, given it has a two way traffic separation scheme (TSS) along the entire route, the area is largely covered by radar monitored by Vessel Traffic Services, the average width of the TSS in Boundary Pass and Haro Strait is over a nautical mile wide with much of the safe navigational area exceeding this, navigational dangers along the route are well marked, and a special operating area has been established in the vicinity of Turn Point.

VFPA said an alternative to moving shipping lanes is to laterally displace shipping to one side within a shipping lane. VFPA indicated that the ECHO Program and Transport Canada conducted a voluntary lateral displacement trial from August 2018 to October 2018 in the Strait of Juan de Fuca to move vessels southward, further from SRKW feeding areas along the northern side of the Strait of Juan de Fuca. Transport Canada said JASCO modelling of this lateral displacement trial indicates that, while shifting commercial shipping towards the centre of the shipping lane has little effect, a shifting of offshore smaller vessel traffic (including tugs) towards the centre of the Strait produces important noise savings. DFO said it will be analyzing acoustic data from before, during and after the trial to evaluate the potential reductions in underwater ambient noise in the foraging area, and it is anticipated that results will be reported out in Spring 2019. VFPA said if the results are positive, the parties to the conservation agreement noted above intend to work collaboratively to consider the continued implementation of a similar seasonal lateral displacement measure annually for five years, where it is safe and operationally feasible to do so.

Two other potential lateral displacements, or shifting of shipping lanes, were discussed in the evidence:

- *Haro Strait:* The Board heard that SRKW heavily utilize the area along the west side of San Juan Island, raising the question of whether a westward shift within Haro Strait might be possible. VFPA said when the ECHO Program considered this, safety concerns were raised around inbound and outbound traffic coming into closer proximity in this narrower strait, as well around recreational vessels potentially redirecting into the Traffic Separation Scheme. Transport Canada said Haro Strait is a relatively narrow channel, at the south end there is a complex routing system that has connections to the waters of Puget Sound, there are strong tidal currents, the south end can be subject to strong winds, and there are several areas with shoals and areas dangerous to navigation. Transport Canada concluded that, while it may be possible to make some changes that might mitigate adverse effects on SRKW, they are likely to be very limited.
- *Victoria to Race Rocks:* The Board of Friends of Ecological Reserves asked about a possible lateral displacement of shipping to the south in the Victoria to Race Rocks area to move it further from shore. VFPA said the ECHO Program looked at a potential southward shift of the shipping lanes in this area, but said that a navigational risk assessment deemed it unacceptable for further examination, and that a similar risk assessment would be required to evaluate the feasibility of lateral displacement within the shipping lanes. Transport Canada said it will be conducting a feasibility study on potential amendments to the Traffic Separation Scheme in this area to explore what may be possible to reduce the impacts of underwater noise on SRKW.

The potential for alternative marine terminal locations (which would result in alternative shipping routes) is discussed in Sections 14.6.2 and 11.1.2.

Sanctuaries / acoustic refuges

In its evidence, DFO noted that it has recently commenced work examining the feasibility of SRKW sanctuaries to reduce physical and acoustic disturbance within key sub-areas of critical habitat, with a particular focus on foraging areas. Federal authorities said a sanctuary could, for example, be established as a Marine Protected Area under the Oceans Act and that activities such as fishing and commercial carrier vessels, ferries, whale watching vessels, and recreational boating could be restricted or prohibited when SRKW are present. DFO said candidate area discussions will be linked to discussions on potential future fisheries closures, given fishery closures also limit acoustic and physical disturbance of SRKW by reducing the number of fishing vessels in key foraging areas.

In various submissions, participants noted a number of potential challenges with sanctuaries, such as potential socio-economic concerns, impacts on Indigenous fishing rights, safety concerns if small craft operators are pushed closer to the Traffic Separation Scheme, potential enforcement difficulties for small recreational crafts, and the need to respond dynamically if SRKW foraging areas changes.

Whale watching boats

The Board heard about a number of measures in place to reduce disturbance on whales from whale watching boats, including voluntary guidelines and amendments to the Canadian *Marine Mammal Regulations* under the *Fisheries Act* that include a minimum approach distance of 100 metres for most whales, dolphins and porpoises, as well as a new mandatory requirement for vessels (except those in transit, such as tankers) to stay at least 200 metres away from killer whales in B.C. and the Pacific Ocean. The SRKW Imminent Threat Assessment filed by federal authorities states that DFO has identified the need for discussions with other sectors, including whale watching, to understand activity levels within key foraging areas and what potential additional voluntary measures may be taken to minimize physical and acoustic disturbance in identified killer whale foraging areas to the extent possible.

The Washington State November 2018 Southern Resident Orca Task Force Report and Recommendations included a number of recommendations aimed at decreasing disturbance and risk to SRKW from whale watching boats:

- Establish a statewide "go-slow" bubble (7 knots or less) for small vessels and commercial whale watching vessels within half a nautical mile of SRKW.
- Establish a limited-entry whale-watching permit system for commercial whale-watching vessels and commercial kayak groups in the inland waters of Washington.
- Increase the buffer to 400 yards behind the orcas in order to decrease the occurrence of chase-like situations.
- Suspend viewing of SRKW: establish a whale watching regulation that precludes SRKW viewing by all boats in Puget Sound for the next three to five years. The Pacific Whale Watch Association (PWWA) did not support this proposed moratorium, and instead proposed a plan that would include a goal of 'near zero' acoustic footprint from vessels in the vicinity of SRKW, establishment of a panel of scientists to issue recommendations on how best to achieve that goal, and a permit system to cap the industry and which could require adherence to restrictions in an adaptive manner such as quieter propulsion systems, 'engine off' zones, or silent electric propulsion only zones, as necessary over time.

In Canadian waters, DFO said that there are currently no limitations on the number of whale watching boat trips, and there is currently no permitting scheme for whale watching or commercial kayak vessels.

Quieter vessels

The Board received considerable evidence and submissions about the potential for wide-ranging and multiple benefits if ships are simply quieter. For example, a July 2018 JASCO report noted that ship design changes, vessel retrofitting, and regular ship maintenance could result in long-lasting change to underwater noise levels everywhere that these vessels operate. VFPA likewise cautioned against focusing too heavily on short-term operational measures such as reducing vessel speed to reduce vessel noise, saying it could have the unintended consequence of stifling innovation and progress towards the development of ship design and technology solutions, which will yield much greater conservation benefits regionally and globally in the longer term.

VFPA said a study conducted for the ECHO Program found that regular hull cleaning and propeller cleaning and repair was reported in literature as having measurable underwater noise reduction potential. DFO said that more information is needed to determine which types of maintenance are most important in reducing noise levels and how frequently maintenance must be performed to be effective. Federal departments said Transport Canada is supporting a project to evaluate the potential noise and fuel consumption reductions associated with vessel hull and propeller cleaning, and that trials have been completed and data analysis is underway.

In a letter from Canada to the Marine Environmental Protection Committee (MEPC) of the International Maritime Organization (IMO) filed by federal authorities, Canada said that ship design is likely to provide the best long-term solutions to the challenge of underwater noise, but can only be introduced gradually as new ships are built and existing ships refitted. In another such letter, Canada said there have been significant advances in quiet ship design, technologies, and understanding since the adoption of the 2014 IMO Guidelines for the Reduction of Underwater Noise. Canada provided an example: Maersk invested in ship design retrofits for 11 of its Panamax-size container ships, such as a new propeller with four fins and propeller boss cap fins to reduce cavitation. As well as a 10 per cent improvement in fuel efficiency and associated air and GHG emission reductions, noise reductions of 6-8 dB were observed and largely attributed to these retrofits.

Transport Canada in its evidence said it is undertaking a number of research initiatives to advance long-term, sustainable reductions in underwater radiated noise through the design of new, quiet vessels and the refit of existing vessels. For example, the department is funding a technology scan to identify mature and near commercial technologies with the greatest potential to reduce vessel URN. Transport Canada said it is also evaluating classification society noise criteria in

order to model the underwater radiated noise reductions that could be achieved in the Salish Sea, if commercial vessels complied with them (or alternative proposed silent notations).

VFPA said that in 2017 it became the first port in the world to offer financial incentives to vessel operators for underwater noise reduction. VFPA said vessels with a quiet notation from ship classification societies are eligible for a gold level (47 per cent) discount in harbour dues, and vessels with certain cavitation and wake flow reduction technologies are eligible for a bronze level (23 per cent) discount. VFPA said, however, that it has not been advised of any vessels installing the technologies for the purposes of underwater noise reduction, or for application to the EcoAction Program, although one commercial vessel achieved a quiet ship notation, anecdotally due to the introduction of the EcoAction program incentives. VFPA said the EcoAction Program underwater noise reduction incentives would be most effective if multiple ports around the world offered similar incentives, and Transport Canada said it has provided funding to ECHO to advance work with other ports towards aligning underwater noise incentives and programs.

Federal authorities pointed out that Canada is actively working at the Marine Environmental Protection Committee (MEPC) of the International Maritime Organization (IMO) with respect to underwater noise from shipping, in particular to promote the adoption of quiet ship design standards and technologies, and update the existing 2014 IMO Guidelines for the Reduction of Underwater Noise. Marine Advisor Mr. Clarkson encouraged the government of Canada to have maximum participation as possible with the appropriate IMO committee responsible for undertaking noise reduction study.

Mitigate the 'noisiest' first

Friends of the San Juans submitted a study that found that just 15 per cent of the vessels generate 50 per cent of the noise, and that removing such "gross polluters" would significantly reduce vessel noise impacts to SRKW and other marine species. Trans Mountain posited that since increased or atypical underwater noise could be symptomatic of a maintenance issue with a vessel, it agrees that regulatory agencies could track and monitor vessel underwater noise profiles to identify vessels with such issues so that they may be rectified through effective maintenance.

Transport Canada indicated, however, that there are challenges associated with implementing a program to target specific measures at the noisiest individual vessels, which would include the logistics of determining the noisiest vessels on an ongoing basis, ensuring all vessels throughout the SRKW critical habitat are being included, and developing regulations around that group. Transport Canada added that many of the deep-sea commercial vessels that visit the Port of Vancouver do so less than a handful of times per year, and the benefit of targeting measures at vessels that spend very little time in Canadian waters has not been ascertained. VFPA added that the source level of each vessel is not the only component to be considered, as time-on-water, or time in a specific area is also a component of cumulative noise. VFPA said an alternate option could be for ports in the region to provide recognition or incentives to the quietest vessels, and provide a report card to the noisiest vessels with a request to improve via maintenance, technology application or to potentially implement additional operational mitigation requirements through key areas of importance to SRKW for the vessel's return visit.

Underwater Noise Management Plans and ferries

DFO's suggested priority recovery measures for SRKW include implementing incentive programs and regulations that result in reduced acoustic footprints of the vessels habitually travelling in and near important SRKW habitat. Federal authorities informed the Board that Transport Canada is working to have policy and supporting materials in place so that Canadian fleet owners and operators will begin development and implementation of Underwater Noise Management Plans (UNMPs) to reduce noise by operational and technical means by summer 2019, at least for fleets operating in the Salish Sea. Transport Canada said elements under effective UNMPs could include underwater noise considerations in fleet renewal through quiet ship design, retrofitting ships to be quieter and implementing maintenance plans, as well as operational measures that could be used in the presence of whales to reduce a vessel's impact.

Federal authorities established that Transport Canada is pursuing a conservation agreement with B.C. Ferries on the development and implementation of an UNMP to reduce underwater noise from their fleet, and has signed an agreement with the Canadian Ferry Association to commit to work with other ferry operators on noise reduction targets and to research quiet vessel design and retrofit options for ferries. Transport Canada said these conservation agreements do not create legally enforceable requirements, but they do seek to obtain a commitment to collaborate on measures in the years ahead. In response to the Board's draft recommendations, the Chamber of Shipping said B.C. Ferries has been leading with voluntary measures to mitigate increases to underwater noise and strike risk. The Chamber of Shipping said explicit underwater noise reduction targets for ferries would be premature at this time.

Immediate actions directed by Washington State governor when setting up the Southern Resident Orca Task Force included developing strategies for quieting state ferries in areas most important to SRKW. The November 2018 Southern Resident Orca Task Force Report and Recommendations included a recommendation to reduce noise from Washington state ferries by accelerating the transition to quieter and more fuel-efficient vessels and implementing other strategies to reduce ferry noise when SRKW are present.

Quiet periods

With regard to the potential for creating 'quiet periods' by convoying vessels in the shipping lanes, DFO said that using convoys will increase the sound level and duration of a single transit event (several ships in line), but increase the duration of quiet times between them. DFO said, however, that little is known about the importance of quieter periods to SRKW. The July 2018 JASCO report modelled convoys, and concluded that convoys are not highly beneficial because the noise from non-convoyed vessels filled in the quiet times. Transport Canada added that convoys present a 'high risk' to navigational safety due to the proximity within which vessels would have to travel, and as a result, are not considered to be a feasible mitigation measure for large vessels.

Another potential method of creating 'quiet periods' identified to the Board involved restricting vessel traffic at night through sensitive critical habitat zones. DFO noted that while such an approach would make it quiet at night, it would inevitably increase the noise levels during daytime. DFO said the effectiveness of this mitigation measure would depend on whether SRKWs engage in feeding at night (noting it is logical to think that they do), but night-time foraging behaviour is currently subject to scientific study in both Canada and the U.S. Trans Mountain argued that as far as its applicability to Project-related vessels, this measure is both technically and economically infeasible: given the requirement that loaded tankers transit Second Narrows in daylight and appropriate tidal conditions, a night time restriction at Haro Strait may result in the vessel having to go to anchor, creating pressure on existing anchorages or requiring the creation of new ones. Further, concentrating all vessel traffic within daytime hours would create possible safety concerns due to bunching of vessels, and increase costs for shippers due to additional hours of charter hire. Marine Advisor Mr. Clarkson added that in his opinion, restricting marine traffic in Haro Strait at night is impractical, because it would cause traffic congestion and decrease the safety of vessel traffic. As well, he pointed out that agreements on the rights of passage with the U.S. would need to be considered since this is a shared waterway.

No net increase in underwater noise

T'sou-ke Nation said that its outstanding concerns include the need for a mitigation and impact offset plan for SRKW to address all adverse impacts of marine shipping on the whales as much as possible (e.g., noise, direct interference with habitat, collision risk, and oil spill risk). A paper by Williams et al. submitted by Trans Mountain said that some level of noise reduction will be needed to ensure that additional ship traffic does not cause a net increase in noise levels in SRKW critical habitat; in fact, some currently unspecified level of net reduction in noise will be needed to promote recovery. A July 2018 JASCO modelling report commissioned by Transport Canada found, for example, that an 11 knot speed limit in Haro Strait reduced SRKW-weighted noise levels, but a speed limit much higher than 11 knots would likely be insufficient to balance the additional noise produced by Project traffic.

Transport Canada testified that its current and planned mitigation measures aim for a net-zero increase in underwater vessel noise as a result of Project shipping. It said that net-zero or net-benefit could possibly be achieved by offsetting but more analysis is needed to determine what a reasonable scenario for each would be and to define an appropriate offset ratio. A 2017 DFO report on mitigation measures to reduce shipping-related noise noted that, in previously approving the Project, the Government of Canada committed to more than mitigate the impact of additional Project traffic on SRKW before any shipping associated with the Project begins.

Transport Canada said it has undertaken analysis of underwater noise in various areas of SRKW critical habitat and, through modelling, can determine acoustic baselines and mitigation impacts in both local areas as well as global averages for the entire SRKW critical habitat. DFO said acoustic information is being collected with hydroacoustic listening stations to measure the before and after acoustic signature in the Project area, and with ongoing collection of acoustic information via passive acoustic monitors, empirical data could be used in the future to determine the efficacy of offsetting measures pertaining to noise reduction.

A report by Green Marine prepared for Transport Canada reported that a Marine Strategy Framework Directive was adopted by the European Parliament and the Council of the European Union in 2008. As part of this initiative, the European Commission in 2010 defined two indicators for underwater noise, one of which is for continuous low-frequency sound (designed mainly as a measure of shipping noise) and which includes monitoring of continuous low-frequency sound with the aim of keeping the annual average ambient noise level below the baseline value of the year 2012.

Mitigation: Strike risk

Transport Canada noted the International Whaling Commission acknowledges that there is no universal solution to the problem of ship strikes but the most effective way to reduce collision risk is to keep whales and ships apart, and where this is not possible, for vessels to slow down and keep a look out. The Board heard that many of the mitigations discussed above to reduce underwater noise will also be relevant to reducing the risk of strikes.

Reduce speed

Trans Mountain testified that it has been shown that reducing vessel speed reduces both the relative likelihood of a vessel strike and the likelihood that a strike results in severe or fatal injuries. DFO said the probability of a lethal injury to a whale when struck by a vessel increases significantly above 9 knots and almost certainly results in whale death above 15 knots. DFO said that the potential to reduce the risk of lethal vessel strikes by reduced vessel speeds has been demonstrated for North Atlantic right whales following the 2008 implementation by the U.S. National Oceanic and Atmospheric Administration (NOAA) of a general speed limit of 10 knots in critical habitats and 20 nautical miles around major ports on their migratory path in U.S. waters.

DFO said mitigation measures will be most beneficial if they target areas where species of concern congregate and exhibit high overlap with shipping activity. For example, DFO said observations from recent surveys and current distribution models both highlight the Strait of Juan de Fuca as a potentially important habitat for Humpback whales and therefore as a site of high risk of collisions where mitigation measures would likely be beneficial. Likewise, recovery measures with regard to vessel strikes in the 2017 Action Plan for Blue, Fin, Sei and North Pacific right whales in Canadian Pacific Waters include identifying areas of high risk of interactions through the continued development of spatial analysis of potential whale distribution with respect to ship traffic data. With regard to timing, DFO said mitigation measures targeting periods when abundance of species is highest would likely be most beneficial.

As with dynamic slowdowns to reduce underwater noises, the Board also received evidence that there are challenges with respect to real-time dynamic slowdowns to reduce the risk of strike. For example, DFO said in critical habitat areas, such as the Strait of Juan de Fuca and Swiftsure Bank, the Project tankers are too large and moving at speeds too great to allow for much manoeuvrability should an animal be detected ahead of the ship, and many ship strike records indicate that the whales surfaced close to the front of the ship. Further, within the narrower waterways of the Salish Sea, the ability to manoeuvre the ship away from a whale is limited and likely poses a safety risk in those narrow waterways. DFO said therefore, it is unlikely that marine mammal observers posted on vessels will achieve a significant reduction in the risk of ship strike. DFO added that ships changing speed or direction could confuse the whales with consequent potential increase in strike risk due to lack of predictability of ship movement.

DFO pointed out the effort within the Federal Government's Ocean Protection Plan Whale Collision and Avoidance Initiative to evaluate methods and technology that could be useful for real-time ship alerts of whale presence, such as acoustic monitoring networks in areas of high collision risk, infrared automated detection in narrow waterways, and automated delivery of sightings via mariner sightings networks among other approaches.

Reroute shipping

Participants indicated that measures that alter vessel movements, such as speed restrictions or relocating shipping lanes to avoid marine mammal congregation areas, are effective at reducing impacts from marine shipping practices. Trans Mountain said that steps have been taken by some countries, primarily through government agencies, to reduce ship strike potential to endangered whale species through modifications to vessel operations, such as changing shipping routes. Trans Mountain said that in the Bay of Fundy internationally-mandated shipping lanes were shifted, from an area with high right whale densities to an area with lower right whale densities, which has reduced the relative potential for accidental collisions between right whales and ships by approximately 80 per cent.

DFO said that while the focus of the ECHO Program voluntary lateral displacement trial in the Strait of Juan de Fuca is on reducing noise for SRKW, strike risk could also be lowered by moving vessels away from foraging habitat. DFO noted, however, that ship strikes on marine mammals are not currently being assessed as part of the trial.

Pacheedaht First Nation raised concerns about Swiftsure Bank, and said the outbound shipping lane in the Strait of Juan de Fuca was moved in about 2005, and now goes through Swiftsure Bank. The Greenwood Risk Assessment commissioned by Transport Canada deemed a possible shift of the shipping lanes at the entrance to the Strait of Juan de Fuca further south to provide greater separation from Swiftsure Bank to be acceptable for further examination, although it noted this would be a regressive step towards where the lanes were prior to 2006.

Other mitigations

The 2018 RKW Recovery Strategy noted that personal watercraft (PWC) or 'jet skis' are capable of much more erratic or unpredictable manoeuvres than traditional high-speed vessels, and as a result pose a collision risk to killer whales and other wildlife. It notes that PWC have been banned in the San Juan Islands and in portions of the Monterey Bay National Marine Sanctuary, but they are not banned in the coastal waters of B.C., with the exception of the inner waters of Vancouver Harbour.

A 2017 paper by Nichol et al stated that active acoustic alarms intended to warn whales of approaching vessels have been tested but were unsuccessful, as these sounds caused diving right whales to return to the surface, which increased their exposure to ship strikes rather than reducing it.

Federal authorities said, under the Oceans Protection Plan, a national approach and capacity has been developed by DFO to better respond to marine mammal incidents such as collisions, entanglements and stranding. DFO added that the recently amended Marine Mammal Regulations, which came into force July 2018, include requirements for mandatory reporting on all accidental contact between a vehicle or fishing gear and a marine mammal. DFO said this will provide a more comprehensive data set regarding vessel strikes going forward.

Mitigation: Contamination

A number of mitigation measures aimed at reducing the contaminant loading of the Salish Sea were identified during this MH-052-2018 hearing, such as:

- Transport Canada said that discharges from vessels to water can occur during routine vessel operations, but that such discharges are governed under the *Vessel Pollution and Dangerous Chemicals Regulations* which implement requirements of the MARPOL Convention. Transport Canada described, for example, the treatment of bilge water, oily-water separators, and restrictions on the discharge of sewage. Transport Canada added that Canada is also party to the *International Convention on the Control of Harmful Anti-Fouling Systems on Ships*, which prohibits and/or restricts the use of harmful anti-fouling systems.
- The Federal authorities said that the Wastewater System Effluent Regulations (WSER) require wastewater treatment plants in Canada to upgrade to at least secondary treatment, which can remove approximately 90 per cent of contaminants such as flame retardants (PBDEs) and 95 per cent of conventional pollutants. Under the WSER, the Capital Regional District in Victoria and the Metro Vancouver Lions Gate must install or upgrade facilities to achieve secondary treatment by December 2020, and Iona Island wastewater treatment plants must upgrade to secondary treatment by 2030; and the two regional districts will receive up to $423 million from the Government of Canada for upgrades at Lions Gate wastewater treatment plant and pump stations in Victoria, the latter where treatment will go beyond secondary.
- Federal authorities noted that in October 2018, ECCC published a Notice of Intent to strengthen controls for five persistent organic pollutants and by winter 2020 government will publish proposed amendments to the regulations.
- A new whale contaminant research program was identified by DFO that will concentrate on prey because they are the main route of entry of contaminants into whales.

Mitigation: Prey abundance (Chinook salmon)

A number of the mitigation measures noted below with regard to salmon mitigation in general are relevant to Chinook. Additional measures aimed specifically at SRKW prey abundance were identified by parties in this reconsideration, such as:

- Federal authorities noted that DFO intends to increase SRKW prey abundance and availability by increasing hatchery production at facilities which enhance stocks that most benefit SRKW, while minimizing potential effects of hatchery origin fish on naturally spawning populations.
- DFO reported that fishery management measures were introduced for the 2018 salmon fishing season to reduce the total harvest for Chinook salmon by 25-35 per cent. This included closures in portions of the Strait of Juan de Fuca and the Gulf Islands, as well as partial closures at the mouth of the Fraser River, with the aim of protecting key foraging areas for SRKW by reducing competition between fishers and whales. DFO said that a post-season review of the effectiveness of the closures is underway.
- DFO said, in December 2018, it struck an SRKW Prey Availability working group to provide specific recommendations on actions to be taken in 2019 to improve prey availability for SRKW, and proposals for initial longer-term actions will be developed by June 2019.

Musqueam expressed concern about potential fishery closures to support prey abundance for SRKW affecting their opportunities to fish, and presented a report arguing that there is very little evidence that decreasing fisheries results in an increase in prey availability to SRKW, considering the complicated interaction of other factors. Pacheedaht and Ditidaht First Nations said that their rights need to be respected in any measures that are implemented in relation to the protection of SRKW.

Mitigation: SRKW critical habitat

DFO said that SARA protects critical habitat from destruction, and that since shipping noise is identified as an activity likely to destroy critical habitat, any temporary loss of function should warrant very high priority for management action to reduce this threat, although it is very difficult to determine thresholds or measures of habitat quality. Federal authorities said the amended 2018 RKW Recovery Strategy identifies additional critical habitat for RKW encompassing waters off of southwestern Vancouver Island, including Swiftsure Bank which is an important area for both SRKW and NRKW and overlaps a small portion of the marine shipping lanes at the western end of the Strait of Juan de Fuca.

Views of the Reconsideration Panel

Permanent auditory injury, temporary auditory injury, and sensory disturbance

The Board accepts Trans Mountain's acoustic modelling and finds that permanent or temporary auditory injury is not expected to occur as a result of Project-related marine vessel traffic. The Board is of the view that the underwater noise modelling methods, including scenario locations, were appropriate for the scope of Trans Mountain's assessment. The Board acknowledges that Trans Mountain's underwater noise modelling is meant to be reasonably representative of various locations along the shipping lanes and understands that underwater noise levels could vary from the predicted values provided by Trans Mountain across locations along the shipping lanes according to a variety of factors. The Board recognizes the concerns raised by DFO related to Trans Mountain's underwater noise modelling; however, in the absence of any quantitative evidence to suggest that underwater noise levels would substantially vary from Trans Mountain's predicted values, the Board accepts Trans Mountain's underwater noise modelling. The Board also notes that Trans Mountain did provide a qualitative assessment of the cumulative effects of Project-related marine shipping on marine mammals.

The Board finds that underwater noise produced from Project-related marine vessels would result in sensory disturbance to marine mammals. The Board is of the view that sensory disturbance is expected to be a long-term effect as it is likely to occur intermittently for the duration of operations of Project-related marine vessel traffic. The Board finds this effect to be reversible and is of the view that once a marine mammal is no longer exposed to underwater noise from Project-related marine vessels, then behavior would likely return to normal. The Board accepts that some marine mammals may habituate to underwater noise associated with marine shipping. However, the Board recognizes that sensory disturbance and habituation would result in a variety of adverse effects on marine mammals. The Board also recognizes that the Regional Study Area (RSA) is a heavily utilized marine environment, which is predicted to increase in use, and that once exposure to underwater noise from Project-related marine vessels ceases, it is likely that marine mammals would be exposed to some form of disturbance soon after from another marine vessel. The Board is of the view that the magnitude of this effect would vary, according to biological and environmental conditions, and the species exposed. The Board has carried the above criteria (e.g., reversibility, temporal, and spatial extent) through to its species-specific assessment, which is provided below.

Vessel strikes

The Board recognizes that Project-related marine vessels have the potential to strike a marine mammal, which could result in lethal or non-lethal effects. The Board is of the view that the risk of a marine mammal vessel strike in the RSA would exist for the duration of operations of Project- related marine vessel traffic. The Board finds that the effects of a marine mammal vessel strike would range from reversible to permanent, depending on the severity of the strike (i.e., mortality would be permanent). The Board is of the view that the magnitude of a marine mammal vessel strike would vary according to the extent of the injury and the species struck. The Board has carried the above criteria (e.g., reversibility, temporal, and spatial extent) through to its species-specific assessment, which is provided below. The Board also recognizes that the RSA is a heavily utilized marine environment which is predicted to increase in use, and that the increase in Project-related marine traffic would contribute to the cumulative risk of marine mammal vessel strikes. The Board acknowledges Trans Mountain's commitment to include, as part of its Port Information and Terminal Operations, explicit guidance for reporting marine mammal vessel strikes and mammals in distress to the appropriate authorities to provide clarity around the frequency of marine mammal vessel strikes.

Southern resident killer whale

The Board is of the view that the Southern resident killer whale population has crossed a threshold where any additional adverse environmental effects would be considered significant. The Board is also of the view that the current level of vessel traffic in the RSA and the predicted future increase of vessel traffic in the RSA, even excluding the Project-related marine vessels, have and would increase the pressure on the Southern resident killer whale population. Trans Mountain's Summary of Existing and Future Vessel Movements at Five Locations in the RSA indicates that Project-related marine vessels would represent a maximum of 13.9 per cent of all vessel traffic in the RSA, excluding Burrard Inlet, and would decrease over time as the volume of marine vessel movements in RSA is anticipated to grow. While the effects from Project-related marine vessels will be a small fraction of the total cumulative effects, the Board acknowledges that this increase in marine vessels associated with the Project would further contribute to cumulative effects that are already jeopardizing the recovery of the Southern resident killer whale. The effects associated with Project-related marine vessels will impact numerous individuals of the Southern resident killer whale population in a habitat identified as critical to the recovery and classifies the effects as high magnitude. Consequently, the Board finds that the operation of Project-related marine vessels is likely to result in significant adverse effects to the Southern resident killer whale.

The Board recognizes that DFO's Recovery Strategy for the Northern and Southern Resident Killer Whale (Orcinus orca) in Canada identifies that vessel noise is considered a threat to the acoustic integrity of Southern resident killer whale critical habitat, and that physical and acoustic disturbance from human activities may be key factors causing depletion or preventing recovery of resident killer whale populations. The Board notes that mortality of a Southern resident killer whale from a Project- related marine vessel collision, despite the low likelihood of such an event, would have population level consequences. The Board acknowledges that Project-related marine vessels will encounter a killer whale relatively often. However, given the limited number of recorded killer whale marine vessel strikes and the potential avoidance behaviors of killer whales, the Board agrees with Trans Mountain and DFO that the probability of a Project-related marine mammal vessel strike on a Southern resident killer whale is low.

The Board acknowledges Raincoast Conservation Foundation's Population Viability Analysis, which indicates that the factor with the largest effect on depressing population size and possibly leading to extinction is a reduction of Chinook prey base, and that Trans Mountain has indicated its historical support for wild salmon, as well as support for potential projects such as the Pacific Salmon Foundation – Salish Sea Marine Survival Project, which Trans Mountain believes would contribute to better conservation and increased abundance of Chinook salmon.

The Board recognizes that Port Metro Vancouver and the RSA currently support a large amount of vessel traffic and that the level of traffic is expected to increase with or without Project-related marine vessels. This increase will place even greater burden on the Southern resident killer whale. In this context, and in light of all of the evidence, the Board finds that the operation of Project-related marine vessels is likely to result in significant adverse effects to the Southern resident killer whale.

Since the release of the Board's OH-001-2014 Report in May 2016, the SRKW population has fallen to 74. The Board heard evidence that the abundance of the SRKW population has fluctuated over the last sixty years with a high of 98 individuals in 1995 and a low of 66 individuals in 1973, and that population levels before 1960 are not known with any accuracy. The Board also heard that a particular concern is that the sex ratio at birth is becoming increasingly male biased.

The competent Ministers under the SARA formed an opinion in May 2018 that SRKW face an imminent threat to survival and recovery, and the abundance of Fraser Chinook salmon (SRKW's primary prey) has continued to fall. The Board heard that about 80 per cent of SRKW total diet comes from Chinook salmon, and that major competitors on Chinook populations such as NRKW, transient killer whale, sea lions and seals have experienced significant population growth over recent decades. The Board heard about the many sources of contamination potentially affecting SRKW, including untreated and undertreated wastewater from the cities of Vancouver and Victoria. The Board notes that vessel strikes have also been acknowledged as a threat to SRKW in addition to disturbance, reduced prey availability and contamination. A number of intervenors asserted that SRKW is not able to withstand any additional adverse effects.[128] This is consistent with the Board's finding that the Southern resident killer whale population has crossed a threshold where any additional adverse environmental effects would be considered significant.

[128] Dr. Veirs et al., for example, in a report submitted by Raincoast, concluded that SRKW cannot tolerate any additional anthropogenic stressors. Likewise, Lacy et al. in a report by submitted by Raincoast concluded that updated analyses incorporating the data from the past four years confirmed that the population is fragile and perhaps in a slow decline, with no ability to withstand additional threats and an inability to recover unless current conditions are improved.

The Board finds that routine operations of Project-related vessels would not materially add to decreased prey abundance or contamination. With regard to prey abundance, as detailed below with regard to marine fish and fish habitat, the Board is of the view that some form of adverse, short-term effect on marine fish is likely to occur from underwater noise produced by Project-related marine vessels, but it is unlikely to translate into larger, more substantial impacts. In addition, the Board notes that DFO pointed out there is no published source of information that identifies stocks of Chinook salmon that are impacted by marine shipping activities. With regard to potential contamination from routine operations of Project-related marine shipping, the Board notes national and international requirements such as the *Vessel Pollution and Dangerous Chemicals Regulations* and *the International Convention on the Control of Harmful Anti-Fouling Systems on Ships*, and the relatively small number of Project-related vessels, in contrast to the substantial contamination from other sources such as from surrounding cities and industry.

Project-related marine shipping would, however, overlap SRKW critical habitat along the shipping route, and add to both underwater noise and the risk of strikes throughout that route. The Board remains of the view that cumulative effects are already causing significant adverse effects on SRKW, and that Project-related marine shipping will add to those effects. The Board therefore takes the precautionary view that, absent further mitigation, the designated project is likely to cause significant adverse environmental effects on SRKW because of its addition to cumulative effects.

Other toothed whales

The Board is of the view that adverse effects from an increase in vessel traffic, including Project- related marine vessels, would be comparable within similar species (e.g., toothed whales, baleen whales). The Board agrees with Trans Mountain in that the disparity between habitat usage, occurrence, and abundance of other marine mammals within the RSA are important deciding factors in determining whether or not Project-related marine vessels are likely to cause significant adverse environmental effects.

In regards to other toothed whales, the Board is of the view that effects on other toothed whales from sensory disturbance are likely to be similar across species. Some species, such as the Harbour porpoise, are likely to show more pronounced effects as they are known to be more sensitive than other toothed whales to underwater noise, but the Board accepts Trans Mountain's acoustic modelling that suggested the extent of sensory disturbance is expected to be generally comparable across all toothed whale species found within the RSA.

The Board agrees with Trans Mountain that vessel strikes would be considered a low probability event. The Board recognizes that DFO's Recovery Strategy for the Transient Killer Whale (Orcinus orca) in Canada indicates that collisions with vessels are likely of low concern. The Board finds that Project-related marine vessels would result in impacts to a few or many individual toothed whales of much larger North Pacific populations and are unlikely to result in population level consequences. The Board also recognizes that no other critical habitat has been identified in the RSA for other toothed whales. Therefore, the Board finds that the effects from Project-related marine vessels on other toothed whales are not likely to be significant. The Board finds that the contribution from Project-related marine vessels on the other toothed whales to total cumulative effects is expected to be inconsequential.

Baleen whales

The Board heard that the low frequency peak power in ship noise overlaps baleen whale signals and that baleen whales are, in general, at greater risk of being struck than toothed whales. The Board heard that as baleen whale populations recover and re-inhabit Canadian Pacific waters, the likelihood of strikes is expected to increase unless mitigation measures are put in place. The Board agrees with Trans Mountain that vessel strikes would be considered a low probability event, although the Board acknowledges there is some uncertainty as to the level of threat that strikes pose to each species, and that documented strike rates underestimate the true impact of vessel collisions on whale populations.

Humpback whale: The Board recognizes that sensory disturbance resulting from any increase in vessel traffic, including Project-related marine vessels, would impact Humpback whales and a small portion of their critical habitat (identified when the species was listed under the SARA as threatened). While the Board acknowledges that Humpback whales have the potential to be struck and killed by Project-related marine vessels, DFO's Recovery Strategy for the North Pacific Humpback whale (Megaptera novaeangliae) in Canada indicates that given the current estimated population growth rate of Humpbacks in B.C., present levels of marine shipping activities do not appear to be negatively affecting population viability at this time. The Board is of the view that Humpback whales found seasonally in the RSA, and a small portion of their critical habitat, would be adversely affected from Project-related marine vessels. In light of this, the Board finds that adverse Project-related effects on the North Pacific Humpback whale are expected to be of moderate magnitude and not likely to be significant. The Board finds that the contribution from Project-related marine vessels on the North Pacific Humpback whale to total cumulative effects is expected to be inconsequential.

Other baleen whales: The Board acknowledges that other baleen whales, many of which are SARA-listed, could potentially be found within the RSA. However, given the limited abundance and occurrence of these species in the RSA, and that no critical habitat has been identified in the RSA for baleen species other than the North Pacific Humpback whale, the Board finds that adverse Project-related marine shipping effects on other baleen whales are not likely to be significant. The Board finds that the contribution from Project-related marine vessels on other baleen whales to total cumulative effects is expected to be inconsequential.

Other marine mammals

With regard to pinnipeds (including Steller sea lion) and sea otter, while there may be some sensory disturbance from Project-related marine shipping, the Board agrees with Trans Mountain's assessment that it would be of low magnitude. This is because of, for example, habituation and a large part of the generated underwater noise being inaudible to Steller sea lions, only occasional occurrence for sea otters, and generally rapid recovery from sensory disturbance from Project-related vessels.

Existing measures

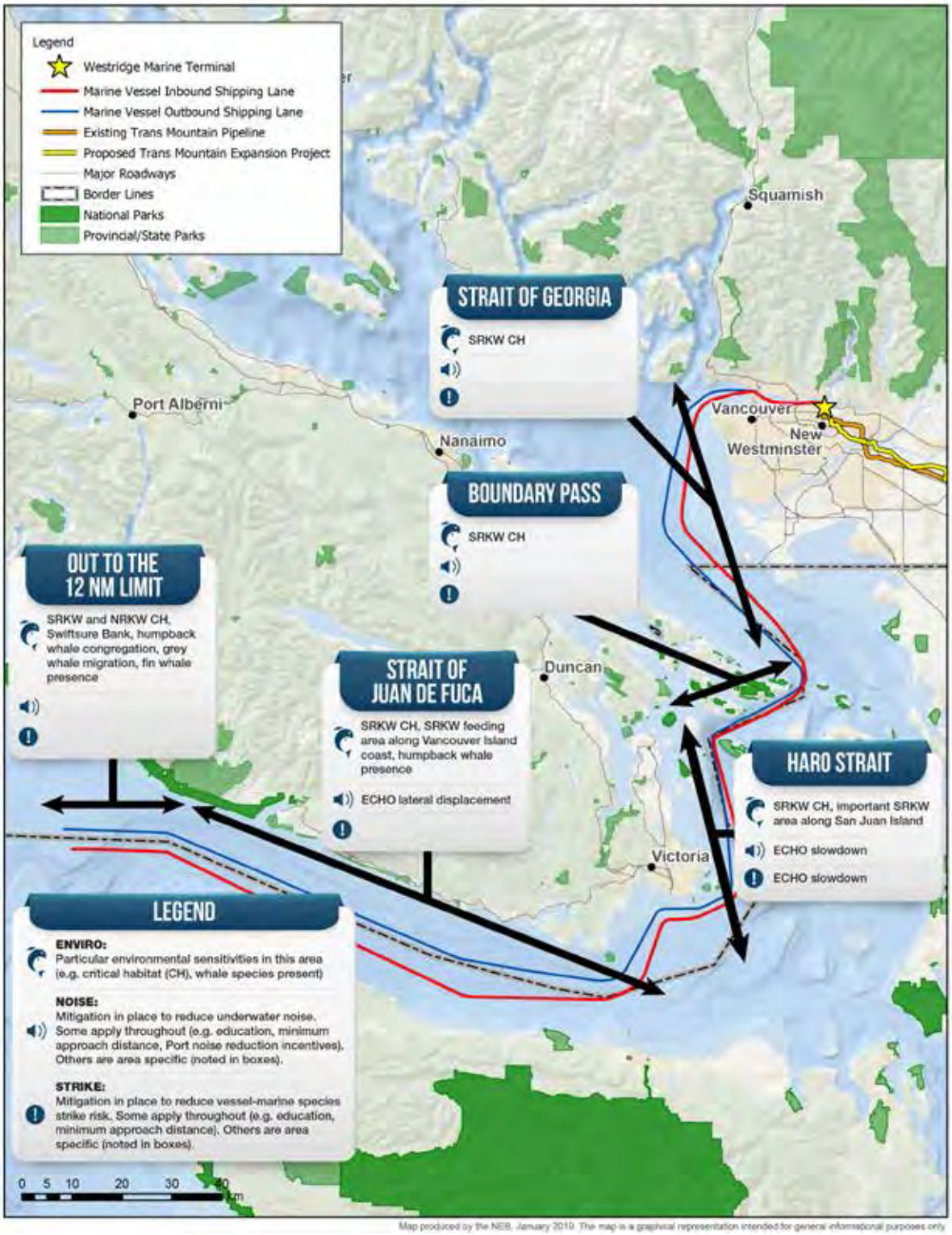
Given routine operations of Project-related marine shipping will add to underwater noise and to the risk of strikes to a number of marine mammal species, the Board's consideration of mitigation measures below focuses on these two threats. Mitigation measures for underwater noise and strike risk are considered together because often the same measure can address both. Contamination and diminished salmon abundance are also considered threats to SRKW and to other marine species, but as noted above, any contribution to these threats from routine operations of Project-related marine shipping is expected to be inconsequential relative to existing cumulative effects.

Measures already being implemented with regard to underwater noise and strike risk in Canadian waters in the Salish Sea include the following (listed in Table 26 illustrated in Figure 27).

Table 26: Existing initiatives

Measure	Application	Purpose	Notes
Education	All vessels	Inform mariners about marine mammals and how to decrease adverse effects on them	· Examples include the 2016 Mariners Guide to Whales, Dolphins, and Porpoises of Western Canada, the online training tutorial developed to build on that, and the 'Be Whale Wise' guidelines for whale watching craft · Extent to which this reduces underwater noise or strike risk is unknown.
Haro Strait slowdown (summer 2017 trial and summer 2018)	Voluntary for piloted vessels transiting Haro Strait shipping lanes	Reduce underwater noise in important SRKW habitat area Secondarily expected to reduce risk of strike	· Implemented through the ECHO Program led by VFPA · Under consideration for 2019 and beyond. Five-year conservation agreement under negotiation · Expansion to Boundary Pass under consideration
Strait of Juan de Fuca lateral displacement (summer 2018 trial)	Voluntary for vessels transiting the Strait of Juan de Fuca	Reduce underwater noise in important SRKW feeding area	· Implemented through the ECHO Program led by VFPA · Results under review · If deemed successful, under consideration for 2019 and beyond. Five-year conservation agreement under negotiation
Minimum approach distance for marine mammals	All vessels (e.g., whale watching boats) except those in transit (e.g., shipping)	To reduce noise, strike risk and other disturbance	· 100 m minimum approach distance for most whales, dolphins and porpoises, 200 m for killer whale · There are also non-mandatory whale watching guidelines · Extent to which this reduces underwater noise or strike risk is unknown.
EcoAction underwater noise incentive (since 2017)	Voluntary for all vessels that pay Port fees	Reduce underwater noise	· Implemented by the Port of Vancouver · Only one ship known to have sought quiet certification as a result.

Figure 27: The marine shipping route showing certain environmental sensitivities and existing mitigation measures in each section of the route



Although Trans Mountain has little direct control over marine vessels other than when they are at Westridge Marine Terminal (WMT), Trans Mountain has nevertheless made a number of commitments as the operator of the Westridge Marine Terminal relevant to reducing underwater noise and strike risk. Subject to its limited control, these include the following (Table 27). The Board's conditions require Trans Mountain to implement what it has committed to.

Table 27: Trans Mountain commitments

Mitigation measure	Application	Purpose	Notes
Education	Project-related vessels	Inform mariners about marine mammals and how to decrease adverse effects on them	Information is shared, for example, via Trans Mountain's Westridge Marine Terminal Regulation and Operations Guide (WMTROG).
Hull and propeller not fouled excessively	Project-related vessels	Reduce underwater noise	Confirmation required in Master's Declaration as part of Trans Mountain's Vessel Acceptance Standard (VAS).
Participate in initiatives to protect marine mammals	Project-related vessels	Participate in the ECHO Program initiatives to reduce underwater noise	Confirmation required in Master's Declaration as part of Trans Mountain's VAS
Consider underwater noise when selecting escort tug	Strait of Juan de Fuca Escort Tug Service	Reduce underwater noise	Trans Mountain said it will, in conjunction with its shippers, consider certain underwater noise factors when selecting the escort tug service

Trans Mountain also mentioned two other possible mitigations (i.e., to request Project-related vessels follow an alternative routing to skirt the new critical habitat for SRKW and NRKW off Southwest Vancouver Island and an associated slowdown, and to explore the potential to minimize the number of Project-related vessels), but these are only at the stage of early consideration.

As noted above, a number of measures for underwater noise and strike risk are already in place. The Board in particular commends the ECHO Program participants for their efforts, and VFPA for its leadership. However, it is evident from the above tables and Figure 27 that only an initial and partial set of mitigation measures are currently in place or being tested, and in a number of cases the effectiveness of a measure has not yet been demonstrated.

Mitigation specific to Project-related vessels

In the MH-052-2018 hearing, Trans Mountain referenced a framework for the Marine Mammal Protection Program (MMPP) it filed in the OH-001-2014 hearing, in which it said it was not proposing specific measures to mitigate the effects of increased marine vessel traffic, but since other components of the Project (such as salmon-bearing watercourse crossings and the construction of Westridge Marine Terminal (WMT) in Burrard Inlet) have the potential to contribute to cumulative effects on marine mammals in the Salish Sea, Trans Mountain believes there is merit in developing a MMPP that addresses both potential Project-specific effects on marine mammals and combined stressors on the endangered SRKW population. The following discussion is therefore focused on the MMPP with regard to effects from Project-related marine shipping.

As noted in the Board's OH-001-2014 Report, the Board would impose Condition 132 requiring Trans Mountain to develop a Marine Mammal Protection Program and undertake or support initiatives that focus on understanding and mitigating Project-related effects. The Board would expect Trans Mountain to develop the program in consultation with appropriate government authorities, species experts, and Indigenous groups. The Board would require Trans Mountain to file the initial Program with the Board prior to commencing Project operations, with any further iterations being developed and implemented in consultation with the appropriate regulatory authorities for marine shipping. The Marine Mammal Protection Program is meant to ensure Trans Mountain fulfills its commitments to participate in the development of industry wide shipping practices in conjunction with the appropriate authorities. The Board recognizes that the Marine Mammal Protection Program offers no assurance that effective mitigation would be developed and implemented to address Project-related marine shipping effects on marine mammals, but the Board is encouraged that Trans Mountain is supporting initiatives to do so. The Board also recognizes a commitment by Trans Mountain to require Project-related marine vessels to meet any future guidelines or standards for reducing underwater noise from commercial vessels as they come into force.

Beyond Condition 132, however, the Board would not impose additional mitigations aimed only at Project-related marine shipping. There are many other vessels impacting marine species in the area, and the Board finds that it would not be effective to attempt to address the cumulative effects on these species by attempting to disproportionately focus mitigations on just one subset of marine traffic. Project-related marine vessels would be a small fraction of large commercial shipping in the area, and an even smaller fraction of total vessel traffic. In addition, Project-related vessels are at the slower end of large commercial shipping vessels in the area and so would be expected to create less overall noise and strike risk compared to faster vessels. Further, the Board heard that regularly operating ferries, tugs, and whale watching boats make substantial contributions to underwater noise, well beyond what will be added by Project-related vessels. The Board concludes that focusing mitigations just on Project-related vessels would not be effective, because the disturbance from all other vessels would remain. The Board therefore recommends additional mitigations be applied to all appropriate vessels (which would include Project-related vessels) as described below.

The Board has kept its previous Condition 132, but has made a few amendments to more accurately reflect what Trans Mountain can control given that it does not own or operate Project-related marine vessels, to reflect the fact that this MH-052-2018 hearing has explored the range of potential mitigations for marine vessels, and to be consistent with the recommendations to government below. Therefore, Condition 132 encompasses mitigations to reduce or offset the contribution to cumulative effects from the Project (e.g., construction at watercourse crossings and at the Westridge Marine Terminal), and, although the Marine Mammal Protection Program does not constitute immediate mitigation for Project-related marine shipping effects, the Board has included reference to shipping in Condition 132 given Trans Mountain's commitments. The Board also has taken into account that Trans Mountain said it will commence a process to solicit and obtain feedback and comments from Indigenous groups on a draft version of the Marine Mammal Protection Program no later than 18 months before commencement of Project operations.

Mitigation recommended for all appropriate vessels

Offsets

As explained above, given the cumulative effects involved, the Board does not expect further mitigations that are applied only to Project-related marine shipping to be effective. Nevertheless, routine operations of Project-related marine shipping will add to both underwater noise and the risk of strikes in each section of the shipping route, and these are identified as threats to a number of the SARA-listed species. In Recommendation 5, the Board therefore recommends that the additional underwater noise and strike risk created by Project-related marine vessels be offset by applying measures to all appropriate vessels, including Project-related marine vessels. Despite some uncertainty in the relative contribution of underwater noise and strike risk to the cumulative effects on SRKW and other species at risk, the Board is taking a precautionary approach and recommending full offsets for the additional underwater noise and strike risk caused by Project-related marine vessels.

While the Board maintains its recommendation that there are likely significant adverse effects on SRKW as described above, this offset approach could allow for a reduction in that finding to non-significant if and when Project-related shipping effects have been effectively reduced to net-zero in each section of the shipping route. The Board has made this recommendation to the GIC because its implementation is beyond the Board's regulatory authority and Trans Mountain's control.

The Board notes existing government commitments appear to be consistent with this recommended approach: Transport Canada said it is aiming for a net-zero increase in underwater vessel noise as a result of Project shipping, while DFO said that, in approving the Project, the Government of Canada committed to more than mitigate the impact of additional Project traffic on SRKW.

This approach is also consistent with guidance in the Board's Filing Manual which states that once all feasible and effective mitigations have been applied to avoid or reduce adverse effects on species at risk, any residual and non-negligible contribution to cumulative effects should be offset. Indeed, the Board took this approach for this Project in a number of cases, such as:

- caribou (see Conditions 37, 128, 149 and 150);
- rare plants (see Conditions 40(c), 40(e) and 155);
- wetlands (see Conditions 41(f), 41(h) and 156);
- grasslands (see Conditions 42(e), 42(g) and 157);
- riparian habitat (see Conditions 71(e), 71(h) and 154); and
- GHG emissions (see Condition 142).

The Board's Recommendation 5 to offset the additional underwater noise and strike risk provides a goal, but it does not prescriptively say exactly how to reach that goal via specific mitigations that apply to specific vessels in specific places and at specific times. The Board considers it imprudent to attempt to do so at this time. The Board heard from participants intimately involved in marine shipping, such as Transport Canada, VFPA, PPA, and the Chamber of Shipping, that marine shipping is complex; that any new mitigation measure must be carefully consulted upon, planned and tested; and that safety must come first. Other important factors must be considered, such as the potential impacts of mitigation measures on Indigenous rights and interests, shipping schedules, port competitiveness, other marine users, U.S. and international coordination, unintended side-effects, and other socio-economic effects.

The Board is nevertheless confident that a technically and economically feasible mitigation mix can be developed to offset the additional underwater noise and risk of strikes due to Project-related vessels given the evidence submitted during the MH-052-2018 hearing. This included, for example, positive experiences with the ECHO program slowdowns in Haro Strait, the ability of slowdowns to reduce both noise and strike risk, the experiences in other parts of the world in reducing strike risk via slowdowns and reroutes or displacements, the multiple technical and operational mitigations that can be applied to regularly operating vessels in the area such as ferries and whale watching boats, and the potential for long term reductions in underwater noise via vessel retrofits and design.

A number of participants focused on the uncertainties of potential mitigation to reduce effects on SRKW, such as the fact that slowdowns can increase the duration of vessel transits and thus of noise. The Board notes that studies following the 2017 Haro Strait slowdown showed a reduction in mean broadband vessel source levels, a reduction in ambient noise received at the Lime Kiln hydrophone, and a slight increase in the total percentage of time below the noise threshold level (below which SRKW behavioural response is not anticipated), suggesting that the increased transit time did not increase the duration of impactful underwater noise.

A number of participants also questioned whether voluntary measures are appropriate as long-term solutions. With regard to the voluntary ECHO program initiatives, the Board heard that voluntary measures can allow for ongoing refinement and adaptation to improve effectiveness and participation rates, can avoid the more severe economic impacts by allowing a small percentage of vessels to not participate when necessary, and can include participation of vessels on both sides of the Canada-U.S. border. Thus, based on the evidence to-date, voluntary measures do appear to offer the potential of effective mitigation. However, as noted in Recommendation 5, monitoring is necessary to track progress, and changes should be made if voluntary measures prove ineffective over time, including consideration of mandatory measures.

In developing the offset program under Recommendation 5, the Board recommends the general principles for offsets outlined in Section 10.1.4.5 of this MH-052-2018 Report be considered. The Board notes that a number of details will also need to be determined. For matters within its regulatory control, the Board typically requires a proponent to submit a 'pre-construction offset plan' and a 'post-construction evaluation of offset implementation' report (see the above referenced conditions for examples). For the Recommendation 5 offset program, details will include the following:

- Specific offsetting objectives will need to be defined spatially and temporally.
- Offset ratios will need to be set.
- A quantification of the additional underwater noise and strike risk in each section of the route added by Project-related marine shipping will need to be estimated – this will likely require monitoring and/or modelling, and may change over time if ship design or operational parameters change (which may result from mitigation measures that apply to vessels generally, including Project-related vessels).
- The specific measures to be undertaken will need to be determined.
- Monitoring programs will be needed to determine the effectiveness of measures taken and the extent to which they are offsetting the additional Project-related underwater noise and strike risk in each section of the route.

With regard to transparency and accountability, the Offset Program recommended in Recommendation 5 includes periodic reporting on progress and results, and the Board recommends it should include each of the above details at the appropriate time. The annual reporting recommended in Recommendation 2 would also be relevant given that it includes a description of progress on each of the other recommendations, as well as a description of consultation activities related to each.

The Board notes that some work has already been undertaken that may be of relevance to the above details. For example, with respect to underwater noise, Transport Canada commissioned modelling by JASCO that predicted future noise conditions including Project-related shipping, both with and without the application of various mitigations

strategies. With respect to strike risk, Trans Mountain filed an encounter modelling study in the OH-001-2014 hearing, and the federal authorities submitted a 2017 report by Nichol et al. on strike risk in this MH-052-2018 hearing. Further, Transport Canada and DFO described the collection of acoustic information to measure the before and after acoustic signature in the Project area, and explained that modelling can be used to estimate the efficacy of mitigations.

With regard to timing, the Board heard from a number of participants that the Project should not be approved, or operations begin, until mitigations are in place and demonstrated to be successful. However, given the above-noted necessities of safety first, taking a careful, deliberative, and collaborative approach, and the potential need for international coordination, the Board considers it likely that it will take some years to plan, test and implement a full suite of measures and to demonstrate ongoing offset success. Thus, the Board has not suggested a time limit for the recommended offsets, but the Board does note that DFO said that, in approving the Project, the Government of Canada committed to more than mitigate the impact of additional Project traffic on SRKW before any shipping associated with the Project begins.

Particular mitigation measures for further consideration

As noted above, the Board considers it imprudent, at this time, to attempt to identify specific mitigations that apply to specific vessels in specific places and at specific times. Nevertheless, of the broad range of mitigation measures the Board heard during the MH-052-2018 hearing, the following five appear to warrant further examination in particular:

1. Slowdowns in each section of the marine shipping route.
2. Limits on the impacts from whale watching boats.
3. Accelerate and confirm the schedule for noise reduction efforts for regularly operating ferries in the area.
4. Identification of specific congregation and migration areas for SARA-listed species, and consideration of mitigations in those areas.
5. Further incentives and requirements for quiet vessel design and refits to address underwater noise over the long term, including maximal international participation.

In Recommendation 6, the Board recommends that each of these five mitigations be further considered and their feasibility be publicly reported on. The Board notes that some mitigations will work with some vessels and not with others. For example, the Board heard that some vessels may not produce less underwater noise, and may even produce more noise, at slower speeds. Navigational safety considerations may also be different for different types of vessels for the same mitigation, affecting the feasibility of which vessels a mitigation measure can be applied to. Thus, in Recommendations 5 and 6, the Board notes that each mitigation measure should apply to all “appropriate” vessels, which will need to be determined on a case-by-case basis. The tables below provide discussion on each of the five mitigation measures the Board recommends for particular further study, including a description of some of the potential benefits and challenges associated with each, some notes on what has been done already, and some of the different ways each might be implemented.

Regarding the other potential mitigation measures discussed during the hearing, the evidence on them is summarized above. The Board has not flagged these as particularly warranting further examination. For example, some do not appear feasible due to navigational safety reasons (e.g., rerouting through Rosario Strait, rerouting north through Johnstone Strait, convoys, and prohibiting night-time transits); some seem to have limited effectiveness, although they may be useful in specific circumstances (e.g., marine mammal observers, identification and mitigation of the ’noisiest’ vessels first); and some seem to have the opposite effects as intended (e.g., emitting warning signals to whales that can have the unintended consequence of bringing them to the surface and increasing strike-risk).

Slowdowns	
Benefits	**Challenges**
Can reduce both underwater noise and strike-risk Could benefit numerous marine mammal and fish species (e.g., Humpback, Fin, Grey and killer whales, Basking shark, Leatherback sea turtle, etc.) May also reduce air and GHG emissions, wash and wake effects, and impacts on smaller vessels	Potential costs due to increased shipping time, additional pilotage, etc., with potential impact on port competitiveness Increased duration of underwater noise (although studies from the ECHO slowdown trial suggest the duration of impactful underwater noise did not increase) Not all vessels are quieter when slower Safety considerations, such as areas where weather is harsher, affecting safe speed Need for coordination across the Canada-U.S. border Potential 'speed ups' elsewhere to make up lost time could increase noise and strike risk in other areas (presumably, however, if slowdowns become routine/predictable they could be factored into revised schedules)
Notes and Variations	
Two seasons of experience has been achieved with the ECHO Program voluntary Haro Strait slowdowns, to be extended for five years via a non-binding conservation agreement Each section of the route is important to one or more SARA-listed species (see Table 25), and reducing speed is one of the key operational mitigations to reduce both underwater noise and strike risk. Thus, consideration should be given to potential slowdowns in each section of the route. The Board heard that real-time slowdowns (e.g., in response to sighting a whale) are challenging, given the difficulty of detection and the limited ability of a large ship to make a quick response. If a species reliably occurs or migrates through an area during known months/seasons, that could be the appropriate duration for a slowdown. Alternatively, a dynamic slowdown that applies if the species of concern has been detected in the area in the past day(s) or week may provide an effective mitigation while not unnecessarily slowing traffic and providing a measure of predictability to shipping.	

Limits on whale watching boats	
Benefits	**Challenges**
Can reduce underwater noise, strike-risk, and physical disturbance Sustainably maintaining the species being watched in turn helps to maintain the whale watching industry	Socio-economic effects, such as potentially limiting the number of whale watching trips
Notes and Variations	
The Board heard that SRKWs have been observed to be within 400 m of a vessel most of the time during daylight hours throughout the entire summer, and of the time SRKW potentially lose for foraging due to disturbance, approximately one third was estimated to be due to noise from whale watching boats. The Board heard that when there are many whale-oriented boats in the vicinity of SRKWs, estimated total underwater noise can get close to the threshold assumed to cause permanent hearing loss. The Board heard there are a number of mitigations in place, some mandatory (e.g., 100 m minimum approach distance, 200 m for killer whales) and some voluntary (e.g., whale watching industry guidelines). However, there is currently no limitation on the number of whale watching boat trips, and no permitting scheme. The Washington State November 2018 Southern Resident Orca Task Force Report included a number of additional recommendations for SRKW (e.g., a go-slow 7 knot zone within half a nautical mile, a limited-entry whale watching permit system, incorporation of quieter technology over time, and increased buffer to 400 yards behind whales to decrease chase-like situations). The Board recommends GIC consider the feasibility of each of these, as well as other potential mitigations.	

Noise reduction efforts for ferries	
Benefits	**Challenges**
Reduce underwater noise May also improve fuel efficiency, and thus reduce air and GHG emissions	Costs if requires new builds or retrofits
Notes and Variations	
The Board heard that ferries are estimated to contribute 52-67 per cent of underwater noise due to their size, the large number of monthly ferry trips, and because their routes are widely distributed throughout the area. The Board heard there are additional routes in the summer which is also a time of primary SRKW presence. Transport Canada said it has entered into a non-binding agreement with the Canadian Ferry Association and is negotiating a non-binding agreement with B.C. Ferries concerning reductions in underwater noise. In Washington State, immediate actions from the Governor's office at the time of creating the Orca Task Force included developing strategies for quietening state ferries, and the Task Force's recommendations included accelerating the transition to quieter and more fuel-efficient vessels. The Board recommends GIC consider the feasibility of accelerating the reduction of impacts from regularly operating ferries in the area, and to publicly confirm the schedule for such reductions.	

Mitigation in Species congregation and migration areas	
Benefits	**Challenges**
Focus mitigations on key areas for one or more species of concern	Requires a degree of site fidelity, otherwise mitigations would need to be moved (if e.g., location of key feeding areas change) Depending on the mitigation measures, a range of potential socio-economic effects
Notes and Variations	
One or more mitigations (e.g., slowdown, moving shipping lanes, lateral displacement within shipping lanes, sanctuary/acoustic refuge designation, restrictions or prohibitions on e.g., fishing or whale watching boats, etc.) might be appropriate depending on the species of concern, the location, and the species' activities in that location. For example, the Board heard that Humpback whales are the most commonly reported species involved in vessel collisions, and that up to 50-100+ animals are often found on Swiftsure Bank in the route of shipping traffic. Swiftsure Bank is also within the newly designated critical habitat for SRKW and NRKW. The Board heard that a preliminary risk assessment considered a southward shift in shipping lanes at Swiftsure Bank to be acceptable for further study, and that slowdowns in the area may also be possible subject to local weather and other safety concerns. The Board heard that thousands of migratory Grey whales have to cut across the western entrance to the Strait of Juan de Fuca, amounting to a high density of whales crossing shipping routes for several months. Recovery measures with regard to vessel strikes in the 2017 Action Plan for Blue, Fin, Sei and North Pacific right whales in Canadian Pacific Waters include identifying areas of high risk of interactions. The Board heard that further information about the locations, movement and abundance of endangered whales in Canada is being pursued under the Oceans Protection Plan and to support the Whales Initiative. The existing ECHO Program slowdown and lateral displacement are targeting noise in two areas of importance for SRKW: Haro Strait and Juan de Fuca.	

Quiet vessel design and refits	
Benefits	**Challenges**
Unlike an operational measure in a particular area and at a particular time, quiet vessel design or refit would reduce noise all the time everywhere the vessel goes Can also improve fuel efficiency and thus reduce air and GHG emissions	Up-front costs for both refits and quieter designs Can be slow to implement as new ships are built and existing ones retrofitted
Notes and Variations	
The Board heard that quiet vessel design is the best long-term solution to underwater noise, and that it would ideally be led through the IMO to be global and long-lasting. Thus the Board recommends Canada encourage, support and participate to the maximal extent possible to accelerate international improvements. Given this may be slow to implement at the international level, the Board recommends GIC also further explore the potential for requirements and/or incentives to accelerate implementation. VFPA has implemented an EcoAction incentive to encourage quiet technologies and quiet certification, and noted it would be more effective if other ports did likewise. VFPA also suggested consideration of making underwater noise measurement a mandatory component of a new vessel's sea trial commissioning stage. The Board heard Transport Canada is funding a technology scan to identify mature and near commercial technologies with the greatest potential to reduce vessel underwater noise. The Board notes that operational mitigations such as slowdowns may still be required to reduce strike risk.	

Mitigating cumulative effects

If Project-related marine shipping additions to underwater noise and strike risk are successfully offset, these two primary adverse effects of routine operations of Project-related vessels on marine mammals could be reduced to net-zero. However, although it appears feasible as discussed above, there remains some uncertainty as to how long it will take and whether it will be 100 per cent achieved over time. Thus, some residual effect will remain from the routine operations of Project-related marine shipping, at least for a while, adding to existing and future cumulative effects.

The Board heard that cumulative effects are already having substantial effects on a large number of marine species, including SARA-listed species. These effects come not only from other marine vessels, but also from surrounding populations and urbanization, such as contamination from untreated and undertreated municipal wastewater, industrial runoff and agricultural activities; habitat degradation; fish farms; bycatch; and broader processes such as climate change and warming oceans. The Board heard about some of the initiatives and measures to address this broad range of impacts.

The Board heard from DFO that, in approving the Project, the Government of Canada committed to more than mitigate the impact of additional Project traffic on SRKW, and that the objective of federal authorities is to go beyond mitigating the impacts of the Project to address more fully the cumulative effects that are threatening SRKW.

The Board has therefore included two recommendations that seek to address the broader issue of cumulative effects on the marine ecosystems through which Project-related vessels will pass:

- In Recommendation 1, the Board recommends GIC develop and implement a regional cumulative effects management plan to assess the overall environmental state of, and cumulative effects on, the Salish Sea, including a long-term strategy to manage those cumulative effects.
- In Recommendation 2, the Board recommends GIC annually report on the oversight, progress and status of initiatives and measures to address cumulative effects on, and to support the health of, the Salish Sea.

The Board notes that sections 73 and 74 of the CEAA 2012 provide for the development of regional studies, and that once completed, the results of such studies are used to inform environmental assessments under that Act. The Board recommends that GIC consider whether such a study, as part of the recommended regional cumulative effects management plan, would be advantageous.

Some participants suggested that these recommendations concerning the overall health of the Salish Sea should be subsumed under an overarching shared management structure or marine use planning process. The Board has included consultation in each of its recommendations, and would recommend consideration of the most appropriate means to manage or plan the process.

With regard to marine vessels, Recommendation 1 includes a recommendation to consider the feasibility of reducing total underwater noise and strike risk over time. The Board refers GIC to the European Marine Strategy Framework Directive which includes an aim of keeping the annual average ambient noise level below the baseline value of the year 2012, which may provide precedent and learnings for such an approach.

As with offsets above, some participants argued that the cumulative effects management plan referred to in Recommendation 1 should be developed prior to the Project's approval and construction. The Board does not consider this necessary. As explained throughout this report, the Board has found that it has sufficient evidence on cumulative effects for the purposes of conducting an environmental assessment of Project-related marine shipping. Further, the Board expects it will take some considerable time to develop an effective and comprehensive plan under Recommendation 1, and it is recommended to be an iterative process of improvement over time. Thus, as further discussed in Chapter 2, the Board is not persuaded that the Project be further delayed.

Significance evaluation: adverse effects on Southern resident killer whale (SRKW)

	Criteria	Rating	Description
Project effects	Temporal extent	Long term	Sensory disturbance and the risk of strike will occur for the duration of operations.
	Reversibility	Reversible to permanent	With regard to sensory disturbance, once a marine mammal is no longer exposed to underwater noise from Project-related marine vessels, then behavior would likely return to normal. The effects of a marine mammal vessel strike would range from reversible to permanent, depending on the severity of the strike.
	Geographic extent	RSA	Underwater noise and strikes will originate in the shipping lanes, but noise spreads underwater, and if threats have population level consequences, they would impact across the range of SRKW.
	Magnitude	High	Underwater noise produced from Project-related marine vessels is not expected to result in permanent or temporary auditory injury, but would result in sensory disturbance which is considered a key threat to SRKW. A strike, although of low probability, could result in lethal or non-lethal effects, and mortality would have population level consequences.
Cumulative effects	With regard to sensory disturbance, the Regional Study Area (RSA) is a heavily utilized marine environment, which is predicted to increase in use. Once exposure to underwater noise from Project-related marine vessels ceases, it is likely that marine mammals would be exposed to some form of disturbance soon after from another marine vessel. With regard to potential strikes, the increase in Project-related marine traffic would contribute to the cumulative risk of marine mammal vessel strikes. The SRKW population has crossed a threshold where any additional adverse environmental effects would be considered significant. While the effects from Project-related marine shipping will be a small fraction of the total cumulative effects, and the level of traffic is expected to increase with or without the Project, the increase in marine vessels associated with the Project would further contribute to cumulative effects that are already jeopardizing the recovery of SRKW.		
Recommendation	Absent further mitigation, likely to result in significant adverse effects. See Chapter 2 for discussion of justification. If the Board's recommendation to offset the additional underwater noise and strike risk from Project-related marine shipping is implemented, then adverse effects from Project-related marine shipping would reduce to net zero if and when offsets are successful, at which time effects would not likely be significant.		

Significance evaluation: adverse effects on other marine mammals

	Criteria	Rating	Description
Project effects	Temporal extent	Long term	Sensory disturbance and the risk of strike will occur for the duration of operations.
	Reversibility	Reversible to permanent	With regard to sensory disturbance, once a marine mammal is no longer exposed to underwater noise from Project-related marine vessels, then behavior would likely return to normal. The effects of a marine mammal vessel strike would range from reversible to permanent, depending on the severity of the strike (i.e., mortality would be permanent).
	Geographic extent	RSA	Underwater noise and strikes will originate in the shipping lanes, but noise spreads underwater, and mortality from a strike could have population level consequences on a small population endangered species.
	Magnitude	Low to high	Underwater noise produced from Project-related marine vessels is not expected to result in permanent or temporary auditory injury, but would result in some sensory disturbance to marine mammals. The magnitude of a marine mammal vessel strike, although unlikely, would vary according to the extent of the injury and the species struck. Mortality of an individual of a low-population SARA-listed endangered species could be of high magnitude (although the Board notes DFO's evidence that endangered Sei, Blue and North Pacific right whales are seldom observed in the Salish Sea and are usually distributed more offshore).
Cumulative effects	With regard to sensory disturbance, the Regional Study Area (RSA) is a heavily utilized marine environment, which is predicted to increase in use. Once exposure to underwater noise from Project-related marine vessels ceases, it is likely that marine mammals would be exposed to some form of disturbance soon after from another marine vessel. With regard to potential strikes, the increase in Project-related marine traffic would contribute to the cumulative risk of marine mammal vessel strikes. Nevertheless, the contribution from Project-related marine vessels on marine mammals (other than SRKW) to total cumulative effects is likely to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

14.7.3 Marine fish and fish habitat

Trans Mountain described the RSA as a productive marine environment, home to hundreds of different marine fish, including nine SARA-listed species or populations (Table 28). Trans Mountain said that no critical habitat has been identified for marine fish species at risk within the RSA; however, portions of the RSA have been classified by DFO as Important Areas for Pacific herring and Pacific salmon. Participants identified that marine resources within the RSA had over time been reduced in abundance (e.g., Pacific salmon).

DFO said that Leatherback sea turtle might also be affected by Project-related marine shipping. Throughout this section, 'marine fish' includes marine invertebrates and reptiles.

Table 28: Marine fish species (including invertebrates and reptiles) listed under Schedule 1 of the Species at Risk Act potentially found within the Regional Study Area

Species	SARA Status
Basking shark	Endangered
Bluntnose sixgill	Special Concern
Longspine thornyhead	Special Concern
Northern abalone	Endangered
Olympia oyster	Special Concern
Tope	Special Concern
Yelloweye rockfish (outside and inside population)	Special Concern
Rougheye rockfish type I and type II	Special Concern
Green sturgeon	Special Concern
Leatherback sea turtle	Endangered

In the MH-052-2018 hearing, Trans Mountain referenced its previous individual assessments for eight of the above SARA-listed marine fish species. Trans Mountain provided new individual assessments of potential residual effects of Project-related marine shipping on Longspine thornyhead and on Leatherback sea turtle. For each species, Trans Mountain noted either no critical habitat identified in Canadian waters, or (for Northern abalone) no spatial overlap with identified critical habitat. Trans Mountain's assessments concluded that residual effects of routine operation of Project-related vessels on each SARA-listed marine fish are predicted to be negligible or low in magnitude, low in probability, and not significant.

DFO maintained its position that potential effects on marine fish and fish habitat from Project-related marine shipping are likely to be low risk (excluding potential accidents or malfunctions). DFO said, given that there have been no significant changes to the proposed marine shipping component of the Project, it does not anticipate any meaningful changes to its assessment of effects on marine fish and fish habitat, including potential effects on Chinook salmon and species that have seen a change in designation, since the filing of its written evidence in the OH-001-2014 hearing.

Participants raised several issues related to effects of Project-related marine shipping on marine fish and fish habitat. In this section, the Board focuses on:

- effects of Project-related vessel wake waves on intertidal habitat and marine fish;
- sensory disturbance to marine fish from underwater noise;
- introduction of aquatic invasive species from Project-related marine vessel ballast water;
- vessel strikes; and
- cumulative effects on salmon and Steelhead.

Effects of marine vessel wake waves on intertidal habitat and marine fish

Trans Mountain indicated that wake waves produced from Project-related marine vessels could result in impacts to intertidal areas and the associated biota. Trans Mountain conducted predictive wake wave height modelling for Project-related marine vessels travelling at various speeds and depths. Trans Mountain concluded that Project-related marine vessel wake wave heights at the shoreline would be well within the range of natural conditions and that wake waves generated from Project-related marine vessels are unlikely to result in any measurable changes to the biophysical characteristics of intertidal habitats. Trans Mountain said that marine organisms that occupy intertidal areas are regularly exposed to waves that are greater than the predicted wake wave heights and would have adapted to the physical forces imparted by Project-related marine vessel wake waves. As such, Trans Mountain said that the Project's contribution to total cumulative effects would be low.

The Board requested a species-specific assessment for all SARA-listed marine fish from Project-related marine vessels, which included a request for species-specific mitigation. Trans Mountain identified that the frequency of occurrence within the LSA and the RSA for SARA-listed marine fish ranged from patchy, uncommon, to rare (Appendix 11 provides a description of the spatial boundaries). For each species, Trans Mountain identified that effects from Project-related marine vessel wakes would be of negligible magnitude and recommended that no mitigation measure be implemented for effects of vessel wakes on marine fish and fish habitat.

Numerous participants raised concerns related to wake waves impacting intertidal habitats and the associated biota. Metro Vancouver's evidence highlighted various ways that shoreline invertebrates and marine fish could potentially be impacted from Project-related marine vessels, including higher invertebrate detachment rates, reduced growth and energy storage of native invertebrates, increased energy expenditure, dislocation of suitable habitat, and decreased feeding efficiency.

The Tsawout First Nation Marine Use Study indicated that molting crabs are susceptible to vessel wakes. It said that when crabs molt, they change their shells and during this time they are very light, and get disturbed and damaged by sudden changes in wave action, such as vessel wakes.

DFO said that potential effects on intertidal fish habitat from Project-related vessel wake are unlikely to differ substantially from current conditions in the RSA, and it considered the likelihood and magnitude of such occurrences to be of low risk to intertidal habitat and associated biota.

A number of participants highlighted the importance of eelgrass beds as marine fish and invertebrate habitat, as well as providing beneficial ecosystem services. Tsawout First Nation said that eelgrass beds at James Island and Sidney Island are being lost due to all the wake waves from vessel traffic. As noted by Marine Use Study Respondents, it is fairly shallow in those areas and the waves are building up the sediment. The eelgrass then disappears and it affects all the crabs and other spawning fish that depend upon it. Trans Mountain said that although there are no mapped eelgrass beds within the Canadian portion of the LSA, any eelgrass beds that are present (i.e., within the eelgrass biobands) would be acclimated to both natural wave conditions and wake waves from existing vessel traffic. Therefore, it considers unlikely that any eelgrass beds would be adversely affected by the Project.

Sensory disturbance to marine fish from underwater noise

Trans Mountain said that it did not conduct a detailed effects assessment on the potential impact of underwater noise produced by Project-related marine vessels on marine fish as there are no standard criteria or thresholds to assess these effects against and there is a lack of data and knowledge surrounding the effects of underwater noise on marine fish. Trans Mountain did acknowledge that underwater noise from Project-related marine vessels could potentially trigger behavioral responses by marine fish ranging from small temporary movements to large scale change displacements. However, Trans Mountain further stated that there is no evidence in the literature that vessel traffic will result in the large scale displacement of fish or invertebrate populations from foraging, spawning, rearing or migrations areas, or will otherwise affect their distribution or abundance. Trans Mountain said that its conclusion is supported by the existing overlap of areas of high shipping activity and Pacific herring and Pacific salmon migration areas, such as the Haro Strait and the Fraser and Columbia Rivers.

Participants raised concerns over underwater noise impacting marine fish. Raincoast Conservation Foundation said that Trans Mountain failed to consider behavioral changes beyond large-scale displacements and that underwater noise produced from Project-related marine vessels may result in sub-lethal consequences, such as cardiovascular disturbances. It noted that the lack of inclusion of information regarding responses of fish to underwater noise could have served to minimize the potential Project-related effects.

Dr. A.L. Schwarz commented that Pacific herring, as well as other species, respond negatively to shipping sounds. Dr. Schwarz further suggested that short-term behavioral changes can lead to long-term significant changes in populations, spawning locations and extents, and feeding grounds.

DFO said that it would be difficult for Trans Mountain to conduct a detailed effects discussion on the potential effects of underwater noise on marine fish and invertebrates, given the limited information on species-specific behavioral responses to marine vessel noise and the absence of Canadian standards or thresholds established for assessing such impacts. It noted that the presence and magnitude of a residual effect from underwater noise generated by Project-related marine vessels, in addition to the existing underwater noise environment in the RSA, is uncertain.

In the MH-052-2018 hearing, Trans Mountain said that Project-related vessels will produce underwater noise that may result in temporary disturbance of individual Leatherback sea turtles in the vicinity, but such disturbance is of low magnitude and not-significant.

Cheam First Nation, Chawathil First Nation, Kwantlen First Nation, Seabird Island Band, and Stó:lō Tribal Council, referred to a 2018 review by Weilgart which overviewed studies that found evidence that fish use sound to perceive the environment, for mating, for communication, and for predator avoidance; and that noise can cause adverse behavioral, physiological, anatomical and development effects. Trans Mountain said the Weilgart metadata study contained no new information that would change the conclusions reached in its Application.

DFO said that it is not aware of any direct evidence of mortality or unrecoverable injury to salmon from shipping noise.

Dr. Schwarz suggested three mitigations with respect to potential effects of shipping on herring:

- *Slowdown:* mandate slower vessel speeds to reduce shipping noise.
- *Nighttime:* minimize nighttime transits in corridors used by migrating fish to avoid physical interference with Pacific herring which rise to the surface at night to feed.
- *Lighting:* reduce vessel lighting to as low in intensity as acceptable for safety and do not position it to shine straight down into the water, to reduce effects on herring and their euphausiid prey. Trans Mountain said tankers already mask or cloak unnecessary lights at sea and typically operate in complete darkness except for navigation lights that are required for navigation safety reasons.

Stz'uminus and Snuneymuxw expressed concerns about increased use of anchorages by tankers and other ships in the southern Gulf Islands, and expressed concerns about underwater noise and other adverse effects negatively affecting fish and marine mammals. Trans Mountain said it expected that tankers will anchor at the three anchorages east of Second Narrows, and pressure on anchorages will be reduced by holding tankers at the dock whenever a berth is available. PPA said for project vessels, if an inbound vessel misses the Second Narrows tidal window, it will anchor in English Bay to await the next tide to transit; and that outbound vessels, once clear of Second Narrows, head straight out through the Strait of Juan de Fuca. Transport Canada said it has launched a National Anchorages Initiative and is developing a Best Practices Manual for ships at anchor, to mitigate adverse effects of anchorage.

Introduction of aquatic invasive species from Project-related marine vessels ballast water

Trans Mountain said that the release of ballast water in Canadian waters is regulated by the Ballast Water Control and Management Regulations pursuant to the *Canada Shipping Act, 2001* Both Trans Mountain and DFO noted that compliance with this regulation will minimize the likelihood of aquatic invasive species being introduced during ballast water exchange.

Participants raised concerns regarding the introduction of aquatic invasive species to Canadian waters through Project-related marine vessel ballast water. Cowichan Tribes said that no form of mitigation measures can eliminate the risk of aquatic invasive species introductions. It further recommended that ballast water discharge should include mandatory treatment of ballast water to standards recommended by the IMO.

In the MH-052-2018 hearing, the Board heard that the 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments, which Canada acceded to in 2010, entered into force on 8 September 2017. Transport Canada explained that the Convention envisions a transition by the existing global commercial fleet from ballast water exchange to the use of ballast water management system between September 2019 and 2024, and that Transport Canada is developing regulations that will, *inter alia*, require Canadian ships to make this transition.

Cowichan Tribes repeated its previously submitted proposed condition that Trans Mountain must file with the NEB proof that it requires all tankers calling at the Westridge Marine Terminal to conduct ballast water treatment in accordance with the standards of the International Maritime Organization (IMO). In response, Trans Mountain noted that ballast water management is a requirement for all vessels under the *Canada Shipping Act, 2001*; all arriving vessels are required to submit a Ballast Water Reporting Form to Transport Canada prior to entering Canadian Waters; compliance is routinely checked by Transport Canada as part of Port State Control for all vessels; and ballast water management is a requirement under Trans Mountain's Vessel Acceptance Standard.

Commenter Mr. Nelson said there is well documented research on the significance of residual bottom communities or "hull fouling" or "biofouling" (spores and resting stage) on invasive species transportation which is not addressed by the ballast water regulations. Transport Canada said that anti-fouling compounds like paint and surface treatments are very effective at keeping sea-life off the bottom of vessels, that Canada has supported the development of the IMO's 2011 *Guidelines for the Control and Management of Ships' Biofouling*, and that an IMO review process is underway focusing on, for example, degree of application and effectiveness of the guidelines.

Vessel strikes

The 2018 Report on the Progress of Recovery Strategy Implementation for the Basking shark in Canada classifies the threat of collision between vessels and Basking sharks as medium level of concern, given that Basking sharks often feed by slowly moving along the surface. It states, however, that there are no recent reported vessel strikes of Basking sharks in Canadian Pacific waters or elsewhere in their range, and the extent and population consequence of vessel collisions is unknown. Trans Mountain said that residual effects on Basking shark would be negligible in magnitude, low in probability, and not significant.

The 2017 proposed Action Plan for Leatherback Sea Turtle states that the Pacific population has experienced particularly precipitous declines over the last two decades, and that major worldwide threats include vessel strikes. Trans Mountain noted that there is critical habitat for Leatherback sea turtle in U.S. waters west of the entrance to the Strait of Juan de Fuca, and acknowledged that a collision between a Project-related vessel and a turtle is possible but of low probability. The 2016 Mariners Guide to Whales, Dolphins, and Porpoises of Western Canada states that the endangered status of Leatherback sea turtles make vessel strikes a particular concern, as mortality of even a few individuals can have a significant impact on their population status. Leatherback sea turtles are a slow-moving species, and spend a significant amount of time at or just below the surface when feeding and travelling, making them particularly vulnerable to vessel strikes.

Cumulative effects on salmon and Steelhead

The Board heard broad concerns over the status of many salmon stocks in the area. For example, Coldwater Indian Band said that recent Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessments have found that interior Fraser Coho salmon, and more than 60 per cent of the sub-populations of Fraser sockeye salmon examined, are all at risk. The Board heard concerns about the many cumulative impacts affecting salmon and other fish species, such as over-fishing, pollution, fish farms, climate change, vessel traffic, and habitat degradation.

DFO said Thompson River and Chilcotin River Steelhead underwent an emergency assessment by COSEWIC in January 2018. COSEWIC assessed both Steelhead populations as Endangered, and they are now being evaluated for potential listing under the SARA through an emergency listing process. Stk'emlupsemc te Secwepemc said it is concerned that Project-related marine shipping will further disrupt their migratory routes. The COSEWIC assessment summary for these populations states that bycatch mortality in commercial Pacific salmon fisheries and declines in marine and freshwater habitat quality are the key factors driving the declines. With regard to marine survival, the summary notes ocean warming

and predation by harbour seals and possibly other predators; there is no mention of shipping. Trans Mountain said recent changes to the COSEWIC status of Steelhead and salmon stocks do not affect its conclusions of the original assessment (i.e., not significant).

The Board heard about a diverse array of efforts for the protection and restoration of west coast salmon and Steelhead species, such as salmon habitat restoration projects under the Coastal Restoration Fund; a new 10-year conservation and harvest sharing arrangement under the Pacific Salmon Treaty; the 2018-2022 Implementation Plan under Canada's Wild Salmon Policy; the completed 2018 Cohen Response Status Update; and proposed amendments to the *Fisheries Act* that would strengthen the protection of fish habitat.

The Board further discusses Chinook salmon with regard to SRKW prey abundance in the section on marine mammals above.

Views of the Reconsideration Panel

Given the threats raised during the hearings have the potential to impact a number of individual marine fish species, the following focuses on those threats. Although individual species are not always named in what follows, the Board has considered each individual SARA-listed marine fish species (including invertebrate and reptile species) potentially affected by Project-related marine shipping.

Wake waves

The Board recognizes the concerns presented by participants in regards to potential impacts to shorelines and associated biota from Project-related marine vessel wake waves. The Board notes that evidence provided by some intervenors, such as Metro Vancouver, was generic in nature and was not specific to the assessment areas for Project-related marine vessels. In the context of Project-related marine vessels, the Board finds Trans Mountain's predicted wake wave height modelling to be adequate and concurs with Trans Mountain's conclusion that Project-related marine vessel wake wave heights at the shoreline would be within the range of natural conditions. The Board generally concurs with Trans Mountain and DFO in that Project-related marine vessels are unlikely to result in any measurable changes to the biophysical characteristics of intertidal habitats. The Board acknowledges the evidence provided by Tsawout First Nation, and agrees that some impacts to intertidal habitat could occur from Project-related marine vessel wake waves, such as increased sedimentation. However, the Board is of the view that these effects would be localized to very small portions of the Local Study Area (LSA).

Therefore, the Board is of the view that effects from Project-related marine vessel wake waves on intertidal habitat and marine fish, including eelgrass beds, would be of low magnitude. The Board finds that the effects would occur for the duration of operations (long-term) and would be reversible. The Board also finds that the contribution from Project-related marine vessels to total cumulative effects on marine fish and fish habitat within the RSA is expected to be inconsequential. Therefore, the Board finds that the adverse effects on marine fish and fish habitat from Project-related marine vessels are not likely to be significant. The Board recognizes that SARA-listed marine fish species are present within the LSA and RSA. The Board is of the view that effects on these species would be similar to other fish species. Given their limited abundance, and absence of critical habitat within the LSA and RSA, the Board finds that adverse effects on SARA-listed marine fish from Project-related marine vessels are not likely to be significant.

With regard to Musqueam's suggestion to add marine shipping to Condition 92 (updates under the SARA), the Board notes that Condition 92 applies to Trans Mountain and so is focused on the Project rather than Project-related marine shipping. As described in more detail above in relation to marine mammals, the Board is directing a number of recommendations focused on marine shipping to the GIC, given federal authorities have regulatory control over that shipping. In response to Musqueam's suggestion, the Board has added a recommendation for updates under the SARA to its recommendation to the GIC concerning reporting on initiatives and measures to support the health of the Salish Sea (Recommendation 2).

Underwater noise

The Board agrees with DFO and Trans Mountain in that a detailed assessment of underwater noise produced by Project-related marine vessels on marine fish is not practicable due to lack of Canadian standards and the limitations in data to support such an assessment. The Board acknowledges the evidence provided by participants and agrees that some form of adverse, short-term effect (e.g., small behavioral changes) is likely to occur from underwater noise produced by Project-related marine vessels. However, the Board was not convinced that these short-term effects would translate into larger, more substantial impacts. Given lack of Canadian standards and the limitations in data to support such an assessment, the Board finds that the exact nature of the effect of underwater noise produced by Project-related marine vessels on marine fish is uncertain.

In the MH-052-2018 hearing, the Board heard there have been a number of new studies showing various effects of underwater noise on fish in recent years. Nevertheless, the Board remains of the view expressed in its OH-001-2014 Report that it is unlikely that short-term effects from Project-related marine shipping on marine fish species will translate into larger, more substantial impacts, because:

- There will only be approximately two transits per day of Project-related vessels along the route.
- The Board accepts DFO's position that potential effects on marine fish and fish habitat from Project-related marine shipping are likely to be low risk (excluding potential accidents or malfunctions), and that there is no direct evidence of mortality or unrecoverable injury to salmon from shipping noise.
- The COSEWIC emergency assessment for Thompson River and Chilcotin River Steelhead (2018), as well as the COSEWIC assessment and status reports for the Interior Fraser population of Coho salmon (2016) and for 24 Fraser River Designatable Units of Sockeye Salmon (2017), list numerous threats and limiting factors. These include habitat degradation, fishing, bycatch, industrial effluent, pathogens, predation, ocean warming, and climate change, but not routine operations of marine shipping.

The Board does not therefore consider it necessary to impose a condition, as requested by a number of First Nations, to require Trans Mountain to carry out further assessment of the effects of underwater noise on fish.

With regard to Dr. Schwarz's proposed mitigation measure for vessels to slowdown to reduce underwater noise, this is discussed in detail with regard to marine mammals above, and is included in the Board's recommendations (see Recommendation 6(a)). With regard to the proposal to minimize nighttime transits, the Board heard about numerous challenges to this approach: for example, it would increase noise for all species during the day, it could increase the need for vessels to go to anchor, and it could create traffic congestion during the day with associated safety concerns (see discussion of 'quiet periods' with respect to marine mammals above). As a result, the Board considers limitations on nighttime transits could create more risk than benefit. With regard to the proposal to reduce vessel lighting to reduce disturbance to fish, the Board heard that tankers operate at low lighting when at sea subject to navigational safety, and so the Board expects that light disturbance from Project-related marine shipping on fish is already likely to be negligible.

The Board heard concerns about anchorages in the southern Gulf Islands and their use by vessels.[129] Federal authorities responded that they have initiatives underway to mitigate adverse effects due to the use of these anchorages, and the Board heard that Project-related tankers use anchorages in other locations.

Invasive species

The Board acknowledges the evidence provided by participants and agrees that ballast water from commercial marine vessels can promote introduction of aquatic invasive species. However, the Board shares the opinion of Trans Mountain and DFO which indicates that compliance with Ballast Water Control and Management Regulations of the *Canada Shipping Act, 2001* would effectively minimize any potential introduction of aquatic invasive species from Project-related marine vessels. Therefore, the Board has not provided a detailed assessment of the potential effects on marine fish from the introduction of aquatic invasive species from Project-related ballast water.

With regard to Cowichan Tribes proposed condition that Trans Mountain should file proof that it requires ballast water treatment, the Board is satisfied that requirements under the *Canada Shipping Act*, *2001* including the upcoming transition from ballast water exchange to the use of ballast water management system, as well as under Trans Mountain's Vessel Acceptance Standard, are sufficient.

The Board heard some evidence on the potential for invasive species to be transferred via hull fouling. The Board notes measures such as anti-fouling compounds, that tanker operators typically arrange for hull cleaning on a regular basis, a requirement for confirmation that a vessel's hull and propeller are not fouled excessively in Trans Mountain's Vessel Acceptance Standard, as well as international attention via the IMO's 2011 *Guidelines for the Control and Management of Ships' Biofouling* and associated IMO review. The Board is therefore satisfied that potential adverse effects related to invasive species transfer via hull fouling from the relatively small number of Project-related marine vessels is likely to be minor.

[129] This was raised, for example, in a report entitled "Vessel Anchorages – Potential Environmental Effects in the Southern Gulf Islands" by PGL Environmental Consultants for the Snuneymuxw and Stz'uminus First Nations.

Vessel strikes

The Board heard evidence that vessel strikes are a threat to both Basking shark and Leatherback sea turtle, and that strikes often go undetected and are thus underreported. Although the likelihood of a strike between a Project-related vessel and a SARA-listed species appears to be low, the loss of an individual of a SARA-listed endangered species in an already small population could have population-level effects. Mitigation measures to reduce the potential for strikes are discussed in detail with regard to marine mammals above, and Basking shark and Leatherback sea turtle are included in the Board's recommendations concerning vessel strikes (see Recommendations 1, 5, and 6).

Salmon and Steelhead

As noted above, the Board's assessment of the adverse effects of Project-related marine shipping on fish and fish habitat (including invertebrates and reptiles) from wake waves, underwater noise, invasive species and vessel strikes, is likely to be of low magnitude. However, the Board heard evidence of extensive concerns about the declining status of numerous west coast salmon and Steelhead species, and about the many and varied cumulative effects on them. The Board received evidence from Federal authorities that there are a wide variety of initiatives and measures currently underway or planned to help address such concerns. The Board also received submissions from parties challenging the adequacy of such initiatives and measures.

While existing cumulative effects on fish and fish habitat do appear to be significant in a number of cases, the Board finds that the contribution from Project-related marine vessels to such cumulative effects is likely to be inconsequential. The Board used the same cumulative effects methodology described in Section 10.1.4.4. The Board concludes that Project-related shipping is not likely to cause significant adverse environmental effects. Nevertheless, the Board's recommendations to government concerning the overall cumulative effects on the Salish Sea (see Recommendations 1 and 2) include consideration of the cumulative effects on, and initiatives and measures for, salmon and other fish stocks.

With regard to Musqueam's suggestion to expand Condition 132 (marine mammal protection plan) to include fish and fish habitat, the Board notes that Condition 132 is focused on measures that Trans Mountain can undertake with regard to marine mammals. The Board has instead included consideration of broader cumulative effects on fish and fish habitat in its recommendations concerning the overall health of the Salish Sea (Recommendations 1 and 2).

In response to suggestions from intervenors for additional mitigation at pipeline watercourse crossings, such as the call for trenchless directional drilling rather than trenching at critical salmon habitat watercourses as suggested by PIPE UP, the Board notes that watercourse crossings were the subject of extensive deliberation during the Board's OH-001-2014 hearing. The Board agrees with the findings in Sections 10.2.3 and 10.2.5 of the Board's Report. The Board also notes that the evidence provided by Dr. Rosenau on behalf of PIPE UP raises comparable issues and is substantially similar to what was provided to the Board in the OH-001-2014 hearing from PIPE UP and Salmon River Enhancement Society.

Significance evaluation: adverse effects from vessel wake on marine fish

	Criteria	Rating	Description
Project effects	Temporal extent	Long term	Effects would occur for the duration of operations.
	Reversibility	Reversible	Localized and short term effects are expected to be reversible.
	Geographic extent	Local Study Area	Localized to small portions of the Local Study Area.
	Magnitude	Low	Some impacts to intertidal habitat could occur from Project-related marine vessel wake waves, such as increased sedimentation. However, wake wave heights at the shoreline would be within the range of natural conditions, and are unlikely to result in any measurable changes to the biophysical characteristics of intertidal habitats. Effects on SARA-listed species and their habitat would be similar, and such species have no critical habitat within the LSA and RSA.
Recommendation	Not likely to cause significant adverse environmental effects.		

Significance evaluation: adverse effects of underwater noise on marine fish

	Criteria	Rating	Description
Project effects	Temporal extent	Long term	Effects would occur for the duration of operations.
	Reversibility	Reversible	Some form of adverse, short-term effect is likely to occur from underwater noise produced by Project-related marine vessels, but the Board was not convinced that these short-term effects would translate into larger, more substantial impacts.
	Geographic extent	Local to Regional Study Area	Project-related vessels would generate underwater noise within the shipping lanes, although underwater noise can extend into the regional study area, albeit attenuated.
	Magnitude	Low	Despite some uncertainties, the Board was not convinced that effects from the relatively small number of Project-related vessels would translate into larger, more substantial impacts.
Recommendation	Not likely to cause significant adverse environmental effects.		

Significance evaluation: adverse effects from invasive species on marine fish

Ballast water from commercial marine vessels can promote introduction of aquatic invasive species. However, compliance with the Ballast Water Control and Management Regulations of the *Canada Shipping Act, 2001*, and the upcoming transition from ballast water exchange to the use of ballast water management system, would effectively minimize any potential introduction of aquatic invasive species from Project-related marine vessels. Therefore, the Board has not provided a detailed assessment of the potential effects on marine fish from the introduction of aquatic invasive species from Project-related ballast water. Likewise, there is potential for invasive species to be transferred via hull fouling, but given measures such as anti-fouling compounds, that tanker operators typically arrange for hull cleaning on a regular basis, that Trans Mountain's Vessel Acceptance Standard requires confirmation that a vessel's hull and propeller are not fouled excessively, and the IMO's 2011 *Guidelines for the Control and Management of Ships' Biofouling* and associated IMO review, the Board is satisfied that the potential for invasive species to be transferred via hull fouling is being minimized**.**

Significance evaluation: adverse effects from vessel strikes on marine fish

	Criteria	Rating	Description
Project effects	Temporal extent	Long term	Effects could occur for the duration of operations.
	Reversibility	Reversible to permanent	At the individual level a vessel strike could range in severity from injury (reversible) to death (permanent). At the population level, effects would likely be reversible unless the population was small and could be permanently affected by one individual loss. This might be the case for Basking shark and Leatherback sea turtle, and although there is some uncertainty given that strikes are not always detected or reported, this is expected to be a low probability event.
	Geographic extent	Local to Regional Study Area	A strike would occur in the shipping lane where the vessel is present, although in the unlikely case of a population level effect, effects could extend to the range of the population.
	Magnitude	Low to High	Magnitude would depend upon the severity of the injury and the relative impact at the population level. Although unlikely, mortality of an individual of a low-population SARA-listed endangered species could be of high magnitude.
Recommendation	Not likely to cause significant adverse environmental effects.		

Significance evaluation: cumulative effects on marine fish

Cumulative effects	Despite some uncertainties, the above effects of Project-related marine shipping on fish (i.e., wake effects, underwater noise, introduction of invasive species, and vessel strikes) in combination are not likely to cause significant adverse environmental effects, given each is of low magnitude or (in the case of a high magnitude strike) of low probability. There are, however, substantial existing cumulative effects from other sources on some species, ranging from inland degradation of spawning habitat, to bycatch, to global processes such as climate change and ocean warming. Some species are, as a result, at-risk and listed under the SARA. Nevertheless, the contribution to such cumulative effects by Project-related marine vessels is likely to be inconsequential.
Recommendation	Not likely to cause significant adverse environmental effects.

14.7.4 Marine birds

In both the OH-001-2014 and MH-052-2018 hearings, participants, including Indigenous communities, outlined concerns related to effects on marine birds, and marine bird species at risk, from Project-related marine shipping including sensory disturbance from noise and vessel presence and mortality risk from collisions with Project-related marine vessels. Participants also raised concerns about effects of large and chronic spills on marine birds, including species at risk. Effects of accidents and malfunctions on marine birds is outlined in Section 14.8.1.

Several participants, including BC Nature and Nature Canada, NS NOPE, Cowichan Tribes and the District of North Vancouver, noted the importance of the southern coast of B.C. and in particular, Burrard Inlet and the Fraser River Estuary, to marine birds during winter, and during fall and spring migration.

In the OH-001-2014 hearing, Trans Mountain said the RSA encompasses many marine bird breeding and staging areas that are in close proximity to the shipping lanes. Trans Mountain noted that out of a total of 124 marine bird species in the RSA, 19 species of waterfowl and coastal seabirds of conservation concern have been identified as potentially occurring within the RSA. Table 29 lists the species that are listed under Schedule 1 of the SARA, with the addition of Western grebe and Horned grebe (western population): two species which have been listed under Schedule 1 of the SARA since the OH-001-2014 hearing.

Table 29: Marine bird species at risk potentially affected by Project-related increase in marine vessel traffic

Species	Status
Marbled murrelet	Threatened
Pink footed shearwater	Threatened
Red knot (*roselaari* type)	Threatened
Short-tailed albatross	Threatened
Ancient murrelet	Special concern
Black-footed albatross	Special concern
Great blue heron	Special concern
Long-billed curlew	Special concern
Western grebe	Special concern
Horned grebe	Special concern

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Newly listed marine bird species at risk

Trans Mountain and BC Nature noted that, since the issuance of the OH-001-2014 Report, Western grebe and Horned grebe (western population) have been listed as Special Concern under Schedule 1 of the SARA (as noted in the updated Table 29) and have the potential to be affected by Project-related marine shipping. Trans Mountain said that there are no species-specific Recovery Strategies, Action Plans or Management Plans for either species; however, both are included in the Multi-Species Action Plan for Gulf Islands National Park Reserve of Canada.

Trans Mountain said that effects on Western grebe and Horned grebe (western population) from Project-related marine shipping are the same as was assessed for marine birds, including marine bird species at risk, in the OH-001-2014 hearing, such as sensory disturbance, and injury or mortality events.

ECCC and BC Nature said that Barn swallow and Bank swallow are likely to be affected by the Project and have been listed under Schedule 1 of the SARA as Threatened since the OH-001-2014 hearing. ECCC also said that Common nighthawk was listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Special Concern in March 2018 from its COSEWIC listing of Threatened in 2015. ECCC noted that Common nighthawk's SARA Schedule 1 listing of Threatened remains unchanged. Parks Canada listed a number of non-aquatic bird species that are known to occur in the Gulf Islands National Park Reserve or Pacific Rim National Park.

Trans Mountain said that it does not predict adverse environmental effects related to mortality risk or sensory disturbance in relation to Project-related marine shipping transportation for Common nighthawk, Bank swallow, or Barn swallow, or other non-aquatic birds identified, because those species are not marine species.

New Recovery Strategies and Management Plans for SARA-listed marine birds

ECCC and BC Nature both stated that, since the OH-001-2014 hearing, Management Plans have been finalized for each of Ancient murrelet, Black-footed albatross, Peregrine falcon, and Great blue heron. ECCC and BC Nature also noted that Recovery Strategies have been finalized for each of Common nighthawk and Red knot since 2015. ECCC provided Recovery Strategies for each of Marbled murrelet, Pink-footed shearwater, Short-tailed albatross, and Red knot, and provided a Management Plan for each of Ancient murrelet, Black-footed albatross, Great blue heron, and Long-billed curlew.

ECCC said that Management Plans for Western grebe, and Horned grebe (western population) and Recovery Strategies for Barn swallow and Bank swallow are currently being prepared. In addition, draft Marine Critical Habitat for Marbled murrelet is being developed for the Salish Sea.

The Wilderness Committee, Barkley Sound Stewardship Alliance (BSSA), and NS NOPE refer to critical habitat of marine bird species, or habitat of critical importance in the area potentially affected by Project-related marine shipping.

Trans Mountain noted that no critical habitat has been identified in either a Recovery Strategy or Action Plan for SARA-listed marine bird species.

Marine bird effects assessment methodology

In its evidence, NS NOPE provided an expert report by Hartley and Hansen that asserted Trans Mountain did not address the unique risk to marine birds, including species at risk, presented by increased shipping in the Central Harbour of Burrard Inlet. Marine bird SARA-listed species noted by the expert report as located in Central Harbour include Great blue heron, Horned grebe, Long-billed curlew, Marbled murrelet, and Western grebe. The expert report stated that, since vessel traffic through the Central Harbour is at a relatively low frequency, Project-related shipping is an entirely new environmental effect in that area.

Trans Mountain replied that it conducted a full assessment of potential effects of Project-related shipping on marine birds and concluded that there would likely be residual effects but that such effects will not be significant.

Overview of effects of Project-related marine shipping operations on marine birds

ECCC said that vessel traffic is recognized as a low, current, and continuous threat that is increasing for Marbled murrelet, that the species' Recovery Strategy specifically identifies the Salish Sea as an area of particular concern, and that reduction of vessel-induced effects is in line with existing Recovery Strategies. ECCC said that the Recovery Strategy for Marbled murrelet recommends establishing information on the extent and magnitude of marine threats, including vessel traffic, that contribute to mortality of that species, as a strategic direction for recovery.

To address threats of marine industrial activity to Short-tailed albatross and Pink-footed shearwater, ECCC suggested supporting research on basic knowledge gaps on species distribution, assessing potential species' impacts as part of

environmental assessment processes, undertaking research to identify areas of habitat use by the species in Canada, and developing tools to explain to vessel operators the conservation issues facing the species. ECCC stated that the COSEWIC status report for Western grebe identifies the extent of human caused disturbance within the species' winter habitat (including the Fraser River Delta and Burrard Inlet) as an information gap.

As in the OH-001-2014 hearing, concerns were raised by various participants regarding effects of a Project-related increase in marine vessel traffic on marine birds, including injury and mortality and sensory disturbance. ECCC said that there is incomplete knowledge regarding population level-impacts to marine birds from routine shipping operations, and as such there is a high degree of uncertainty with regard to potential Project-related impacts and the effectiveness of mitigation measures is challenging to assess.

Trans Mountain considered the potential merits of light reduction, vessel speed and noise reductions, and the avoidance of high density use areas by marine birds, in terms of reducing potential adverse effects of Project-related marine shipping on marine birds.

Trans Mountain said that it believes that any mitigation or monitoring programs to address Project-related sensory disturbance and mortality risk (i.e., collisions) would need to be government led and applied industry

Injury and mortality

Trans Mountain noted that marine bird collisions with Project-related marine vessels are sporadic events that are highly dependent on location, weather and season. It said that vessel strikes are mostly due to attraction to light by nocturnally-foraging species that are naturally attracted to light as they feed on bioluminescent prey.

Trans Mountain said that species potentially sensitive to light (albatross, petrels, auks, murres, and puffins) are generally in low number in the RSA relative to their overall populations. It said that given the relatively small number of individuals reported in the RSA and the fact that light attraction does not necessarily result in mortality, it is unlikely that a population level effect would result.

B.C. Nature and Nature Canada asked if Trans Mountain would include a low-lighting protocol as a condition of contracting with tankers, tugs and any other vessels associated with the Project. Trans Mountain said that it would explore options for reducing lighting on Project-related vessels, to the extent that it is feasible with respect to safety and industry regulations.

MH-052-2018 hearing

Mitigation measures

In the MH-052-2018 hearing, participants including ECCC, Mr. R. MacVicar, and NS NOPE raised concerns about lighting and the resultant risk of mortality from marine birds colliding with Project-related marine vessels, similar to concerns raised in the OH-001-2014 hearing. Participants noted the need for light reduction to mitigate bird attraction and mortality from collisions with vessels. Trans Mountain considered the feasibility of timing of vessel transits to reduce effects on marine birds.

Light reduction

ECCC said that light reduction measures are in line with SARA recovery documents to reduce mortality of species at risk for which light pollution is a threat. ECCC noted that measures such as the use of the minimum intensity lighting, light shielding, use of LED lighting rather than incandescent lighting, and reduction of light use during inclement/foggy weather can help minimize the risk of migratory bird mortality due to human-induced light.

Regarding the technical feasibility of the light reduction measures proposed by ECCC, Transport Canada said ships' lighting is regulated by the Collision Regulations of CSA 2001. The regulations stipulate the number, placement and colour of lights as well as requirements for the distance from which these lights must be visible. Transport Canada said that vessels of the size that would be used for the Project are also required to illuminate their decks while in anchor.

Transport Canada noted that Chamber of Shipping of BC and Vancouver Fraser Port Authority have industry guidelines for vessels at anchor that encourage that deck lights be kept at a minimum consistent with the safety and security of the vessel, and that the deck lights are projected down onto the deck. However, Transport Canada noted that navigation light requirements must be in place as per the Collision Regulations and cannot be replaced with a non-compliant light. Transport Canada also noted that when a vessel 100 metres and more in length is at anchor, it is required to also use the available lights to illuminate its deck.

NS NOPE said that Trans Mountain (with the Port/Transport Canada) should be required to implement a program to safely reduce the use of moored vessel lighting in Burrard Inlet. NS NOPE also suggested that the regional cumulative effects management plan to be developed by the GIC (Recommendation 1) should also include new regulations for vessel lighting

and noise on moored ships and shipping traffic to mitigate risk to birds and other organisms. Trans Mountain said that Transport Canada and the Canadian Coast Guard would be best placed to create a mechanism (e.g., regulation, policy, guidelines) for vessel operators to avoid or reduce unnecessary lighting. Based on the measures provided by ECCC, it would likely be well placed to support Transport Canada and the Canadian Coast Guard.

The Vancouver Fraser Port Authority suggested that Trans Mountain's Vessel Acceptance Standard could be modified to require lighting management while at sea to minimize the risk of strikes by marine birds. In response to the Vancouver Fraser Port Authority, Trans Mountain noted it does not have the authority to enforce vessel operations once the vessel has left Westridge Marine Terminal. Trans Mountain said its Vessel Acceptance Standards already exceeds regulatory requirements and there are certain items in the Vessel Acceptance Standards, such as requiring use of deck lights to be kept to a minimum, consistent with safety and operational requirements that could be considered as operating best practices that are not typically implemented elsewhere. Trans Mountain said it will continue to work with the shippers' marine sub-committee to promote high technical and operating standards for vessels they charter to call at Westridge Marine Terminal.

BC Nature said that, even though ECCC presents mitigation practices to reduce effect on marine birds from Project-related lights, Trans Mountain did not propose mitigation because vessel lighting for safe navigation is unavoidable.

Trans Mountain said that it does not have direct control over lighting on vessels calling at the Westridge Marine Terminal because those vessels are operated by third parties and are regulated through the CSA 2001. As part of implementing Trans Mountain's Light Emissions Management Plan, however, Trans Mountain will request vessel operators to reduce the amount of exterior deck lighting wherever possible.

Sensory disturbance

Trans Mountain said that marine birds could alter their normal movement patterns to avoid sensory disturbances in the LSA associated with Project-related marine traffic. It also said that birds could avoid preferred sites within the LSA because of atmospheric and underwater noise during vessel operations. Trans Mountain said that the magnitude of effect varies by species and setting, as well as from the type and frequency of disturbance.

Trans Mountain said that existing atmospheric sound in the vicinity of the marine shipping lanes is a combination of natural and man-made sound, and no changes to the type or intensity of sound generated are expected as a result of the Project. It said that the only change expected is the number of pass-by occurrences from the increase in tanker traffic, which is expected to be, on average, one laden tanker and one empty tanker daily. Trans Mountain said that vessels associated with the Project represent a small portion of the total vessel traffic in the RSA.

Trans Mountain said that given there is already substantial amount of marine vessel traffic in the LSA and RSA, birds have likely become habituated to noise, and there is no evidence to suggest that the increase in Project-related marine vessel traffic could result in population level cumulative effects. Trans Mountain noted that intolerant marine birds would be displaced by marine traffic, so birds that continue to use this habitat have adjusted to accept this disturbance. Trans Mountain said that proving habituation is difficult in most cases, but especially so at sea where adequate baseline data are scarce. It said that, based on the reasonable assumption that habituation occurs, the cumulative effect on marine birds has been reduced relative to what it would be without habituation.

ECCC said that the continued presence of marine birds in the LSA and RSA where they are currently exposed to vessel traffic and industrial activity does not mean that they would continue to acclimate to increases in vessel traffic and industrial activity as a result of the proposed Project. It said that the response of marine birds can be expected to vary with volume and frequency of vessel traffic and industrial activity to such a point where birds abandon the area.

Trans Mountain said that it did not propose mitigation for Project-related marine vessel effects on marine birds from sensory disturbance or mortality because Project-related marine vessels would be operated by third parties acting under relevant shipping and piloting laws and regulations. It said that since it has little direct control over the actions of vessel owners and operators, mitigation is considered to include existing regulations and shipping standards that are monitored by several federal and international authorities. Trans Mountain said it expects that, through its tanker acceptance process, Project-related vessels would be maintained and operated to high industry standards. For example, all Project-related vessels would be fitted with exhaust silencers.

The Board requested a species-specific assessment for all SARA-listed marine birds from Project-related marine transportation, which included a request for species-specific mitigation. For each species, Trans Mountain recommended that no mitigation measure be implemented for effects on marine birds from Project-related marine vessels. Trans Mountain said that Project-related marine vessels will be operated by third-party subcontracting corporations acting under relevant shipping and piloting authorities, and that marine transportation in Canadian territorial waters is regulated through the CSA 2001 administered by Transport Canada and the Canadian Coast Guard.

ECCC recommended that certificate conditions include an Avian Monitoring Plan to assess the effectiveness of proposed mitigation measures to avoid harm (incidental take) to migratory birds that could arise from activities related to marine

transportation, or any other lighting sources. It said that this plan should include monitoring aboard tankers during shipping to assess the effectiveness of mitigation measures in avoiding incidental take through collisions and to identify the need for additional mitigation measures.

In response to ECCC's recommendation, Trans Mountain said that although it is not the owner or operator of tankers and cannot commit operators of Project-related vessels to report marine bird strikes/collisions with vessels in transit, it would include a section on marine birds in its Port and Terminal Book. Trans Mountain said the Port and Terminal Book would be submitted to the TERMPOL Review Committee a minimum of six months prior to commencement of operation, and would include a request for vessel operators to report any bird strikes/collisions to Marine Communication and Traffic Services.

Trans Mountain said that a bird strike notification system would be best developed by federal departments responsible for protecting the marine environment, such as ECCC.

MH-052-2018 hearing

In the MH-052-2018 hearing, ECCC stated that several SARA recovery documents, including those for Marbled murrelet and Red knot, indicate that boat traffic can disturb species at risk on their marine foraging grounds. ECCC said that, in particular, the Recovery Strategy for Marbled murrelet states that the species is easily disturbed by the passage of boats, highlights speed as a factor in the degree of disturbance, and notes that already high levels of traffic along commercial shipping routes as a threat.

ECCC also said that, depending on the sensitivity of response, marine birds, including species at risk, may be temporarily or permanently displaced from breeding, foraging, staging, or roosting habitats due to underwater noise.

ECCC said that, currently, neither the Province of British Columbia nor the Government of Canada has prescribed sound level criteria for assessing injury or behavioural responses of marine birds to underwater noise sources. ECCC suggested that Trans Mountain (alone or in partnership with others) conduct surveys on the presence, abundance, and distribution of marine birds within the area of Project-related marine shipping and conduct acoustic modelling to characterize the potential for interaction with Project-related vessel activities contributing to underwater noise.

Trans Mountain responded that ECCC would be best placed to conduct acoustic modelling and surveys within the area of Project-related marine shipping. Trans Mountain noted that acoustic modelling would likely be misdirected if focused only on Project-related vessel traffic, as birds would not likely exhibit unique responses to Project-related vessels compared to other vessels with similar characteristics (e.g., size, design, and transit speed). Trans Mountain said it would consider any invitation from ECCC (or their partners) to support these undertakings in a meaningful way.

ECCC suggested adherence to the Government of Canada's Guidelines to Avoid Disturbance to Seabird and Waterbird Colonies in Canada as an example of measures it considered to be technically feasible to avoid or reduce effects on marine birds.

Mitigation measures

Vessel design and maintenance procedures

Trans Mountain noted that possible regional mitigation measures requiring government and/or industry leadership for further investigation and implementation with support or participation from Trans Mountain, include vessel design and maintenance procedures to reduce underwater noise production. Trans Mountain said that responsible parties for this mitigation would be the shipping industry, ECHO, and itself. Mr. R MacVicar also noted that tanker design and better prop screw design could reduce underwater noise.

Vessel speed

ECCC suggested measures such as reducing vessel transit speeds to the extent feasible, consistent with recommendations that would support other marine wildlife expected to interact with Project vessels (e.g., whales). ECCC also suggested adhering to speed restrictions that may be established by Transport Canada or the Vancouver Fraser Port Authority, and adhering to any Project-specific Operational Management Plans, a Noise Management Plan, and/or a Marine Activities Plan that includes feasible measures to reduce vessel volumes and/or vessel speeds, which may be developed by Trans Mountain. ECCC said that reduction in vessel speed, if feasible, is in line with recovery documents for marine bird species at risk.

Trans Mountain also noted that possible regional mitigation measures requiring government and/or industry leadership for further investigation and implementation with support or participation from Trans Mountain include vessel speed restrictions.

Trans Mountain said that a reduction in vessel speed might change the response of some birds from a more energetic to a less energetic one, but regardless of vessel speed, marine birds in the path of an oncoming vessel will need to avoid the respective vessel. Trans Mountain, however, noted that slower vessel transit speeds would mean that the vessel is present at a given location longer, potentially extending the duration that an area of the marine environment would be unusable to marine birds.

Transport Canada said that prior to implementing speed reduction, the risks to navigation and safety would need to be considered to determine safe speeds within the geographic region, and challenging navigational conditions and the impact of weather would make effective implementation difficult, depending on speeds considered. Transport Canada noted that imposing a speed restriction specific to Project-related marine vessels would introduce further complexity due to safety issues caused by vessels travelling at different speeds in the same area where some vessels would not be free to increase or decrease speed based on the situation faced during a given transit.

Forage fish habitat enhancement

NS NOPE said the Board should require that Trans Mountain help mitigate the effects of disturbance from ship movement in Burrard Inlet by committing money to habitat enhancement for forage fish in Burrard Inlet (restore food supply for birds to compensate for energy spent flying away from ships). Trans Mountain stated that it made a $50,000 contribution to the Pacific Salmon Foundation (PSF) in November 2014 to be used for salmon habitat restoration in Burrard Inlet. In 2017, Trans Mountain said it signed a Memorandum of Understanding with PSF for terrestrial and marine multi-year programs. The agreement committed up to $3 million in funding to support grants to community groups for salmon conservation, coastal research as a part of the Salish Sea Marine Survival Program and Strategic Salmon Health Initiative.]

Application of marine bird mitigation to apply to all marine shipping

BC Nature said that Trans Mountain's argument that potential mitigation strategies would need to be universally adopted across all shipping for it to be effective, is made without supporting evidence and its scientific validity is questionable. BC Nature stated that actions that result in decreased mortality in species at risk or species with declining populations are likely to help conserve those species.

Marine bird monitoring

ECCC said that since there is limited information on the impacts to marine birds from vessel noise and other disturbances (e.g., lighting), monitoring stemming from an Avian Monitoring Plan coupled with adaptive management, could serve to improve the understanding of these impacts to marine bird species, including those federally designated as species at risk listed under the SARA. ECCC also said that monitoring for sensory disturbance with adaptive management measures where appropriate, are in line with recovery documents for marine bird species at risk. As in the OH-001-2014 hearing, ECCC continued to recommend that Trans Mountain develop the Avian Monitoring Plan, in consultation with ECCC, other relevant federal departments/agencies, the provincial government, and Indigenous communities.

NS NOPE proposed that the Avian Monitoring Plan be a separate condition of the certificate to monitor the actual effects of shipping on Marine birds in Burrard Inlet and along the entire shipping route.

Trans Mountain also noted use of vessel-based marine bird mortality and sensory disturbance monitoring. Trans Mountain said that for monitoring to be meaningful at the Project and cumulative scales, a government-led program supported by industry could be tenable. Trans Mountain said the program could initially be constrained to large vessels (e.g., cruise ships, bulk and cargo vessels, tankers and ferries), and be expanded to include smaller vessels if necessary. Trans Mountain did note, however, that there is likely no technically or economically feasible mitigation that could be implemented to mitigate observed effects. However, Trans Mountain said that, while it may be possible to obtain a relative measure of marine bird mortality across the shipping industry, mitigating an identified effect may be technically and economically impractical.

Trans Mountain identified two specific potential monitoring programs that could be government-led with financial support coming from vessel operators, that could provide some insight into the effects of marine transportation on marine birds: onboard marine bird monitoring during vessel transit along the shipping lanes; and use of satellite (i.e., GPS) or radio (i.e., Motus Wildlife Tracking System) transmitters to track real-time movement of individual birds in relation to the positions of vessels. However, Trans Mountain noted issues with the feasibility of each of onboard monitoring or use of transmitters.

Trans Mountain also noted that potential confounding, biasing, or limiting factors that could affect the results of such a study would be: other marine traffic, time of day or year in relation to species presence and being able to do the survey, and weather (i.e., fog or rain can impact viewing distance and species identification). Ship orientation relative to the sun's position could also affect the ability to detect birds, and might affect bird responses to approaching vessels.

Trans Mountain said that the use of satellite or radio transmitters to track real-time movements of individual birds in relation to the positions of vessels is technically, and probably economically, feasible, but the program itself would likely

cause stress to individual birds through capture and handling, and some birds may accidentally die or be more susceptible to predation because of capture or from having a tracker attached. In addition, to keep data 'fresh', new birds would need to be captured and tagged annually to account for bird movements out of the marine bird RSA and for loss over time (e.g., lost transmitters; bird mortality). Trans Mountain said that, for the Motus Wildlife Tracking System to work, infrastructure would need to be put in place so that the marine bird RSA, or at least an "area of interest," is adequately covered. A highly coordinated system of the spatial and temporal whereabouts of vessels and tracked birds would be needed to effectively assess potential sensory disturbance from vessel traffic.

ECCC stated that, with respect to onboard marine monitoring and the use of transmitters, it is of the perspective that both measures would be technically feasible, but the MOTUS and satellite transmitters are not likely to collect information on a fine enough scale to detect impacts from sensory disturbance related to marine shipping.

ECCC noted that it and other organizations administer a variety of monitoring and research programs related to marine bird sensitivities in the south coast region including surveys ECCC said that its current monitoring activities focus on tracking populations (e.g., generating population estimates, identifying bird use of important habitats or generating population trend estimates for migratory bird species and some SARA-listed Migratory Birds). ECCC said it was engaged in migratory bird inventory work and the results of past regional migratory bird inventories are available in ECCC technical reports. ECCC stated that it currently allocates approximately $200,000 annually to marine bird research and monitoring programs in the Project area.

Trans Mountain said that it is committed to exploring ways to help collect monitoring data in cooperation with local communities, Indigenous groups, regulatory authorities, common marine users, and other stakeholders. Trans Mountain said that it would support an industry-wide marine bird monitoring program led, coordinated, financed (with industry support), and overseen for technical and scientific merit, by government agencies. Depending on the type of monitoring program adopted, and of the specific details required for implementation, Trans Mountain could provide support that might include, but not be limited to, financial support, technical expertise, and direct participation. Trans Mountain said that it remains interested in contributing if collaboration is through the OPP, managed by ECCC and/or TC, and with an emphasis on baseline monitoring on B.C.'s southern coast,. Trans Mountain said it envisions that its contribution to the OPP would be directly linked to establishing and growing the capacity of a local group by providing a means for them to undertake a regional marine bird baseline monitoring program.

Views of the Reconsideration Panel

Trans Mountain and intervenors have filed conflicting evidence about the level of habituation that may occur with marine birds, including marine bird species at risk. The Board is of the view that habituation is species and context dependent. It is reasonable to expect that where marine birds have not already been displaced from busy marine waters that some level of habituation has occurred.

Newly listed marine bird species and marine critical habitat

The Board notes that Western grebe and Horned grebe (western population) have been listed under Schedule 1 of the SARA since the OH-001-2014 hearing and have the potential to be affected by Project-related marine shipping. Barn swallow and Bank swallow have been listed under Schedule 1 of the SARA as Threatened since the OH-001-2014 hearing, and Common nighthawk has been down-listed from Threatened to Special Concern by COSEWIC. While the Board considers effects of Project-related marine traffic on the grebe species, it is of the view that terrestrial species such as Barn swallow, Bank swallow, and Common nighthawk would not be affected by Project-related marine vessels, as these are not marine species.

The Board also notes that, despite reference to marine bird critical habitat by each of Wilderness Committee, Barkley Sound Stewardship Alliance (BSSA), and NS NOPE, no critical habitat has been identified for SARA-listed marine bird species potentially affected by Project-related marine shipping.

Marine bird effects assessment methodology

The Board gives low weight to the expert report from NS NOPE. The Board is of the view that, given there is currently shipping traffic from the existing Westridge Marine Terminal, shipping is not a new environmental effect in the Central Harbour. The Board finds that the species at risk found in Central Harbour, according to NS NOPE, are the same species for which Trans Mountain provided assessments on the effects of marine shipping, and whose location is not exclusive to the Central Harbour. The Board is of the view that Trans Mountain's assessment of Project-related marine shipping on marine birds in Burrard Inlet, including Central Harbour, is adequate, as it is consistent with the Board's filing requirements.

Mitigation measures for injury and mortality risk and sensory disturbance

ECCC, NS NOPE, and the Vancouver Fraser Port Authority proposed mitigation measures such as marine vessel light reduction, to mitigate or avoid effects of Project-related marine traffic on marine birds, including species at risk. The Board does not agree with BC Nature's and NS NOPE's assertion that Trans Mountain did not propose mitigation to reduce or avoid effects on marine birds.

The Board agrees with Trans Mountain that it has little direct control over vessels that are not at the WMT, and acknowledges the mitigation Trans Mountain has included in its WMT Emissions Management Plan, including a commitment to request that vessel operators reduce the amount of exterior deck lighting wherever possible after departing from the WMT.

Also with respect to lighting, the Chamber of Shipping of BC and the Vancouver Fraser Port Authority recommended industry guidelines on reducing lighting. NS NOPE requested that the regional cumulative effects management plan to be developed pursuant to Recommendation 1 to the GIC should also include new regulations for vessel lighting. It further requested conditions be applied requiring the reduction of moored vessel lighting. Transport Canada submitted that adequate navigation light is required under the *Collision Regulations* of the *Canada Shipping Act, 2001*. The Board is of the view that safe navigation is the first priority and finds that lighting reductions may only be applied as a mitigation measure if navigational safety concerns are addressed in a manner that is consistent with the *Collision Regulations* of the *Canada Shipping Act, 2001*.

ECCC and Trans Mountain both proposed speed reduction as a possible measure to mitigate effects of Project-related marine shipping on marine birds, including species at risk. Given the risk to navigation and safety that Transport Canada noted would come with a potential reduction in speed, especially if applied only to Project-related vessels, the Board finds that speed reduction could only be applied as a mitigation measure, if public safety concerns are addressed.

NS NOPE requested a condition requiring Trans Mountain to commit money to habitat enhancement for forage fish. This would provide a food supply for birds to compensate for energy spent flying away from ships in Burrard Inlet. The Board notes that Trans Mountain already funds habitat enhancement for fish in Burrard Inlet and finds that Trans Mountain's funding for habitat enhancement for fish in Burrard Inlet is sufficient.

Marine bird monitoring

In the OH-001-2014 hearing, ECCC recommended a condition for Trans Mountain to implement an Avian Monitoring Plan to assess effectiveness of mitigation measures proposed by it to reduce effects of Project-related marine vessel traffic on marine birds. The Board is of the view that given Trans Mountain would not own or operate the tankers that are related to the Project, and has limited control beyond WMT, such a condition would be inappropriate to impose on Trans Mountain. Trans Mountain did commit to requesting that vessel operators report any bird strikes to the Marine Communication and Traffic Services through its Port and Terminal Book. The Board agrees that federal departments, such as ECCC, may be best able to develop a marine bird strike notification system for all vessels.

During the MH-052-2018 hearing, the Board heard that there is uncertainty as to effects of marine traffic on marine birds at the population level and uncertainty as to what mitigation measures may indeed be technically and economically feasible. Given this uncertainty, the Board is of the view that a marine bird monitoring and protection program, if implemented, would allow a better understanding of impacts of vessel use within the Salish Sea on marine bird populations, including species at risk, and would inform implementation of mitigation measures through adaptive management, if warranted by the monitoring results.

While some Parties, including BC Nature, disagreed with Trans Mountain's argument that potential mitigation strategies would need to be universally adopted across all shipping for it to be effective, the Board is of the view that, since Project-related marine tankers are only a small fraction of the total vessels in the region, to be effective, a monitoring plan should apply more broadly.

ECCC and other organizations administer a variety of monitoring and research programs related to marine bird sensitivities in the south coast region including surveys, and ECCC allocates an annual budget toward marine bird research and monitoring programs in the Project area. As well, Trans Mountain has committed to explore ways to help collect monitoring data in cooperation with regulatory authorities and others. The Board is of the view that, given monitoring and research programs in which ECCC is already involved, that the Government of Canada is best placed to develop and implement a marine bird monitoring and protection program, with support of industry including Trans Mountain. The Board is of the view that this program, and any associated mitigation that follows from monitoring results, should ultimately extend to all marine shipping vessels in Salish Sea.

The Board therefore sets out Recommendation 3 to the GIC regarding the implementation of a marine bird monitoring and protection program for the Salish Sea.

The Board is of view that Project-related marine shipping effects (mortality and sensory disturbance) on marine birds are expected to be long-term and would vary in spatial extent from the Local Study Area to the Regional Study Area. However, effects are expected to be reversible at the population level, and of low magnitude and that population-level effects uncertain. Similarly, the contribution from Project-related marine vessels to total cumulative effects on marine birds from Project-related marine shipping is expected to be of long-term duration, reversible in the long term, and of low magnitude.

Taking the evidence from Parties into account, the Board's significance findings under the CEAA 2012 for Project-related marine traffic on marine birds, including species at risk, are as follows:

Significance evaluation: adverse effects on marine birds

	Criteria	Rating	Description
Project effects	Temporal extent	Long term	Sensory disturbance is likely to occur intermittently for the duration of operations of Project-related marine vessel traffic. The risk of a marine bird-vessel strike would exist for the duration of operations of Project-related marine vessel traffic.
	Reversibility	Reversible	With regard to sensory disturbance, it is reasonable to expect that where marine birds that have not already been displaced from busy marine waters, that some level of habituation has occurred. Population-level effects on marine birds from Project-related marine shipping are uncertain.
	Geographic extent	LSA to RSA	The effects associated with Project-related marine vessels could impact numerous species of marine birds found within the LSA and RSA.
	Magnitude	Low	Species of marine birds potentially sensitive to light (and therefore susceptible to collisions with Project-related vessels) are generally in low number in the RSA in relation to their overall populations. Strikes due to light attraction do not necessarily result in mortality. Regarding sensory disturbance, the Board is of the view that habituation is species and context dependent, and that it is reasonable to expect that where marine birds that have not already been displaced from busy marine waters, that some level of habituation to disturbance has occurred. Population-level effects on marine birds from Project-related marine shipping are uncertain.
Cumulative effects	Similar to the rationale above, the contribution from Project-related marine vessels to total cumulative effects on marine birds is expected to be of long-term duration, reversible in the long term, and of low magnitude.		
Recommendation	Not likely to result in significant adverse environmental effects.		

14.7.5 National Marine Conservation Areas / Marine Protected Areas

This section provides a discussion on marine park reserves, historic site, conservation areas under Parks Canada Agency's and DFO's responsibilities in the areas of Project-related marine shipping, and potential mitigation and monitoring measures to avoid, reduce, and/or offset the impacts of Project-related marine shipping on marine and shoreline ecosystem components.

Proposed Southern Strait of Georgia National Marine Conservation Area Reserve (SSG NMCAR)

Trans Mountain said that the SSG NMCAR has been proposed and would protect much of the Salish Sea used by a diversity of birds, marine mammals, and fish (Figure 28). Parks Canada said that approximately 108 km^2 of the proposed shipping route goes through the proposed SSG NMCAR as it goes parallel to Galiano and Mayne Islands and around Tumbo, Saturna, and Pender Islands as it goes through Boundary Pass and parallel to Sidney and D'Arcy Islands as it crosses through Haro Strait.

Parks Canada said that Canada and the Province of British Columbia signed a Memorandum of Understanding in October 2003, that committed the two governments to assess the feasibility of a national marine conservation area reserve in the southern Strait of Georgia, and a proposed boundary for a national marine conservation area reserve in the southern Strait of Georgia was announced on 13 October 2011. It said that a feasibility assessment study on the proposed SSG NMCAR was launched in 2004. It has included dialogue with Indigenous groups and consultations with key stakeholders, communities and the public. As part of the consultation process, Parks Canada hosted 35 public consultations, and over 300 meetings and presentations have taken place.

It said that for the purposes of the marine transportation assessment, it considered planning documents that were relevant to the Project, including Parks Canada's feasibility study for the Proposed SSG NMCAR.

Parks Canada said that the *Canada National Marine Conservation Areas Act* (CNMCAA) is the federal law that establishes National Marine Conservation Areas (NMCA). It said that NMCAs are marine areas that are managed to protect and conserve representative marine ecosystems while ensuring the ecologically sustainable use of marine resources.

Parks Canada said that Southern resident killer whale (SRKW) critical habitat has been identified within the boundaries of the proposed SSG NMCAR; however, these waters are not currently being managed by Parks Canada. The establishment of the SSG NMCAR would, however, make the Minister responsible for the Parks Canada Agency the "competent minister" under the SARA with respect to the individuals of listed species in the SSG NMCAR.

Parks Canada said that it has consulted the federal family, and will continue to work closely with Transport Canada to analyze regulatory options related to marine shipping in NMCAs, as Transport Canada remains the federal authority regulating marine shipping under the CNMCAA. Regulations specific to marine shipping under the CNMCAA would be considered only if there is a gap that cannot be filled using existing Transport Canada legislation and regulations.

Gulf Islands National Park Reserve (GINPR)

Parks Canada said that portions of the proposed shipping route is adjacent to GINPR as it goes through Boundary Pass and Haro Straight, and the entirety of GINPR is within the Marine Transportation Assessment Regional Study Area.

Pacific Rim National Park Reserve (PRNPR)

Parks Canada said that the southern section of the West Coast Trail unit from approximately Nitnat Lake (Clo-oose) to Port San Juan (Port Renfrew) is encompassed in the Marine Transportation Assessment Regional Study Area.

Fort Rodd Hill National Historic Site

Parks Canada said that Fort Rodd Hill is a National Historic Site, and the waters directly adjacent to Fort Rodd Hill is encompassed in the Marine Transportation Assessment Regional Study Area as indicated in the Project's Marine Transportation Assessment.

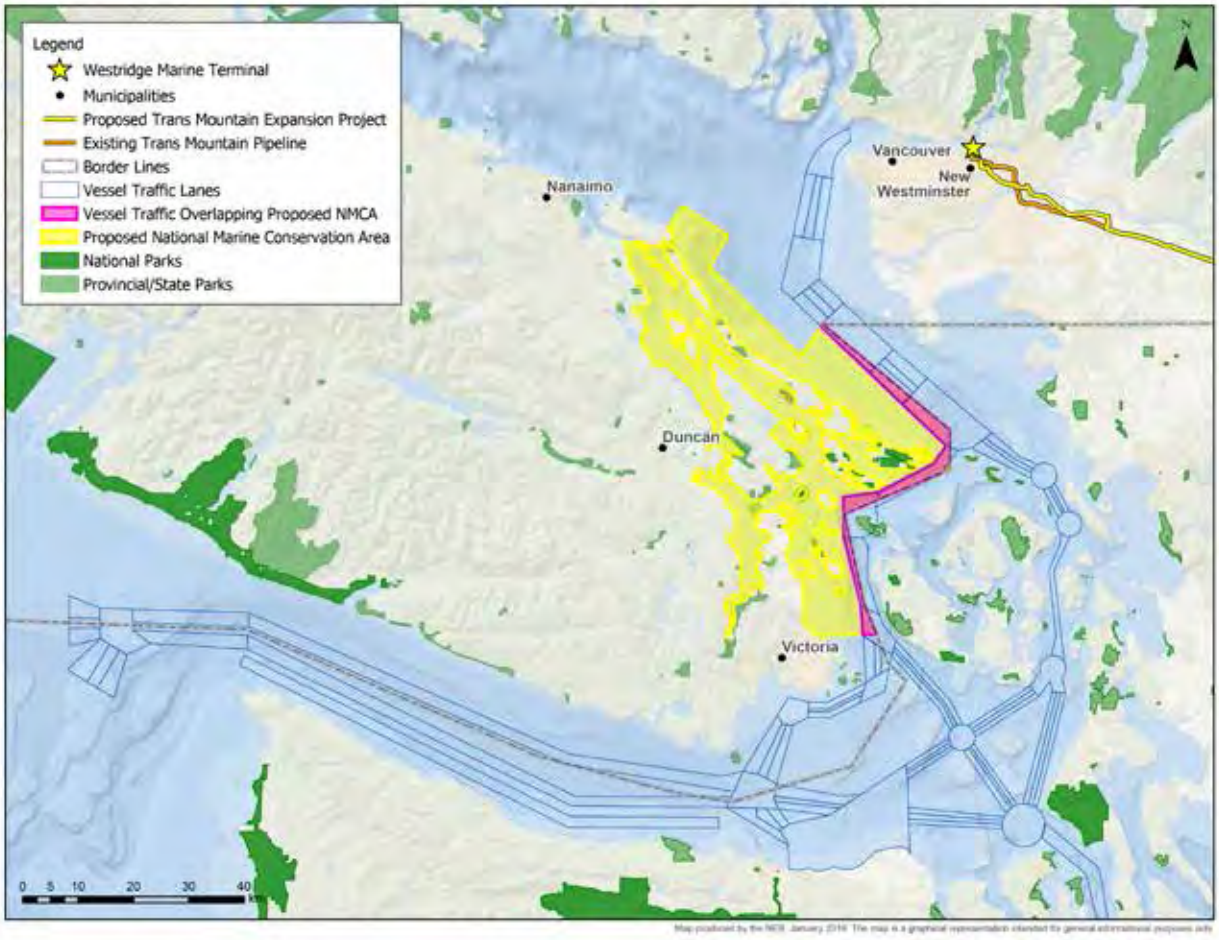
Marine Protected Areas and Ecological Reserves

DFO said that there are currently no Marine Protected Areas (MPAs) in the Marine Regional Study Area (RSA).

Pender Oceans Defenders said that the Federal and Provincial Governments have been working toward the development of a Marine Protected Area in the Haro Strait — Boundary Pass area and beyond to promote sustainability of the marine environment and the economy that depends on that environment. It urged the Board to recommend the completion of a Marine Protected Area as a necessary pre-condition for further consideration of any expansion of existing tanker traffic.

Board of Friends of Ecological Reserves said Race Rocks Ecological Reserves has been considered for over two decades to be worthy of status as a marine protected area. It said that the Province of B.C. knew the values at Race Rocks decades ago when it received ER status. It said that there has been interest in adding additional protection to Race Rocks by the Federal government but after two decades of talk, nothing has been achieved.

Figure 28: SSG NMCAR (Proposed) within the Marine Transportation Assessment Regional Study Area



The Board of Friends of Ecological Reserves said that change in shipping lanes can mitigate risk to other high value habitat and can be used to protect high value habitats in Ecological Reserves such as Trial Island, Oak Bay Islands and Race Rocks Ecological Reserves. It said that these reserves, just like SRKW habitat, have shipping lanes that could be moved further offshore to mitigate all shipping impacts. It said that moving shipping lanes is a practical mitigative strategy and when applied to all shipping, will reduce the risk to many high value sensitive ecosystems such as ERs and known high use SRKW areas in Haro Strait.

Indigenous Caucus of the Indigenous Advisory and Monitoring Committee for the Trans Mountain Expansion Project (Indigenous Caucus) fled a report from Compass which provided a preliminary review of First Nations involvement in marine use planning in B.C. and Canada along with some examples of First Nation co-governance models in other areas. This work also included a brief discussion on marine protected areas in the Salish Sea with reference to initiatives underway on the northern Pacific coast. Indigenous Caucus provided background information on marine protected area planning. It said that in 2016 Canada committed to (and directed Fisheries and Oceans Canada to) increase the proportion of Canada's marine and coastal areas that are protected to 5 per cent by 2017 and to 10 per cent by 2020 and this was supported through new programs and funding. It said that Canada has also made international agreements to meet a global target of at least 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services.

Indigenous Caucus said that given the threats to the ecological integrity and biodiversity of marine ecosystems in the Salish Sea there should be a lot of attention and efforts being directed towards the establishment of a network of MPAs, which has been repeatedly highlighted as the primary mechanism for protecting marine biodiversity on the scale of a bioregion by the federal government over the past twenty years. It said that with the development of a national framework in 2011, Canada committed to advance network planning in each of Canada's 13 bioregions which included the Strait of Georgia (Salish Sea). In 2015, Canada and B.C. reached an agreement on a strategy for developing MPA networks over the entire Pacific region (which included the Strait of Georgia).

DFO said that MPAs established under subsection 35(1) of the *Oceans Act* may prohibit or impose restrictions on classes of activities, such as marine shipping, for the purpose of marine conservation through regulations. For example, the Hecate Strait and Queen Charlotte Sound Glass Sponge Reefs Marine Protected Areas Regulations (outside of the Marine RSA) enable navigation activities throughout the MPA, but no anchoring in the core protection zones. It said that no MPAs have yet been established in the Marine RSA, but under the *Oceans Act* the Minister retains the authority to recommend to the GIC that regulations be made to designate new MPAs at a future time.

Species at risk

Parks Canada said that given the size and spatial locations of both GINPR and PRNPR, most species at risk present have the potential to be affected by marine shipping should a spill occur. In addition, the shipping routes are close to Fort Rodd Hill National Historic Site. At that location, the only species that would be impacted is the Great blue heron (fannini subspecies) and Macoun's meadowfoam.

Parks Canada noted that the Multi-species Action Plans for GINPR, PRNPR and Fort Rodd Hill National Historic Site provide detailed information regarding critical habitat, and specific conservation and recovery methods that will be carried out on PCA managed lands and waters.

Parks Canada said that both GINPR and PRNPR will continue to protect individuals and suitable habitat on national park reserve lands and support partners where feasible on recovery and protection of these species. Additionally, GINPR and PRNPR will work with partners to conduct opportunistic surveys for under-surveyed species in the park reserve and adjust management approaches appropriately when new populations or threats are found.

Mitigation

Parks Canada said that it does not have any mitigation measures to "avoid, reduce, and/or offset the impacts of Project-related marine shipping on marine and shoreline ecosystem components." However, the GIC may make regulations governing marine shipping in marine conservation areas under the *Canada National Marine Conservation Areas Act* paragraph 16(1)(e) which allows for: restricting or prohibiting activities or regulating the use of facilities in marine conservation areas or in any zones.

Views of the Reconsideration Panel

The Board recognizes that approximately 108 km^2 of the proposed shipping route goes through the proposed SSG NMCAR. The Southern Strait of Georgia is rich in marine biodiversity and is home to many marine species. The Board notes that Parks Canada is responsible for setting up national marine conservation areas that are intended to protect and conserve representative marine ecosystems and key features, while ensuring the ecologically sustainable use of marine resources. NMCAs are established to represent a marine region and to demonstrate how protection and conservation practices can be harmonized with resource use in marine ecosystems.

The Board notes that in October 2003, Canada and the Province of British Columbia signed a Memorandum of Understanding that committed the two governments to assess the feasibility of a national marine conservation area reserve in the southern Strait of Georgia. A proposed boundary for a national marine conservation area reserve in the southern Strait of Georgia was announced on 13 October 2011. The Board understands that a feasibility assessment study on the proposed SSG NMCAR was launched in 2004, and since then there has been an ongoing dialogue with Indigenous groups and consultations with key stakeholders, communities and the public. The Board realizes the importance of establishing NMCAs, and hence recommends the GIC to expedite the work in completing the feasibility study for establishing a Southern Strait of Georgia National Marine Conservation Area, and publicly report on the outcomes of that study, and (if considered feasible) proceed to establish it (Recommendation 4). The Board also notes that Recommendation 2 would also be relevant in that it includes a description of the progress on each of the recommendations.

The Board received several comments from the intervenors supporting the Board's draft recommendation. Some intervenors advised the Board that work should proceed on other potential protected marine areas in the Salish Sea as well. The Indigenous Caucus recommended that the GIC, in addition to establishing the SSG NMCAR, identify other areas that could be given similar protections to create a network of marine protected areas.

The Board recognizes Canada's commitment to meet marine conservation targets established under the Convention on Biological Diversity to conserve 10 per cent of coastal and marine areas through effectively managed networks of protected areas and other effective area-based conservation measures by 2020. The Board notes that network planning has always been emphasized as one of the primary tools in fulfilling government mandates to protect conservation and the protection of the natural environment. The Board expects Government of Canada to consider the

possibility of identifying and creating a network of marine protected areas in the Salish Sea as part of its implementation of Recommendation 1.

Effects of the Project-related marine shipping on valued environmental components within the NMCAs and ERs are considered in environmental effects assessment sections for marine fish and fish habitat, marine mammals, and marine birds (Sections 14.7.2, 14.7.3, and 14.7.4 of this chapter).

14.8 Socio-economic effects of increased marine shipping (routine operations of the tankers)

This section focuses on the changes to the socio-economic setting caused by the routine operation of the Project-related marine vessels. The socio-economic effects of the spills from marine shipping are discussed in Section 14.10 of this chapter.

14.8.1 Marine commercial, recreational, and tourism use (socio-economic conditions)

In the OH-001-2014 hearing, Trans Mountain said that Indigenous and non-Indigenous people using marine waters may experience potential marine commercial, recreational and tourism use effects from increased Project-related marine vessel traffic.

Commercial fisheries

Trans Mountain said there are substantial commercial fishing activities throughout the RSA, including areas of the southern Strait of Georgia, Boundary Pass, Haro Strait and the Strait of Juan de Fuca. There are also aquaculture operations in the RSA, although none are proximal to the shipping lanes. Trans Mountain said that in 2011 commercial fisheries in B.C. harvested approximately 168,000 tonnes of fish, worth $845.3 million. Targeted species, including salmon, herring, groundfish, crab, shrimp and prawn, are fished year-round. However, the location and timing of specific commercial fishing activities depends on a number of factors, such as the abundance and distribution of the species, the season, the value of the fishery and regulations determined by DFO. Although fishing vessels are permitted to fish in the shipping lanes as long as the passage of other vessels is not impeded, most fishing activity takes place outside of the shipping lanes.

Marine transportation

Trans Mountain said that marine transportation in the RSA includes commercial marine transport, such as passenger ferries, cargo ships, the CN Rail Bridge at the Second Narrows in Burrard Inlet, and marine transport services such as tugs and barges. There are about 475,000 vessel movements per year on the West Coast, and tankers accounted for about 1,500 movements (0.3 per cent) during 2009-2010. Most commercial vessels use the shipping lanes for transiting through B.C. coastal waters, although tugs engaged in barging activities may also use the most expedient route through smaller navigable channels, and ferries travel specific routes between terminals that cross shipping lanes.

Marine recreational use

Trans Mountain said that residents and visitors use the area for recreational activities including fishing, boating, sea kayaking and scuba diving, and marine tourism activities including cruise ship journeys, commercial sport fishing and whale-watching. It described specific characteristics of recreational use in the RSA in areas located in or near the shipping lanes, as well as near-shore locations such as river mouths, coastal campgrounds and marinas.

Marine tourism use

Trans Mountain said that tourism is a large contributor to the provincial economy, and contributed $6.5 billion to the B.C. economy in 2011. Marine tourism within the RSA is diverse, and includes cruise ships calling from international and US ports, commercial sport fishing, fishing lodges, marinas, sea kayaking tours, dive charters, whale-watching and wildlife viewing tours, and marine cruising.

Project interactions and effects

In the OH-001-2014 hearing, Trans Mountain said that a disruption of marine commercial, recreational or tourism uses may occur due to increased transit of Project-related marine vessel traffic through the RSA The company said there is a potential for increased marine vessel collisions between Project-related vessels and commercial, recreational or tourism vessels, but that such collisions are considered to be unlikely due to adherence to regulatory standards and navigational and safety measures by most marine vessels. A collision event could result in damage to vessels or gear or economic impacts for commercial marine users.

Trans Mountain said commercial fishers, marine transportation users, and some recreational marine vessels and tourism operators may alter their movement patterns to accommodate the increased presence of Project-related marine vessel

traffic, and that marine vessels in Burrard Inlet may be the most affected. The increase in tankers may be perceived to affect the quality of recreational or tourism experiences and this may lead to avoidance of certain recreational marine areas near the shipping lanes.

Indigenous and non-Indigenous participants, including Adam Olsen, Cowichan Tribes, the First Nations of Maa-nulth Treaty Society, Musqueam Indian Band, Tsawout First Nation, T'Sou-ke Nation, the Swinomish, Tulalip, Suquamish, and Lummi Indian Nations, Lyackson First Nation, and Unifor, raised concerns about the social and economic importance of commercial fisheries and seafood processing. They described their right to fish for commercial trade purposes, and the scope and extent of commercial fishing activities, including historical practices, frequented fishing areas, revenues and quotas. Many raised concerns that the increase in Project-related tankers, both in transit and while at anchor, may restrict the times and locations in which commercial fishing activities can take place or impede the ability of fishers to access fishing areas. Others expressed safety concerns about potential collisions with tankers and potential associated economic losses.

NS NOPE said that Trans Mountain understated the number and frequency of pleasure boat traffic in the vicinity of the WMT, and failed to include an adequate assessment of impacts to recreational boater traffic or the risks of a tanker accident related to recreational boater traffic, including incidents resulting in bodily injury or death. Several participants also raised concerns regarding the impact that increased Project-related traffic will have on congestion at the Second Narrows, resulting in unsafe conditions for recreational vessels and delays.

Trans Mountain said that it assessed the impact of Project-related marine traffic on the capacity of the Second Narrows Marine Restricted Area. It said there should be sufficient transit opportunities through the Second Narrows Marine Restricted Area to accommodate both Project-related marine traffic, as well as other foreseeable commercial and recreational traffic on most days of the year.

Trans Mountain said that there is potential for commercial fishers, and recreational and tourism users to experience increased sensory disturbance related to nuisance noise, visual effects and air quality associated with Project-related marine vessels transiting through the shipping lanes. However, once the tanker has passed, the nuisance effect will quickly decline.

Several participants noted that increased marine vessel traffic from the Project may indirectly contribute to a decrease in marine tourism, even during normal operations, resulting in economic loss. Some participants referred to the reputation of B.C. as an international ecotourism destination, and questioned whether increasing oil tankers in B.C. coastal waters would present an unfavourable image of B.C. to the world.

Trans Mountain said that any change in tourism patterns could have any number of contributing factors, and it is considered unlikely that increased Project-related marine vessel traffic under normal operating circumstances could be directly attributed to a decline in tourism, if one were to occur.

To mitigate these effects and concerns, Trans Mountain committed to, among other measures, provide regular updated information to fishing industry organizations, shipping associations, including the Chamber of Shipping and CN Rail, Indigenous communities and other affected stakeholders. It also committed to initiate a public outreach program prior to the Project operations phase to communicate information on Project-related timing and scheduling with affected marine users and Indigenous groups.

Trans Mountain said it supports the TERMPOL Report Recommendation 11, that Trans Mountain should provide input to the appropriate authorities for the development of an engagement and awareness strategy with respect to safety of navigation and prevention of collisions targeting recreational boaters, fishing vessel operators, and operators of small vessels. Trans Mountain also accepted Finding 20 regarding Trans Mountain's commitment to provide financial support for an enhanced education campaign for small vessel operators about safe boating practices.

Trans Mountain also said that Project-related marine vessels would be fully compliant with all applicable navigational, communications and safety regulations, including those of Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority (PPA) and Vancouver Fraser Port Authority.

MH-052-2018 hearing

Many participants raised issues and concerns with respect to marine commercial, recreational and tourism use that were similar to those expressed in the OH-001-2014 hearing. Several Indigenous groups noted concerns that the increase in Project-related tankers would restrict the times and locations in which commercial fishing activities can take place or impede the ability of fishers to access fishing areas. Others expressed safety concerns related to the potential collisions with tankers or the effects of wakes on smaller vessels, and described potential interactions resulting in personal safety concerns, and damage or loss to fishing vessels and gear. Several participants raised concerns about the developments and increased tanker traffic in the Coast Salish Region limiting or restricting their ability to use the marine waterways to access preferred harvesting sites.

Musqueam Indian Band provided a report entitled "Impacts of Marine Vessel Traffic on Access to Fishing Opportunities of the Musqueam Indian Band," which assessed the contributing factors and cumulative effect of marine vessel traffic on the ability of Musqueam fishers to navigate on and access fishing opportunities within their territory. The report estimated the potential future impacts of marine vessel traffic on fishing access, and provided recommendations on how restrictions in access to fishing opportunities can be improved by addressing known data gaps and advancing methods for estimating effects today and into the future.

As part of their Oral Traditional Evidence, Musqueam Indian Band presented a video showing the kind of waves Musqueam fishers have to deal with on the Salish Sea and described the dangers associated with these encounters. Chief Wayne Sparrow from the Musqueam Indian Band said the following during OTE:

> "...it becomes very dangerous out there with – you know, in the spring and winter months with the -- not just the traffic, but the weather and the tides. The tides are big tides, and the winter months you get the heavy winds and tides, so it makes even the bigger boats danger where you can't even go out on some days to access something on a bigger boat because it's too dangerous."

Trans Mountain said the information provided by Indigenous groups about commercial fishing and small vessel safety did not identify any potential effects that were not previously assessed in the OH-001-2014 hearing and the conclusions of these assessments of potential effects have not changed with the additional information provided.

Trans Mountain provided an assessment of Project-related marine shipping wakes with focus on the potential for negative effects of wakes on other vessel traffic, including commercial traffic and private recreational vessels, in four locations along the shipping route (Burrard Inlet, Strait of Georgia, Haro Strait and the Strait of Juan de Fuca). The study determined the height and period of wakes generated by Project-related vessels (both tankers and tug boats), and compared their magnitude and frequency of occurrence to vessel wakes caused by other vessel traffic already operating in the region. A comparison was also made with typical natural ambient wave conditions caused by winds. The study concluded that Project-related vessel waves are substantially smaller in height and substantially less in frequency of occurrence compared to existing and future commercial vessels (particularly ferries) operating along the same vessel routes and, therefore, Project-related wakes are insignificant compared to other vessel wakes already present. The study also concluded that vessel wakes from Project-related traffic are small or insignificant compared to naturally occurring wind waves that occur frequently in local waters and are considered routine by most experienced boaters.

The Pacific Pilotage Authority said that the resultant wake of an inbound Project-related tanker will be no more than that of any other slow moving bulk carrier transiting the area, and will be a lot less than a fast moving large container ship or a Cape size laden bulk carrier. It also said that the outbound tanker in the loaded condition will be restricted in its speed due to the requirement for a tug either in the vicinity (Georgia Strait and Juan de Fuca) or tethered (Haro Strait and Boundary Passage), and the maximum speed while tethered is 10 knots which will significantly reduce any wash and wake effect and minimize any impact on private recreational vessels.

Measures

Trans Mountain said that raising user awareness and knowledge amongst small vessel operators is of great importance to ensure safety of all waterway users, regardless of Project-related shipping. Trans Mountain noted that multi-party solutions with active collaboration between industry and government are required to ensure continued maintenance and advancement of the marine safety regime, and it supports the approach proposed under the OPP, whether or not the Project proceeds. Trans Mountain submitted that it has been working with the PPA to develop public education materials and promote safe boating around deep draft vessels as part of its development of the Marine Public Outreach program for Indigenous and non-Indigenous coastal communities. Trans Mountain submitted that it has also engaged directly with the VFPA, Royal Canadian Marine Search and Rescue, Boating BC and other marine safety organizations, to share information and better understand other existing public education initiatives and proactive public education for boat owners in Port of Vancouver and areas of B.C.'s south coast. Trans Mountain said that based on feedback from this engagement it will continue to share boating safety information that is available and look for ways to extend its reach to Indigenous and non-Indigenous communities along the shipping lanes.

Trans Mountain committed to provide financial assistance to smaller vessels registered in WCMRC's Vessel of Opportunity program to be fitted with Automatic Identification Systems and radar reflectors, which will aid in locating vessel assets during standard operations, as well as while undertaking response activities, and will enhance safety.

The Federal authorities said that the Oceans Protection Plan outlines several initiatives being undertaken to improve marine navigational safety and enhance sharing of marine traffic information with local communities in near real time, such as:

- Transport Canada's Enhanced Maritime Situational Awareness initiative will provide a web-based, near-real time common operating picture that will assist Indigenous and coastal communities with maritime awareness, preparedness and emergency response.

- Canadian Coast Guard's marine communications and traffic services centres will be modernized to ensure that Canada's marine safety system is better positioned to prevent and respond to marine safety and pollution incidents, and provide better information on marine traffic to both Indigenous and coastal communities.
- Canadian Coast Guard is constructing six new radar sites on the West Coast to provide marine communications and traffic services centres with greater capability to monitor marine traffic, improving overall marine situational awareness.
- Transport Canada's overall objective of the Proactive Vessel Management initiative is the development of a national framework to provide guidance and direction for the establishment of local Proactive Vessel Management forums to reduce conflicts on local waterways through a new, collaborative approach with Indigenous and coastal communities to the management of marine traffic issues, in support of improved marine safety and environmental protection, and partnerships with Indigenous communities.

The Federal authorities submitted that amendments are being proposed to the *Navigation Safety Regulations* to extend the requirement for Automatic Identification System to smaller passenger vessels to enhance navigation safety in terms of search and rescue efforts and collision avoidance.

The VFPA said that measures to avoid, reduce, and/or offset the impacts of Project-related marine shipping vessels on non-Project-related vessels, including private recreational vessels, included the establishment of Traffic Control Zones in both the First Narrows (TCZ-1) and Second Narrows (TCZ-2) facilitating the safe navigation and efficient movement of vessels in this area of the port.

The VFPA said that in addition to the relevant information published in the Port Information Guide, the VFPA publishes the safe boating guides for various parts of the ports jurisdiction, including the Burrard Inlet. The VFPA noted that the Burrard Inlet safe boating guide promotes safe boating practices, identifies hazardous navigation areas within Burrard Inlet, provides emergency contact information and other relevant information, as well as identifies the route of Project-related shipping vessels and other commercial marine shipping. The VFPA said that to support the safe and efficient movement of all vessel traffic within the Port of Vancouver, the VFPA issues annual media releases highlighting safe boating initiatives.

The PPA said that, in order to minimize any interaction between recreational and fishing vessels, it embarked on an awareness campaign providing information on the dangers of approaching too close to deep sea traffic. The PPA indicated that this included a pamphlet that has been distributed annually for the last three years to all marinas from Campbell River to Port Renfrew.

The PPA said that, in partnership with the Canadian Coast Guard and Transport Canada, it has been holding workshops over the last four years to communities all across B.C. in delivering the story of the "voyage of a vessel" and explaining the dangers of getting too close to deep sea vessels. The PPA committed to continuing the campaign with regular mail-outs to yacht clubs, marinas and fishing companies on an annual basis and offering to give presentations on small vessel safety.

Several intervenors raised concerns about the OPP initiatives to improve marine safety for smaller vessels. Some referred to the Proactive Vessel Management initiative noting that either no consultation has occurred or progress has been slow and it is uncertain if Canada's stated goal will result in meaningful improvements to marine safety and reduce accidents and impacts associated with shipping.

Heiltsuk First Nation described its experience of being given access to a marine traffic information system by Transport Canada and the CCG in order to access to real-time shipping information for certain vessels in Heiltsuk territory. Heiltsuk First Nation said that receiving access to the system was a delayed process that required Heiltsuk to follow-up numerous times to gain access, and once access was gained, it was apparent that system did not work reliably and did not contain the information that Heiltsuk requires in order to effectively manage their traditional territories.

Views of the Reconsideration Panel

The Board acknowledges the many ways in which Indigenous groups and other users enjoy the waters within the Project's marine setting. The Board recognizes that Project-related vessels would pass through areas of great significance to Indigenous peoples, community members, tourists, and recreational users, among others.

The Board is encouraged by Trans Mountain's support of the TERMPOL Report Recommendation 11, and notes that it is a key measure to minimize the potential disruption to recreational boaters, fishing vessel operators, and operators of small vessels as a result of increased Project-related marine vessel traffic. The Board is also encouraged by the initiatives being undertaken by the Federal authorities in the OPP, as well as those the VFPA and the PPA are currently carrying out to promote navigational safety. The Board acknowledges that many of these initiatives are being developed and implemented in consultation with marine users in Indigenous and coastal communities, including

Transport Canada's Enhanced Maritime Situational Awareness initiative which will be piloted by two Indigenous communities on the Strait of Juan de Fuca beginning in spring 2019.

The Board is of the view that the OPP contains several initiatives that will reduce accidents and impacts associated with Project-related shipping on smaller vessels once fully developed and implemented. The Board notes the concerns raised by intervenors that it is too early to determine the extent to which the OPP's initiatives will be effective in their stated goals to meaningful improve marine safety and reduce accidents and impacts associated with shipping. As a result, the Board proposes Recommendation 2 that encourages GIC to report publically and annually on the status of the OPP's initiatives and measures. The Board is of view that this will create transparency and accountability of the work being conducted.

In Certificate OC-064, the Board imposed Condition 131 requiring Trans Mountain to develop a public outreach program prior to Project operations in order to ensure that the program is designed in consultation with the PPA and implemented in a manner that is appropriate to its intended audience. The Board has decided to revise Condition 131 into a recommendation to the GIC which has the necessary authority to address such matters. As such, the Board proposes Recommendation 12 that encourages GIC, in conjunction with the PPA and Transport Canada, to continue engagement and awareness activities targeting coastal Indigenous communities, recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. While some intervenors argued that the Board has authority to impose and assess compliance with conditions outside its regulatory authority, no specific authority was provided by intervenors to support that the Board can enforce marine shipping conditions not linked to WMT.[130]

The Board acknowledges the concerns expressed by several intervenors regarding the proposed change of Condition 131 to a recommendation, including those which submitted that Trans Mountain would no longer be required to conduct marine safety engagement activities. The Board notes that in the OH-001-2014 hearing Trans Mountain committed to initiate a public outreach program prior to Project operations phase to mitigate the potential effects of disruption of subsistence hunting and commercial fishing activities due to increased Project-related marine vessel traffic. As such, the Board expects Trans Mountain to continue to collaborate and work in partnership with active marine authorities and organization, and coastal communities to provide information about Project-related marine vessels and associated marine concerns. The Board further expects the Trans Mountain will update its status on this commitment as part of Condition 6 (Commitments Tracking Table).

The Board acknowledges the safety concerns that were shared related to the potential collisions with tankers or the effects of wakes on smaller vessels. Many concerns raised by participants regarding marine shipping are under the jurisdiction of several federal and international authorities. The Board expects that Project-related marine vessels will be fully compliant with all applicable navigational, communications and safety regulations including those of Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority and Port Metro Vancouver (PMV).

The Board sees value in the work the Federal Authorities are doing to enhance sharing of marine traffic information with local communities and promote safer navigation, including the Enhanced Maritime Situational Awareness initiative and the proposed extension of the Automatic Identification System to smaller passenger vessels. The Board proposes Recommendation 13 that encourages GIC to accelerate the development and implementation of these programs.

The Board notes that the Salish Sea is a heavily utilized marine environment which accommodates vessels of varying sizes and speeds, and the concerns raised by Indigenous groups regarding the effects of Project-related vessel wakes on smaller vessels were not supported by any analysis disputing the quantitative assessment Trans Mountain conducted as part of the MH-052-2018 hearing. The Board accepts Trans Mountain's conclusion that wakes generated by Project-related vessels would be insignificant compared to both other vessel wakes already present and naturally occurring wind waves. The Board accepts the evidence of the PPA that Project-related marine shipping vessel wake would be no more than that of any other bulk carrier transiting the area, and would be less than other fast moving, large vessels transiting the area. The Board also agrees that the frequency of occurrence would be less than vessels currently operating along the same vessel routes.

The Board is of the view that increased marine shipping is not likely to have significant adverse effects on socio-economic conditions, including marine commercial, recreational and tourism use.

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[130] The Federal Court of Appeal at para. 456 found that while the Board lacked authority to regulate marine shipping, GIC was not so limited. The Board is of the view that enforcement and regulation are tied together and therefore has provided Recommendation 2 to the GIC.

Significance evaluation: adverse effects on socio-economic conditions, including marine commercial, recreational and tourism use

	Criteria	Rating	Description
Project effects	Temporal extent	Short term to long term	Effects are expected to occur intermittently for the duration of operations.
	Reversibility	Reversible to permanent	Depending on the type of interaction, effects may be reversible to permanent.
	Geographic extent	RSA	Effects are expected to be mostly limited to shipping lanes, although alternation of movement patterns to accommodate or avoid Project-related vessels could affect adjacent areas.
	Magnitude	Low to moderate	Effects from the Project-related marine shipping would be limited to a few or many individuals and therefore be considered to range from low to moderate magnitude. Mitigation measures are expected to reduce the magnitude of effects.
Cumulative effects	The Regional Study Area (RSA) is a heavily utilized marine environment, which is predicted to increase in use. The contribution from Project-related marine vessels to total cumulative effects on marine commercial, recreational and tourism use is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

14.8.2 Heritage resources (cultural and physical heritage)

In the OH-001-2014 hearing, several Indigenous intervenors raised concerns regarding the impact to archaeological and cultural heritage sites as a result of increased Project-related marine vessel traffic. Pauquachin First Nation said that although the possible risk of Project-related vessel wake erosion is small, assuming the projected wake heights provided by Trans Mountain are accurate, it is possible that even small waves, combined with high tide and storms, may have a negative cumulative impact, particularly given the frequency and high volume of the predicted traffic. Several Indigenous groups recommended that sites at potential risk due to erosion be visited, mapped, assessed and monitored over time to determine the current extent and ongoing rate of erosion and its impacts, and that a specific spill response plan with mitigation be developed.

Trans Mountain said there are 81 previously recorded archaeological sites located in proximity to the marine vessel corridor. The combination of existing vessel traffic, Project-related vessel traffic and reasonably foreseeable vessel traffic will increase the frequency of wake waves interacting with the shoreline. Trans Mountain said that as wakes generated by vessels will be within natural wave size variation by the time they reach the shoreline, there is no discernible impact on shorelines associated with the shipping channel and, therefore, it did not complete an Archaeological Impact Assessment for the entire marine zone.

In the MH-052-2018 hearing, Indigenous intervenors raised concerns similar to those expressed in the OH-001-2014 hearing regarding the impact to archaeological and cultural heritage sites as a result of increased Project-related marine vessel traffic. Tsartlip First Nation said that instruments developed by Canada at the conclusion of the OH-001-2014 hearing to address monitoring have not materialized and establishing effective shore-based monitoring would require years of planning effort, baseline data, and training in order to prepare for meaningful monitoring and mitigation of adverse effects.

The Parks Canada Agency noted that portions of the proposed shipping route are adjacent to the Gulf Islands National Park Reserve.

Views of the Reconsideration Panel

Paragraphs 5(1)(c)(ii) and (iv), and 5(2)(c)(ii) and (iv) of the CEAA 2012 require consideration of the environmental effects that are likely to result from the designated project on physical and cultural heritage, or any structure, site or thing that is of historical, archaeological and paleontological or architectural significance, including with respect to Indigenous people. In its evaluation, the Board has considered the effects of the Project on heritage resources to include all of the effects described in paragraph 5 of the CEAA 2012, including those of the natural landscape.

The Board accepts Trans Mountain's evidence that Project-related vessel wake will not be detectable from existing wave conditions along the shoreline adjacent to the shipping lanes given vessel size and speed along with the channel depth and width. The Board notes that the concerns raised by Indigenous groups were general in nature and were not

specific to the assessment areas for Project-related marine vessels. As such, the Board is of the view that there will not be an impact to archaeological sites located on the shoreline due to an increase in marine traffic, and, therefore, an Archaeological Impact Assessment was not required.

The Board acknowledges that archaeological sites are of significance and value to Indigenous groups. The Board encourages Indigenous groups to share information regarding potential archaeological and cultural heritage sites with the B.C. Ministry of Forests, Lands & Natural Resource Operations.

Significance evaluation: adverse effects on heritage resources

	Criteria	Rating	Description
Project effects	Temporal extent	N/A	The Board is not convinced that effects from the Project-related vessels would translate into impacts on heritage resources
	Reversibility	N/A	
	Geographic extent	Shipping lanes	The Board is of the view that Project-related vessel wake will be localized to the shipping lanes and within natural wave size variation by the time they reach the shoreline
	Magnitude	N/A	
Recommendation	Not likely to cause significant adverse environmental effects.		

14.8.3 Traditional marine resource uses, cultural practices, and activities

Trans Mountain conducted traditional marine resource use (TMRU) studies to evaluate the potential effects of Project-related marine vessel traffic on traditional resource use. The spatial and temporal boundaries used for the TMRU assessment are described in Appendix 11.

Methodology and scope of assessment

In the OH-001-2014 hearing, Trans Mountain said the TMRU studies took place in coastal and international waters to provide information regarding the marine-based activities that participating Indigenous communities undertake. The company said that the information collected in the TMRU studies was used to assess potential Project effects on travelways, plant gathering sites, hunting, fishing, gathering places and sacred areas.

Trans Mountain said the results of the TMRU studies, and desktop analysis and literature review, indicate that Indigenous groups have historically used and presently use the RSA to maintain a traditional lifestyle, and that they continue to use marine resources throughout the RSA for a variety of purposes. Trans Mountain said that this includes, but is not limited to fish, shellfish, mammal and bird harvesting, aquatic plant gathering, and spiritual/cultural pursuits, as well as the use of navigable waters within the RSA to access subsistence resources, neighbouring communities and coastal settlements. As part of its assessment, Trans Mountain prepared and submitted a supplemental TMRU report incorporating information from traditional marine resource use reports and related evidence filed directly with the Board by Indigenous intervenors, or that were provided directly to Trans Mountain. Trans Mountain stated that the TMRU result and concerns raised by these Indigenous communities are summarized in these reports.

Trans Mountain said that the two indicators used to assess potential effects from increased Project- related marine vessel traffic on TMRU were subsistence activities and cultural sites. The company said that subsistence activities and sites represent the extensive land and water bases on which activities take place, and provide a broad view of where and how people move in the landscape, how they use it and where they inhabit it. The company said that cultural sites represent people's long-term connection to the land and water, and include the ability to participate in and continue practices and activities conducted by past generations, and the ability to pass on the collective knowledge and use of the environment according to tradition. Trans Mountain noted that access to and continued use of cultural sites promotes cultural continuity, and that gathering areas and sacred areas are collective terms used to incorporate all types of sites unrelated to the acquisition of environmental resources.

Indigenous groups raised a numbers of concerns about Trans Mountain's approach to assessing potential effects to TMRU, including cumulative effects. These included:

- failure to conduct an effects assessment specific to each Indigenous group's areas of interest;

- that the level of site-specific mitigation for TMRU was not sufficient, and should be developed in consultation with Indigenous groups;
- flaws in spatial scope identified for the Project;
- failure to include the potential effects of increased Project-related marine vessel traffic on coastal habitation and cultural sites; and
- Trans Mountain's conclusion that there would be no significant adverse effects to traditional marine resource use, except potential adverse effects to traditional use of Southern resident killer whale populations.

In response to the concerns raised by Indigenous groups regarding its approach to assessing potential effects to TMRU, determination of significance, and proposed mitigation measures, Trans Mountain said that its assessment addresses the potential interactions identified by Indigenous groups through the assessment of the likely effect of the Project on the environment and TMRU. Trans Mountain said it reviewed the findings of each TMRU report submitted by Indigenous groups in the context of the assessment and determined that the significance conclusions with regard to TMRU remain unchanged by this evidence. In addition, Trans Mountain said that, where feasible, it identified mitigation to reduce the magnitude and duration of potential TMRU effects.

Trans Mountain said that with respect to the size of the study areas that were used in the assessment, the spatial extent of the RSA represents a trade-off between choosing too large an area that would mask Project effects, versus choosing an area too small where the effects on the population under consideration might no longer be meaningful at a landscape scale.

Several Indigenous groups raised concerns regarding potential damage or erosion to coastal natural habitats/harvesting areas such as kelp beds and reefs, and culturally or spiritually sensitive shoreline areas as a result of Project-related vessel wake. Squamish First Nation said that Trans Mountain's lack of assessment regarding these coastal sites represents an error in assessment scoping because it fails to consider the profound connections between land, sea, and culture of the Squamish Nation that are potentially affected by the Project.

Trans Mountain said that due to the average channel width, and the relatively rapid rate at which wake waves decrease in height away from the transiting tankers and escort tugs, vessel wake is not expected to be detectable from existing wave conditions along most of the shoreline in the RSA. Therefore, it did not include the potential effects of Project-related marine vessel traffic on coastal habitation sites since it was not considered to interact with land-based activities.

Effects of Project-related marine vessel traffic on traditional marine harvesting and cultural activities

In the OH-001-2014 hearing, Trans Mountain said that resources used and activities associated with TMRU are located within the RSA and situated along or near shipping lanes. Based on the results of the TMRU studies and the desktop analysis, travel corridors are essential for conducting traditional activities and accessing locations for traditional harvesting, and the shipping lanes must be traversed to access TMRU sites. Trans Mountain noted that subsistence harvesting and associated travel can occur within the RSA year round.

Trans Mountain said that the potential effects of Project-related marine vessels on TMRU include the disruption of subsistence hunting, fishing, plant gathering activities, the disruption of use of travelways, and the disturbance of gathering places and sacred areas.

Trans Mountain said that a disruption of subsistence activities may occur due to increased transit of Project-related marine vessel traffic through the RSA by restricting access to traditional use areas particularly if the resource users' travel occurs at the same time and in the same location as the Project vessel's transit. The company said that this could result in limiting the ability to harvest in certain areas, missed harvesting opportunities, or an increase in travel time to reach a destination, all which could reduce access to marine resources. Trans Mountain stated the magnitude of the effect is considered to be low, since it is expected that subsistence activities may be interrupted due to Project-related marine vessel traffic but the Project-related disruption would only be temporary and activities are likely to be resumed in most cases once the vessel has passed, and the frequency of Project-related marine vessels would be once a day.

Trans Mountain said that sensory disturbance as a result of increased marine vessel traffic may deter resource harvesters from using areas or could influence the focus of the activity, particularly if the Project- related marine traffic occurs at the same time and place as the subsistence activities. Trans Mountain said that sensory disturbance due to increased marine vessel traffic may also result in disruption to cultural activities (e.g., gathering places, sacred areas), as well as influence the focus and intent of ceremonial activities. The company said this could result in choosing other locations for their traditional activities, and increased travel time to reach a destination.

Trans Mountain said that there is a potential for increased disruption of traditional marine resource user activities from Project-related marine vessel wake, and increased potential for marine vessel collisions between Project-related vessels and traditional marine vessel traffic. The company said that such disruptions and collisions are considered to be unlikely due to

adherence to regulatory standards and navigational and safety measures by most marine vessels. A collision event could result in lost opportunities for traditional resource harvesting may result if an incident occurs. Trans Mountain also said damage or loss to fishing vessels or fishing gear may result from interactions between Project-related marine vessels and traditional marine resource users' fishing vessels. Trans Mountain said lost economic opportunities to marine users could result from: damage or loss of marine vessels; damage to fishing gear; injury; or physical displacement of marine users from the presence of Project-related marine vessels in transit or occupying anchorages.

Trans Mountain said that changes to the distribution and abundance of resources could result in loss or alteration of harvesting areas, which could result in indirect effects such as harvesters having to spend more time and money to travel further for subsistence activities. The results of effects assessments for marine mammals, marine birds and marine fish and fish habitat indicate that although there may be residual effects due to the increase in Project-related marine vessel traffic the effects are considered to be not significant, with the exception of Southern resident killer whales. Trans Mountain said it has been determined that there is a currently-existing significant adverse cumulative effect on this population and that while the endangered status of the Southern resident killer whale prohibits the current hunting of this species, historical data indicates that Southern killer whale populations were once, and may in future be, a traditionally harvested resource within the RSA.

With the exception of effects on the Southern resident killer whale, Trans Mountain said the Project's contribution to broader Indigenous cultural effects related to change in traditional marine use patterns is considered not significant. Trans Mountain noted that some traditional resource use vessels may only be temporarily inconvenienced by the presence of Project-related marine vessels (low magnitude), but for others, fishing activities may be delayed (medium magnitude) since routes to fishing grounds may need to be altered, or fishers may not be able to fish in preferred locations due to increased Project-related marine vessel traffic.

Trans Mountain said the combined effects from Project-related marine vessel traffic on TMRU are long- term and with a low to high magnitude given the predicted residual effects on the Southern resident killer whale population. It said effects are considered in the context of existing high-volume vessel activity within the RSA and an existing regulatory framework. Trans Mountain also said this takes into account the context of the availability of a traditionally harvested resource to meet the cultural and subsistence needs of potentially affected Indigenous peoples. Trans Mountain said the combined residual effects associated with Project-related marine vessel traffic on TMRU are considered not significant, with the exception of the expected residual effects on the Southern resident killer whale population, which are considered to be significant.

Trans Mountain said it assessed cumulative effects for marine transportation by considering projects that overlap with potential effects of Project-related marine vessel traffic. All components of the marine environment are understood to support the marine resource base and habitat conditions essential to the practice of traditional activities. As such, the potential cumulative effects on subsistence activities and sites were assessed in consideration of all pertinent biophysical resources known or assumed to be of importance to Indigenous communities for traditional use, as well as in consideration of the existing high volume of large vessel traffic within the RSA.

Trans Mountain said that increased marine vessel traffic is likely to increase congestion in areas that are geographically constrained and already experience high marine traffic volumes and may potentially cause some traditional marine users to avoid these areas or to alter their preferred routes due to sensory disturbance from transiting marine vessels. Trans Mountain said that a significant adverse total cumulative effect is predicted for traditional use of Southern resident killer whales due to existing marine shipping activities that will continue with or without the Project, however, total cumulative effects on other traditional marine resources and indicators, and the Project contribution to those effects, are concluded to be not significant.

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Impacts on traditional marine resource uses, cultural practices, and activities

Trans Mountain said that it considered the potential effects of increased Project-related marine vessel traffic on traditional marine resource use (TMRU) in the original Application. It said that the data used to inform its assessment of environmental effects and the environmental resources that underpin Indigenous rights is described in its original Application, and included desktop/literature reviews, TMRU studies completed and engagement feedback-to-date. As new information has been submitted, Trans Mountain said it has been reviewed to see if new issues, interactions or effects not previously anticipated are identified and whether conclusions of the assessment would be altered in light of the new information.

Trans Mountain stated that it had received traditional ecological knowledge/traditional marine resource use (TLU/TMRU) from 21 marine Indigenous communities. During ongoing engagement, Trans Mountain said that some of these 21 communities have provided further detailed information on their TLU/TMRU. Trans Mountain noted that the remaining marine Indigenous communities have chosen not to provide TLU/TMRU information to Trans Mountain or have chosen not to engage at all. Trans Mountain said that it respects the decision of these Indigenous communities to provide the

information or not, and is always open to and welcomes receiving TLU/TMRU information or studies for further analysis. Trans Mountain said that it welcomes such supplemental information at any time during the lifecycle of the Project, and will analyze it in the context of the stage of the Project that it was provided. Trans Mountain said that all TLU/TMRU information provided to date has been reviewed and it will continue to consider the information in the context of Project planning and mitigation as the Project is developed.

Trans Mountain said that it continues to receive updated TMRU information, formally and informally through engagement meetings, and continually reviews the information for specific impacts and mitigation measure opportunities that can be incorporated into Project plans prior and during the construction cycle, and into post-construction remediation plans.

With regards to concerns regarding Southern resident killer whales (SRKW) and traditional use by Indigenous peoples, Trans Mountain said that for those communities who presented evidence regarding this issue throughout the OH-001-2014 hearing (Ditidaht, Lyackson, Pacheedaht, Squamish, Stz'uminus, Tsawout, Tsawwassen, Tsleil-Waututh, T'Sou-ke), Trans Mountain followed up with each Indigenous community with a letter response addressing each of the specific concerns raised. Trans Mountain also prepared a detailed overview of issues, mitigation measures and resolutions, referred to as "Issues Summary and Resolution Tables," for each Indigenous group in response to the concerns identified.

Trans Mountain said that from 2014 to present, Indigenous communities continue to raise general concerns about the SRKW, but to date there has been no additional, specific TLU or TRMU feedback since the OH-001-2014 hearing. Trans Mountain responded to the general concerns by reaffirming its commitment to developing a MMPP with a purpose of outlining Project-related tanker specific measures that would be implemented by Trans Mountain as well as regional collaborative initiatives along the marine shipping lanes that are intended to mitigate and manage potential environmental effects on marine mammals. Trans Mountain said that it has received feedback from many Indigenous communities about the deep cultural ties they have with SRKW. Trans Mountain hopes that the efforts to mitigate effects will be viewed positively by all Indigenous peoples, including the Pacheedaht First Nation and Ditidaht First Nation, who have expressed a deep interest to Trans Mountain in ensuring the marine safety at Swiftsure Bank, a critically important offshore fishing area and a key harvesting area.

Trans Mountain also noted that Lyackson First Nation in particular provided it with correspondence regarding its concerns with Project-related marine shipping impacts on SRKW, including highlighting the gaps in knowledge with respect to understanding the threats to the deteriorating population of SRKW, as well as for understanding the mitigation strategies required to overturn the trend of the decline in population. Trans Mountain said that Lyackson recommended that Trans Mountain wait for the completion of research that informs scientifically proven mitigation measures prior to proceeding with the Project, so that the SRKW population can recover to sustainable levels.

Trans Mountain noted that to mitigate potential adverse effects associated with increased Project-related marine vessel traffic on traditional Indigenous use associated with marine mammals, it committed, among other measures, to:

- Provide regular updated information on Project-related marine vessel traffic to fishing industry organizations, Indigenous communities, and other affected stakeholders, where possible through the Chamber of Shipping of BC (COSBC); and
- Initiate a marine public outreach program prior to Project operations phase. Communicate any applicable information on Project-related timing and scheduling with fishing industry organizations, Indigenous communities and other affected stakeholders.

Trans Mountain also stated that it is of the view that multi-party initiatives are an essential approach to managing cumulative effects on the SRKW population, its critical habitat, and associated effects on traditional Indigenous use of the population.

Trans Mountain said that it is committed to continuing to build positive relationships with Indigenous communities and to meaningful engagement to address concerns. Trans Mountain said that its support for and participation in successful mitigation measures and joint programs that promote the survival and recovery of SRKW will address the main concerns raised by Indigenous groups.

Throughout 2016 to 2017, Trans Mountain said that it engaged with Indigenous communities with an interest in the marine environment regarding the concept of a Salish Sea initiative to understand concerns, remedies and mitigation with respect to the SRKW and the marine environment. Initial discussions focused on the possible role of this initiative and concepts with respect to collaboration to implement targeted priority stewardship projects that restore and enhance the environment, monitoring and assessing cumulative environmental impacts, supporting ecosystem research and knowledge exchange, and providing stewardship education and training.

Marine shipping impacts on TMRU, cultural practices, and activities provided by Indigenous groups

In the OH-001-2014 hearing, several Indigenous communities and Adam Olson expressed the importance of their continued ability to exercise their Indigenous rights to fish, harvest, and hunt throughout their respective traditional territories within the RSA. The information provided by Indigenous intervenors described the scope and extent of their activities, and focused on how communities and individuals use the lands, waters, and their respective resources to exercise their claimed or established Indigenous and treaty rights. This included information about food harvesting activities (primarily relating to fishing, but also hunting, trapping, medicinal herbs, and plant and berry gathering), as well as the cultural importance of these activities.

Indigenous groups described the traditional methods of fishing, the important role the harvesting sites and camps play in passing traditional knowledge on to future generations, how food is prepared and stored, and the sharing, trading, and feasting that comes after foods are harvested. They also described how their cultural systems, practices, and stewardship are inextricably connected to the traditional use of the lands and the waters. They included specific information on annual and seasonal harvesting locations and species used by Indigenous groups for the activities described, how the needs of that community continued to be met by these activities, as well as specific sites that are of cultural or spiritual importance to potentially affected Indigenous groups.

Several Indigenous groups, including Cowichan Tribes, Scia'new First Nation, Ditidaht First Nation, Esquimalt Nation, Pacheedaht First Nation, Lyackson First Nation, Tsawout First Nation, T'Sou-ke First Nation, Squamish First Nation, Musqueam First Nation, Tsartlip First Nation and Tsleil-Waututh Nation, said that existing levels of large ship traffic and industrialization have already reduced the ability to harvest in the certain areas, and reduced the frequency of interactions with mainland nations for cultural, ceremonial and economic reasons. They also raised concerns about the effects of existing development on the health of the ecosystems and resources harvested and their cultural and spiritual well-being.

Lyackson First Nation said that it estimates more than 50 per cent of their salmon harvest relies on transit of the Salish Sea and the Fraser River.

T'Sou-ke First Nation characterized the ongoing impact of cumulative effects in the T'Sou-ke territory as "death by a thousand cuts" or the "tyranny of small decisions" carried out over generations affecting the T'Sou-ke Nation's traditional mode of life, including its ability to maintain the sustainability of traditional marine resources to a level adequate to ground T'Sou-ke Nation's cultural connection to its territory.

Several Indigenous groups, including Esquimalt First Nation and Stz'uminus First Nation expressed concern that accessing marine harvesting, and cultural and spiritual sites will be further restricted as a result of increased Project-related marine traffic. Indigenous groups, including Tsleil-Waututh Nation, T'Sou-ke First Nation and Pacheedaht First Nation, described how a disruption or reduction to traditional travelways would represent a loss of cultural expression and identity, as well as a loss of teaching opportunities for youth.

Indigenous groups, including Tsleil-Waututh Nation, Scia'new First Nation and Lyackson First Nation, expressed concerns that noise from Project-related vessel traffic would impact cultural heritage and activities by disrupting ceremonial activities, alienating members from some parts of their territory, complicating ties with other First Nations communities, and exposing territory, including sacred sites, to Project-related risks They said that the Project-related vessel traffic would create loss of privacy and quiet for cultural and sacred practices.

Indigenous groups noted concerns regarding marine safety. Indigenous groups, including Esquimalt First Nation, Pacheedaht First Nation and Ditidaht First Nation, said that increased tanker traffic would threaten marine safety, presenting increased risks of collisions between tankers and smaller traditional resource use vessels. They explained that a collision could result in damage to vessels or gear utilized to exercise harvesting rights. Tsleil-Waututh Nation said the increased shipping associated with the Project could physically curtail their ability to travel around the inlet in small vessels. Lyackson First Nation said they were concerned with the increased risk of accident and interference with small boat navigation including canoes and subsistence fishing boats.

Several Indigenous groups raised concerns with respect to the alteration of subsistence resources as a result of increased Project-related vessels. The Indigenous groups said that an increase in tanker traffic will alter subsistence hunting and fishing resources by changing wildlife behaviour and migration routes. This would have a negative impact on their ability to harvest these resources.

A number of Indigenous groups raised concerns about the increased tanker traffic at Swiftsure Bank, which has been a shared fishing area for centuries. These Indigenous groups said studies should look at weather extremes including full stochastic modelling of extreme wind and wave conditions.

In the MH-052-2018 hearing, Indigenous intervenors submitted evidence, both written and oral, regarding the impacts of marine shipping on their traditional marine resource uses, cultural practices and activities within the marine RSA. As in the

OH-001-2014 hearing, they noted the importance of marine resource use to their way of life, including resources for food, social, cultural and ceremonial purposes, and governance.

Indigenous communities continued to express the importance of their continued ability to exercise their Indigenous and Treaty rights to fish and harvest throughout their respective traditional territories within the marine RSA and shipping route. Indigenous intervenors described the scope and extent of their activities, including their travel routes, specific traditional use sites, fishing and food harvesting activities, as well as the cultural practices and activities associated with the exercise of their claimed or established Indigenous and Treaty rights. Indigenous communities noted the importance of marine fish and other resources for food, social and cultural uses, including trade, as well as ceremonial purposes.

Indigenous communities also expressed concerns about how Project-related marine shipping would impact their Indigenous and Treaty rights, not only due to interruptions to their physical ability to access the marine resources of the Salish Sea, but the impacts on their cultural and spiritual connection with these marine resources, including their ability to pass knowledge down to future generations, and their stewardship activities to protect the marine resources of the Salish Sea. For instance, Chief Harvey Underwood from the Tsawout First Nation said the following during OTE:

> Just like that moth that needs that flower, we need that ocean, we need that land, in the same way that moth thrives on that to live for another time."

Ditidaht, Pacheedaht, T'Sou-ke, Tsawout and Tsartlip all filed new or updated traditional marine use studies as part of the MH-052-2018 hearing. These studies identified sites within the marine RSA and the shipping route where individual First Nations continue to practice traditional marine uses, including descriptions of the cultural connection associated with these areas and practices. Tsleil-Waututh Nation (TWN) provided new confidential information related to their cultural and spiritual connections within the area, and noted that lack of privacy caused by increased marine shipping would prevent their cultural practices.

Indigenous communities continued to raise concerns regarding marine safety, including the concern that increased tanker traffic would present increased risks of collisions between tankers and smaller traditional resource use vessels, as well as unsafe navigation due to wakes created by tankers.

Indigenous intervenors continued to raise concerns that increased Project-related traffic would impede travel routes and access to important traditional fishing grounds. Ditidaht and Pacheedaht once again expressed that Swiftsure Bank is a preferred location for exercising Indigenous rights to harvest marine resources, and expressed concerns that the increased traffic in Swiftsure Bank would impact the availability and abundance of marine resources. Ditidaht also suggested that vessel traffic should be rerouted to avoid Swiftsure Bank.

As in the OH-001-2014 hearing, multiple Indigenous intervenors also described the importance of their traditional use activities for cultural continuity. Indigenous communities noted that fishing and harvesting has always been a means of transmitting traditional knowledge, culture and way of life from generation to generation. For instance, Councillor Chris Lewis from the Squamish Nation said the following during OTE:

> Everything we do as Squamish people is based in place. Our songs, our teachings, our ancestral names tell us of who we are and where we come from.

Indigenous communities upstream of the marine shipping areas described their traditional interaction with coastal Indigenous communities. They spoke of the interconnection of their waterways, such as the Fraser and Thompson rivers, with the Salish Sea, as well as the familial connections amongst Nations. Indigenous communities in Alberta described the trade and bartering that took place between coastal and inland Indigenous communities, which included, among other resources, plants, salmon, meats and medicines.

Southern resident killer whale

In the OH-001-2014 hearing, a number of Indigenous groups expressed concern about the social and cultural effects that would result from impacts of marine shipping on the SRKW. Tsawwassen First Nation stated it does not have a history as a whaling nation but has strong cultural ties to killer whale. The species figures prominently in the stories of Tsawwassen First Nation citizens and the Tsawwassen have adorned their ocean-going canoe with an image of the killer whale. Tsawout First Nation said there are clans and families that are connected to killer whales, and the impacts and loss of whales in their territories is a loss to those clans and families.

Pacheedaht First Nation said that increased tanker traffic will further impact the recovery of the killer whales. Given the importance of killer whales to their culture, this was a serious concern to Pacheedaht First Nation. T'Sou-ke First Nation said adverse effect on a key resource such as killer whale could have catastrophic ripple effects on their rights, title and sense of identity as Indigenous peoples of Canada.

Tsartlip First Nation said killer whales are culturally and spiritually important to Tsartlip people. Tsartlip First Nation described the profound spiritual importance of killer whales to their people, their relationship with them, and their obligation to protect them.

In the MH-052-2018 hearing, Indigenous intervenors submitted evidence, both written and oral, regarding the impacts of marine shipping on their traditional marine use, activities and practices associated with the SRKW.

TWN provided new information relating to its cultural relationship with the SRKW. In confidential oral and written evidence, TWN explained that its relationship with the SRKW are both a cultural relationship and an embodiment of its stewardship laws. TWN noted that the significant adverse environmental effects that marine shipping will visit upon SRKW will impair TWN's cultural relationship with them. Specifically, losing SRKW would impair TWN people's traditional identity, which is dependent upon their ability to maintain their connection with their community and ancestors. TWN noted that this connection includes the ongoing tradition of SRKW visiting Burrard Inlet upon the deaths of TWN chiefs and other leaders.

Multiple Indigenous communities, including Malahat, Tsawout, T'sou-ke, Snuneymuxw, Tsartlip, Tsawwassen, Pacheedaht and others, explained the importance of SRKW in their culture and spirituality. They explained that SRKW have prominent roles in their origin stories and that any reduction in their numbers, let alone their complete extirpation, would take an important and sacred piece of the culture of coastal Indigenous communities. Indigenous intervenors such as Makah Tribal Council and Snuneymuxw shared stories about the transformation of ancestors into killer whales, that these transformers would undertake spiritual matters of the sea or return to the community with lessons or messages from the whales. Elder Geraldine Manson, from the Snuneymuxw First Nation said the following during OTE:

> To remove something that is so sacred to our communities, the killer whale … it would be so devastating. It's like losing language. It's like losing culture. It's removing something, a part of us.

Indigenous intervenors such as Lyackson and Tsawout explained that their oral traditions and history include stories of SRKW accompanying their ancestors on fishing trips, or guiding them to important marine resources. Indigenous communities noted that the killer whales are considered to be their ancestors and that they play an important role in teaching younger generations. Several Indigenous communities also noted that because of the important role that the SRKW play in their cultural and spiritual practices, that the First Nations themselves have responsibility in the protection and stewardship of these whales. Elder Pearl Harris from the Stz'uminus First Nation said the following during OTE:

> We believe that the killer whale is an ancestor of someone's ancestor, our ancestors. They come in many forms. And I believe that if we lose the killer whale, we lose some of our teachings, our teachers. We lose that spirit that is needed for our survival, just like we need seafood, we need the land, we need the animals. And I keep saying that they are our spirit, they are our people. We all have that strong belief.

Mitigation measures

In the OH-001-2014, in order to mitigate the effects and concerns regarding traditional marine harvesting and cultural activities, Trans Mountain committed to, among other measures, provide regular updated information on Project-related marine vessel traffic to Indigenous communities. It also committed to initiate a public outreach program prior to the Project operations phase to communicate information on Project-related timing and scheduling with Transport Canada, the Canadian Coast Guard, the Chamber of Shipping for British Columbia, commercial and tourism associations, and potentially affected Indigenous groups.

Trans Mountain said that Project-related marine vessels would be fully compliant with all applicable navigational, communications and safety regulations, including those of Transport Canada, the Canadian Coast Guard, the PPA and PMV.

Trans Mountain said it has identified mitigation to reduce the magnitude and duration of potential effects, where feasible. However, Trans Mountain said that as the shipping industry follows internationally and federally regulated guidelines and rules (such as the use of the international shipping lanes for routing and the use of pilots during transit), the company said there is limited ability for any tanker or vessel to alter route or schedule. Trans Mountain stated that all Indigenous groups will be invited to attend regional EPP workshops where mitigation measures and monitoring programs will be discussed.

With respect to the Southern resident killer whale, Trans Mountain committed to developing a Marine Mammal Protection Program with a purpose of outlining Project-related tanker specific measures and regional collaborative initiatives that would be implemented by Trans Mountain and other operators along the marine shipping lanes to mitigate and manage potential environmental effects on marine mammals.

With respect to Swiftsure Bank, Trans Mountain acknowledged its importance to Indigenous communities, and recognizes that the shipping lanes cross over Swiftsure Bank. Trans Mountain said it will raise awareness amongst Project tankers about conditions near Swiftsure Bank in its Port Information and Terminal Operations Manual.

In the MH-052-2018 hearing, Trans Mountain acknowledged the information provided by Indigenous communities regarding their use of the marine RSA for cultural and subsistence activities and noted the overall importance of marine resource use to Indigenous way-of-life. It also acknowledged that Indigenous communities' connection to the marine environment is profound. Trans Mountain noted that it had assessed potential residual effects related to Project-related marine vessels in regard to disruption of traditional activities, alteration of subsistence resources and alteration of vessel movement patterns and included consideration of effects related to sensory disturbances and changes in access.

Trans Mountain said that the types of impacts presented by Indigenous communities in their written and oral traditional evidence are consistent with those assessed in the original Application, and no new information was presented that changes any of the results from that assessment. Trans Mountain said that it has reviewed the new information provided by Indigenous communities as part of the MH-052-2018 hearing in the context of its original ESA and has determined that the significance conclusions of the ESA with regard to TMRU remain unchanged for both Project-related effects and the contribution to cumulative effects.

With respect to the SRKW, Trans Mountain said that it is of the view that multi-party initiatives are an essential approach to managing cumulative effects on the SRKW population, its critical habitat, and associated effects on traditional Indigenous use of the population. In its evidence, it provided an outline on those initiatives that were already underway, as described elsewhere in this Report, including:

- The Oceans Protection Plan (OPP)
- The Action Plan for the Northern and Southern Resident Killer Whale
- Pacific Salmon Foundation – Salish Sea Marine Survival Project
- ECHO Program
- Green Marine
- Chair in Cetacean Research at UBC

Trans Mountain noted that all of the multi-party initiatives also act in support of the requirements of Condition 132 - Marine Mammal Protection Plan (MMPP). Trans Mountain noted that its Condition 132 compliance filing is required three months prior to commencing operations on the Project, however, it said that it had plans to commence a process to solicit and obtain feedback and comments from Indigenous communities on a draft version of the MMPP no later than 18 months prior to the commencement of Project operations.

The Federal Authorities also pointed to these multi-party initiatives in their evidence. They noted that a key principle across all OPP activities is building Indigenous partnerships. They said that funding for Indigenous engagement and participation in the OPP gives recipients the opportunity to take part in developing and improving Canada's marine transportation system and contribute their knowledge towards tailoring marine transportation systems to local conditions and the environment.

The Federal Authorities also noted that during engagement on the OPP, as well as during Project-specific reviews and engagement activities, they heard from Indigenous communities that they want to be able to monitor real-time vessel traffic in a system that identifies areas of traditional use, as a potential means to mitigate impacts on this use. Further, Indigenous communities have indicated during this engagement that they may want sensitive areas, such as SRKW habitat, identified in the system. One of the potential sources of information to be displayed in the Enhanced Maritime Situational Awareness system is data relating to the current position of marine mammals, including the SRKW. The Federal Authorities noted that there are various potential sources of this data, which could be shared directly with British Columbia Coast Pilots and the commercial shipping industry to improve their situational awareness and minimize interference with the SRKW. Although the pilot project has not yet begun, the Federal Authorities said that they understand that Indigenous peoples want to be able to monitor real-time vessel traffic in an application that identifies areas of traditional use, as a potential means to mitigate impacts on this use.

The Federal Authorities said that meaningful collaboration on potential adverse effects of Project-related marine traffic could be enabled through Proactive Vessel Management forums between Indigenous communities, industry, Non-Governmental Organizations, and federal and other authorities. For example, they noted that Indigenous communities could raise their concerns in a Proactive Vessel Management Forum around the impacts of vessel traffic patterns on the SRKW populations in their local waterways. Forum participants would then work to gather information and evidence necessary to assess these concerns and identify potential, cooperative (i.e., non-regulatory) measures to address them. The Federal Authorities also noted that a contracted study on how to incorporate traditional knowledge into a proactive vessel management approach has been received and analyzed.

The Federal Authorities noted that one of the measures for the Species at Risk Action Plan for Northern and Southern Resident Killer Whale (Orcinus orca) in Canada (2017) is to incorporate Indigenous Traditional Knowledge on the behaviour

and distribution of SRKW and their prey into measures for the recovery of the species. Fisheries and Oceans Canada (DFO) said that Indigenous communities are being engaged through governance bodies such as the SRKW Indigenous and Multi-stakeholder Advisory Group, and the DFO-led SRKW prey availability working group.

More specific information regarding the measures being put in place by the Federal Authorities to reduce disturbances on the SRKW in the Salish Sea is found in Section 14.7.2 of this Report. Multiple Indigenous intervenors indicated that the proposed measures from the Federal Authorities and Trans Mountain aimed at mitigating effects of Project-related marine shipping on SRKW are not sufficient to adequately mitigate the threats Project-related marine shipping pose to the SRKW, nor do the measures adequately accommodate impacts from this shipping on Indigenous communities and their traditional Indigenous use associated with the SRKW.

Driftpile Cree Nation, for example, said that Trans Mountain should not proceed with the Project until results of their funded research produces scientifically sound and reliable recommendations, DFO's SRKW Recovery Strategy objectives have demonstrated more measureable progress, or Trans Mountain commits to implementing enhanced Project-specific mitigation measures.

Lyackson noted that Trans Mountain's support of collaborative, regional approach to development of mitigation options to reduce risk to marine mammals (such as the Oceans Protection Plan, the proposed Action Plan for the SRKW prepared by DFO and the Pacific Salmon Foundation's Survival Project) should not be considered a concrete mitigation measure. Lyackson said that the Project continues to present an enormous threat to the SRKW population and to date, no effective mitigation measures have been presented.

Views of the Reconsideration Panel

The Board acknowledges that uses, practices and activities such as hunting, fishing, harvesting, plant gathering and the use of cultural sites are very important for Indigenous groups along the coastal areas of B.C. These uses, practices and activities are undertaken for both subsistence and traditional cultural purposes, and are important for maintaining Indigenous cultures and transmitting these across generations. The Board acknowledges the effort undertaken by Indigenous communities who provided oral traditional evidence to the Board as part of the MH-052-2018 hearing to share additional information regarding their traditional marine use within the Salish Sea, as well as their deep spiritual connections with the SRKW, and the role these have in their cultural practices. The Board also acknowledges the significant and detailed evidence provided by Indigenous groups about their use of the marine environment where Project-related marine vessel traffic is proposed to take place. The Board considered all of the evidence provided by Indigenous groups, Trans Mountain and other participants on these matters.

The Board is of the view that, for the purposes of assessing the potential effects of Project-related marine traffic on traditional marine use, the methodology used by Trans Mountain was appropriate and effective for identifying and evaluating the Project-related potential effects. Trans Mountain identified components of the marine environment that are understood to support the marine resource base and habitat conditions essential to the practice of traditional use, practices and activities, and that potential residual effects were assessed in consideration of pertinent biophysical resources known or assumed to be of importance to Indigenous communities for traditional use. TMRU studies completed by Indigenous groups provided information on impacts of Project-related marine traffic in the shipping lanes on subsistence sites and resource use. In its supplemental technical reports on TMRU, Trans Mountain incorporated the results of TMRU studies filed by Indigenous groups, and described mitigation for the effects and concerns raised. In addition to the information regarding TMRU that Trans Mountain filed in the OH-001-2014 hearing and in the MH-052-2018 hearing, Trans Mountain also noted that it will continue to update its project plans and any appropriate mitigation based on additional TMRU information it receives from Indigenous communities.

The Board finds that Project-related vessel wake will not be detectable from existing wave conditions along the shoreline adjacent to the shipping lanes based on Trans Mountain's predicted wake wave height modelling, which the Board accepts. As Project-related vessel wake will be of the same magnitude as existing wave conditions along the shoreline adjacent to shipping lanes, the Board also finds that Project-related marine vessels are unlikely to result in any measurable changes to coastal habitats, harvesting and culturally sensitive areas.

The Board notes Trans Mountain's commitments to provide regular updated information on Project-related marine vessel traffic to Indigenous communities, and to initiate a public outreach program prior to the Project operations phase to communicate information on Project-related timing and scheduling with Transport Canada, the Canadian Coast Guard, the Chamber of Shipping for British Columbia, commercial and tourism associations, and potentially affected Indigenous groups. Trans Mountain committed to raise awareness amongst Project-related tankers about conditions near Swiftsure Bank in its Port Information and Terminal Operations Manual. The Board acknowledges the safety concerns that were shared by Indigenous communities. Therefore, the Board has included Recommendation 12 which would require the GIC to ensure that the Pacific Pilotage Authority and Transport Canada continue engagement and awareness activities targeting coastal Indigenous communities, recreational boaters, fishing vessel operators, and

operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. This should include incorporating the resources and information that Trans Mountain has already provided or will provide to the Pacific Pilotage Authority, such as applicable information on Project-related vessel timing and scheduling. As noted in Section 14.8.1, the Board also sees value in the work the Federal Authorities are doing to enhance sharing of marine traffic information with local communities and promote safer navigation. The Board proposes Recommendation 13 that encourages GIC to accelerate the development and implementation of these programs.

Trans Mountain committed to support the multi-party initiatives that are being led by Transport Canada, the Canadian Coast Guard, DFO, the VFPA, all of which are working to better understand and manage the potential impacts of marine shipping activity throughout the south coast of B.C. The Board is of the view that, not only will the Federal Authorities learn from Indigenous communities, the communities themselves will have the opportunity to become more aware of the entirety of marine traffic activity as well as the government's proposed measures in the TMRU areas that are of importance to them.

With respect to the effects of Project-related marine vessel traffic on traditional marine resource uses, activities and sites, the Board finds that there will be disruptions to Indigenous marine vessels and harvesters, and that this may disrupt activities or access to sites. The Board is of the view that these disruptions will be temporary, only occurring during the period of time when Project-related tanker vessels are in transit. The Board is of the view that Indigenous marine vessel users will maintain the ability to continue to harvest marine resources and to access subsistence and cultural sites in the presence of these periodic and short-term disruptions. The Board therefore finds that, with the exception of effects on the Southern resident killer whale, the magnitude of effects of Project-related marine vessel traffic on traditional marine resource uses, activities and sites is low. Given the low frequency, duration and magnitude of effects associated with potential disruptions, and Trans Mountain's commitments to provide regular updated information on Project-related marine vessel traffic to Indigenous communities, the Board finds that adverse effects on traditional marine resource uses, activities and sites is not likely, and that overall, Project-related marine traffic's contribution to overall effects related to changes in traditional marine use patterns is not likely to be significant. The Board is also of the view that Project-related marine traffic's contribution to cumulative effects is of low to medium magnitude and reversible in the long-term. The Board therefore finds significant adverse cumulative effects associated with Project-related marine vessel traffic on TMRU are not likely to be significant, with the exception of effects associated with the traditional use of the SRKW, which are considered significant.

The Board acknowledges the concerns raised by Indigenous groups about marine safety, increased congestion of marine vessel traffic, and potential disruptions that may occur as a result of vessel collisions. This potentially includes damage to or loss of fishing gear, or vessel damage or loss in the event of a direct collision. While there is concern about interactions between Project-related marine vessels and traditional fishing vessels, the Board is of the view that disruptions that may result from interference or collisions with Project-related vessels are considered to be unlikely due to adherence to regulatory standards and navigational and safety measures by marine vessels. The Board is also of the view that any disruptions to Indigenous marine vessel users that would result from Project- related marine vessel traffic would be temporary, that the frequency of Project-related marine vessels would be one return transit per day, and that all other marine vessels, including Indigenous marine vessel users, would be able to continue their movements very shortly after the transit of the tanker. In the unlikely event of a collision or damage to or loss of fishing gear, a comprehensive scheme of compensation would be available. Further information on financial responsibility and compensation is discussed in Section 14.12.

The Board notes that, within the MH-052-2018 hearing, Indigenous communities provided additional evidence regarding their familial connections with the SRKW, including the role the SRKW have in their origin stories and the cultural teachings that have been passed down from generation to generation as result of their spiritual connection with the SRKW. The Board acknowledges that some of this evidence was passed on in confidence, and thanks the Tsleil-Waututh Nation in particular for providing this sensitive information.

The Board finds that, as described in its views in Section 14.7.2 on marine mammals, the increase in marine vessel traffic associated with the Project is likely to result in significant adverse effects on the SRKW. The Board finds that Project-related marine vessel traffic would further contribute to total cumulative effects which are determined to be significant, with or without the Project. Given these conclusions and recognizing the stated cultural importance of the killer whale to certain Indigenous groups, the Board finds that the increase in marine vessel traffic associated with the Project is likely to result in significant adverse effects on the traditional Indigenous use associated with the SRKW.

The mitigation measures to reduce adverse effects on SRKW are also described in Section 14.7.2. The Board notes that Indigenous intervenors have indicated that they were not satisfied with the mitigation measures that have been proposed by Trans Mountain or are currently underway as part of the Federal Authorities programs to reduce disturbances on the SRKW in the Salish Sea. The Board notes that embedded in all of these initiatives is consultation with Indigenous communities, with an aim to understanding where traditional marine use activities take place, as well as the incorporation of Indigenous traditional knowledge, where appropriate. The Board is of the view these increased

opportunities for Indigenous communities to provide input about their, traditional knowledge, TMRU activities and cultural practices, could, in time, lead to improvements in the mitigation measures. As a result, the Board has included Recommendation 1 which would require GIC to develop and implement a regional cumulative effects management plan implemented in consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders. The Board also refers to Recommendations 5 and 6, which are discussed further in Section 14.7.2.

Significance evaluation: adverse effects on traditional marine and resource use

	Criteria	Rating	Description
Project effects	Temporal extent	Short term to long term	Effects are expected to occur intermittently for the duration of operations.
	Reversibility	Reversible to permanent	Depending on the type of interaction, effects may be reversible to permanent.
	Geographic extent	RSA	Effects are expected to be mostly limited to shipping lanes, although alternation of movement patterns to accommodate or avoid Project-related vessels could affect adjacent areas.
	Magnitude	Low to medium	Effects from the Project-related marine shipping would be limited to a few or many individuals and therefore be considered to range from low to moderate magnitude. Mitigation measures are expected to reduce the magnitude of effects.
Cumulative effects	The Regional Study Area (RSA) is a heavily utilized marine environment, which is predicted to increase in use. The contribution from Project-related marine vessels to total cumulative effects on traditional marine resource use, practices and activities is expected to be inconsequential.		
Recommendation	Not likely to cause significant adverse environmental effects.		

Significance evaluation: adverse effects on traditional marine and resource use associated with the Southern resident killer whale

	Criteria	Rating	Description
Project effects	Temporal extent	Long Term	Sensory disturbance and the risk of strike will occur for the duration of operations.
	Reversibility	Reversible to permanent	With regard to sensory disturbance, once a marine mammal is no longer exposed to underwater noise from Project-related marine vessels, then behaviour would likely return to normal. The effects of a marine mammal vessel strike would range from reversible to permanent, depending on the severity of the strike.
	Geographic extent	RSA	Underwater noise and strikes will originate in the shipping lanes, but noise spreads underwater, and if threats have population level consequences, they would impact across the range of SRKW.
	Magnitude	High	Underwater noise produced from Project-related marine vessels is not expected to result in permanent or temporary auditory injury, but would result in sensory disturbance to marine mammals, including SRKW. A strike, although of low probability, could result in lethal or non-lethal effects, and mortality would have population level consequences.

Cumulative effects	With regard to sensory disturbance, the Regional Study Area (RSA) is a heavily utilized marine environment, which is predicted to increase in use. Once exposure to underwater noise from Project-related marine vessels ceases, it is likely that marine mammals would be exposed to some form of disturbance soon after from another marine vessel. With regard to potential strikes, the increase in Project-related marine traffic would contribute to the cumulative risk of marine mammal vessel strikes. The SRKW population has crossed a threshold where any additional adverse environmental effects would be considered significant. While the effects from Project-related marine shipping will be a small fraction of the total cumulative effects, and the level of traffic is expected to increase with or without the Project, the increase in marine vessels associated with the Project would further contribute to cumulative effects that are already jeopardizing the recovery of the SRKW.
Recommendation	Absent further mitigation, likely to result in significant adverse effects on the traditional Indigenous use associated with the SRKW. See Chapter 2 for discussion of justification. If the Board's recommendation to offset the additional underwater noise and strike risk from Project-related marine shipping is implemented, then adverse effects from Project-related marine shipping would reduce to net zero if and when offsets are successful, at which time effects would not likely be significant.

14.8.4 Human health

In the OH-001-2014 hearing, Trans Mountain estimated the potential effects on human health from the routine operations of marine transportation associated with the Project.

Trans Mountain said it followed a conventional risk assessment paradigm, which is an approach endorsed by a number of federal, provincial and regional regulatory health authorities, including Health Canada, Environment and Climate Change Canada (ECCC), the Canadian Council of Ministers of the Environment (CCME) and B.C. Ministry of Environment (BC MOE).

The spatial boundaries for Trans Mountain's assessment of human health effects of marine transportation are described in Appendix 11, and included the inbound and outbound marine shipping lanes, the area between the shipping lanes, where it exists, and a 5 km buffer extending from the outermost edge of each shipping lane. Trans Mountain said for the purposes of its assessment, the shipping lanes were divided into four distinct regions: Burrard Inlet; Strait of Georgia; Boundary Passage and Haro Strait; and Strait of Juan de Fuca. Trans Mountain said of these, only Burrard Inlet revealed some potential exceedances of contaminants that may affect human health and therefore this was the only region carried forward for detailed assessment.

Trans Mountain said specific consideration was given to Indigenous peoples because of the unique opportunities for chemical exposures that might occur through traditional Indigenous practices, including the consumption of traditional foods such as game meat, fish, beach food and wild plants.

Trans Mountain said it evaluated potential health risks that could result from exposure to the chemical emissions originating from Project-related marine vessel traffic. Trans Mountain considered the potential effects on people living within the assessed area boundaries, on those who might frequent these areas for recreation or other purposes, as well as how age, gender or health status may affect people's vulnerability to potential effects.

Trans Mountain said it used exposure limits to assess the potential health effects that could result from short-term and long-term exposure to the various chemical emissions associated with Project-related marine transportation. Reliance was placed on exposure limits developed or recommended by regulatory authorities or reputable scientific authorities for the protection of human health. These included, among others, those available from Health Canada, the BC MOE, the United States Environmental Protection Agency (US EPA) and the World Health Organization (WHO).

Trans Mountain said it assessed short-term (acute), long-term (chronic) and cumulative exposure scenarios, and considered the potential health risks associated with the chemicals of potential concern (COPC) acting either singly or in combination (i.e., chemical mixtures). Inhalation was considered the primary exposure pathway, but it also considered secondary pathways including food ingestion and skin contact. Trans Mountain said that due to strict regulations prohibiting the release of untreated bilge water and ballast water under routine operating conditions, releases to water were not considered.

Acute effects

Trans Mountain said the maximum predicted acute exposure to the COPC (acting either singly or in combination) were below their exposure limits, with the exception of short-term inhalation of nitrogen dioxide (NO_2) and the respiratory irritants mixture. For acute exposure to NO_2, Trans Mountain said no exceedances were predicted for residents within the communities surrounding Burrard Inlet, or for the area users frequenting the provincial parks. The company said

exceedances only were predicted at an isolated location along the water's edge of Burrard Inlet within the perimeter of another industrial facility, where public access will be restricted.

Trans Mountain said the risk estimates for short-term inhalation of NO_2 did not change between the assessment cases (i.e., base, application and cumulative cases), indicating that the incremental change associated with the Project-related marine vessel traffic will have very little, if any, effect on the health risks associated with short-term exposure to NO_2.

Trans Mountain said that short-term exceedances were predicted for the respiratory irritants mixture across all the assessment cases for the residents of the Squamish Nation at Capilano 5, and for the District of North Vancouver. Exceedances were not predicted at any of the other Indigenous communities (i.e., Tsleil-Waututh First Nation at Burrard Inlet 3 and Squamish Nation at Seymour Creek 2, Kitsilano 6 and Mission 1). Trans Mountain said the incremental changes as a result of COPC emissions from the marine vessel traffic associated with the Project and the reasonably foreseeable increase in other marine vessel traffic are essentially negligible, and that the Project will have very little, if any, impact on health risks associated with short-term exposure to the respiratory irritants at these locations.

The company concluded that, overall, adverse health effects from acute exposures would not be expected.

Chronic effects

Trans Mountain said that, for chronic effects via the primary inhalation pathway, in all cases the maximum predicted air concentrations of the COPC (acting either singly or in combination) associated with the Project were lower than the corresponding exposure limits. Trans Mountain concluded long-term health risks associated with the COPC exposures are considered negligible or low, and adverse health effects from the long-term inhalation of the COPC associated with the Project-related marine vessel traffic are not expected.

Trans Mountain said the potential health risks associated with Project-related marine vessel traffic via the relevant secondary exposure pathways were also examined. The company said that potential chronic multiple pathway health risks were estimated based on the assumption that residents would be continuously exposed for an assumed lifespan of 80 years. Trans Mountain said that in all cases the maximum predicted exposures through the secondary pathways of the COPC (acting either singly or in combination) were lower than the corresponding exposure limits, and that long-term health risks are therefore considered negligible or low, and adverse health effects from the inhalation of dust, food ingestion, and dermal contact are not expected.

Trans Mountain said the high degree of conservatism incorporated into both the exposure estimates and the exposure limits must be considered in the interpretation of the exceedances, and that based on the weight of evidence, it is unlikely that people would experience health effects as a result of the potential increase in Project-related marine vessel traffic.

Cumulative effects

Trans Mountain said the RSA was used for the purposes of assessing the cumulative health effects associated with the chemical emissions from increased Project-related marine vessel traffic. It said the contribution from Project-related marine vessel traffic to the cumulative exposure to COPCs was negligible. Trans Mountain said in the majority of instances, the potential health risks remained unchanged between the cases, indicating that Project-related marine vessel traffic will have very little, if any, effect on the base case health risks or cumulative exposure contributions.

A number of participants raised concerns regarding Trans Mountain's assessment of the potential effects on human health resulting from Project-related marine traffic.

Burnaby Residents Opposed to Kinder Morgan Expansion (BROKE) said that Trans Mountain did not adequately assess the human health risks, including acute and chronic health effects of exposure to benzene and 1,3-butadiene. BROKE said additional information to understand the human health impacts in the area surrounding the terminal and the exit for ships through the First and Second Narrows is needed to better understand the impacts, and should include a focus on those most vulnerable to exposure to benzene and 1,3-butadiene, such as young children and those with genetic susceptibility to carcinogens.

NS NOPE expressed concern over the potential human health effects associated with short-term and long-term exposure to benzene, including as part of a mixture with 1,3-butadiene. Living Oceans Society raised concern that the maximum predicted ground-level air concentrations of benzene in Burrard Inlet area would exceed the national one-hour Ambient Air Quality Objective (AAQO) for benzene.

In response to concerns about the potential effects of butadiene, for acute exposure to 1,3-butadiene, Trans Mountain said the predicted 24-hour air concentrations for the three assessment cases (i.e., Base Case, Application Case and Cumulative Case) were compared with the acute (24-hour) exposure limit or Reference Concentration developed by the U.S. EPA for the protection of the human population (including sensitive individuals) against the potential reproductive and developmental effects associated with short-term inhalation of 1,3-butadiene. Trans Mountain said that chronic health risks were assessed

by comparing the maximum predicted annual air concentrations for the three assessment cases (i.e., Base Case, Application Case and Cumulative Case) to the U.S. EPA's chronic Reference Concentration for the potential reproductive and developmental effects associated with long-term inhalation of 1,3-butadiene (U.S. EPA 2002a). The potential cancer risks, specifically the risk of developing leukemia, also were assessed.

Trans Mountain said that in all instances, cancer risks for 1,3-butadiene were predicted to be less than 1 in 100,000, indicating that the incremental cancer risks from the Project-related increase in marine vessel traffic are deemed to be "essentially negligible." It said the contribution from the Project-related marine vessel traffic to the cumulative 1,3-butadiene exposures was negligible, and that in all instances, the potential health risks remained unchanged between the Base Case and Application Case, signifying that the Project-related marine vessel traffic will have very little, if any, effect on the Base Case health risks associated with 1,3-butadiene exposure.

With respect to benzene, Trans Mountain said it used the acute health-based exposure limit developed by the Texas Commission on Environmental Quality (TCEQ) for benzene rather than Alberta's one hour AAQO for benzene as the latter did not satisfy the requirement for adequate supporting documentation. Nonetheless, Trans Mountain said it committed to meeting the lowest applicable AAQO established in B.C. or Alberta at each terminal, including Alberta's one-hour AAQO for benzene.

Trans Mountain said the findings of its HHRAs indicate that adverse health effects from short-term and long-term exposure to benzene are not anticipated as a result of the Project-related marine vessel traffic. In all cases, the potential health risks associated with short-term and long term inhalation of benzene were below the benchmark (or target risk estimate) of 1.0, indicating that the predicted peak hourly and annual average air concentrations of benzene were below the corresponding exposure limits. Trans Mountain also said incremental lifetime cancer risks associated with Project-related marine vessel traffic were predicted to be less than 1 in 100,000 (i.e., less than one extra cancer case in a population of 100,000 people). This indicates that the incremental cancer risks from the Project-related marine vessel traffic are deemed to be "essentially negligible."

Trans Mountain said benzene was assessed in the acute immunotoxicants mixtures, and in assessment of chronic effects, benzene was included in both the immunotoxicants and hematotoxicants mixtures. It said the potential health risks for each of the mixtures was predicted to be below the target risk estimate of 1.0, indicating that adverse health effects from short-term and long-term exposure to the immunotoxicants and hematotoxicants mixtures, of which benzene is a constituent, would not be anticipated. Trans Mountain concluded that overall, the absence of adverse health effects associated with the Project and Project-related marine vessel traffic applied whether benzene was assessed on an individual basis or as part of a mixture.

Living Oceans said Trans Mountain's assessment does not provide the information needed to adequately assess the human health risks, and significantly underestimates the impact of operations on air quality. Living Oceans said that where emissions exceed exposure limits, such as for the respiratory irritants mixture, these emissions should be mitigated to improve air quality and reduce human health risks.

The Upper Nicola Band and Tsawout First Nation said that Project components, including the incremental tanker and tug traffic associated with the Project, would release sulphur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM_{10}; $PM_{2.5}$) that affect human health, and that exposure to these pollutants can cause respiratory and heart health effects and increase mortality rates in humans. Living Oceans raised concerns regarding emissions from tugs and tankers, and that exceedance of air quality limits for NO_x and SO_2 will occur along the tanker route, and produce plumes that potentially affect long sections of coastline.

Health Canada said the information provided by Trans Mountain suggests that overall, there is low likelihood for acute and chronic health effects due to Project air emissions, including effects due to Project- related marine vessel emissions. Most of the health risks appear to be a result of the ambient air quality, since there are minor changes in health risk estimates for the base, application, and cumulative cases. However Health Canada said deficiencies identified by a number of participants regarding the air dispersion modelling affected its level of confidence, and that individuals with existing respiratory or cardiovascular conditions may experience reactions to even small changes in Project-related emissions. Health Canada said it supports Trans Mountain's commitment to continuous improvement in the implementation of efficient emission control measures and air quality monitoring to manage the health risks due to changes in air quality.

In response to these concerns, Trans Mountain noted that the results of additional air dispersion modelling for marine transportation present the predicted peak 24-hour and maximum annual concentrations for $PM_{2.5}$ and PM_{10} under the Base Case, Application Case and Cumulative Case, and that the revised results are lower than those assessed in the HHRA of marine transportation. The company said the results of the additional air dispersion modelling for PM do not affect the conclusions of the HHRAs in that they continued to show a low potential for adverse health effects as a result of the Project and Project-related marine vessel traffic.

Trans Mountain said the results of its HHRA of marine transportation revealed exceedances of the one hour Metro Vancouver AAQO for NO_2 under each of the assessment cases (i.e., Base Case, Application Case and Cumulative Case). However, it said maximum predicted annual average air concentration for NO_2 within the LSA for marine transportation (i.e., 5-km buffer extending from the outermost edge of each shipping lane within Burrard Inlet) was below Metro Vancouver's annual AAQO, suggesting that adverse health effects associated with long-term exposure to NO_2 are not expected. Trans Mountain also noted that the results of additional air dispersion modelling show a peak predicted one-hour concentration for NO_2 of 186 $\mu g/m^3$ for the Base Case, Application Case and Cumulative Case, and this predicted peak is below the one-hour Metro Vancouver AAQO. Trans Mountain said for these reasons, the risk of people experiencing adverse health effects within the LSA for marine transportation from the short-term inhalation of NO_2 is low.

Trans Mountain said the findings of the HHRAs indicate that adverse health effects from SO_2 exposure associated with Project-related marine vessel traffic are not anticipated. In all assessment cases (i.e., Base Case, Application Case and Cumulative Case), the predicted health risks associated with short- term exposure to SO_2 were below the benchmark (or target risk estimate) of 1.0, indicating that peak predicted 10-minute and one-hour air concentrations for SO_2 were less than the corresponding exposure limits. The company also noted that the air dispersion modelling that formed the basis of the HHRAs did not take into account the more stringent fuel sulphur regulations that were introduced in January 2015. Under these regulations, the maximum sulphur content in fuel oils within ECAs is 0.1 per cent. Inclusion of the lower sulphur fuel content into air dispersion modelling would serve to reduce the SO_2 emissions from marine vessels and subsequently the predicted air concentrations of SO_2 in the Burrard Inlet area.

Effects from noise and light

Several participants raised concerns regarding noise, vibration, odour and light emissions from the increase in Project-related vessels. Some intervenors said that the increased use of anchorages in Burrard Inlet and English Bay would detract from the experiences of other marine users and would negatively affect residents in nearby communities through increased noise and light. Others said that the increase in other activities, such as bunkering and increased use of escort vessels, would increase noise and air pollution for users.

MH-052-2018 hearing

During the MH-052-2018 hearing, Trans Mountain submitted a 2017 report prepared for the VFPA titled "Environmental Air Assessment." Annual emission estimates for all of the contaminants of interest including GHGs and NO_x were provided in Tables 37 to 40 for the VFPA Study Area, which extends to the western port jurisdictional boundary at the mouth of the Burrard Inlet. This report indicated that, based on dispersion modelling results with a number of conservative assumptions, which were intended to over-estimate effects, the Project would comply with all applicable ambient air quality objectives in place at that time, including those for nitrogen dioxide (NO_2).

Health Canada said that it is not aware of any information that would alter the views expressed in the department's 2015 letter of comment concerning mitigation and monitoring for the potential health effects of Project-related marine shipping.

TWN filed its Assessment Report in the OH-001-2014 hearing and is of the view that it remains accurate and applicable to the MH-052-2018 hearing. For example, TWN identified the following consequences of marine shipping effects on individual and community health: dietary change and health effects from lack of resources, including traditional staple foods; hindrance of and failure to provide conditions for cultural work.

The BC Métis Federation raised concerns that Project-related marine shipping will impact air quality and human health. In order to address these concerns, the BC Métis Federation made recommendations around clean marine shipping, firm limits on tanker speeds in local waters, and funding for Indigenous health organizations.

Metro Vancouver said that changing standards for nitrogen dioxide (NO_2) as set out in the new Canadian Ambient Air Quality Standards (CAAQS) established subsequent to the OH-001-2014 hearing, and updated new air quality monitoring data, both highlight the potential for significant impacts to onshore air quality.

In response to the concerns from Metro Vancouver, Trans Mountain said that these CAAQS are intended to be objectives for ambient air quality measurements recorded at air quality monitoring stations in large urban areas or municipalities, as opposed to assessing dispersion modelling results (which are inherently conservative) at points close to the emission sources. Trans Mountain has committed to monitor the ambient air quality at a new monitoring station within the fence-line of the WMT, and to comply with applicable ambient air quality objectives as noted in the Air Emissions Management Plan, in accordance with the requirements of NEB Condition 52.

More specific information regarding the mitigation measures being put in place to reduce air emissions from Project-related marine shipping is found in Section 14.7.1 of this report.

Effects from noise and light

Trans Mountain said that it considered anchoring within the assessment of potential effects on the acoustic environment in the OH-001-2014 hearing. It noted that noise related to dropping of anchor chains may contribute to the potential residual effect of annoyance to human receptors by singular sound events and concluded that this potential residual effect was to be periodic in frequency, low-to-medium in magnitude, and not significant.

Trans Mountain said that it intends to manage arriving vessels to minimize the use of anchorages by holding tankers at the Westridge Marine Terminal dock whenever a berth is available, even if cargo transfer is not planned immediately. Trans Mountain also said that if assigned berth is not immediately available, there is inclement weather, or for any other reason the berth or vessel is not ready, the vessel may anchor at one of the four designated anchorages that have been established within the jurisdiction of the VFPA.

The VFPA said that it does not anticipate the number of anchorages will have to be increased to service Project-related tanker traffic. Further, the VFPA said it did not identify a requirement to conduct a Project-related anchorage environmental or risk assessment given that additional Project-related anchorage requirements are not envisioned and the practice of having deep-sea vessels, including tankers, anchor in the Port of Vancouver is well-established.

The VFPA Port Information Guide from May 2018 includes guidelines concerning noise and light for all vessels anchoring within the Port of Vancouver. For example, all vessels, while at anchor, should minimize noise levels and light usage in consideration of local residents. VFPA also created a Noise Monitoring Program to help better understand the source and intensity of port-related noise in order to better respond to community concerns.

Health Canada said that it does not appear that the sound from three ships docked and idling at the same time was evaluated, which is the worst-case scenario for noise generation from docked vessels. Health Canada also said there is no apparent formal complaint resolution plan identified. In the event of public complaints related to Project-related noise as it affects residents adjacent to anchorages, Health Canada recommended that a formal, transparent and readily accessible complaint-response process be in place as a means of identifying and mitigating Project-related noise complaints.

The District of West Vancouver said the Project will bring negative impacts and costs to the District through its regular operations, including the effect of emissions on air quality and noise and light pollution.

NS NOPE repeated their concerns expressed in the OH-001-2014 hearing that the increased noise and light pollution caused by the tankers anchored in Burrard Inlet opposite Westridge Marine Terminal will cause significant adverse impacts to local residents. NS NOPE suggested additional conditions for Trans Mountain related to effects of marine shipping on the residents on the shores of Burrard Inlet, specifically: consideration of effects of shipping on human health, noise effects study, lighting impacts study, and complaints-response process.

Views of the Reconsideration Panel

The Board is of the view that for the purposes of assessing the potential effects on human health resulting from Project-related marine shipping, Trans Mountain followed a generally acceptable risk assessment paradigm, and that its assessment adequately identified and evaluated the potential effects on human health from Project-related marine shipping. The Board notes that Trans Mountain relied primarily on the use of exposure limits developed or recommended by authorities such as Health Canada and the United States Environmental Protection Agency (US EPA). The Board finds this approach acceptable, as these guidelines are broadly protective of human health.

The Board acknowledges that several Indigenous groups, municipalities and federal departments expressed concerns that the potential emissions associated with Project-related marine vessel traffic could affect human health. The Board acknowledges that there would be minor predicted exceedances of the short-term exposure limits for respiratory irritants at the Squamish Nation Capilano 5 reserve and for the District of North Vancouver. The Board notes, however, that these predicted exceedances occurred through all of the assessment cases examined by Trans Mountain. Therefore, the Board is of the view that the contributions of Project-related marine traffic to these exceedances would be inconsequential and not likely to cause significant adverse effects on human health.

A number of intervenors raised concerns regarding the potential health risks associated with exposure to chemicals of potential concern (COPCs) including benzene and 1,3-butadiene. The Board considered these concerns, the evidence of intervenors and the applicant. The Board finds that, based on the generally accepted methodologies used by Trans Mountain, the potential health risks associated with long-term inhalation of chemicals, such as benzene, were below the corresponding exposure limits, and that this applied whether benzene was assessed on its own or as part of a mixture of chemicals. The Board therefore finds that for long-term exposure risks associated with Project-related marine shipping, the maximum predicted concentrations of carcinogenic and non-carcinogenic chemicals, including benzene and 1.3-butadiene, are likely to be lower than the corresponding exposure limits developed by Health Canada and other authorities and, therefore, are not likely to cause significant adverse effects on human health.

The Board acknowledges the relevant conclusions drawn in this chapter on air emissions that, although Project-related marine shipping is expected to result in increased emissions in the Regional Study Area (RSA), such emissions are expected to remain below applicable ambient air quality objectives. As discussed in the section in this chapter on marine air emissions, the Board finds that Trans Mountain's predicted concentrations for both $PM_{2.5}$ and nitrogen dioxide emissions at the Tsleil-Waututh Nation's Burrard Inlet No. 3 reserve, as a result of Project-related marine shipping, are well below the applicable objectives. The Board notes Trans Mountain's commitment to discuss the possibility of undertaking an ambient survey on Tsleil-Waututh Nation's reserve lands. The Board is not persuaded that a program to monitor air contaminants at or adjacent to Tsleil-Waututh Nation's reserve is warranted at this time.

The Board acknowledges that there is an existing regulatory regime governing air emissions from tankers underway or in transit. Trans Mountain would require Project-related tankers and barges to follow international and federal regulations and apply best practices during operations. Under Transport Canada's *Vessel Pollution and Dangerous Chemicals Regulations* pursuant to the *Canada Shipping Act, 2001* these tankers would be required to carry onboard a volatile organic compound management plan that meets the requirements of the International Convention for the Prevention of Pollution from Ships.

As stated in Chapter 10, the Board would impose Condition 52 requiring Trans Mountain to develop an air emissions management plan for the Westridge Marine Terminal. Monitoring conducted pursuant to this plan would verify predicted emissions levels, and would require Trans Mountain to implement appropriate mitigation if there are exceedances of criteria established within the approved plan.

With regard to the concerns raised by participants about noise and light from tankers docked at the VFPA managed anchorages, the Board notes that all vessels at anchor within VFPA's jurisdiction are expected to adhere to VFPA's guidelines regarding noise and light pollution. The Board further notes that Trans Mountain intends to utilize the three berths available at the Westridge Marine Terminal dock in order to reduce pressure on anchorages.

In response to Health Canada's recommendation during the MH-052-2018 hearing to estimate noise impacts based on three ships docked and idling at the same time, the Board is of the view that this is unnecessary because it is adequately covered by Board's established lifecycle compliance verification and enforcement approach. Trans Mountain has control over ships when they are at berth at the WMT. The Board would impose Condition 141 requiring Trans Mountain to conduct and file post-construction noise surveys, including at the WMT.

In response to Health Canada's recommendation and NS NOPE's submissions during the MH-052-2018 hearing for a formal complaint resolution process to address concerns about noise and light from tankers docked at the VFPA managed anchorages, the Board is of the view this mitigation measure is not within Trans Mountain's control. The VFPA remains the steward of the Port of Vancouver. The VFPA has guidelines concerning noise and light for all vessels anchoring within the Port of Vancouver; however, it is not clear from the evidence on the record whether the VFPA has a formal complaint resolution process. Therefore, the Board would include Recommendation 16 encouraging GIC, in conjunction with VFPA, to develop a formal complaint resolution program that gathers community feedback, brings together diverse community stakeholders to facilitate discussions about port-related impacts, and resolves complaints about vessels anchored at the VFPA-managed anchorages.

In conclusion, considering that Trans Mountain will be required to adhere to all federal and international emission requirements to reduce emissions from the Project-related marine shipping, the Board finds that the residual effects from Project-related marine shipping is not likely to cause significant adverse effects on human health, including the health of Indigenous people.

Significance evaluation: adverse effects on human health

	Criteria	Rating	Description
Project effects	Temporal extent	Long-term	Potential human health effects caused by air emissions, noise and light would occur for the duration of operations.
	Reversibility	Reversible	Potential human health effects caused by emissions, noise and light will reverse shortly once the tankers exit the RSA.
	Geographic extent	LSA	The HHRA LSA includes the inbound and outbound marine shipping lanes, the area between the shipping lanes, where it exists, and a 5 km buffer extending from the outermost edge of each shipping lane.
	Magnitude	Low to moderate	Air emissions, noise and light from marine shipping are generally expected to be below regulatory thresholds or guidelines. The instances of minor predicted exceedances of the short-term exposure limits for respiratory irritants at the Squamish Nation Capilano 5 reserve and for the District of North Vancouver occurred though all of the assessment cases examined by Trans Mountain. Therefore, the Board is of the view that the contributions of Project-related marine traffic to these exceedances would be inconsequential.
Cumulative Effects	The Board finds that the contribution from Project-related marine shipping to total cumulative effects on human health is not likely to be significant given that there is an existing regulatory regime that governs the air emissions from the tankers, and the noise and light from vessels at anchor. Taking into consideration that Trans Mountain and Project-related vessels will be required to adhere to all federal and international emission requirements to reduce emissions from Project-related marine shipping, the Board finds that the residual effects from Project-related marine shipping is not likely to cause significant adverse effects. The Board notes that Trans Mountain has set the age limits for tankers that would be acceptable to call at the WMT which in Board's view will improve the efficiency of the vessels resulting in reduction of air emissions. The Board is of the view that as new more efficient vessels account for a greater share of the fleet over time, these standards help in reduction of air emissions from Project-related marine shipping.		
Recommendation	Not likely to cause significant adverse environmental effects.		

14.9 Environmental effects of malfunctions or accidents (spills)

This section discusses the potential environmental effects of spills from Project-related increase in marine vessels. Chapter 10, Section 10.2.17 discusses the effects of spills from the Project, such as from the pipeline or terminals, on various valued environmental components.

14.9.1 Ecological risk assessment methods

In the OH-001-2014 hearing Trans Mountain submitted a Preliminary and Detailed Quantitative Ecological Risk Assessments to evaluate the potential effects of accidental releases at various locations along the marine transportation route. Trans Mountain evaluated a total of six hypothetical scenarios at three different locations with two credible worst-case crude oil spills: 16 500 m^3 and a smaller volume of 8 250 m^3. Each scenario was evaluated under a range of environmental conditions including winter, spring, summer and fall. Table 30 provides a summary of hypothetical marine transportation oil spill scenarios.

Table 30: Summary of hypothetical marine transportation oil spill scenarios

Scenario	Incident Summary	Release Volume (m^3)
1	Strait of Georgia - Main ferry crossing. Collision with crossing traffic from Fraser River and ferries is a low probability event, but considered because of higher number of crossings per day.	16 500
2		8 250
3	Arachne Reef - Powered grounding is a low probability event due to pilots and tethered tug, but this location is rated with greatest level of navigation complexity for the entire passage. Location also has high environmental value.	16 500
4		8 250
5	Race Rocks - Collision with crossing traffic from Puget Sound and Rosario Strait or grounding at Race Rock is a low probability event, but considered because not all vessels in this location would have pilot onboard.	16 500
6		8 250

Trans Mountain considered the following spatial boundaries for the assessment:

- Oil spill footprint – the area directly affected by oil as a result of a release at various locations along the shipping route; and
- Regional Study Area (RSA) - The RSA is generally centered on the marine shipping route, which extends from the WMT through Burrard Inlet, south through the southern part of the Strait of Georgia, the Gulf Islands and Haro Strait, westward past Victoria and through the Strait of Juan de Fuca out to the 12-nautical-mile limit of Canada's territorial sea. The western boundary of the RSA extends further out to sea than the western boundary of the Salish Sea and the northern boundary of the RSA is limited to the southern portion of the Strait of Georgia. Puget Sound is excluded from the RSA.

Trans Mountain selected ecological receptors to represent species believed or known to be sensitive to spills, and which act as indicators of overall environmental health. Trans Mountain carried out the recovery assessment based on the recovery of ecological receptors following the Exxon Valdez Oil Spill, as many of these ecological receptors also occur along the Project-related shipping route.

Trans Mountain superimposed probability of oiling contours on ecological resource sensitivity maps to quantify the length of shoreline or the area of a particular habitat type that is potentially affected. Trans Mountain said that its ecological risk assessment focused on areas having medium, high or very high probability of oil exposure. Trans Mountain quantified the habitat exposures to different probabilities of oiling and compared that to the total amount of that habitat within the RSA.

Intervenors filed numerous third party expert reports related to marine oil spills.

In the OH-001-2014 hearing, Tsleil-Waututh Nation, City of Vancouver and Living Oceans Society and Raincoast submitted a report prepared by Dr. Jeffrey Short. Dr. Short said that there were shortcomings in Trans Mountain's Ecological Risk Assessment (ERA) with respect to oil spills, including that it:

i. failed to integrate exposure to oil based on multiple locations, instead choosing a few locations where there might be a higher risk of collision, and omitting some of the most sensitive habitats from its analysis;

ii. failed to assess hazard based on species sensitivity to oiling independently of oiling probability, took an inappropriately generic approach to assessing sensitivity of species to oiling, and conflated the two concepts of probability and consequence of exposure to oil, which should have been evaluated independently;

iii. failed to assess the possibility of organisms being exposed to submerged oil; and

iv. failed to consider all of the ways that oil can harm organisms.

Evaluating exposure to oil based on multiple locations, instead choosing a few locations

Dr. Short's report noted that Trans Mountain's ERA assessed oil exposure risks on the basis of four assumed spill origin locations, one for each ecologically distinct sub-region along the tanker route. It further noted that rather than relying on a single point of origin, the oil exposure assessment should have been based on trajectory modeling results from several points along the tanker route. The report said that integrating exposure risks across several possible spill origin sites provides a more accurate assessment of exposure risk for habitats, especially habitats of high concern such as the intertidal

flats at Sturgeon Bank and the South Arm Marshes. The single spill origin selected by Trans Mountain resulted in a low probability of oiling for these sensitive habitats.

Trans Mountain said that it completed Preliminary Quantitative Ecological Risk Assessments, and Detailed Quantitative ERA to evaluate the potential adverse effects of hypothetical spills from Project-related marine shipping. The ERAs accounted for both the probability and consequences of an accidental cargo spill for six different scenarios. It said that the ERAs were informed by stochastic and deterministic oil spill fate modelling for credible worst-case and smaller spills under a range of environmental conditions representing winter, spring, summer and fall. The ecological consequences of the hypothetical spills were evaluated for ecological receptors representing marine species and habitats found along the shipping route.

Trans Mountain said that it undertook extensive stochastic modelling for three locations, representing spill behaviour, trajectories and fate under realistic combinations of weather and tides in all four seasons. Trans Mountain said that the three hypothetical spill locations bracket the critical habitat for Southern resident killer whale, in addition to capturing major breeding and feeding habitats for marine birds, among other important ecological receptors. It said that the Strait of Georgia hypothetical spill location is in fact most proximal to both the Fraser River Delta and Boundary Bay intertidal habitats that are of great important to shore birds and migratory birds. Trans Mountain said that it rejects Dr. Short's assertion that had the spill location been moved farther north (to a location that would in fact be farther away from these habitats), the oiling risk to these habitats would have been "considerably greater."

Assessing hazard independently of exposure

Dr. Short's report noted that because results from a single location were incorrectly taken as typical of Georgia Strait, habitats and the species that had low estimated likelihood of oiling were then presumed to have low sensitivity to oiling. The report said that the method used by Trans Mountain to evaluate the sensitivity of species to oiling is flawed. Dr. Short said that in the Trans Mountain ERA, species sensitivity to oiling is semi-quantitatively "assessed" by assigning "biological sensitivity ranking factors" (BSF) to species or habitats categorized on the basis of taxonomic or habitat similarity. The four categories considered include seabirds, marine mammals, fish and other inhabitants of the water column and shorelines. Within each category, the same semi-quantitative measures of sensitivity (low, BSF=1; medium, BSF=2; high, BSF=3, and very high, BSF=4) are applied. This approach is invalid because it creates a misleading appearance of false equivalencies for sensitivities to oiling across species and habitats.

Trans Mountain said that the methodology that was used in the ERA of Marine Transportation Spills was based upon the methodology used in the Aleutian Islands Risk Assessment, which is generally regarded as an exemplary study and methodology, and which was recommended by ECCC as an approach that should have been followed by the Enbridge Northern Gateway Project. It said that its ERA demonstrates clearly an independence of evaluation and differentiation between the sensitivity of receptors, and the probability of receptor habitat experiencing oiling.

Assessing the possibility of organisms being exposed to submerged oil

Dr. Short's report noted that Trans Mountain's ERA dismisses the possibility of exposure to submerged oil on the basis of the flawed experimental studies done to evaluate the susceptibility of diluted bitumen to submerge in fresh water from evaporation alone. The report noted the five experimental studies that were conducted to evaluate the environmental conditions and times required for diluted bitumen to submerge in receiving waters, provided limited guidance for predicting the time required for these products to submerge in water. It notes that the thick oil layers (1 mm–20 mm) used in these experiments would rarely occur during the initial discharge phase of a real oil spill unless the spill occurred in a confined area that prevented the oil layer from spreading to its fullest natural extent. The thickness of diluted bitumen slicks that are allowed to spread in unconfined waters is around 0.4 mm, which is 3 to 50 times thinner than the oil slick layers used in the experiments. The report noted that under conditions of warm summer temperatures and moderate wind speeds, the density of diluted bitumen could increase above that of fresh water within as little as 24 hours, which could cause the diluted bitumen to submerge. Further, the report noted that Trans Mountain's ERA excluded potentially major oil exposure pathways, which comprise a host of species, many of which are important for commercial and subsidence harvests.

Trans Mountain said that the scenario advanced by Dr. Short of diluted bitumen achieving a density greater than that of ambient water within 24 hours is not supported by scientific studies, as the shift over to the "secondary" phase of weathering precludes this outcome. Trans Mountain said that more recent literature points to the important role of viscosity in the environmental behaviour of diluted bitumen. It said that as a relatively viscous oil, diluted bitumen is actually less likely to disperse into the water column than conventional crude oils, and concluded that diluted bitumen is likely to pose less risk to aquatic life, or risk that is no different from conventional crude oils.

With respect to the exposure pathways, Trans Mountain said that such exposure pathways were evaluated implicitly in the ERA of Marine Transportation Spills and explicitly in the Detailed Quantitative ERA for Loading Accidents and Marine Spills.

Considering all of the ways that oil can harm organisms.

Dr. Short's report noted that Trans Mountain failed to consider any consequences that may result from photo-enhanced toxicity. This toxicity mechanism has recently been shown to be important for species such as Pacific herring (Clupea pallasi) that deposit eggs on intertidal reaches of shorelines and which is an important component of the marine ecosystem in the Salish Sea.

Trans Mountain said that although the potential for photo-enhancement of PAH toxicity exists and has been demonstrated in laboratory studies, it is not considered to be of sufficient importance in the natural environment to merit special consideration. Trans Mountain said that the Detailed Quantitative ERA for Loading Accidents and Marine Spills acknowledged that non-polar narcosis does not address the issue of chemicals that may have a specific mode of action, while also potentially possessing a narcotic effect of lower potency. Trans Mountain said that it believes that phototoxicity is not the primary mechanism of toxicity likely to be responsible for environmental effects in the event of a crude oil spill, and that the ecological relevance of PAH phototoxicity remains questionable, and that it should not be used for environmental management decisions unless its ecological relevance is firmly established.

Concerns raised in the MH-052-2018 hearing

In the MH-052-2018 hearing, several intervenor raised concerns with respect to the adequacy of Trans Mountain's ERA of Project-related marine shipping, including using an indicator species-based approach for assessing the effects of spills.

Living Oceans/Raincoast filed a motion requesting the Board require Trans Mountain to conduct a new risk assessment of Project-related marine shipping that includes all SARA-listed species that may be affected by Project-related marine shipping. Raincoast and Living Oceans submitted that the Board should require the proponent to identify effects and measures with respect to the s. 79(2) requirements for each SARA-listed marine species. They further submitted that the Board should require the proponent to complete a proper risk assessment that addresses effects of Project-related marine shipping, including effects of an oil spill from Project-related marine shipping.

Living Oceans Society, Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation and City of Vancouver submitted "Further report on fate and effect of oil spills from TM project in Burrard Inlet and the Fraser River Estuary, 2018."

Dr. Short's 2018 report raised the same concerns regarding the adequacy of Trans Mountain's ecological risk assessment for the Project as those raised in the OH-001-2014 hearing. The 2018 report also said that the Board's conclusion in relation to Dr. Short's 2015 report regarding assumed spill sizes where the Duke-Point-Tsawwassen ferry route intersects with the marine shipping route was factually incorrect and wrong. Dr. Short said that the spill sizes assumed in his May 2015 report were the same as those that Trans Mountain used for its "credible mean and worst-case" scenarios at the location they modeled.

Dr. Short's 2018 report said that within the Strait of Georgia, Trans Mountain selected a single location to "represent" likely effects from a large oil spill anywhere else within the Strait. This location is at the intersection of the marine shipping route through the Strait and the Swartz Bay-Tsawwassen ferry route. It said that however, Trans Mountain's results, and corresponding conclusions about the magnitude of potential oil spill effects, would have been very different if it had conducted the same analysis for a large oil spill where the other major ferry route intersects the marine shipping route in the Strait of Georgia, a mere 16 kilometres to the northwest of the location Trans Mountain actually used. It said that although Trans Mountain initially considered the intersection of the Duke Point-Tsawwassen ferry route with the marine shipping route as another location to model and assess the ecological effects from a major oil spill, Trans Mountain ultimately did not use that location because it concluded that the likelihood of an oil spill there was too low to warrant consideration.

Dr. Short's report said that despite the similarity of the likelihood of a large oil spill occurring at the two major ferry routes within the Strait of Georgia, the ecological consequences of oil spills occurring at those locations would be very different. It said that based on oil spill trajectory modeling performed by Tsleil-Waututh, a major oil spill originating at the intersection of the Duke Point-Tsawwassen ferry route with the marine shipping route would heavily oil shorelines along the length of Roberts Bank, and could oil shorelines within English Bay and perhaps even Burrard Inlet. If a large oil spill contaminated those locations during the spring or fall bird migrations, it could have catastrophic consequences for migratory waterfowl, and these consequences would be much worse that those anticipated by Trans Mountain. It said that had Trans Mountain relied on modeling from the location of the Duke Point-Tsawwassen ferry crossing intersection with marine shipping route, it would have concluded that shorebirds were more vulnerable than seabirds.

Dr. Short's report said that even spills considerably smaller than the credible mean scenario of 8,250 m^3 can have substantial adverse effects on sea- and shorebirds as well as marine mammals and other organisms inhabiting the sea surface, and shorelines, and on organisms inhabiting the water column if the oil submerges. The report said that small to medium sized oil spills on the order of 100 to 1,000 m^3 can cause substantial mortalities to seabirds, and estimated effects

for small to medium spills in Canada and in Alaska have the potential to contaminate tens of kilometres of shorelines on time scales of decades.

Snuneymuxw First Nation said that Dr. Short provides evidence that an oil spill in the Fraser estuary could kill 100,000 to 500,000 sea- and shorebirds. This would impact Snuneymuxw's ability to access a food source upon which it has traditionally relied, and could also have a devastating effect on finfish populations which are important to Snuneymuxw people. Dr. Short also notes that marine mammals, including killer whales, are particularly vulnerable to oiling as a result of contact with floating dilbit.

Trans Mountain said that the information contained in Dr. Short's 2018 report is generally the same as that presented in the OH-001-2014 hearing, that the report erroneously interpreted the intent and conclusions of Trans Mountain's evidence regarding the fate and behaviour of diluted bitumen, and the opinions presented lack substantiation through provision of specific numbers or reference to relevant expert studies. Trans Mountain said that as such Dr. Short's 2018 report does not change, or cast doubt on, the findings or conclusions in the NEB Report.

BC Nature submitted a report from Anne Harfenist that raised issues related to inadequate consideration of species at risk in the Preliminary Quantitative Ecological Risk Assessment and Detailed Quantitative Ecological Risk Assessment, and underestimate of impacts on species at risk related to inconsistency of approach based on Aleutian Islands Risk Assessment (AIRA) methodology. B.C. Nature and Nature Canada said that Trans Mountain's assessment approach has the potential to inaccurately estimate potential ecological consequences on marine birds and their habitat. The Anne Harfenist report also says there are deficiencies in the assessment of impacts on marine birds from both oil spills and chronic oiling and that new evidence on the distribution and abundance of marine bird species at risk confirms the likelihood that the habitat-focused approach used in the Ecological Risk Assessment studies underestimates the impact of an oil spill on marine bird species at risk.

In the OH-001-2014 hearing, Trans Mountain said it used a habitat-based approach that stems from the assumption that if habitat is protected, then species that use that habitat will also be protected; and conversely, that if habitat is damaged, then species that use that habitat may be harmed. Trans Mountain said that the habitat-based approach provides an estimate of areas that could be affected by spilled crude oil and therefore, all birds using such habitat are addressed in the assessment, including any federally- or provincially-listed species of concern.

In the MH-052-2018 hearing, Trans Mountain stated that BC Nature's evidence does not include any new or updated information that casts doubt on the methodology used to assess effects of crude oil spills in the OH-001-2014 hearing, or that would lead Trans Mountain to alter its conclusions regarding the potential environmental effects of marine crude oil spills on birds.

Trans Mountain said that the Royal Society of Canada (2015) Expert Panel Report on "The Behaviour and Environmental Impacts of Crude Oil Released into Aqueous Environments," commented that the risk assessments conducted for Trans Mountain Expansion Project are impressive documents in their scope and detail, and are among the best of their kind.

Views of the Reconsideration Panel

With regard to concerns raised by intervenors on the spill evaluation methodology used by Trans Mountain, the Board finds Trans Mountain's methods to assess effects from marine transportation spills to be acceptable. Trans Mountain followed the approach in the Board's Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, which requires assessment of potential accidents and malfunctions at representative locations along the marine shipping routes.

The Board in its Ruling No. 24 found that an indicator species approach is appropriate for assessing the effects of spills from Project-related marine shipping. The Board was of the view that a risk assessment that considers potential effects on each individual species for every eventuality would be impractical and of little value since the effects of a spill would depend on site- and situation-specific circumstances associated with the spill. The Board noted that no submissions provided new evidence showing how an ERA could be conducted for each individual species considering these variables. The Board was also of the view that the indicator species approach in Trans Mountain's ERAs is adequate for identifying and assessing effects of spills, and for identifying appropriate mitigation measures that could protect individual species and their habitats. The Board said that it finds the indicator species methodology used by Trans Mountain to be credible and consistent with standard practice for conducting an ERA. The Board notes that this is also supported by the Royal Society of Canada Expert Panel Report.

The Board notes BC Nature's concerns based on the report by Harfenist about the habitat-focused approach taken by Trans Mountain to determine effects of an oil spill on marine birds. However, the Board is of the view that a habitat-focused approach is reasonable, since marine birds using that habitat would be directly or indirectly affected by damage to that habitat. The Board is of this view especially given Trans Mountain's assertion in the OH-001-2014

hearing that any mortality of birds caused by a crude oil spill would be a significant adverse environmental effect, and no such mortality is acceptable under any circumstances.

The Board does not accept the conclusion of BC Nature's Anne Harfenist report that the approach used by Trans Mountain based on Aleutian Islands Risk Assessment (AIRA) methodology resulted in inadequate consideration of species at risk. The Board is of the view that the AIRA methodology is consistent with accepted practice and also notes that the Royal Society of Canada (2015) Expert Panel Report on "The Behaviour and Environmental Impacts of Crude Oil Released into Aqueous Environments" acknowledged that the risk assessments conducted by Trans Mountain was among the best of their kind. The Board finds that the Preliminary Quantitative Ecological Risk Assessment and Detailed Quantitative Ecological Risk Assessment included adequate consideration of species at risk.

Trans Mountain's ERAs considered a number of hypothetical oil spill scenarios. Dr. Short's report submitted by Tsleil-Waututh Nation, City of Vancouver and Living Oceans Society, questioned whether these scenarios were truly representative, whether they were close enough to particular environmentally sensitive areas, and whether they give an adequately comprehensive view of the potential effects of an oil spill.

The Board agrees that the spill sizes considered in Dr. Short's 2015 report were similar to those that Trans Mountain used for its "credible mean and worst-case" scenarios at the location it modeled 16 km away from the location modeled by Dr. Short. However, the Board does not agree that a credible mean or worst-case scenario spill is likely at the location suggested by Dr. Short. Trans Mountain's marine shipping quantitative risk analysis concluded that a large spill is not a likely event at the location considered by Dr. Short. Therefore, Trans Mountain did not conduct spill modelling at this location. The Board's Views on Trans Mountain's marine shipping quantitative risk analysis, including the likelihood of a spill at this location, are provided in Section 14.11.2. The Board's views on the concerns noted by Dr. Short regarding slick thickness used in research and its effects on the potential for spilled diluted bitumen to sink or submerge are provided in Chapter 8.

The Board has not considered Trans Mountain's scenarios as a demonstration of all the potential locations and volumes of a spill. Rather, the Board has used them as examples that provide an idea of the potential effects pathways that could occur, and together with the evidence from other hearing participants, has generalized such pathways to predict the type of effects that could result from a spill. The Board finds Trans Mountain's approach reasonable and in Board's view the locations modeled by Trans Mountain provide representative effects.

The Board notes that some of the evidence submitted by participants did not always distinguish the source of the spill when discussing the potential effects. The Board agrees that it is not always necessary to make such a distinction. For example, oil spilled from the pipeline or facilities could enter the marine and estuarine environment and affect valued components discussed in this chapter.

In regard to issues related to assessing the possibility of oil exposure to submerged oil in Dr. Short's report, the Board accepts Trans Mountain's assessment of selecting ecological receptors to represent species believed or known to be sensitive to spills, and which act as indicators of overall environmental health. The Board notes that Trans Mountain quantified the habitat exposures to different probabilities of oiling and compared that to the total amount of that habitat within the RSA, which the Board finds acceptable. The Board's views on the environmental behaviour of spilled oil, including the potential for submergence, are included in Chapter 8.

In regard to the concerns raised by Dr. Short with respect to the consequences from phototoxicity, the Board finds that although possible, photo-enhanced toxicity of organisms is not likely to be material to the results of the ecological risk assessment as phototoxicity is not likely a primary mechanism of toxicity. The Board accepts Trans Mountain's evidence based on its review of research conducted on the topic that indicates although the potential for photo-enhancement of PAH toxicity exists and has been demonstrated in laboratory studies, it is not considered to be of sufficient importance in the natural environment to merit special consideration. The Board is of the view that Trans Mountain's ecological risk assessment is adequate to provide an indication of potential environmental effects based on the toxicity pathways used.

14.9.2 Baseline data

In the OH-001-2014 hearing, numerous participants raised concerns about the sufficiency of marine resources baseline data. The Board of the Friends of Ecological Reserves and the City of Port Moody raised concerns over the adequacy of baseline data of marine resources (i.e., fish, vegetation, etc.) within Burrard Inlet and along the shipping lanes. They emphasized that such baseline data is crucial in considering what might be lost if there is a spill, determining effects after a spill, and in crafting criteria for monitoring during post-spill restoration efforts. In response, Trans Mountain said that it conducted the marine transportation effects assessment based on up-to-date research, does not believe that additional data collection would affect the conclusions presented in the Application, and that vessel traffic associated with the Project would represent a relatively small proportion of total vessel traffic along the marine shipping lanes.

B.C. Nature and Nature Canada and ECCC raised concerns about sufficiency of marine bird baseline data.

B.C. Nature and Nature Canada said that without the quantitative marine bird community baseline information, the Project-related impacts cannot be assessed, mitigated and monitored in the event of a large oil spill in the Marine Transportation RSA.

During the MH-052-2018 hearing, ECCC reiterated that a solid marine bird baseline would be key to informing spill response and to inform recovery of marine bird species at risk. Mr. R. MacVicar and the Province of B.C. also outlined the need for marine bird baseline data.

ECCC said that the existing data would not provide a sufficient baseline to inform the development of recovery initiatives, to determine the types and levels of compensation measures, and to allow for an evaluation of recovery success in the event of a spill. It proposed a condition that would require Trans Mountain to develop a marine bird baseline monitoring plan that would describe species composition and their spatial and temporal abundance patterns to identify high consequence areas/habitats in the event of an oil spill.

Trans Mountain agreed that collection of additional baseline marine bird data could contribute to coordinated planning initiatives and said it has provided support to several initiatives to collect additional marine bird data in the Marine Transportation RSA. Trans Mountain said that it was exploring additional options to contribute towards the collection of long-term monitoring data for marine birds that may be affected by the Project-related marine shipping and other industrial activities, in cooperation with regulatory authorities, industry, local communities, Indigenous groups, and other stakeholders.

ECCC stated that during an emergency, its National Emergencies Centre under the Environmental Emergencies Program identifies sensitive ecosystems and wildlife, such as migratory birds. ECCC said that the Canadian Wildlife Service conducts monitoring programs to support its mandate for migratory birds, species at risk, and habitat under its jurisdiction, and that available migratory bird and species at risk distribution and abundance data is shared with the National Environmental Emergencies Centre.

ECCC said that work initiated through the World Class Tanker Safety System is being continued through the Oceans Protection Plan (OPP). The following plans for the coming year are of particular relevance:

- At-Sea-Surveys are currently planned for 2019, with the aims of collecting baseline data to inform emergency response and building on long-term distribution, abundance and habitat use information. These surveys will include >1200 km of transects and >50 days of observer effort, covering both nearshore and pelagic habitat throughout the west coast of Vancouver Island and the Salish Sea. The program will coordinate with ongoing ships-of-opportunity surveys, as well as systematic surveys in the Salish Sea. The program also provides support for future surveys by the Tsleil-Waututh Nation in Burrard Inlet.
- Occurrence data or other products generated by marine bird monitoring activities funded under OPP will be stored either in existing databases or in new databases, archived by the principle investigators.

Trans Mountain committed, in the OH-001-2014 hearing, to participate in additional collaborative partnerships to collect data on marine bird abundance, distribution and diversity in the Marine RSA and to consult with ECCC and other industry and stakeholders on the structure and scope of a monitoring program. Though the initiative did not proceed due to stakeholder availability, Trans Mountain said it remains interested to contribute to marine bird monitoring in the Salish Sea that would grow capacity of local research groups to monitor marine birds and provide a means for them to contribute to a regional marine bird baseline program.

During the MH-052-2018 hearing, ECCC said that the south coast of B.C. and the Fraser River has an extensive shoreline data set collected over many years by several agencies. ECCC said that it utilizes shoreline data collected by the Province of B.C. and shared with ECCC for spill preparedness- and response-related activities. ECCC said that it and other organizations administer a variety of monitoring and research programs which have included nearshore and pelagic vessel-based surveys, aerial surveys for large congregations of marine birds, and long-term shore-based surveys. In the past few years, several groups including the Tsleil-Waututh Nation, ECCC, and Fisheries and Oceans Canada have undertaken work to update the shoreline data set. This included aerial overflights and ground surveys at selected location. The Burrard Inlet was one of areas recently surveyed in 2018. The Burrard Inlet shoreline data has been segmented and is currently being reviewed for quality control.

Views of the Reconsideration Panel

With regard to baseline information, Trans Mountain and participants submitted some general and some specific evidence concerning the distribution of marine habitats and species throughout Burrard Inlet and the RSA. Detailed mapping of all such habitats and species was not provided. However, participants have provided extensive evidence

concerning the potential effects of a spill on relevant marine habitats and species, which, together with the evidence on the general location of such habitats and species, has provided the Board with sufficient information to evaluate the potential significance of effects from spills. The Board notes that there are many marine users in Burrard Inlet and along the shipping lanes. Therefore, in the Board's view, it is not reasonable for Trans Mountain to take on the sole burden of baseline data collection and monitoring to determine the overall effects of potential accidents and malfunctions associated with all shipping operations.

With respect to baseline information for marine birds in particular, including marine bird species at risk, the Board notes that Trans Mountain is supportive of forming a collaborative partnership along with other industry stakeholders operating in Burrard Inlet and along the shipping route. This partnership would collect data on marine bird abundance, distribution, and diversity in the RSA, and on baseline physiological condition of marine birds. The Board further notes that Trans Mountain has provided support to several initiatives to collect additional marine bird data in the Marine Transportation RSA.

The Board notes the work being conducted by or planned for by ECCC through initiatives such as the OPP. The Board is of the view that baseline data collection currently conducted by ECCC should continue, with support from industry, as warranted.

14.9.3 Air quality

As part of its spill modelling investigations of a hypothetical marine spill at the WMT and the Northern entrance to Haro Strait (Arachne Reef), Trans Mountain conducted air dispersion modelling of a hydrocarbon cloud. Trans Mountain said that evaporation accounts for 20 per cent of the fate of spilled diluted bitumen, and the bulk of evaporation occurs within the first two days. Trans Mountain modelled for the airborne transport of the portion of each pseudo component which evaporated from the spill for both spill locations, using CALPUFF air dispersion modelling.

Several participants expressed concerns with respect to the air dispersion modelling conducted by Trans Mountain in support of the spill modelling. Metro Vancouver said that Trans Mountain did not consider a credible worst-case scenario (similar magnitude spill of 16 500 m^3 at Arachne Reef) in Burrard Inlet. Metro Vancouver said that Trans Mountain has not taken into account the full range of weather conditions and marine conditions that could prevail during a spill event.

Metro Vancouver conducted an air quality assessment (Levelton report) for four potential oil spill locations in Burrard Inlet and English Bay in order to capture a range of possible tidal and meteorological conditions during a spill. Metro Vancouver made several recommendations, one of which is to require Trans Mountain to establish real-time air quality dispersion modelling. This modelling would have to be capable of considering an oil spill using real-time meteorological observations. Metro Vancouver said that Trans Mountain should be required to provide the modelling results to municipalities and other agencies within 30 minutes of the initiation of a spill event.

Trans Mountain said that the Levelton report modelled spill volumes that were much larger than what is viable or credible in the selected locations. Trans Mountain said that the report over estimated higher airborne concentrations of evaporated volatiles by two orders of magnitude.

Living Oceans Society said that Trans Mountain cannot assume that the evaporation of hydrocarbons following a spill will generally occur within the first 12 hours, as excess concentrations can persist for weeks after a spill. It also said that oil spill air quality monitoring will need to include both primary emissions from the oil slick (e.g., hydrocarbons) and secondary products (e.g., secondary organic aerosol, ozone, organic nitrates). It requested of Trans Mountain that independent scientists, working in coordination with Trans Mountain, be allowed access to any spill or event site so that credible and transparent air quality information can be provided to the public in the days and weeks following the event.

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The Board finds that any air quality modelling would have certain limitations and uncertainties associated with it. There is always a wide range of possible scenarios (i.e., all possible combinations of oil spill trajectories, oil spill emissions and meteorological conditions) that can be included in the assumptions. The Board acknowledges the importance of understanding the risks, as informed by air dispersion modelling, in planning and responding to an emergency situation. This could assist the relevant authorities, such as the health authorities, to act in a responsible way and be able to respond in a timely manner.

The Board concurs with Trans Mountain that the Levelton report submitted by Living Oceans Society modelled spill volumes that were much larger than what is considered as a credible event. The Board finds that there is little evidentiary basis to support spills of this size to be credible events, as described in this chapter. As a result, the Board assigned low weight to the Levelton report.

The Board recognizes the regulatory framework that applies to marine oil spill preparedness and response as summarized in Section 14.3. As previously noted, the evidence before the Board indicates that there are competent authorities responsible for the marine oil spill preparedness and response regime and that the regime is functioning appropriately. Trans Mountain does not own the Project-related marine vessels and therefore, does not have direct control over the vessel owner's pollution response planning. Evidence filed by Trans Mountain, Transport Canada and Canadian Coast Guard confirms that vessel owners must have an agreement in place for spill response with Western Canada Marine Response Corporation, and vessels must also have a Shipboard Oil Pollution Emergency Plan.

14.9.4 Environmental effects of spills

For the OH-001-2014 hearing, Trans Mountain evaluated potential environmental effects of the tanker marine spill scenarios for four main ecological receptor group/habitat combinations:

- shoreline and near shore habitats;
- marine fish community and supporting habitat;
- marine birds and supporting habitat; and
- marine mammals and supporting habitat.

Trans Mountain divided each receptor group into sub-categories to reflect their sensitivity to oil exposure and assigned a biological sensitivity ranking factor from low (a value of 1) to very high (a value of 4). Trans Mountain assessed the potential for negative environmental effects of oil exposure at any given location by the overlap of the probability of oil presence, and the sensitivity of the receptor or habitat present at that location. If the receptor is an endangered species, or if provincial and national parks or other conservation areas are present, Trans Mountain considered those as additional factors.

Intervenors questioned Trans Mountain's assignment of biological sensitivity rankings for marine mammals, shorelines, and marine fish.

Trans Mountain said that there is potential for oiling of marine bird and marine mammals following an accidental spill of crude oil along the marine transportation route, and that the extent of oiling and its subsequent effects would depend on the size of the spill, the efficacy of measures to contain and recover spilled oil, the ability of oil spill responders to capture and treat oiled animals, and the intrinsic sensitivity of animals to exposure.

Shorelines and near shore habitat

In the OH-001-2014 hearing, Trans Mountain said that low-energy or protected shorelines almost always have a fine subsurface substrate (sand or mud), even though the surface veneer may be coarse pebble, cobble or boulder. It said that the presence of a water-saturated fine subsurface layer is an important factor that affects sensitivity to oil exposure because it provides a barrier that limits oil penetration of sub-surface sediment and hence, limits long-term retention of oil. Trans Mountain said that in contrast, coarse (pebble, cobble or boulder) shorelines that are highly exposed may be coarse to considerable depth, increasing permeability and the potential for retention or sequestration of stranded oil.

Trans Mountain said that tidal marshes are often associated with river mouths and estuaries, behind barrier islands, or on tidal flats where low-energy wave action and fine-grained sediment accumulation provides an elevated surface where marsh vegetation can become established. It said that eelgrass beds are also typically found in soft sediments of protected bays, inlets and lagoons.

Trans Mountain said the ecological risk assessment indicates that while shoreline habitats would be affected by spilled oil along the marine transportation route, the affected areas generally represent a small fraction of total amount of shoreline belonging to each shoreline sensitivity class within the RSA. Tran Mountain said that very little of the potentially affected shoreline habitat is of a type that would tend to sequester spilled oil. It said that although salt marsh and eelgrass habitats are considered to be highly sensitive to oil exposure, these habitats have a very low probability of oiling for these representative scenarios. Shoreline classes with low exposure cobble/boulder veneer over sand would be most affected, but shorelines of this type are more readily restored if oiled, and would recover in a relatively short period of time.

Trans Mountain said that it is expected that shoreline cleanup and assessment techniques would be applied to the spilled oil that reached the shore, and that most of this oil would be recovered. It said that biological recovery from spilled oil, where shoreline communities were contacted by and harmed by the oil or by subsequent cleanup efforts, would be expected to lead to recovery of the affected habitat within two to five years. Trans Mountain said that by comparison, whether cleaned or not, intertidal communities had recovered within five years after the Exxon Valdez oil spill.

Numerous intervenors raised concerns over spilled oil impacting shorelines. Living Oceans Society said that shoreline oiling following a major oil spill would inflict serious injuries to biological communities inhabiting them in the short term, and

lingering effects could persist for decades to a century on porous beaches (gravel, sand and mud) and in intertidal marshes if oil becomes associated with hypoxic sediments or accumulations of organic matter. These lingering reservoirs of oil pose long-term threats to intertidal organisms, predators that consume them, and to marsh-dwelling birds and mammals. Metro Vancouver said that the large tidal range in Burrard Inlet, along with a shallow, sloping coastline, would result in large areas of intertidal and shoreline habitat being exposed, contaminating oysters, barnacles, and other intertidal invertebrates and shellfish species that are relatively immobile, indiscriminate filter feeders.

Trans Mountain said that it does not dispute that small amounts of crude oil can become sequestered and remain in deep, porous beach deposits, or brackish marshes following an oil spill, and that such oil could remain following a Net Environmental Benefits Assessment. Trans Mountain further noted that sequestered oil along shorelines can persist in a relatively fresh state and that small amounts of this oil can get released exposing marine organisms present in the vicinity. However, the isolated nature and low levels of such exposures render the likelihood of population-level effects low.

ECCC said that, depending on the volume, location, time of year, and other factors, an oil spill could have serious, long-lasting effects on important habitats such as eelgrass. Numerous participants expressed concerns about the effects of oil spills on particularly productive and sensitive marine vegetation communities, such as the freshwater, brackish and salt marshes and eelgrass beds on Sturgeon and Robert banks and upriver on the islands of the Fraser River South Arm; and the eelgrass and kelp beds throughout the Gulf and San Juan Islands. Elaine Leckie filed a report which said that an oil spill could result in long term chronic contamination of eelgrass beds. Cowichan Tribes said that because kelp canopies float, they are subject to oiling in a spill, and that bull kelp is particularly vulnerable.

Trans Mountain said that the level of exposure to spilled oil for eelgrass beds and for kelps, being found in the lower intertidal and subtidal areas, is generally lower than for other ecotypes. It said that based on previous spills, effects are expected to be relatively minor.

Trans Mountain said that eelgrass beds generally recover on their own within one or two growing seasons after light to moderate oiling, and that plants that grow from rhizomes in the soil or sediment usually regenerate, even if the aboveground portions exhibit die-back. Trans Mountain said that, with the implementation of appropriate oil spill response activities, recovery of oiled shoreline habitat within two to five years following a large spill is a reasonable expectation, and referenced studies from a number of previous spills. Cowichan Tribes questioned the assertion of complete recovery within two to five years, and said that Trans Mountain did not discuss the potential for residual effects resulting from disruption of biological community structure. This process can in turn free up habitat space which can be utilized by opportunistic species that can slow or inhibit the recovery of the original community.

A number of participants noted the potential for terrestrial vegetation close to shorelines to be affected by a marine spill. The Board of the Friends of Ecological Reserves, for example, said there are numerous rare plants and lichens in the spray zone of terrestrial ecological reserves along the marine shipping lanes that would be susceptible when storms are blowing sea spray laden with toxic oil, and that this would very likely lead to local extirpations. Trans Mountain said that 43 SARA-listed plant and lichen species, and their critical habitat, have the potential to occur in the supratidal zone; and that high wind and wave conditions leading to the formation of sea spay could result in oiling and death of vascular plants, mosses or lichens. Trans Mountain said with regard to SARA-listed terrestrial plant and lichen species in the supratidal zone that could be affected by oiled sea spray, that although the recovery potential of such communities following oiling is unknown, in consideration of their SARA status and the documented sensitivity of some lichen species to air pollution, it must be assumed that the prognosis for recovery would be poor.

In the MH-052-2018 hearing, Tsawout First Nation said that it is concerned about impacts from Project-related marine shipping on the Sand-verbena moth's critical habitat within Tsawout territory, including loss of Yellow sand-verbena habitat in the event of an oil spill in Tsawout territory.

Trans Mountain said that Sand-verbena moth and Yellow sand-verbena are terrestrial species that occupy habitats above the high tide limit. There are no identified direct interactions between Sand-verbena moth (and its host plant) and Project-related marine transportation (routine operations or accidents and malfunctions). Therefore, no adverse effects are anticipated, and no specific mitigation measures are proposed or required.

Marine fish and fish habitat

In the OH-001-2014 hearing, Trans Mountain said that acute effects of spilled oil on marine fish and invertebrates are rarely observed, except in situations where oil is confined and dispersed into shallow water. It noted that acute toxicity is most likely to occur in the initial 24 to 48 hours following an oil spill as compounds associated with acute toxicity tend to be volatile during that period and are rapidly lost to the atmosphere. Trans Mountain identified non-polar narcosis and Blue sac disease as the two major mechanisms of toxicity to marine fish.

Trans Mountain said that the potential for toxicity to the marine fish community is greatest near the surface where more soluble hydrocarbons can dissolve from the floating fresh oil or form droplets that can be temporarily dispersed down into

the water column by wave action. It also said that extensive formation and dispersion of oil droplets into the water column is unlikely to occur in sheltered waters and that the potential for acutely toxic concentrations of hydrocarbons to extend down into deep water is very low, due to the limited solubility of hydrocarbons, and the dilution that would accompany mixing into deep water.

Trans Mountain said that its ecological risk assessment indicates that fish habitat would be affected by spilled oil along the marine transportation route for all oil spill scenarios and seasonal conditions. It said that the potential for negative effects to the marine fish community is generally low as a result of the low potential for dissolved hydrocarbon concentrations in water to reach thresholds that would cause mortality of fish or other aquatic life. Trans Mountain said that the potential for dissolved hydrocarbon concentrations to reach toxic levels would be greatest in shallow water areas, under weather conditions that caused spilled oil to be driven into shallow areas with wave action, leading to localized high concentrations of dissolved hydrocarbons in the water. This could result in the death of fish and invertebrates as a result of narcosis, or could cause abnormalities in developing embryos if spawn was present.

Trans Mountain said that due to the generally low potential for the spill scenarios to cause wide spread mortality of fish, recovery of the marine fish community would be expected to be rapid. It said that even under a worst-case outcome where localized fish kills might be observed, it is expected that the lost biological productivity would be compensated for by natural processes within one to two years. Trans Mountain said that effects of this type were seen following Exxon Valdez oil spill, but large-scale effects at the population level were not observed. It noted that the effects of the Exxon Valdez oil spill on marine fish populations, were either not significant to begin with or recovery occurred within one or two years at most.

Trans Mountain said that effects of the Exxon Valdez oil spill on marine fish and fish habitat were generally limited to areas where oil was driven into near-shore areas, and these effects were for the most part short-term (days to weeks, rather than years). Trans Mountain said that evidence has been presented for longer-term effects on some habitats, such as intertidal pink salmon spawning areas, where sequestered oil may have leached into spawning gravels up to several years after the spill, causing mortality and developmental effects. However, this did not result in effects at the population level for pink salmon. Trans Mountain indicated the most controversial recovery assessment for the Marine Fish Community aquatic receptor after the Exxon Valdez oil spill is the Pacific herring, as there is debate among scientists on the overall impact of spilled oil and the effect it had on Pacific herring populations.

Numerous participants expressed concern over the recovery of marine fish resources resulting from a Project-related marine vessel. Raincoast Conservation Foundation indicated that Trans Mountain's claim that natural processes would compensate for the lost biological productivity within one to two years potentially misrepresents and minimizes the consequences of an oil spill in the RSA on Pacific herring and other forage fishes. It said that Pacific herring in the RSA recruit to the commercially valuable adult population at age three. Theoretically, if there was an oil spill that caused significant mortality to adult, juvenile and larval herring in the RSA, it would take a minimum of three years for the first generation of post-spill herring to recruit to the adult population and represents the earliest possible timeframe for recovery following significant mortality of adult, juvenile and larval herring.

Raincoast Conservation Foundation also said that cumulatively, chronic small discharges of oil contribute more oil to marine environments than the larger, catastrophic oils spills. It said that due to the documented responses of Pacific herring and other fishes to chronic exposures of oil, even relatively small discharges of oil pose a substantial risk to Pacific herring, other forage fish and marine ecosystems in the RSA. Raincoast Conservation Foundation said that Trans Mountain's failure to include chronic oil spills as an existing habitat disturbance to marine wildlife in the RSA represents a substantial omission and serves to minimize the existing hazards that negatively impact wildlife and their habitats in the RSA.

In the MH-052-2018 hearing, Trans Mountain, in its response to an Information request by Nooaitch and SSN said that it evaluated potential environmental effects of worst-case and smaller pipeline spills and oil spills resulting from marine transportation and these results can be applied to evaluate potential spill-related effects on salmonid fish including Chinook salmon and Steelhead trout.

Trans Mountain said that the potential effects of pipeline and marine oil spills on salmonid species, including Coho salmon and Steelhead trout, were evaluated and tested during the OH-001-2014 hearing. It said that there has been no change in Trans Mountain's assessment of potential effects to Pacific salmon species resulting from hypothetical pipeline spills, or hypothetical spills along the marine transportation route.

Squamish Nation said that the potential impacts of a diluted bitumen spill on fish and fish habitat is of significant concern to Squamish. It stated that the spill response procedures and protocols were insufficiently defined to safeguard their waters and resources, and that the residual or mitigated impacts of accidents and malfunctions cannot yet be adequately assessed.

Coldwater said that each year, several species of fish, including Coho, Chinook, and Steelhead, make the journey from the Coldwater River to the Salish Sea and beyond. Coldwater filed a report prepared by PGL Environmental Consultants entitled 'Effects of Marine Shipping on Anadromous Species" that stated Trans Mountain failed to assess potential effects of a dilbit spill on the threatened and endangered Coho and Steelhead that return to the Coldwater River, including the potential that a

dilbit spill could result in extinction. It said that Trans Mountain's broad assessment of impacts on marine fish – without a specific assessment of potential effects on threatened and endangered species important to Coldwater – is unacceptable because it fails to consider the unique impacts on Coldwater. The PGL report noted that Trans Mountain's conclusions regarding the effects to fish from a Project-related dilbit spill are based on recovery of sockeye salmon stocks following the Exxon Valdez Oil Spill (EVOS) in Alaska in 1989, and said that this is not an appropriate analogy.

Nooaitch said that increased marine shipping is expected to result in adverse effects to salmon stocks, particularly the already declining Chinook; considered by some to be endangered. A spill in the marine environment could extirpate Chinook salmon, which would result in Nooaitch being denied its Indigenous right to fish a species it has relied on for centuries. Louis Bull said that an oil spill would affect salmon which would in turn affect Bears.

In response to Nooaitch Information request, Trans Mountain said that it evaluated potential environmental effects of worst-case and smaller pipeline spills and oil spills resulting from marine transportation and these results can be applied to evaluate potential spill-related effects on salmonid fish including Chinook salmon and Steelhead trout. It said that the environmental effects of hypothetical spills at four locations and in all seasons were considered to be representative of the environmental effects that could occur at almost any location along the proposed pipeline corridor. For each river, season and ecological receptor type, the expected spatial extent, magnitude, duration and reversibility of negative environmental effects was evaluated, based on the effects documented in various case studies. The spatial extent of environmental effects was found to vary, depending upon the season and river characteristics, and both the spatial extent and magnitude of environmental effects was often rated as "high," at least locally.

Cheam First Nation, Chawathil First Nation and Kwantlen First Nation, Seabird Island Band and Stó:lō Tribal Council and Ermineskin said that in light of how small the salmon runs are these days, and how precarious other fish populations (such as sturgeon and eulachon) are, a spill could potentially have very serious impacts on the fish in the Fraser. Further, there is potential for a spill in the Salish Sea to travel up the tidal portion of the Fraser, which could have very substantial impacts on the sturgeon and eulachon that depend on that habitat.

Driftpile said that the proponent should re-evaluate the potential impacts of a spill on species at risk known to spend time in association with the sea floor including the tope, Green sturgeon (special concern), Longspine thornyhead (special concern), Rougheye rockfish (special concern), Northern abalone (endangered), and Olympia oyster (special concern). It further said that the Proponent must prepare measures within the spill prevention and emergency preparedness and response plan for avoiding and mitigating potential effects on these species.

BC Métis Federation expressed concerns regarding contamination of the Salish Sea (and beyond) in the event of a spill. It said that participants raised concerns about potential impacts to water quality, to people who fish and make a living from the ocean and their way of life, as well as the devastating effects that spills have to marine habitat and wildlife along affected shores.

Marine mammals

Trans Mountain said that aquatic mammals, such as otters and mink that rely upon fur for insulation in cold ocean water, are extremely sensitive to oiling, as well as having potentially high exposure to oil ingestion. It said that mammals that rely upon blubber for insulation are less sensitive to external oiling, although the potential for mortality cannot be ruled out due to other exposure pathways or mechanisms. Trans Mountain said that oil ingestion remains a potentially important exposure pathway, and fouling of baleen plates can have adverse effects on baleen whales, although this would not be a problem for toothed whales.

Trans Mountain said that its ecological risk assessment indicates that marine mammal habitat would be affected by spilled oil along the marine transportation route for all oil spill scenarios and seasonal conditions. Trans Mountain said that there is clearly potential for oiling of marine mammal habitat following an accidental spill of oil along the marine transportation route. It said that the degree to which this potential is realized would depend upon the size of the oil spill, the efficacy of measures intended to promptly contain and recover spilled oil, the ability of oil spill responders to capture and treat oiled animals, and the intrinsic sensitivity of the animals to exposure.

Trans Mountain said that while there is a relatively high probability of exposure for seals and sea lions in the event of an oil spill, and some level of negative effect would be expected for animals exposed to oil, the effects would not likely be lethal, except in the case of weaker animals such as pups or older and diseased animals. Trans Mountain said that there is also a high probability of exposure for whales and that while some level of negative effect would be expected for animals exposed to oil, the effects would not likely be lethal, except in the case of weaker animals, such as calves or older and diseased animals, or animals that were exposed to heavy surface oiling and inhalation of vapours from fresh oil as could occur in the immediate vicinity of the spill location. Trans Mountain said that for mammals with very high sensitivity to oil exposure, such as otters, there is a medium probability of exposure along the marine transportation route in the event of an accidental oil spill. It said that some level of negative effect would be expected for animals exposed to oil and exposure during the winter season would be more stressful than exposure during the summer, but in either case, the combination of

hypothermia and damage to the gastro-intestinal system caused by oil ingested through grooming the fur would have the potential to cause death.

Trans Mountain said that, in the event of a spill, the recovery of marine mammals would depend upon the nature of the injuries received. For some mammal species, recovery may occur at a population level within two to five years. However, for populations such as Southern resident killer whale, the loss of a single animal would constitute an effect at the population level and recovery could take a decade or longer.

Trans Mountain said that despite the intensive studies that followed the Exxon Valdez oil spill, findings on the actual effects and recovery remain controversial. Trans Mountain said that recovery conclusions of the Exxon Valdez oil spill for killer whales are complicated by a focus on specific whale groups that are subject to additional stressors and have not recovered, in contrast with population-level trends which are increasing.

Trans Mountain said that many sea otters were severely affected by the Exxon Valdez oil spill and that a large number of carcasses were collected throughout the spill area. Trans Mountain also said that the sea otter population has been slow to recover, although river otters were deemed to have recovered within 10 years after the spill.

Numerous participants raised concern over spilled oil impacting marine mammals, specifically the Southern resident killer whale. Living Oceans Society said that a large diluted bitumen spill anywhere along the tanker route through the Gulf Islands and the Strait of Juan de Fuca would almost certainly kill substantial numbers of marine mammals, especially harbour seals and harbour porpoises, because of their relative abundance in the Salish Sea. It said that exposure of individual killer whales, however, could have adverse population level consequences for this already endangered stock, where premature loss of just one individual could significantly contribute to the jeopardy of this stock.

Raincoast Conservation Foundation said that Pacific herring and other forage fishes represent a crucial conduit of energy and nutrients from lower trophic levels to upper level predators, such as salmon, marine birds, and mammals. It said that because certain contaminants bio magnify up the foodweb, any increased contamination of Pacific herring could potentially influence the contamination load of upper- level predators, including Southern resident killer whale and other species. Trans Mountain said that the exposure of marine mammals to PAHs was generally found to be low, indicating that chronic exposure to PAHs following a crude oil spill under the conditions assessed is not likely to be harmful to species such as the Southern resident killer whale, Humpback whale, harbor porpoise, harbor seal or Steller sea lion. In particular, the chronic exposure of Southern resident killer whale, which are protected at the individual level under the SARA, was low due to the low and temporary level of bioaccumulation of PAHs by its prey (i.e., salmon and other fish). These low levels of exposure are not expected to result in adverse effects, such as death or injury.

In the MH-052-2018 hearing, Mr. Stewart referred to the "SRKW- A science based review of Recovery Actions," which noted that work on preparing for oil or chemical spills to minimize impacts to resident killer whales identified in the 2011 Southern resident killer whale recovery strategy had still not been started. The review also noted that there is no marine mammal response plan in the event of an oil spill in Canada or specific recovery measures to address the threat of ship strikes, because it wasn't identified as a threat during recovery planning.

Raincoast filed a report by MacDuffee that examined the availability of Chinook salmon as an aspect of critical habitat, the existing degradation of that aspect of Southern resident critical habitat, and the effect that an oil spill in the Fraser River estuary could have for the Southern residents and their critical habitat.

Stz'uminus and Snuneymuxw said that it is deeply concerned about the impacts of a spill on the Southern resident killer whale population. It said that it understands from the Dr. Short Report that a dilbit spill would be catastrophic for these whales, with long-term and potentially irreversible effects on population.

Wilderness Committee said that the recovery strategy for North Pacific Humpback whale states that "proposed pipeline projects, associated tanker traffic, and possible offshore oil and gas exploration and development in coastal B.C. all increase the likelihood of toxic spills in Humpback whale habitat in the future, and underscore the importance of protecting critical habitat and supporting mitigation measures and plan." It said that there is not sufficient data from past oil spill events to conclude how Humpback whales specifically are impacted by these spills. However, research after the Exxon Valdez oil spill showed that it accelerated the killer whale population trajectory towards extinction. It said that two groups of killer whales were severely impacted by the spill and suffered losses of 33 and 41 per cent in the year following the spill. Both groups have not recovered to pre-spill numbers even 16 years post spill and one of the groups is listed as deplete under the *Marine Mammal Protection Act*.

Squamish said in the event of a spill, high mortalities of marine mammals could also result for species such as killer whales, porpoises, dolphins and seals that, like seabirds, routinely inhabit the sea surface, making them especially vulnerable to contact with floating diluted bitumen. In the case of the Southern resident population of killer whales, any additional mortalities resulting from oil exposure could materially contribute to the extinction risk for this stock, which would permanently alter ecosystem functioning in the Salish Sea.

Shxw'ōwhámel First Nation asked for the MMPP to include a specific emergency response plan for marine mammals.

DFO said that a marine mammal oil spill response plan is in development. It focuses on preventing exposure of marine mammals, including resident killer whales, to spills. This includes strategies for monitoring and tracking SRKW; prevention of exposure to oil spills by prioritizing cleanup and booming efforts for key areas; and prevention of exposure using acoustic deterrents to keep resident killer whales away from spill affected areas. There are a number of actions completed or underway to support the strategies described above, including: a real time SRKW tracking network in SRKW critical habitat is in development to assist with locating and determining the direction of travel of SRKWs using hydrophones and cetacean sighting. It said that the current Fisheries and Oceans Canada (DFO) approach is to develop a single marine mammal spill response plan that covers all marine mammal species, including SARA-listed species. It focuses on preventing exposure of marine mammals, including resident killer whales, to spills. This includes strategies for monitoring and tracking SRKW; prevention of exposure to oil spills by prioritizing cleanup and booming efforts for key areas; and prevention of exposure using acoustic deterrents to keep resident killer whales away from spill affected areas.

DFO said that in the case of significant spills, it provides advice and input about environmental sensitivities in the spill area and the prioritization of protection measures through the Incident Command System (ICS). It said that the Environmental Unit under the ICS is where technical experts from all response partners combine to provide advice on environmental protection objectives and priorities, strategies and tactic implementation. Species of conservation concern (e.g., SARA-listed species) are considered an "elevated priority" when the Environmental Unit determines the protection objective and its subsequent protection strategies and tactical implementation.

DFO said that a holistic approach for the protection and treatment of marine mammals, invertebrates, fish and turtles for an oil/chemical spill will draw on all relevant information including physical, chemical, biological, and geographic information.

WCMRC said that it has commissioned the development of specific plans as tools for the use of the entire response community. These plans pre-identify critical information that can be used during a response and present a holistic approach for the protection and treatment of marine mammals, terrestrial animals and birds in the event of an oil spill. The Marine Mammal Oil Spill Response Protocol, developed in collaboration with Sea View Marine Sciences, is an example of one such plan. It said that the Marine Mammal Oil Spill Response Protocol has been exercised by WCMRC and applicable stakeholders.

WCMRC filed a Draft Marine Mammal Oil Spill Response Protocol (MMOSRP) which has been developed to integrate into the WCMRC wildlife response protocols for an oil spill response on the B.C. coast. The intent of this MMOSRP is to build preparedness capacity on the B.C. coast by defining a standard for marine mammal response that uses Incident Command System to drive process. It said that the development of this MMOSRP led to the identification of a number of gaps that provide guidance for the next steps in oil spill preparedness planning. These include the following:

- Consolidation and integration of existing resources for the development of an oiled wildlife response network in B.C. including regulatory agencies, rehabilitation centres, marine professionals, oil spill response organizations (i.e., WCMRC), and oiled wildlife specialists into a British Columbia Marine Wildlife Response Team.
- Assemble oil spill response kits for marine mammals.
- Identify oil spill response training required for marine mammals and other marine wildlife.
- Development of species-specific response plans that include assessment, capture protocols, and rehabilitation guidance.

WCMRC said that The Vessel of Opportunity program is a critical component of WCMRC's response readiness regime. It said that using nearby vessels is an excellent way for a response organization to leverage its resources and expertise during an oil spill.

Marine birds

Section 14.7.4 describes the SARA-listed marine birds that may be affected by operational effects of Project-related marine shipping, as well as the status of species recovery strategies. Since issuance of the OH-001-2014 Report, Western grebe and Horned grebe have been listed as Special Concern under Schedule 1 of the SARA. Trans Mountain said that there are no species-specific Recovery Strategies, Action Plans or Management Plans for either species; however, both are included in the Multi-Species Action Plan for Gulf Islands National Park Reserve of Canada.

ECCC said that Barn swallow and Bank swallow were listed under Schedule 1 of the SARA as Threatened since the OH-001-2014 hearing. ECCC said that an oil spill could impact Barn swallow, Bank swallow, and Common nighthawk given that an oiling event could result in adverse effects to coastal habitats that these species, or their prey, frequent. However, due to the distributions of these species and/or the habitats they use in coastal B.C., ECCC said that the potential for sizable interaction is thought to be much lower than for species identified as having higher vulnerabilities.

ECCC stated that, since the OH-001-2014 hearing, Management Plans have been finalized for each of Ancient murrelet, Black-footed albatross, Peregrine falcon, Red knot, and Great blue heron. ECCC also stated that Recovery Strategies have been finalized for each of Common nighthawk and Red knot since 2015.

Trans Mountain noted that no critical habitat has been identified in either a Recovery Strategy or Action Plan for SARA-listed marine bird species. ECCC said that Management Plans for Western grebe, and Horned grebe (western population) and Recovery Strategies for Barn swallow and Bank swallow are currently being prepared. In addition, draft Marine Critical Habitat for Marbled murrelet is being developed for the Salish Sea.

ECCC stated that it continues to be concerned with the potential consequences of a spill resulting from an accident during loading or transportation of oil. In particular, depending on the specific timing, location and other conditions related to an oil spill, it remains ECCC's view that a large scale spill resulting from the Project has the potential to result in significant impacts to marine birds.

ECCC notes that several recovery strategies and action plans place emphasis on acute and chronic oil spills as a major threat to marine birds. Marbled murrelets are described as being among the species most vulnerable to oil spills at sea. Western and Horned grebes have been among the most frequently oiled birds in past spills in Canada and the United States, and both acute and chronic oils are listed as threats to these species. Ancient murrelets are described as highly vulnerable to chronic and acute oil spills, and the recovery plan identifies increased tanker traffic and risk of oil spills as a threat to the species.

Various participants, in both the OH-001-2014 hearing and the MH-052-2018 hearing, raised concerns about oil spill effects on marine birds and their habitat.

Trans Mountain said that shorebirds have a generally low sensitivity to oiling; however, some shorebirds would be sufficiently oiled to result in mortality of adult or juvenile birds, or that eggs would become oiled resulting in embryo mortality. It further noted that oil exposure could extend to affect a large number of known breeding or colony sites for seabirds, as well as a large number of Important Bird Areas in the Strait of Georgia, Gulf Islands, and Strait of Juan de Fuca region. Trans Mountain said that there is a high probability of exposure for seabirds in the unlikely event of a crude oil spill, and some level of negative effect would be expected for birds exposed to crude oil up to and including death as a result of hypothermia, loss of buoyancy, and / or oil ingestion.

B.C. Nature and Nature Canada raised concerns about effects of chronic oil spills on marine birds. Trans Mountain said that as part of its Tanker Acceptance Standard, it would require Project vessels to not discharge any bilge water while within the territorial waters of Canada. Trans Mountain said that escort tugs would discharge bilge water, if required, in compliance with the *Canada Shipping Act, 2001*, Vessel Pollution and Dangerous Chemicals Regulations, which states that discharged bilge water must contain no more than 15 mg/L oil and discharges must be made when the vessel is underway. Trans Mountain said that the requirement to treat bilge water is contained in the International Maritime Organization's International Convention for the Prevention of Pollution from Ships (MARPOL) and in Canada is enforced through the *Canada Shipping Act, 2001, Vessel Pollution and Dangerous Chemicals Regulations*.

During the OH-001-2014 hearing, the City of Vancouver, Tsleil-Waututh Nation, and Living Oceans submitted a report by JWS Consulting LLC on the fate and effect of oil spills from the Trans Mountain Expansion Project on Burrard Inlet and the Fraser River Estuary. The report noted that a major spill could result in a large scale mortality of sea- and shorebirds.

Trans Mountain said that any mortality of birds caused by a crude oil spill would be a significant adverse environmental effect, and no such mortality is acceptable under any circumstances.

During the MH-052-2018 hearing, intervenors including Tsleil-Waututh First Nation, Malahat First Nation, Stz'uminus First Nation, Snuneymuxw First Nation, Squamish First Nation, referred to a report by Dr. Short that concluded that small to medium sized oil spills on the order of 100 to 1 000 m^3 from the Project can cause substantial mortalities to seabirds.

Biofilm

In the OH-001-2014 hearing, the Lyackson First Nation stated that if diluted bitumen made it to shore at Roberts Bank, it could potentially adversely affect migratory birds and/or the biofilm and biomat on which they rely. ECCC noted the importance of biofilm to sandpipers and said that in the event of a spill where oil reached the Fraser River estuary, changes to important food supplies, such as biofilm, could have population effects on Western sandpiper and other shorebirds. It recommended a certificate condition that would require Trans Mountain undertake studies on the effects of oil on biofilm with the focus on crude oil, that would fill identified data gaps and would inform emergency response.

Trans Mountain said that oil fate modelling showed that probability of oiling on sturgeon and Roberts Bank is very low, and stochastic oil spill modelling results indicate that oiling potential along mudflats in the Fraser River Delta is limited. Trans Mountain said that any such effects would be reversible and therefore, it was not proposing to undertake studies to investigate potential effects of oil on biofilm.

In the MH-052-2018 hearing, ECCC provided studies that it said provides a greater understanding of the importance of biofilm in the marine shipping area for migratory shorebirds. Trans Mountain said that the studies that have become available recently as a result of the review of the Roberts Bank Terminal 2 Project, provide no new information that would add to the existing assessment of the effects of crude oil spills on biofilm.

Trans Mountain notes that most spills of heavy oils arise from conventional shipping, not from crude oil tanker accidents. Therefore, the perceived risk of oil spills to Roberts and Sturgeon Banks is associated with the broader marine shipping industry, and not the Project specifically.

Wildlife emergency response plan

During the MH-052-2018 hearing, ECCC reiterated its recommendation made in the OH-001-2014 hearing that Trans Mountain develop a Wildlife Emergency Response Plan (WERP). ECCC said that WERPs are documents that outline the initial and ongoing wildlife-related strategies that are needed to support any wildlife response objectives that may occur at the onset of a pollution or non-pollution incident.

ECCC said that Trans Mountain would be best placed to collect migratory bird and species at risk data, conduct risk assessment strategies, identify response strategies, and determine the type and extent of monitoring in relation to various events to inform the Plan, with support and assistance from qualified professionals. ECCC recommended that Trans Mountain consult with ECCC, other relevant regulatory authorities and Indigenous groups in the development of data collection approaches, risk assessment and response strategies, and monitoring approaches that would inform the plan. ECCC would provide guidance, information and relevant data for Trans Mountain to incorporate into the plan, and regular oversight of the effectiveness of its implementation.

ECCC noted that it conducts ongoing baseline surveys of priority marine bird species to identify their abundance and distribution, including SARA-listed species. In the event of an oil spill, this information, as well as on-site reconnaissance and local and Indigenous knowledge, is used to assess the threat to birds. ECCC may also convene the Environmental Emergencies Science Table, an advisory mechanism that coordinates scientific expertise to identify environmental protection priorities for a pollution incident. At this time, ECCC has not developed any species-specific response plans for SARA-listed marine birds that may be affected by Project-related marine shipping, and is not aware of any such plans that have been created by third parties. However, for an oil spill that threatens wildlife, a Wildlife Management Plan is developed. This plan assesses the potential impact to all wildlife in the geographic area. SARA-listed species that may be impacted are specifically identified and prioritized in the Wildlife Management Plan. As well as a Wildlife Impact Assessment, the Wildlife Management Plan also includes wildlife reconnaissance surveys, ongoing monitoring, hazing and deterrence and wildlife collection and rehabilitation.

ECCC said it has been resourced (initially under World Class Tanker Safety Phase II, and currently under Oceans Protection Plan Regional Response Planning sub-initiative) to collect marine bird environmental sensitivities data in marine waters of southern B.C., including but not limited to the Salish Sea.

Trans Mountain, in response, said that ECCC would be best placed to collect migratory bird and species at risk data, conduct assessment strategies, identify response strategies, and determine the type and extent of monitoring in relation to informing WERPs for marine transportation. Through participation in regional planning and preparedness efforts, Trans Mountain understands that other federal government agencies, provincial government agencies, Indigenous and local communities, vessel operators, Western Canada Marine Response Corporation, and other stakeholders would also have a role in one or more aspects related to informing a WERP. Trans Mountain said that it would consider opportunities to implement or support or participate in the collection of information that could be used in a WERP.

Marine bird recovery post-spill

In the OH-001-2014 hearing, Trans Mountain said that recovery of marine birds following the Exxon Valdez Oil Spill (EVOS) was generally rapid and uncomplicated. Trans Mountain said that it is reasonable to expect marine bird recovery at a population level within two to five years following a large oil spill. Trans Mountain further said that populations of alcid birds, which are considered to be most sensitive to spilled oil, could take longer to recover, on the order of 10 years or longer.

B.C. Nature and Nature Canada raised concerns about the post-spill recovery times estimated by Trans Mountain and suggested that Trans Mountain consider other spill events in addition to the EVOS. ECCC said that Trans Mountain's characterization of the EVOS recovery and application of recovery times to potential spill impacts from the Project do not reflect the full breadth of conclusions in the literature regarding recovery times for marine birds. It also said that some studies suggest longer impacts to certain species than what Trans Mountain suggested. Trans Mountain said that its recovery assessments are considered to be realistic.

During the MH-052-2018 hearing, ECCC stated that there is a broad spectrum of results from EVOS studies on marine birds; some provide evidence of longer-term impacts (including suggestions that impacts to some species are still ongoing) and some suggest that impacts only persisted in the short to mid-term.

Views of the Reconsideration Panel

The Board heard several concerns regarding the potential environmental effects of spill on shorelines and near shore habitat, marine fish and fish habitat, marine mammals and marine birds.

The Board also heard from several intervenors that there is potential for a spill in the Salish Sea to travel up the tidal portion of the Fraser, which could have very substantial impacts on various fish species.

The Board is of the view that the environmental effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time, the effectiveness of containment and clean-up, the valued components that are impacted, and the weather and time of year of the spill.

For example, a small spill that is quickly contained could have adverse effects of low magnitude, whereas a credible worst-case spill could have adverse effects of larger geographic extent and longer duration, and such effects would probably be significant. Dr. Short said that small to medium sized oil spills on the order of 100 to 1 000 m^3 from the Project can cause substantial mortalities to seabirds, and estimated effects for small to medium spills in Canada and in Alaska. In the Board's view, there is a spectrum of potential spill outcomes ranging from small quickly contained spills that do not result in significant effects to credible worst-case spills that would result in significant effects. In between these two extremes are other spills that could also result in significant effects depending upon the circumstances.

The Board is of the view that spills could impact key marine habitats, such as salt marshes, eelgrass beds and kelp forests, which could, in turn, affect the numerous species that rely upon them. Spills could also affect terrestrial species along the coastline, including SARA-listed terrestrial plant species.

The Board is of the view that although impacts from a credible worst-case spill would probably be adverse and significant, natural recovery of the impacted areas and species would likely return most biological conditions to a state generally similar to pre-spill conditions. Such recovery may be as quick as a year or two for some valued components, or may take as long as a decade or more for others. Valuable environmental values and uses could be lost or diminished in the interim. For some valued components, including certain SARA-listed species, recovery to pre-spill conditions may not occur.

As discussed in Section 14.11.2, the Board is of the view that although a large spill from a tanker associated with the Project would result in significant adverse environmental effects, such an event is not likely.

In regard to the PGL report entitled 'Effects of Marine Shipping on Anadromous Species" submitted by Coldwater, the Board finds that Trans Mountain's ERAs adequately considered various environmental effects of hypothetical spills that are representative of the range of seasonal effects that could result from an oil spill. In the Board's view, a specific assessment Coldwater Steelhead and Coho is not necessary as Trans Mountain's ERA provides an idea of the potential effects that could occur as a result of a spill. The Board is of the view that effects of a spill could be significant, and as noted above, it is dependent on various factors.

In regard to the MacDuffee report, the Board acknowledges the risks that catastrophic events such as oil spills could present to Southern resident killer whales and their prey. The Board is of the view that, as noted above, the effects of a spill are very dependent upon the circumstances. The Board notes the concerns raised by intervenors in regard to the recovery of fish populations affected by a spill. The recovery of fish populations contacted by oil could take a number of years depending on the severity of the impact on the population. For SARA-listed or COSEWIC species (including certain salmonid species), the recovery may take even longer or the populations may never recover. In addition, predators of impacted fish species could also be affected indirectly due to diminishment of their prey.

Several intervenors raised concerns about the impacts of a spill on marine mammals, including the impacts on the Southern resident killer whale population. In the Board's view, mortality of individuals of the SARA-listed species could result in population level impacts and could jeopardize recovery. For example, the Recovery Strategy of the Northern and Southern Resident Killer Whales (Orcinus orca) in Canada states that while the probability of either Northern or Southern resident killer whales being exposed to an oil spill is low, the impact of such an event is potentially catastrophic.

With respect to the concerns raised by Tsawout First Nation regarding impacts of spills from Project-related marine shipping on the Sand-verbena Moth's critical habitat within Tsawout territory, including loss of Yellow Sand-verbena habitat, Trans Mountain noted that there are no identified direct interactions between Sand-verbena Moth (and its

host plant) and Project-related marine transportation (routine operations or accidents and malfunctions). Trans Mountain said that it did not anticipate any adverse effects, and therefore no specific mitigation measures are proposed or required. The Board accepts the logic of Trans Mountain's response to this concern.

Despite suggestions from some intervenors that marine bird critical habitat could be affected by Project-related marine shipping, none of the Recovery Strategies for marine bird species at risk potentially affected by Project-related marine traffic have identified marine bird critical habitat.

Parties have said that large spill would have an adverse effects on marine birds. ECCC filed studies highlighting the importance of biofilm for marine life, including birds. The Board accepts this evidence, and finds that a credible worst-case oil spill, although unlikely, would have a significant effect.

The Board does not accept ECCC's recommendation that Trans Mountain would be best placed to collect the data, develop the required strategies, and determine the type and extent of monitoring required in order to develop a Wildlife Emergency Response Plan. The Board is of the view that ECCC's work in the development of a Wildlife Management Plan which assesses the potential impact to all wildlife, including SARA-listed species, and that also includes wildlife reconnaissance surveys, ongoing monitoring, hazing and deterrence and wildlife collection and rehabilitation demonstrates that ECCC, and not Trans Mountain, is best placed to develop a Wildlife Emergency Response Plan.

The Board acknowledges that a marine mammal oil spill response plan is in development which focuses on preventing exposure of marine mammals, including resident killer whales, to spills. The Board also acknowledges that there is a Draft Marine Mammal Oil Spill Response Protocol which has been developed to integrate into the WCMRC wildlife response protocols for an oil spill response on the B.C. coast. The Board notes that the development of this plan led to identification of a number of gaps that provided guidance for the next steps in oil spill preparedness planning. To further the consideration of response planning for SARA-listed species, including marine mammals, the Board notes that it has included this issue within Recommendation 7.

The Board acknowledges that, since the OH-001-2014 Hearing, there have been improvements in the area of spill prevention, and emergency preparedness and response, as discussed in Section 14.11 of this chapter.

14.10 Socio-economic effects of malfunctions or accidents (spills)

This section discusses the potential socio-economic effects of spills from Project-related increase in marine vessels. Chapter 11 discusses the effects of spills from the Project, such as from the pipeline or terminals, on various valued socio-economic components. A discussion on the spill evaluation methodology can be found in Section 14.9.1

14.10.1 Marine commercial, recreational, and tourism use

In the OH-001-2014 hearing, Trans Mountain said that, while potential socio-economic effects of worst-case and smaller spills will vary depending on the exact location and nature of the incident, particular patterns of resource use in the vicinity and key economic activities in areas that may be reached by a spill, a worst-case spill from a marine vessel could have potentially large impacts on marine commercial, recreational and tourism use.

Trans Mountain said that a marine spill, particularly a large spill that affects one or more important commercial fishing areas, would likely result in loss of commercial fishing income due to regulated or voluntary closures and possibly reduced demand due to concerns about fish quality. It said a Project-related tanker spill could affect the tourism and recreation industry by directly disrupting the activities of tourists and recreationalists, and by causing economic effects to recreation or tourism-based businesses as a result of activities being restricted or prohibited near the spill site and in cleanup areas. Marine spills could potentially damage marinas, boats, and business or commercial establishments and infrastructure, resulting in costs for individuals and municipalities and lost income for affected businesses. Trans Mountain said that in such cases, the vessel responsible for the spill would be responsible for compensating those who suffered damage.

Both Indigenous and non-Indigenous participants noted the significant economic value commercial fishing provides to B.C.'s coastal communities and stressed the very serious risks to the livelihood of those who depend upon it should a spill occur. Indigenous groups, including the First Nations of Maa-nulth Treaty Society, Lyackson First Nation, Cowichan Tribes, Musqueam Indian Band, Tsawout First Nation, T'Sou-ke First Nation, and the Swinomish, Tulalip, Suquamish, and Lummi Indian Nations, expressed concern regarding the impact a spill would have on their economic development interests and commercial harvesting rights.

Several participants raised concerns about the impact a spill would have on recreational and tourism use, either by causing disruption to tourist and recreation activities, or economic loss to local businesses and tourism. Both the City of Vancouver and the City of Victoria noted the contribution tourism and commercial activities serve for the local population and

economy, and expressed concern that an oil spill would result in both short-term and long-term impacts to local businesses and tourism.

Numerous letters of comment described the pristine beauty of the coastal waters of B.C. and the value the natural resources bring to the writers, their families and all visitors to the region through recreational activities and artist endeavors. Many said that if a spill were to occur, there would be a loss in activities such as recreational fishing, whale-watching, ocean kayaking, and recreational boating and sailing, as these are all dependent on clean waters.

The City of Vancouver said it undertook an assessment of the value of the City of Vancouver brand to determine what impact, if any, a small, medium or large oil spill in the Metro Vancouver area would have on the brand value from an economic standpoint. The City of Vancouver concluded that an oil spill would result in the impairment of the Vancouver brand and a reduction in brand value ranging between USD $1 billion for a small spill and USD $3 billion for large spill.

The Wilderness Tourism Association of B.C. said that any spill in B.C. would have an impact on B.C.'s Super, Natural British Columbia® brand, and affect both provincial and Canadian tourism industries.

In the MH-052-2018 hearing, participants continued to express concerns about the impact a spill would have on marine commercial, recreational and tourism use, including economic impacts to the commercial fishing and tourism industry, as well as impacts to recreational activities.

Views of the Reconsideration Panel

After considering the relevant evidence filed in both the OH-001-2014 hearing and MH-052-2018 hearing, the Board confirms the following views expressed in the OH-001-2014 Report.

The Board is of the view that the effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time to contain and recover the spill, the effectiveness of containment and clean-up, the valued components that are impacted, and the weather and time of year of the spill. For example, a small spill that is quickly contained could have adverse effects but of low magnitude, whereas credible worst-case spills would have adverse effects of larger geographic extent and longer duration, and such effects would probably be significant.

The Board acknowledges that many parties expressed concerns about potential short-term and long-term spill effects on resources that they use or depend on. The Board finds that a large oil spill would cause disruptions in people's lives, especially those people who depend on the marine environment for commercial and recreational activities and other uses. As discussed in Section 14.9.4, the Board finds that although impacts from a credible worst-case spill would probably be adverse and significant, natural recovery of the impacted areas and species would likely return most biological conditions to a state generally similar to pre-spill conditions. Certain values and uses could be lost or diminished in the interim. The Board views recovery of the socio-economic environment as the time when immediate impacts and interruption to people's lives are no longer evident, and the natural resources upon which people depend are available for use and consumption. The Board notes Trans Mountain's commitment to use available spill response technologies to mitigate spill impacts to ecosystems and assist in species recovery. The Board is of the view that implementation of an appropriate spill response, and measures such as compensation and harvest restrictions or closures would lessen the effects experienced until resource-dependent species recover.

As discussed in Section 14.11.2, the Board is of the view that although a large spill from a tanker associated with the Project would result in significant adverse environmental and socio-economic effects, such an event is not likely.

For all socio-economic elements, the Board has incorporated the potential consequences of a spill into its discussion on Spill Risks in Chapter 1, and considered them in its overall weighing of the benefits and burdens of the Project in Chapter 2.

14.10.2 Heritage resources

In the OH-001-2014 hearing, Trans Mountain said that heritage resources could be affected by a spill in a number of ways. Oil and cleanup activities can directly damage artifacts and sites or disturb their context, which may result in permanent loss of information critical to scientific interpretation.

Several intervenors expressed concerns regarding the impacts an oil spill would have on heritage resources along the marine coastline. Pauquachin Nation said it conducted an Archaeological Overview Assessment of the marine shipping component of the Project and found that there are potentially hundreds of sites at theoretical risk. Pauquachin Nation recommended that a general archaeological specific spill response plan be developed and include protocols and procedures to ensure protection of archaeological sites where possible, and mitigation of impacts where these are unavoidable.

Scia'new First Nation said the coast is dotted with registered archaeological sites, burial sites and sacred sites that may be affected by oil contamination from small or large mishaps, and impacts associated with cleanup measures following a spill.

In the MH-052-2018 hearing, intervenors continued to express concerns about the impact a spill would have on heritage resources including how the effects of an oil spill would cause loss, damage or contamination of important archaeological resources.

Views of the Reconsideration Panel

After considering the relevant evidence filed in both the OH-001-2014 hearing and MH-052-2018 hearing, the Board confirms the following views expressed in the OH-001-2014 Report.

The Board acknowledges the high degree of concern Indigenous groups have regarding potential spills or contamination of the ocean, and how it would impact archaeological sites located on the shoreline. The Board is of the view that the effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time to contain and recover the spill, the effectiveness of containment and clean-up, and the weather and time of year of the spill. A credible worst-case spill would have adverse effects.

The Board is of the view that the effects of a credible worst-case spill on heritage resources could be adverse and significant. However, as discussed in Section 14.11.2, the Board is of the view that although a large spill from a tanker associated with the Project would result in significant adverse environmental and socio-economic effects, such an event is not likely.

The Board encourages Indigenous groups to participate in the spill response planning process with regulatory authorities such as the Canadian Coast Guard and Transport Canada, and the certified response organization WCMRC. The Board also encourages Indigenous groups to share information regarding potential archaeological and cultural heritage sites with the B.C. Ministry of Forests, Lands & Natural Resource Operations.

14.10.3 Community well-being

In the OH-001-2014 hearing, Trans Mountain said that marine oil spills may adversely affect community well-being by affecting cultural and heritage resources, traditional lands, culture, and practices and psychological well-being.

Several participants raised concerns about the impact a spill would have on their quality and enjoyment of life, and community well-being.

Numerous letters of comment explained personal attachments the authors have with the land and water, and described how life would change in the event of a spill. Many commenters described a sense of devastation and incalculable loss at the thought of a spill.

The Village of Belcarra said that an oil spill of any size into Central Burrard Inlet would irreparably harm the social fabric of the Belcarra community which includes fishing, tourism and recreation.

Mr. Guy McDannold said that an oil spill would cause socio-economic devastation, the destruction of the fishery, tourism and the established way of life so important to the communities in the area. The result would be a catastrophic loss of the foundation upon which the communities and the lives of those on the south west coast of Vancouver Island are built. Mr. McDannold said that an oil tanker spill would kill the small coastal communities, and that people would no longer have a reason or ability to live there.

Ms. Sara Steil said that, along with the unknown physical effects attributable to an oil spill, there would also be mental health effects. Job and income loss, and the loss of the attributes of unspoiled natural beauty of the area could deeply affect the members of a community, whose identities have been formed around living in close proximity to these attributes. As an island community; the sea and shorelines are part of the fabric of its existence.

In the MH-052-2018 hearing, participants continued to express concerns about the impact a spill would have on community well-being, including how a spill would negatively affect their quality and enjoyment of life, and community well-being.

Views of the Reconsideration Panel

After considering the relevant evidence filed in both the OH-001-2014 hearing and MH-052-2018 hearing, the Board confirms the following views expressed in the OH-001-2014 Report.

The Board considered all of the evidence regarding the value that people and communities place on a healthy natural environment. The Board is not able to quantify how a spill could affect people's values and perceptions, given that it would be highly dependent on the particular circumstances. The Board finds that a credible worst-case spill would be

likely to have short-term negative effects on people's values, perceptions and sense of well-being. The Board is of the view that implementation of appropriate mitigation and compensation following a spill would lessen these effects over time. The Board is also of the view that appropriate engagement of communities in determining spill response priorities, identifying community impacts, and developing associated community mitigation plans can also lessen effects on communities. As discussed in Section 14.11.2, the Board is of the view that although a large spill from a tanker associated with the Project would result in significant adverse environmental and socio-economic effects, such an event is not likely.

14.10.4 Local infrastructure and services

Trans Mountain said that in the event of a spill, particularly a credible worst-case incident, demands are likely to be placed on local, municipal, regional and independent emergency responders, hospitals, clinics, social service and relief organizations, and local, municipal, regional and federal government officials and staff.

During both the OH-001-2018 hearing and MH-052-2018 hearing, participants, including several municipalities, expressed concern that a spill response would cause a significant draw on resources, including the need for increased operational staff.

Views of the Reconsideration Panel

The Board acknowledges the high degree of concern municipalities have regarding potential spills, and how it would impact local infrastructure and services. The Board finds that a credible worst-case spill would be likely to have short-term negative effects on infrastructure and services; however, as discussed in Section 14.11.2, the Board is of the view that although a large spill from a tanker associated with the Project would result in significant adverse environmental and socio-economic effects, such an event is not likely. The Board is of the view that implementation of appropriate spill response measures following a spill would lessen these effects. A more detailed discussion of the commitments and initiatives by Trans Mountain, WCMRC and the Federal Authorities regarding spill response is found in Section 14.11.3.

14.10.5 Traditional marine resource use

In the OH-001-2014 hearing, Trans Mountain said that Indigenous peoples have historically used or presently use the shipping route to maintain a traditional lifestyle and continue to use marine resources throughout the Salish Sea region for a variety of purposes, including fish, shell-fish, mammal and bird harvesting, aquatic plant gathering, and spiritual/cultural pursuits, as well as through the use of waters within the region to access subsistence resources, neighbouring communities and coastal settlements.

Trans Mountain said that although the risk of a Project-related oil spill was shown to be low, evidence from the Exxon Valdez Oil Spill indicates that subsistence harvesting by Indigenous communities and individuals would be affected. Trans Mountain said that adverse effects resulted from reduced availability of fish and wildlife, concern about possible health effects of eating fish and wildlife, and disruption of traditional lifestyle due to participation in, or disturbance by, cleanup activities. The company said fears about food safety diminished over time and harvest levels increased since the spill, but the increase has been variable, and composition of harvested species has changed. Trans Mountain noted that other factors have influenced this change and discerning what is spill-related is difficult.

Indigenous groups in the marine corridor expressed concerns about the impacts of spills. Several Indigenous groups, including Tsawout First Nation, the First Nations of Maa-nulth Treaty Society, and Musqueam First Nation, said that rights were not being accommodated and that if a spill occurred, it would impact their ability to exercise harvesting rights as a result of access restrictions due to regulated or voluntary spill-related closures, or damage to vessels or gear. They also expressed concern that an oil spill may damage culturally or spiritually sensitive areas, or cause interruption of traditional ceremonies during the cleanup period.

A number of Indigenous groups, including Musqueam First Nation and Scia'new First Nation, described the importance and value of aquatic resources for their subsistence activities and culture. Many Indigenous groups, including Snuneymuxw First Nation and the First Nations of Maa-nulth Treaty Society, expressed concerns that an oil spill may reduce the quantity and quality of marine resources and wildlife. They said this impact could extend beyond when closures are lifted. They noted that just because the probability of a spill is small, that is not sufficient reason to determine the effects of a spill are not significant. They also noted concern that there is no adequate compensation for loss of marine resources in the event of large spill.

Several Indigenous groups, including Tsleil-Waututh First Nation and Stz'uminus First Nation, noted that an oil spill would affect integral aspects of their culture including their subsistence, economy, social activities, ceremonial activities, cultural transmission, and water based travel. Tsleil-Waututh Nation said that there is not one single negative effect to Tsleil-Waututh culture from the potential spills associated with the Project, but rather a number of effects and cascading effects

that reach all aspects of Tsleil-Waututh culture. The most certain negative effect would be further dislocation from their territory and the resources of that territory. Many Indigenous groups said that if there is an oil spill, the adverse effects could be catastrophic and devastating, causing severe and irreparable harm, and remain for many years as a result of loss of cultural knowledge.

Through its extensive engagement activities, Trans Mountain said that it understands that an oil spill into the marine environment, arising from an incident involving a tanker is a major concern for Indigenous communities. Trans Mountain said it recognizes that an unmitigated oil spill from a tanker could have immediate to long-term effects on the biophysical and human environment of the Salish Sea. Trans Mountain committed to enhanced navigation and safety measures and to the continued identification of improvements to the existing oil spill response preparedness and response capacity, in consultation with Indigenous groups. Trans Mountain also committed to invite all Indigenous groups to attend regional workshops where mitigation measures and monitoring programs will be discussed.

In the MH-052-2018 hearing, Trans Mountain said that it considered the potential effects of a large or credible worst-case oil spill on elements of the environment that support Indigenous rights and interests and Indigenous culture and subsistence in its original Application.

Trans Mountain said that it understands the importance of marine resources to Indigenous communities and understands the concerns in the unlikely event of a spill occurring during tanker transit through their traditional territories. Trans Mountain said that it considered the potential effects of spills on elements of the environment that support Indigenous rights and interests including TMRU and proposed mitigation in its original Application. Trans Mountain said that it also considered and assessed spill effects on environmental health and community wellbeing, including toxic exposure, traditional lands, culture, and subsistence practices and psychological well-being.

Throughout 2015 to the present, Trans Mountain said that it had facilitated introductions and meetings of marine Indigenous communities with the Western Canada Marine Response Corporation (WCMRC). The purpose of these meetings was to inform Indigenous communities of WCMRC's state of preparedness and current plans in place should a marine spill occur and to mitigate the impacts thereof. This includes protection of wildlife, economic and environmental sensitivities.

Indigenous intervenors continued to express concerns about the impacts of spills within the marine corridor. They raised concerns about the impacts that spills would have on their Indigenous and Treaty rights, including interruptions to fishing and harvesting activities due to impacts to the environment and marine resources or spill-related closures. Indigenous intervenors also expressed concerns about the long-lasting impacts to their cultural practices and activities as a result of a spill, noting that the continuity of their culture and identity is dependent upon access to healthy marine resources. Marie Zackuse, Chairwoman of Tulalip Tribes said the following during OTE:

> The consequences ... of a spill would be unspeakable. It would affect marine life and shellfish for decades to come. Frankly, it would have the potential to put an end to our Coast Salish lifeways. Without access to healthy fish, clams, and wildlife, our culture and spiritual practice could not continue.

Tsleil-Waututh Nation (TWN) provided new confidential information related to their spiritual and cultural connections within these areas, and noted that water pollution caused by oil spills would prevent access to their practices. TWN also noted that the discontinuation of these practices would permanently negatively impact TWN's culture and spiritual practices.

Indigenous communities along the coast and upstream of the marine shipping areas, such as Squamish, Neskonlith, Coldwater, Adams Lake, Little Shuswap Lake Indian Band, and SSN raised concerns with the impacts of marine spills on their ability to engage in traditional practices in relation to salmon. They noted that any spills impacting the health or abundance of salmon or Steelhead upstream would interrupt their fishing, trade, stewardship, story-telling and ceremonial practices associated with these fish. Councillor Chris Lewis from the Squamish Nation said the following during OTE:

> "...if the salmon did not return, the stories would not be told because there's no salmon. So that connection to the salmon and the Squamish People is very significant."

Multiple Indigenous communities such as Malahat, Pacheedaht, Lyackson. Musqueam and others noted that there needs to be a greater role for First Nations in spill response. They noted that this would help identify and protect traditional resources, culturally sensitive sites and locations of special importance to First indigenous communities in the event of an oil spill in the Salish Sea. Indigenous intervenors noted that this type of involvement would also fit within the stewardship responsibilities that Indigenous communities have for their traditional territories. The Indigenous Caucus of the IAMC noted that the inclusion of Indigenous peoples in spill response is one of the priorities for the marine subcommittee of the IAMC, and the Caucus had a variety of recommendations regarding the involvement of First Nations in spill response.

Trans Mountain acknowledged the concerns raised by Indigenous communities related to the potential for a marine spill and the adequacy of spill response procedures and mechanisms and the ultimate effect of any oil spill on Indigenous culture and way of life. Trans Mountain submitted that the original assessment conclusions have not changed as a result of the additional evidence provided by Indigenous communities in the MH-052-2018 hearing.

Trans Mountain also acknowledged the concerns raised by non-coastal Indigenous communities regarding the impacts of a marine spill adversely affecting the salmon resources returning from the ocean to inland areas. Trans Mountain said it understands the integral cultural and economic importance of the Thomson and Fraser River fisheries to inland Indigenous communities in B.C. Trans Mountain noted that the assessment of Project-related effects on the exercise of Indigenous and Treaty rights, including in the unlikely event of a spill, was extensively summarized in Chapters 5, 11 and 14 of the Board's OH-001-2014 Report.

Trans Mountain noted that Geographic Response Strategies (GRS) are being developed by WCMRC as part of implementing the Enhanced Response Regime (ERR). It further noted that WCMRC continues to develop partnerships with Indigenous and/or coastal communities as part of their overall community engagement process and in order to develop new and improve existing GRS, including the collection of Traditional Marine Resource Use/Traditional Ecological Knowledge information from Indigenous communities to incorporate into its GRS. Trans Mountain stated that upon request of WCMRC it is ready to assist or facilitate conversations between WCMRC and Indigenous communities.

Views of the Reconsideration Panel

The Board acknowledges the high degree of concern Indigenous groups have regarding potential spills or contamination of the rivers and ocean, and how it would affect their traditional use and cultural identity. The Board acknowledges the effort undertaken by Indigenous communities who provided oral traditional evidence to the Board and shared additional information regarding their traditional marine use areas within the Salish Sea, as well as their concerns regarding the impacts a spill would have on their traditional marine use, cultural practices and activities. The Board has considered all the evidence placed on the record, including that related to marine shipping safety and navigation. The Board also has taken into consideration the commitments by Trans Mountain, WCMRC and the Federal Authorities to engage and involve Indigenous communities in spill response. More information regarding initiatives by Trans Mountain, WCMRC and the Federal Authorities regarding Indigenous involvement in spill response is found in Section 14.11.3.

The Board is of the view that the effects of a credible worst-case spill on the current use of lands, waters and resources for traditional purposes by Indigenous people would likely be adverse and significant.

As discussed in Section 14.9.4, the Board finds that although impacts from a credible worst-case spill would probably be adverse and significant, natural recovery of the impacted areas and species would likely return most biological conditions to a state generally similar to pre-spill conditions. Certain values and uses could be lost or diminished in the interim. The Board notes Trans Mountain's commitment to use available spill response technologies to mitigate spill impacts to ecosystems and assist in species recovery. The Board is of the view that implementation of an appropriate spill response, and measures such as compensation and harvest restrictions or closures would lessen the effects experienced until resource-dependent species recover. The Board finds the probability of a worst-case event is very low.

The Board has incorporated the potential consequences of a spill into its discussion on Spill Risks in Chapter 1, and considered them in its overall weighing of the benefits and burdens of the Project in Chapter 2.

14.10.6 Human health

In the OH-001-2014 hearing, Trans Mountain said for the credible worse-case marine spill scenario (16 500 m^3 of spilled oil), comparison of the predicted maximum one-hour average concentrations of the chemicals of potential concern (COPC) to corresponding acute inhalation exposure limits revealed exceedances of the exposure limits were predicted for the following COPC: aliphatic C1-C4, aliphatic C5-C8, and aromatic C9-C16 groups, benzene, toluene, and xylenes. The exceedances indicate the possibility that people exposed to each of these COPC during the early stages of the spill incident could potentially experience adverse health effects.

Trans Mountain said the exceedances were spatially predicted to occur predominantly over water, but in some instances, extended over land, including island communities along the marine shipping route. The areal extent and coverage was greatest for the aromatic C9-C16 group and benzene, with exceedances extending up to approximately 20 km from the spill source. Coverage across this area was nearly complete with a number of island communities located within the affected area. In the case of the aliphatic C5-C8 group, toluene, and xylenes, the areal extent of the exceedances was similar to that of the aromatic C9-C16 group and benzene. However, coverage was much sparser and confined predominantly to areas over

water, with fewer island communities likely to be affected. In the case of the aliphatic C1-C4 group, the predicted areal extent of exceedances did not extend beyond three kilometres from the spill source.

Trans Mountain said the temporal extent of the exceedances followed a biphasic pattern, with the second phase extending out to approximately 20 to 30 hours after the start of the spill event, regardless of the spill size. It is conceivable that these exceedances could occur before the arrival of first responders and the implementation of emergency and spill response measures.

Trans Mountain said a comparison of the predicted maximum one-hour average airborne concentrations of the COPC against the corresponding one-hour Acute Exposure Guideline Levels (AEGL) and Emergency Response Planning Guidelines (ERPG) reveals that the predicted concentrations were consistently lower than these guidelines, including the Tier-1 values, indicating that people in the area would not be expected to experience health effects other than mild, transient sensory and/or non-sensory effects.

Trans Mountain said that, based on the weight-of-evidence, there is no obvious indication that human health would be seriously adversely affected by acute inhalation exposure to the chemical vapours released during the early stages of a spill under any of the simulated and unmitigated oil spill scenarios examined. The health effects that could be experienced by people in the area would likely be confined to mild, transient sensory and/or non-sensory effects, attributable largely to the irritant and central nervous system depressant properties of the chemicals. Odours also might be noticed, which could contribute to added discomfort and irritability.

Trans Mountain said these mild, transient health effects could be experienced under all of the simulated and unmitigated oil spill scenarios examined. However, the intensity of the effects would be greatest for the larger-sized spills because of the higher concentrations of the chemical vapours that could be encountered and the longer durations of exposure. The absence of any serious adverse health effects from exposure to the chemical vapours released from the surface of the oil slick during the early stages of the spill scenarios applies to people in general, including the general public as well as first responders arriving on scene. First responders could remain on scene for some time while working to isolate, contain and recover the spilled oil, and could face the prospect of direct physical contact with the oil and/or more prolonged exposure to the vapours.

A number of intervenors and commenters, including Indigenous groups, and municipal and federal governments, raised a range of concerns regarding potential effects on human health that may result from a spill or accident in the marine environment.

Metro Vancouver and Tsleil-Waututh Nation said the results from their own air quality modelling assessment were based on hypothetical large spills of 16 000 m^3 at English Bay, First and Second Narrows, and a spill of 8 000 m^3 in Burrard Inlet. The scenarios predicted exceedances for a number of COPC for areas where people may be present (but not permanently living), including Stanley Park, Lions Gate Bridge and Second Narrows Bridge. Tsleil-Waututh Nation said that, based on the simulated scenarios considered, the greatest human health risk from benzene and i-butane is likely to occur during the first hour following an oil spill.

The City of Burnaby said even if a large oil spill in Burrard Inlet is extremely unlikely, the public health consequences could be very significant, given the large and densely populated communities surrounding Burrard Inlet. It said health authorities do not have the capacity for monitoring chemicals released following a large oil spill, and that local public health authorities should be included in incident notification protocols. The City of Burnaby said Trans Mountain has not described how it intends to communicate with health authorities and other agencies, and how it intends to assess and monitor exposure in the event of a spill and to share information necessary to make timely public health decisions.

The City of Burnaby and the Fraser Valley Regional District said Trans Mountain's HHRA results potentially underestimate the predicted health risks The Cities said the exclusion of possible large spills of gasoline or jet fuel, and potential post-spill health risks associated with all plausible pathways of exposure were not considered.

Health Canada said the effects of oils spills into the marine environment are a major concern of area residents, including Indigenous people, due to effects on marine country foods, the environment and recreation activities. Health Canada said country foods are major components of the Indigenous traditional lifestyle, and it is important to consider potential impacts of a spill on the contamination of, access to, and availability of marine country foods consumed by Indigenous communities.

Health Canada said eliminating or minimizing exposure is of utmost importance to protect the health of a population located in the vicinity of a spill. Health Canada suggested a number of considerations for the development of mitigation measures and spill management plans, including measures to quickly and effectively limit human exposure, the possible time lags for contaminants to appear in country foods, and communications plans and health advisories developed with communities and health authorities. Health

Canada said the magnitude of air quality impacts of spills into the marine environment may be greater than was presented in Trans Mountain's HHRA.

NS NOPE said there is evidence of appreciable but reversible short-term impacts for residents living in spill impact zones. There is an extended range of impacts with potentially longer duration for workers (resident and non-resident volunteers and paid professionals) engaged in clean-up. Although long-term studies are lacking, there is some evidence of respiratory, endocrine, immunological and genotoxic effects persisting for years in highly exposed cleanup workers. NS NOPE said these short- and long-term physical impacts can be mitigated to some extent through the use of appropriate personal protective equipment, and effective health and safety training.

NS NOPE also said mental health impacts were more sensitive indicators of harm than physical impacts, and were most often related to income loss or financial uncertainty. Mental health and community impacts can be mitigated, in some cases, by easing financial uncertainty through timely and satisfactory compensation and through mechanisms that encourage or utilize social support.

Living Oceans said Trans Mountain's two evaluated spill scenarios represent a very small subset of possible failures, environmental conditions and other factors that might affect human health, and therefore do not represent the magnitude of human health risks resulting from a maximum credible worst-case spill. Living Oceans said even considering the limitations of the two scenarios, the modeled releases pose inhalation risks to nearby populations, as well as the potential for significant dermal and ingestion exposures.

Tsleil-Waututh Nation raised a number of concerns about the potential impacts of an oil spill on Tsleil-Waututh Nation's practices and customs. Tsleil-Waututh Nation said, depending on the location, extent and timing of a spill, it could have major impacts on Tsleil-Waututh Nation's practice and custom of relying on salmon for subsistence, would limit Tsleil-Waututh Nation's potential to harvest seabirds and shorebirds, and would severely limit their ability to re-start clam harvesting. Tsleil-Waututh Nation said if their traditional foods sources are negatively affected by a spill, this affects their ability to harvest them, and hence Tsleil-Waututh's primary context for cultural transmission is also negatively impacted.

Matsqui First Nation provided an assessment of the potential impacts of a number of hypothetical spill scenarios (including a marine spill in the Strait of Georgia). Matsqui said the predicted impacts on physical health in each scenario are characterized as severe, including impact outcomes such as higher rates of illness (from lower nutrition due to limited consumption of fish after spill), high stress, and reduced pre-natal health and youth development. Matsqui First Nation said immediate and long-term health related issues from a spill affecting Matsqui reserve lands, the Fraser River or Burrard Inlet were rated as ' extremely significant'.

Pacheedaht said a number of elements were missing from Trans Mountain's assessment of the Project, including potential health effects based on specific consumption patterns, potential health effects associated with abandonment of traditional diet, and a determination of significance of these potential effects.

Pauquachin Nation and Tsawout First Nation raised a number of general concerns about potential impacts on the health of community members, including loss of access to marine resources, and concerns about the potential health effects related to the replacement of traditional foods with store-bought foods.

Trans Mountain said planning and preparedness around emergency and spill response are critical to ensure timely and adequate response to any spill event, to limit opportunities for chemical exposures, such that public health is not threatened or compromised.

Trans Mountain said, to mitigate human health impacts in the event of a spill, environmental monitoring and surveillance programs would be initiated to help guide decision-making. Once a spill has occurred, DFO would be notified, and it, working with other government authorities (e.g., ECCC and the Canadian Food Inspection Agency) and in consultation with other appropriate network resources, would assess the spill. Based on spill location, size and the potential opportunities for people to be exposed to the spilled oil through different exposure pathways, they would determine if additional spill response measures may be needed to protect public health. Trans Mountain said this determination would extend to measures required to ensure the safety of the public food supply, and if warranted, could include controls such as the closure of commercial and recreational fisheries and the issuance of fish, shellfish and/or other seafood consumption advisories.

Trans Mountain said as part of overall emergency and spill response, notification of the public of the spill would include notice to avoid contact with the spilled oil, with examples provided of precautions to take to prevent both direct and incidental exposure. If people might be exposed to the oil through direct skin contact, consultation with the appropriate network resources and public health authorities would be undertaken on measures to be implemented beyond recovery and clean-up. Trans Mountain said closure of public waterways, beaches or shorelines could be ordered by the appropriate authorities if public health or safety were threatened.

During the MH-052-2018 hearing, Trans Mountain said that effects of an oil spill from Project-related marine shipping was another issue that was thoroughly canvassed in the OH-001-2014 hearing. Overall, none of the information filed by intervenors in the MH-052-2018 hearing is new or updated information that is materially different from the information the Board considered in the OH-001-2014 hearing. As a result, Trans Mountain said that the Board's findings in OH-001-2014 hearing remain valid and no changes to the Conditions are warranted.

The Canadian Coast Guard said that it undertakes emergency response planning for marine spills within its mandate, which includes potential spills from Project-related marine shipping. The approach and principles described in the Canadian Coast Guard's response plans are consistent with those described in Health Canada's "Guidance for the Environmental Public Health Management of Crude Oil Incidents – A Guide Intended for Public Health and Emergency Management Practitioners." Both Health Canada and the Canadian Coast Guard prioritize the health and safety of first responders and the public during the spill response.

The Canadian Coast Guard submitted version 2.0 of the Greater Vancouver Integrated Response Plan (GVIRP) for Marine Pollution Incidents. At a local level, the GVIRP integrates public health management during both preparedness and response. There are many organizations that were instrumental and agree in principal to support the implementation and ongoing maintenance of the Plan, including First Nation Health Authority and Vancouver Coastal Health Authority. The GVIRP includes information about the role of health authorities during response to marine pollution incidents that occur, or may occur, in the Greater Vancouver Area.

A number of intervenors and commenters, including Indigenous groups, and municipal governments, raised a range of concerns during the MH-052-2018 hearing regarding potential effects on human health that may result from a spill or accident in the marine environment. For example, a number of municipalities said the Project poses an unacceptable risk of oil spills and the related environmental, health and economic impacts of those spills. Metro Vancouver and the District of North Vancouver said the NEB should recommend that GIC include air quality monitoring during spills in response plans such as the GVIRP and WCMRC Spill Response Plan.

A number of Indigenous communities (i.e., Chawathil First Nation, Cheam First Nation, Kwantlen First Nation, Seabird Island Band, Stó:lō Tribal Council) raised concerns during the MH-052-2018 hearing about potential impacts on the health of community members, including loss of access to marine resources, and concerns about the potential health effects related to the replacement of traditional foods with store-bought foods. For instance, Mr. Mark Sampson a fisherman from the Tsartlip First Nation said the following during OTE:

> The marine environment and everything it has to offer is very important to our diet. We need these things in our bodies to continue on growing in a healthy way.

And Councillor Ms. Tumia Knott from the Kwantlen First Nation recounted during OTE the following words from an Elder:

> We are the river. The river is us. We are connected to that river. We are responsible for the health and well-being of that river and, in turn, it is responsible for our health and well-being.

The Stó:lō Collective said that air quality is a key environmental concern in relation to Project-related marine shipping, including contributions from a marine spill to regional air quality issues and the contamination of the fish being wind dried. The Squamish Nation said that oil spills from Project-related marine shipping in the Nation's territory will cause significant adverse effects on the health and socio-economic conditions of Squamish Nation members. TWN identified the following effects of an oil spill on individual and community health: diabetes and cancer rates are high in the community and the proposal will only make them worse; the proposal threatens many elements of community health – natural resources, security, community cohesion and well-being, and self-determination.

Evidence submitted by BROKE and NS NOPE, such as the Takaro Update Report and the Updated Ott Evidence, expressed concerns surrounding the potential health effects that could be experienced by communities and clean-up workers as a result of a marine oil spill. NS NOPE said the Board should find that Project shipping will cause significant adverse effects to the health of North Shore communities, and the Board should determine that these effects cannot be justified in the circumstances.

The FER said that Trans Mountain's marine public outreach program should include risks to public health in the event of a marine spill.

In response to suggestions about the health effects of dispersants, the CCG said that no dispersants are currently approved for use in response to ship-source oil spills in Canada. Given that the use of dispersants is not a pre-approved response technique in the marine RSA, Trans Mountain said an evaluation of the combined effects of crude oil and dispersants in the Ecological Risk Assessment of Marine Transportation Spills Technical Report is not warranted.

Views of the Reconsideration Panel

The Board is of the view that, in the event of a spill in the marine environment during shipping, including a large spill, there would be adverse effects on human health. These effects would vary over time and space depending on the location and extent of the spill, and there would likely be exceedances of certain short-term exposure limits for some chemicals of potential concern, including both carcinogenic and non-carcinogenic chemicals, but these would be expected to diminish in the hours following a spill. Some people would likely experience health effects, including a

range of transient effects. These health effects could be experienced in all spills, but the intensity of the effects would be greatest for the larger-sized spills because of the higher concentrations of the chemical vapours that could be encountered and the longer durations of exposure. As noted by Trans Mountain, first responders could face the prospect of direct physical contact with spilled oil, and may have more prolonged exposure to the vapours. Trans Mountain has described its emergency response measures that would be initiated in the event of a spill, including those intended to protect human health. The Board acknowledges that, since the OH-001-2014 hearing, there have been improvements in the area of spill prevention, and emergency preparedness and response.

The Board notes some of the concerns from the OH-001-2014 hearing about the inclusion of local and Indigenous health authorities in marine pollution incidents. The Board is encouraged to see, in the evidence submitted in the MH-052-2018 hearing, that the First Nation Health Authority and Vancouver Coastal Health Authority were instrumental and agree in principal to support the GVIRP. The Board also notes concerns raised by municipalities in the MH-052-2018 hearing about the inclusion of more detailed information in the GVIRP around air quality monitoring. The Board is not including a recommendation to the GIC on this topic because the GVIRP is the product of a cooperative effort and the Board is not well positioned to prescribe detailed requirements.

In response to the suggestion for Trans Mountain to expand its Marine Public Outreach Program to include risks to public health in the event of a marine spill, the Board is of the view that the federal government has the authority to address such matters. Therefore, the Board would include Recommendation 12 encouraging GIC, in conjunction with the Pacific Pilotage Authority and Transport Canada, to continue engagement and awareness activities targeting Indigenous coastal communities, recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. The focus of these engagement and awareness activities should be determined by the regulatory authorities who have the appropriate jurisdiction and expertise.

The Board assessed all the evidence placed on the record, including that related to marine shipping safety and navigation (for example, the mitigation measures to anticipate and prevent marine spills and protect human health). The Board is of the view that although a credible worst-case spill from a tanker associated with the Project would result in significant adverse environmental and socio-economic effects, the probability of such an event is very low. For example, the Board notes that Trans Mountain's risk assessments, which the Board accepts, show a very low likelihood of major oil spills within Burrard Inlet and English Bay. As discussed further in this chapter, the Board finds that based on evidence filed by Trans Mountain and intervenors, a large spill in Burrard Inlet would result in significant adverse environmental and socio-economic effects. Evidence filed by parties such as the City of Vancouver, City of Burnaby, NS NOPE and BROKE, and the Tsleil-Waututh Nation indicate the potential extent of such effects. However, based on the evidence before it, the Board finds that a large spill in Burrard Inlet is not a likely event. The Board is therefore of the view that the potential effects on human health that are predicted to result from such spill scenarios are also not likely to occur.

14.11 Spill prevention, risk analysis, emergency preparedness, and response

14.11.1 Spill prevention

14.11.1.1 Marine shipping safety

Marine vessel traffic and Project-related tankers

In the OH-001-2014 hearing, Trans Mountain said that the sailing route from the WMT to the high seas outside the mouth of the Strait of Juan de Fuca is a relatively uncomplicated route. The most challenging part of the route is from the WMT to the Second and First Narrows in the Traffic Control Zones (known in the OH-001-2014 hearing as Movement Restricted Areas) within Vancouver Harbour.

Trans Mountain said that weather conditions and oceanographic factors along the tanker route are considered to be mild and should not cause delays or alterations to the vessel route, except for reduced visibility due to fog. The TERMPOL Review Committee said that with respect to the oil tanker transits, there are no restrictions in place along the proposed route aside from those within Vancouver Fraser Port Authority's Traffic Control Zones, where vessels are not permitted to continue transit if weather prevents them from staying on course. The Pacific Pilotage Authority has not had to abort a transit due to poor weather since its inception, and ensures its pilots exercise the practices of good seamanship in adverse weather conditions. The Committee found weather related restrictions beyond existing requirements were not currently necessary and that additional weather monitoring is not required in the southern Strait of Georgia as the area is already adequately monitored.

Trans Mountain said that the global safety record in the marine industry has improved continuously over the past 40 years due to regulatory changes and improved safety procedures. In particular, the worldwide incident frequency involving oil tankers was among the lowest for all marine vessels from 2002 to 2011. Despite the increase in volume of oil transported, the number of oil spills has decreased between 1970 and 2012. Trans Mountain said that between 2002 and 2011, there was one incident on the west coast involving an oil tanker; no damage was done to the tanker's hull and no oil was released. It specifically said that double hull tanker design has significantly reduced the number of oil spills from tankers and that only a fraction of tanker incidents result in the release of oil. Other contributing factors included the segregation of oil cargo tanks, improved reliability of machinery, improved navigational aids, and improved risk management.

Trans Mountain said that there has not been a complete loss of cargo from a double hull tanker over the last 30 years. Between 1998 and 2011, there have been five collision incidents involving double hull and double sided crude and product tankers that led to spills; the average cargo oil outflow was approximately 2,000 metric tonnes. Trans Mountain said that this record highlights the benefits of double hulls in limiting outflow from a tanker in case of hull damage. Trans Mountain said that tankers have operated out of the WMT for 60 years with no oil pollution incident from tanker operations.

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Current data from the International Tanker Owners Pollution Federation filed by Trans Mountain indicated that there is a continued downward trend in large oil spills (>700 tonnes) and medium sized spills (7 – 700 tonnes) from tankers on a world-wide basis despite a world-wide increase in seaborne oil trade.

TERMPOL review process

In the OH-001-2014 hearing, Trans Mountain said that it participated in a TERMPOL review process focused on the increase in marine transportation related to the Project. The review process was chaired and led by Transport Canada. Other federal departments and stakeholders that participated included Fisheries and Oceans Canada, the Canadian Coast Guard, ECCC, the Canadian Hydrographic Service, Pacific Pilotage Authority Canada, British Columbia Coast Pilots and Vancouver Fraser Port Authority.

Trans Mountain said that, in general, the TERMPOL process focuses on the marine transportation components of a project, and examines the safety of tankers entering Canadian waters, navigating through channels, approaching berthing at a marine terminal and loading or unloading oil or gas. With respect to the increase in existing marine traffic related to the Project, the TERMPOL process focused on the effects of the incremental increase in marine traffic related to the Project.

Trans Mountain said that, to fulfill the requirements of TERMPOL, it submitted a number of studies to Transport Canada for review, and that the relevant results of these studies had been incorporated into its environmental and socio-economic assessment. In particular, Trans Mountain said that the results of a quantitative risk assessment informed the assessment of accidents and malfunctions, the description of spill prevention, emergency preparedness and response, and the identification of improved practices.

Transport Canada filed with the Board a copy of the TERMPOL Report which included a number of findings and recommendations from the TERMPOL Review Committee. Trans Mountain said that it supported and agreed to adopt, and provided information on how it would address, each of the recommendations and findings.

The TERMPOL report is discussed more in Section 14.11.2.

Tanker construction and design

Trans Mountain said that before coming to Canada, tankers are required to meet high standards of design and construction:

- Tankers are built according to regulations established by the International Maritime Organization and adopted by their flag state.
- Ship construction and repairs are inspected and documented by a classification society to ensure construction meets these regulations and specifications.
- All oil tankers calling at the WMT would be of double-hull construction and have segregated cargo holds. This type of construction reduces the possibility of cargo spills and minimizes potential spill volume in the event of damage to the hull.

Tanker operations

Trans Mountain said that tankers coming into and departing from the WMT are subject to requirements that contribute to navigational safety and thus spill prevention in Canadian waters.

Trans Mountain said that, throughout operations, tankers are:

- inspected by their flag state, by classification societies and by insurers;
- vetted by charterers and terminals; and
- inspected in other ports of call by inspectors of the respective local national authorities, including those (e.g., Canada) that are signatories to the various international conventions on port state control (ship inspection programs).

Trans Mountain said that its Vessel Acceptance Standard (called Tanker Acceptance Standard in the OH-001-2014 hearing) describes the requirements for accepting a vessel for berth at the Westridge Marine Terminal and it applies to all ocean going tankers carrying crude oil. It said that a common purpose of both the Vessel Acceptance Standard and the Westridge Marine Terminal Regulation and Operations Guide is to maintain, promote and encourage high standards in Project-related marine shipping. It noted the following in relation to its Vessel Acceptance Standard.

- Pipeline shippers own the product shipped on the Trans Mountain pipeline and that the shippers are responsible for chartering tankers to transport the product that arrives at the WMT.
- Pipeline shippers have their own tanker screening and selection process to ensure that tankers calling on the WMT meet international regulations and Trans Mountain's Vessel Acceptance Standard.
- Pipeline shippers are required to submit a Vessel Proposal Form to Trans Mountain prior to the pipeline shipper's first batch of product leaving from Edmonton to the WMT.
- Based on the information submitted and the vessel's inspection history, which is maintained on an international database, Trans Mountain has the right to reject any vessel proposed by the pipeline shipper that does not meet the standards and criteria set by the harbour master for Port of Vancouver, and by Trans Mountain.
- Project-related commitments or NEB condition items would be included in both the Vessel Acceptance Standard and the Westridge Marine Terminal Regulation and Operations Guide as appropriate. For example, the Vessel Acceptance Standard would include the requirement for loaded tankers to have a suitable arrangement for the proposed enhanced tug escort between the WMT and Buoy J prior to departure. The Westridge Marine Terminal Regulation and Operations Guide would provide guidance on the tug, tug procedures, and communication practices.

Upon coming to Canada, tankers are scrutinized to ensure they are compliant with Canadian and Trans Mountain's requirements including:

- Vessels proposed by a pipeline shipper to receive oil at the WMT are pre-screened by the Trans Mountain loading master using industry databases and the company's own records before being accepted or rejected for scheduling purposes.
- The pipeline shipper arranges for a local shipping agent to assist the vessel with local logistical and regulatory requirements.
- A tanker must have an arrangement with a Transport Canada certified response organization for spill response services and a Shipboard Oil Pollution Emergency Plan before entering Canadian waters.
- A tanker must contact the Canadian Coast Guard for permission to enter Canadian waters before entry.

Upon arrival in Canadian waters, tankers must follow strict communications and guidance protocols:

- A tanker must contact the Canadian Coast Guard for permission to enter Canadian waters before entry.
- A tanker travelling in the Strait of Juan de Fuca must use the International Maritime Organization approved traffic separation scheme, which is managed jointly by Canadian and United States authorities. Traffic Separation Schemes are used worldwide and have been proven to reduce the possibility of collision between vessels by regulating the flow of crossing traffic.
- Ship traffic through the shipping lanes in the Salish Sea Region is jointly monitored by the Canadian and United States Coast Guards.
- The tanker remains in communication with the Canadian Coast Guard Marine Communications and Traffic Services and the tanker's position is monitored throughout the transit. A combination of radar, automatic

information system and direct radio communication is used to coordinate safe conduct of the vessel with other masters and pilots.

- Empty tankers headed for the WMT pick up a pilot at the Victoria pilot station near Brotchie Ledge.
- Under the pilot's guidance, and monitored by the Marine Communications and Traffic Services, the ship navigates through the established shipping lanes to Port Metro Vancouver.
- The established shipping lanes maintain separation between inbound and outbound traffic. Many different types of vessels use the shipping lanes to access the ports and terminals of the Puget Sound, various ferry terminals, Robert's Bank terminal, the mouths of the Fraser River, and the Burrard Inlet/Vancouver Harbour.

Once a tanker enters the jurisdiction of Vancouver Fraser Port Authority, a series of additional established operating rules and protocols apply. Should the Project be approved, Trans Mountain said that existing rules and protocols would likely apply subject to improvements resulting from the TERMPOL process and from other federal and provincial reviews currently underway:

- Vancouver Fraser Port Authority rules for conduct of shipping within its jurisdictional area are documented in its Harbour Operations Manual.
- The ship's agent would have requested Port of Vancouver operations to assign an anchorage for the tanker based on availability and operational requirements. A tanker may anchor at one of the designated locations in English Bay or off the WMT, depending on the timing of tides, the WMT loading schedule, and the tanker's own requirements for provisioning and maintenance. In some cases, the tanker may proceed directly to berth.
- Pilots leave the tanker when it is at anchor, but are aboard anytime it moves, even if from anchor to the dock and back.
- The tanker is inspected by Transport Canada upon its first arrival in Canada and once per year after that. This might occur at anchor or alongside the WMT.

Trans Mountain said that, when a tanker berths at the WMT:

- The tanker is assisted by docking and mooring tugs tethered to the tanker at the WMT dock.
- The WMT loading facility is operated in accordance with regulations established by the National Energy Board, Transport Canada, and others as required.
- In accordance with its Tanker Acceptance Standard, prior to commencing any cargo operation, the tanker is physically inspected by Trans Mountain's loading master to confirm both the information presented in the pre-screening and the condition of the vessel. Any deficiencies noted have to be rectified before cargo loading can commence.
- A spill containment boom is deployed to enclose the tanker and terminal. A second boom is on-hand as a back-up in case of an emergency and WCMRC moors a skimming vessel at Trans Mountain's utility dock near the loading dock.
- Loading arms and vapour recovery lines are connected to the tanker. The WMT vapour destruction system is started and loading commences. Loading typically takes 24 to 36 hours depending on the size of the vessel.
- The Loading Master stays aboard the tanker throughout the loading process, and has the authority to stop the loading process at any time should concerns arise. The Loading Master also acts as the key shipside contact for communication with the terminal.
- Terminal operating procedures include an emergency response plan. Staff is trained and regular exercises are held to practice procedures.
- WCMRC has spill response equipment staged on the water in Vancouver Harbour and a main base of operations close to the WMT in Burnaby. WCMRC also maintains equipment caches on Vancouver Island for response in the Salish Sea.
- Trans Mountain has its own spill response equipment.

When tanker loading is complete and the vessel departs:

- Tran Mountain's Loading Master stays on board until pilots come to move the vessel away from the dock.

- After the tugs are made fast, the tanker is cast off and typically goes to anchorage to wait for tide for the Second Narrows transit, as required by Vancouver Fraser Port Authority's Harbour Operations Manual.
- Two Pacific Pilotage Authority-certified pilots come aboard to safely navigate the tanker out of Canadian waters. Laden tankers must have two pilots on board, one to ensure safe conduct of the vessel and one to monitor the bridge crew and ship systems.
- Vancouver Fraser Port Authority's Harbour Operations Manual defines the Second Narrows Traffic Control Zone and associated rules of transit, including daylight transit, size restrictions, required tug escorts and speed restrictions. Only one vessel at a time is allowed in the Second Narrows Traffic Control zone and First Narrows. Marine Communications and Traffic Services monitors the tankers' progress and other vessels' traffic in the Vancouver Harbour.
- Before the transit begins, Marine Communications and Traffic Services declare a clear narrows and the Canadian National Railway is contacted to raise its rail bridge, which spans the Second Narrows.
- Vancouver Fraser Port Authority rules require that two large tugs be tethered to the stern and at least one tug to the bow for the Second Narrows Traffic Control Zone transit. The two large tugs tethered to the stern are required for the transit through the remainder of Vancouver Harbour.
- After clearing the First Narrows, the escort tugs fall away and the tanker transits without escort until it approaches the East Point on Saturna Island.
- The Pacific Pilotage Authority has established tug escort requirements for the Salish Sea region, in particular in Haro Strait through Boundary Pass. A single large tug must be tethered to the tanker before East Point and remain tethered until Victoria. The tug remains in untethered escort until the tanker passes Race Rocks.
- The two Pacific Pilotage Authority-certified pilots disembark at the Victoria pilot station near Brotchie Ledge.
- The tug leaves the tanker at Race Rocks as the tanker enters the Strait of Juan de Fuca.
- No pilotage or escort is required through the Strait of Juan de Fuca but the tanker and all other traffic are monitored by Marine Communications and Traffic Services.
- United States industries fund a rescue tug at Neah Bay, Washington, to assist any vessels in distress in the Strait of Juan de Fuca.
- Upon clearing the Strait of Juan de Fuca, the tanker continues to its destination.

Trans Mountain said that Trans Mountain shippers exporting crude oil via Westridge are aware of the need to only nominate tankers of high operating standards. Shippers know a tanker that fails to be accepted or is rejected outright could lead to delays and business loss. Trans Mountain said that it has not had to reject a tanker once it had been deemed acceptable at the conclusion of the pre-screening for scheduling purposes.

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Pilotage

Trans Mountain, Transport Canada, Pacific Pilotage Authority, The Canadian Marine Pilots Association, and BC Coast Pilots Ltd. discussed pilotage in relation to Project vessels and other marine vessels.

Trans Mountain said that since the issuance of the OH-001-2014 Report, it has continued to engage and work with the BC Coast Pilots Ltd., Pacific Pilotage Authority, Transport Canada, Canadian Coast Guard and the Vancouver Fraser Port Authority to complete its commitments under the TERMPOL Review Committee's Findings and Recommendations. For example, it said that real time navigation simulations have been completed with Aframax vessels simulating arrival, departure and emergency maneuvers involving a simulated expanded marine terminal at the BCIT Marine Campus facilities in North Vancouver. Parties involved were satisfied with the navigation of the vessels in relation with the layout of the expanded marine terminal. It said that BC Coast Pilots Ltd. continues to practice simulated exercises in cooperation with Trans Mountain to ensure safe and efficient movement of Project tankers, and other vessels, through Burrard Inlet.

Pacific Pilotage Authority said that since its input to the OH-001-2014 hearing, it has implemented a number of improvements to further enhance the safety of the marine pilotage operation on the west coast of Canada, which could be considered relevant to the project being considered. It said that the most significant improvements included:

- For enhanced training, testing and mentoring programs, a partnership with the BC Coast Pilots Ltd. regarding ownership and operation of a full mission bridge simulator housed on the premises of the Pacific Pilotage Authority;
- Implementation of a more formalized training program; and
- Development of a sophisticated forecasting model to forecast manpower needs based on the number of projects that are expected to go to fruition.

The Pacific Pilotage Authority noted that one of the courses a pilot is required to take is a tethered tug training course. This is conducted in partnership with the local tug companies who supply tug masters to participate in joint training with the pilots, thereby further refining the use of tethered tugs for tankers. The course tests the attendee's reactions and actions to catastrophic failures along the route of the tanker.

The Pacific Pilotage Authority said that it believes that when all the agreed upon mitigations are in place, the Project vessels can be moved safely within the waters of the west coast of Canada. It noted that pilots on the west coast of Canada have moved crude oil carriers without incident for over 50 years. The Pacific Pilotage Authority said that even with the inclusion on Project-related tankers its overall assignment totals would still be lower than they have been in the past.

The Canadian Marine Pilots Association noted that pilots are not employed by shipowners or shippers. They are dispatched to commercial vessels via regional federal agencies and are formally entrusted with responsibility for conducting vessels, and for making all decisions necessary for their safe navigation. Approximately 50,000 pilotage assignments take place every year in Canada translating to over 2,000,000 assignments since the *Pilotage Act* was enacted in 1972. It said that success rate of these assignments has consistently stood at over 99.9 per cent, despite the increasing size of vessels using the waterways. The Canadian Marine Pilots Association said that the *Pilotage Act* ensures that only the most senior, properly trained pilots would be dispatched to Project-related vessels. It said that the pilots have a unique level of knowledge of local waters and they continue to receive extensive training throughout their career on the latest navigational techniques and the most modern technologies and aids to navigation available. They are able at all times to exercise their best professional judgement, without undue pressure from commercial interests, and with safety as the first consideration. The Canadian Marine Pilots Association said that this system compares favourably with anywhere in the world.

The Canadian Marine Pilots Association said that Canadian pilots are at the forefront of new navigation technology, and are deeply involved in many related international, national and regional forums, and provided examples of innovative developments recently integrated in Canadian pilotage practices.

The Canadian Marine Pilots Association said that it is of the view that the conclusions and conditions contained in the Board's OH-001-2014 Report, as they relate to the safe navigation of Project-related vessels, are sound.

BC Coast Pilots Ltd. said that pilots played an important role during the TERMPOL review of the Project and a related formal risk assessment regarding transits through Vancouver's Second Narrows, providing an independent point of view in the review of the shipping-related operational parameters of the Project, and identifying many required risk-mitigation measures.

BC Coast Pilots Ltd. said that BC Coast Pilots live and work along the B.C. coast and have a lifetime of experience in how tides, geography and weather patterns affect the way ships move in and out of B.C.'s ports and harbours. BC Coast Pilots Ltd. said that pilots across Canada operate under the *Pilotage Act*, which is focused on making sure pilots can operate independently from industry and can provide unbiased service, and fact-based expert opinions, that focuses only on safety and protection of the marine environment.

BC Coast Pilots Ltd. said that in light of pilotage requirements and other risk-mitigation measures that have been identified to provide for the safe navigation of Project-related ships, it is of the view that the conclusions and conditions contained in the OH-001-2014 Report, as they relate to the safe navigation of Project-related vessels, are valid.

The Board's Marine Technical Advisor said that in his view, the competency of the BC Coast Pilots Ltd. is perhaps the most crucial factor in vessel transit safety and incident mitigation.

Marine Communications and Traffic Services, and safe navigation

The Canadian Coast Guard provided an update on improvements and initiatives related to Marine Communications and Traffic Services (MCTS) and the safe navigation of vessels. The role of the MCTS program is to provide communications services to mariners in Canadian waters on a 24/7 basis. This includes responding to vessels in distress, providing safety services to mariners, communicating with vessels, regulating traffic in vessel traffic zones and identifying and tracking vessels operating in Canadian waters through data sensors such as radar and Automatic Identification System. Canadian Coast Guard said:

- Modernization and consolidation of MCTS centres across the country has been completed, including those in Victoria and Prince Rupert. Through the Oceans Protection Plan, existing operational network equipment located at these MCTS centres will also be modernized. Other improvements to MCTS include installation of redundant communications technology, installation of six new radar sites on the West Coast, additional staffing, improvements in hydrography and charting in key areas, and enhanced marine weather services.
- A preliminary assessment of the existing aids to navigation system along the route identified in the Trans Mountain's TERMPOL submission was completed. The assessment evaluated the level of risk in the waterway to determine the appropriate combination of aids to navigation required for risk mitigation, and took into account the larger draft and under keel clearance of Project size vessels. The assessment also identified the authority responsible for implementing and maintaining any new aids to navigation in accordance with existing national directives and policies.
- It is continuing to explore and test e-Navigation concepts and technologies in order to provide current and contextualized marine navigational information to improve marine safety when operating in Canadian waters.
- From 2024 to 2026, the Canadian Coast Guard will replace its RADAR systems as part of its lifecycle management of these assets. The new RADARs will have enhanced capabilities reflective of the latest technology and will foster increased situational awareness accuracy in waters within the scope of the Project.

Emergency towing and places of refuge

Transport Canada and Canadian Coast Guard discussed the increased emergency towing capacity initiative under the Oceans Protection Plan. The objective is to increase emergency towing capacity to assist disabled vessels and enhance both incident prevention and response capacity. Implementation is underway and includes installation of emergency tow kits in caches along the B.C. coast, the leasing of two emergency offshore towing vessels for operations on the West Coast of Canada for three years beginning fall 2018, conduct of a national emergency towing needs assessments; and, developing a long-term national strategy for emergency towing. Transport Canada and Canadian Coast Guard said that the Government of Canada will review the operations of the two leased emergency offshore towing vessels throughout the duration of their three-year lease, including the frequency of their deployment for emergency towing operations. This information will support the development of a long-term approach to emergency towing on the West Coast. Funding models for a long-term national strategy for emergency towing including private, public, and a combination thereof.

Heiltsuk Nation said that the emergency offshore towing vessels referred to by Transport Canada and Canadian Coast Guard would not be in place by the end of 2018 due to a faulty procurement process for the vessels. It submitted that the proposed towing vessels cannot reasonably be taken as contributing to mitigation measures for a credible worst-case spill.

Transport Canada said that pre-identification of potential places of refuge is key in a time-sensitive situation. Pre-planning allows for the deliberate compilation and consideration of information prior to an incident such as information on logistics, environmental sensitivities, human use, navigation, potential use conflicts and local knowledge. It said that it is reviewing and updating the 2007 Places of Refuge Contingency Plan and associated regional plans, with engagement from key partners. The intent is for the work to be completed by 2022.

Vancouver Fraser Port Authority requirements

The Vancouver Fraser Port Authority said that it has developed and formalized Traffic Control Zones, formerly known as Movement Restricted Areas, for the purpose of promoting safe and efficient navigation and environmental protection in the waters of the port. It said that the First Narrows Traffic Control Zone and Second Narrows Traffic Control Zone establish practices and procedures to be followed by ships, including Project-related vessels. The Traffic Control Zone practices and procedures establish a one-way vessel traffic system, navigation clearances, communications protocols, navigation restrictions (i.e., tidal current windows, clear narrows, speed, visibility and wind restrictions), vessel traffic procedures, pilotage requirements and vessel assist (escort) tug requirements.

The Vancouver Fraser Port Authority also noted that it had proposed to Transport Canada Marine Safety and Security in 2018 that the Vancouver & Approaches Traffic Separation Scheme be amended, with a target date for implementation of 2019. It said that the Vancouver and Approaches TSS is a two-way ship routing system providing piloted ships (including Project-related marine shipping), and other large vessels safe access from the Strait of Georgia Traffic Separation Scheme, through English Bay to the Burrard Inlet, accessed via the First Narrows Traffic Control Zone. Changes to the Traffic Separation Scheme are being proposed because of the trend toward increased size and dimensions of ships calling the Port of Vancouver and to improve the alignment of inbound vessels.

Turn Point Special Operating Area

The Friends of Brooks Point expressed concerns about violation of navigational rules within the Turn Point Special Operating Area, an area that Project-related tankers travel through. It said that the current navigational rules in the Turn Point SOA are outdated and inadequate for the current level of shipping and that the rules are not currently enforced.

The Canadian Coast Guard said that it has not observed or reported any marine occurrences or incidents in the Turn Point Special Operating Area in the past 5 years. The Special Operating Area is under 24/7 surveillance by the officers of the Victoria MCTS Centre and information is constantly being exchanged between the MCTS officers and the pilots or bridge officers of obliged domestic vessels navigating within this zone. It said that due to the voluntary nature of the Turn Point Special Operating Area, not all instances of apparent noncompliance are problematic. Although very rare, there are cases where pilots coordinate meeting arrangements that are outside of the standard and then inform the MCTS centre of these arrangements in advance of the encounter. The MCTS centre monitors for compliance with the new expected interaction to ensure the arrangements are safe and properly applied. Transport Canada said that there are no proposed changes to the navigational rules within the Turn Point SOA.

14.11.2 Marine shipping risk analysis

In the OH-001-2014 hearing, numerous participants, including Ms. Daphne Louis and Ms. Sheila Harrington, said that the significant increase in tanker traffic associated with the Project would increase the risk of a large spill and said that the risk of a catastrophic oil spill is too great to allow the Project to proceed Participants referred to the potential for a spill from a tanker at berth or within Burrard Inlet to be 8 000 m^3 or more or for a spill along the marine shipping routes to be the complete loss of the tanker's cargo. Participants said that such scenarios should be considered credible worst-case scenarios.

Lopez No Coalition said that although project tankers will be double hulled and accompanied by tugs, the probability of such a major oil spill in San Juan Islands waters cannot be completely eliminated.

Trans Mountain said that its marine shipping risk analysis considered regional traffic growth, navigational hazards, vessel construction, and risk controls under the existing marine shipping safety regime. The analysis identified potential locations for tanker accidents, the probability of an incident and potential spill volumes associated with those incidents. It said that its marine shipping risk analysis was based on the use of Aframax tankers and the spill volume associated with a credible worst-case spill scenario was 16 500 m^3, with a mean case spill volume of 8 250 m^3. Neither of these spill volumes represented the loss of the entire cargo of an Aframax tanker, and Trans Mountain said that such an event was so unlikely it was not a credible event. Trans Mountain said that exclusive use of smaller Panamax vessels for the risk assessment would not materially change the overall oil spill risk.

Following its marine shipping risk analysis, Trans Mountain conducted additional detailed analysis indicating that any large volume tanker spill within Burrard Inlet would not be a credible event. This conclusion was based on lack of energy to puncture the hull and marine safety mitigation measures within Burrard Inlet and area such as pilotage and traffic restrictions.

Trans Mountain's marine shipping risk analysis identified eight locations along the tanker route where there is a higher degree of navigation complexity and probability of an incident due to a navigation issue involving collision or grounding of a tanker due to vessel traffic or narrow passage width (Figure 29). Five of these eight locations were then modeled for hypothetical spill scenarios as described in Chapter 8, Section 8.1.3.2. Trans Mountain said that it chose its modelling locations based on an assessment of both probability and consequence associated with an oil spill. Spill modelling was not conducted at locations B and C because of the low probability of an accident occurring at these locations. Site F was not modeled because the modelling conducted at site G would be representative of both locations.

The Tsleil-Waututh Nation, the City of Vancouver and the City of Burnaby said that spill volumes ranging from 8 000 m^3 at the WMT to 16 000 m^3 at other locations in Burrard Inlet and area, including from a tanker at anchor in English Bay, were credible worst-case scenarios.

Trans Mountain said that its risk assessment work indicated that there was a very low likelihood of major oil spills within Burrard Inlet and English Bay and that no credible large oil spill scenarios in these segments of the transit were identified. In response to the assertion made by Tsleil-Waututh Nation, City of Vancouver and the City of Burnaby that 16 000 m^3 in English Bay was a credible scenario, Trans Mountain said that a potential large spill for a tanker at anchor in English Bay was not credible because:

- there is no incident on record of a vessel being struck by another while at anchor in English Bay;
- the selected spill site is close to 2 km from the route used by those vessels that are large enough and capable of causing sufficient damage to the inner hull of a double hull tanker at anchor as to cause an oil spill;

- vessels entering Burrard Inlet are subject to a number of navigational and safety measures;
- a laden tanker would almost always proceed directly to sea and not anchor in English Bay; and
- it would take more energy on the part of the colliding vessel to breach a vessel at anchor than it would if both vessels were moving.

The Cowichan Tribes critiqued Trans Mountain's marine shipping risk analysis including the model upon which the analysis was based. The Cowichan Tribes said that while the underlying methodology was sound and followed industry accepted practice, the underlying data and details of the implementation lead to several significant weaknesses. It said that key conclusions drawn from Trans Mountain's analysis were incomplete and misleading.

The City of Vancouver said that Trans Mountain's marine shipping risk assessment incorrectly focused on hazard probability instead of risk and this resulted in an improper exclusion of a large range of low probability, high consequence events from the risk assessment. It said that an assessment of the risk of a diluted bitumen spill to Vancouver requires an assessment of both the likelihood of a spill occurring and the impact of a spill on Vancouver.

Metro Vancouver said that Trans Mountain failed to adequately assess the potential effects of a credible worst-case oil spill scenario of 16 500 m^3 within Burrard Inlet, and the associated impacts on air quality, human health and environment.

Trans Mountain said that intervenors, such as the Cowichan First Nation, the City of Vancouver and Metro Vancouver, focused on potential consequences associated with spills but did not consider the likelihood of such an incident occurring. Trans Mountain said that by focusing on consequences, these intervenors did not consider: the presence (or lack) of hazards that might cause accidents, the engineering and procedural controls and safety management systems which are applied to reduce their likelihood, or steps that might be taken to mitigate the consequences.

Concerned Registered Professional Engineers said that the spill return periods estimated by Trans Mountain are mathematically equivalent, for example, to a 10 per cent probability that a spill of 8.25 million or more litres will occur in a 50 year operating period, even taking into account all the proposed mitigation strategies (e.g., use of escort tugs). Concerned Registered Professional Engineers said that this risk was unacceptable.

The Tsawout First Nation compared Trans Mountain's marine shipping risk estimates to alternative methodologies. The Tsawout concluded that Trans Mountain's spill risk estimates are at the low end of the range of estimates and work conducted by the Tsawout was at the upper end of the range of estimates. The Tsawout said that a comparison of strengths and weaknesses for each method suggests that there is no single best guess estimate of potential spill risk from the increase in Project-related tankers. It said that Trans Mountain's estimates should not be relied upon as an accurate estimate of tanker spill risk.

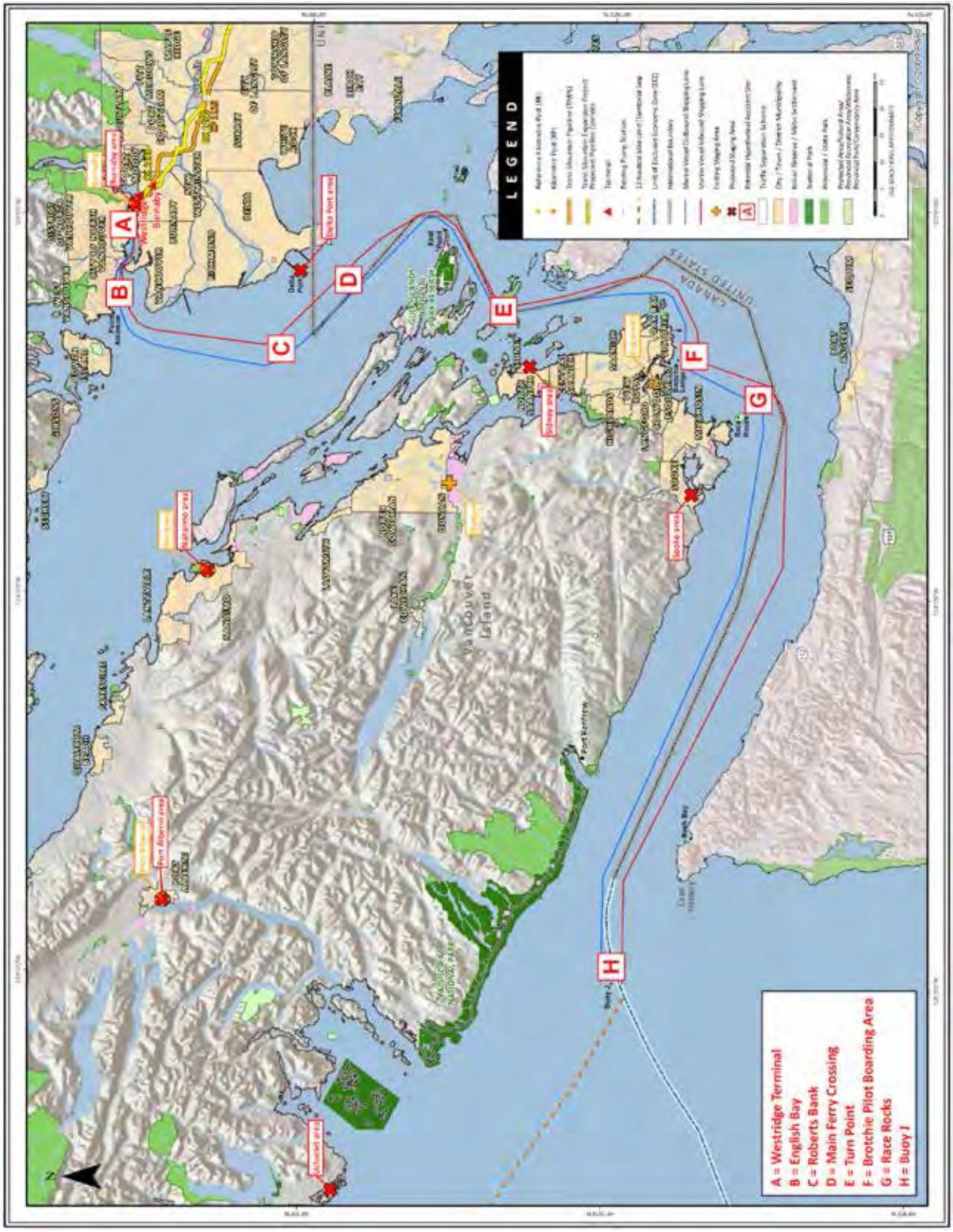
In response to the Tsawout First Nation's work, Trans Mountain said that it did not agree with the Tsawout's conclusions and that it took exception to several aspects of the report. Trans Mountain said that the Tsawout had made no attempt to gather independent data and carry out a structured risk assessment as had been done for Trans Mountain or for Transport Canada as part of the Tanker Safety Expert Panel Review. Trans Mountain said that the results of the risk assessment conducted for the Tanker Safety Expert Panel and its own risk assessment were closely correlated.

The Islands Trust Council, Pacheedaht First Nation and Capital Regional District also referred to the marine shipping risk assessment prepared for Transport Canada and the report of the Tanker Safety Expert Panel. The participants said the information confirms that there is high risk associated with oil spills in the waters off the southern coast of Vancouver Island, due to large volumes of marine traffic close to environmentally sensitive areas. Capital Regional District said that the risk would increase further if tanker traffic increased. The Islands Trust Council noted that the Tanker Safety Expert Panel report said that the southern coast of B.C., including Vancouver Island, was one of two areas in Canada with the highest potential impact from a spill.

Participants filed comments regarding recent marine shipping risk assessment work conducted in Washington State. The United States Environmental Protection Agency recommended that the NEB review the Vessel Traffic Risk Assessment Study developed for the Gateway Pacific Environmental Impact Assessment for additional conditions that the NEB or other Canadian agencies may require for vessel traffic associated with the Project.

Trans Mountain said that the NEB's Filing Requirements Related to the Potential Environmental and Socio- economic Effects of Increased Marine Shipping Activities required it to include an assessment of potential accidents at the Terminal and at representative locations along the marine shipping routes. Selection of locations should be risk-informed, considering both probability and consequence, and that the assessment must include a description of credible worst-case spill scenarios and smaller spill scenarios.

Figure 29: Possible locations for an accident involving a Project-related tanker



Trans Mountain said that the TERMPOL Review Process Guidelines do not define a credible worst-case scenario but that the definition is determined by the risk assessor and then evaluated by the TERMPOL Review Committee. Trans Mountain said that there is no precedent of complete loss of all cargo from a double hull tanker. Its analysis concluded that the credible worst-case spill volume along the tanker route was 16 500 m^3. The volume of oil spilled during an accident is directly related to the severity of the incident and the type and extent of damage caused. Therefore, the probability of a very large oil volume being released during a tanker incident must be assessed, in the first place, based upon the probability of the selected location being capable of hosting such a severe incident.

Trans Mountain said that there are no proposed or widely accepted risk acceptance criteria for marine oil spills. If criteria were defined, the proposed operations could be either acceptable or not acceptable. Trans Mountain said that its quantitative marine risk assessment shows a substantial reduction of risks, on a risk per cargo transported basis. This was achieved by adopting an informal risk acceptance criterion for marine oil spills of "minimum increase of risk compared to present day operations." Trans Mountain said that the adoption of such an approach resulted in the proposed extraordinary precautionary measures undertaken during tanker loading and transit and its proposal to significantly enhance oil spill response in the region.

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The Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, and the City of Vancouver submitted an updated assessment of potential marine shipping oil spill risk associated with the project prepared by Drs. Thomas Gunton and Chris Joseph. The report provided an alternate assessment of oil spill risk using the United States Bureau of Ocean Energy Management's Oil Spill Risk Assessment Model. Based on a review of Trans Mountain's evidence, evidence based on other spill risk methodologies including the United States Bureau of Ocean Energy Management's Oil Spill Risk Assessment Model, and adherence to the precautionary principle as prescribed in relevant Canadian legislation, Dr.'s Gunton and Joseph said; …"it is our professional judgment that the probability of a marine tanker spill for the Project over a 50-year operating period based on the NEB definition of the marine project area ranges between 43 per cent and 75 per cent, with the best estimate based on the precautionary principle being at the upper end of this range." The report concluded that is it likely that marine tanker traffic from the Project will cause significant adverse effects.

The Gunton and Joseph report said that the Board had been unclear in its OH-001-2014 Report conclusions on the likelihood of smaller marine spills causing significant adverse effects. It said that while the NEB reached a conclusion that effects of large marine spills would be significant, the NEB did not reach any conclusion on whether the adverse impact of small marine spills would be significant and whether small spills are likely to occur.

Trans Mountain said that application of the United States Bureau of Ocean Energy Management's Oil Spill Risk Assessment Model to the Project was an overly simplistic method, and a risk assessment based upon that approach would not be geographically specific and would not take into account the specific mitigation measures being proposed for the Project. Trans Mountain noted that United States Bureau of Ocean Energy Management data indicate that there has been only one spill in port and none at sea from 2004 to 2013 in US waters over which time, on average, 3.0311 billion barrels of crude oil was handled annually. Trans Mountain also observed that there have been no spills of Alaska North Slope crude loaded from Valdez, Alaska since 1991. Trans Mountain said that given the similar advanced nature of the marine regimes in the US and Canada, Trans Mountain believes the oil spill record of Alaska North Slope crude is highly representative of the low likelihood of an oil spill from Project-related tankers, which operate under similar marine and navigational regimes to the Alaska North Slope tankers.

Trans Mountain said that the results of its own application of the United States Bureau of Ocean Energy Management's Oil Spill Risk Assessment Model validates the refined results of the risk assessment conducted as part of the OH-001-2014 hearing on the likelihood of oil spill by a Project-related tanker. These results indicated a 16 per cent likelihood of an oil spill over 50 years for Project-related tankers.

Overall, Trans Mountain said that information contained in the Gunton and Joseph report is generally the same as that presented in the OH-001-2014 hearing, is overly simplistic, and fails to consider the specific geography and mitigation measures proposed for the Project. Trans Mountain said that the report should not change the findings or conclusions of the NEB Report.

Dr. Jeffrey Short filed a report on the fate and effect of oil spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary on behalf of the Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, City of Vancouver, and Living Oceans Society. Dr. Short said that a credible worst-case spill is "almost equally likely" at the point where the Duke-Point-Tsawwassen ferry route intersects with the marine shipping route as the location modeled by Trans Mountain for potential spill effects further to the south at the main ferry crossing between Tsawwassen and Swartz Bay.

As described in Section 14.2.1 of this MH-052-2018 Report, NS NOPE said that Trans Mountain had underestimated the number of tankers per month that have utilized Westridge Terminal in the past. Trans Mountain said that the oil spill frequency assessment that formed part of its marine shipping risk analysis, conducted by Det Norske Veritas, was based upon 408 partially laden Aframax tankers. It said that the exact number of vessels that have called on WMT in each year historically does not affect that risk assessment.

The City of Victoria said that it does not agree with Trans Mountain's assertion that the marine oil spill risk will remain the same if the Project is approved. It said that Trans Mountain's own evidence indicates that the probability of a marine oil spill along the tanker route will increase significantly because of the Project from 1 spill in 309 years to 1 spill in 46 years.

Washington State Department of Ecology and Friends of the Earth US filed the 2015 Vessel Traffic Risk Assessment Study funded by the Washington State Department of Ecology and submitted to the Department in 2017. This study was also referred to by other parties such as the Makah Tribal Council. The purpose of the vessel traffic risk assessment was to evaluate the combined potential changes in risk due to potential development of a number of potential maritime terminal developments and inform relevant US regulatory authorities and other marine stakeholders and British Columbia non-profit groups of these potential changes to risk. The vessel traffic risk assessment stated:

> "The combined evaluated risk changes serves as an information source to these tribes and stakeholders to assist them as to what actions could be taken to mitigate potential increases in oil spill risk from large commercial vessels in the VTRA Study Area, should all or some of these terminal projects come to fruition. However, this study was not designed to measure the effectiveness of risk mitigation measures already in place."

Washington State Department of Ecology said that Trans Mountain should consider the information in the Vessel Traffic Risk Assessment Study for additional prevention measures that could be taken to reduce the risk of a spill incident. Washington State Department of Ecology said that all of the risk analysis studies that it reviewed supported the conclusion that large oil spills from tank vessels are expected to be rare events.

Friends of the Earth US also referred to a workshop hosted by the Washington State Department of Ecology in 2016 in which Washington State Department of Ecology described preliminary results of the 2015 vessel traffic risk assessment that included risk mitigation cases to explore actions that could be taken with a goal of reducing potential oil loss from tankers, cargo vessels, and tugs/barges. Washington State Department of Ecology described these results for participants to consider when reviewing risk mitigation measures for marine shipping in the area.

To address the marine shipping risk profile within the shared waters of the Salish Sea, the Makah Tribal Council recommended that development of a Canada/United States Transboundary Vessel Traffic Risk Assessment be pursued.

Concerned Professional Engineers Society said that the marine shipping spill risk analysis, conducted by Det Norske Veritas, and considered in the OH-001-2014 hearing was misleading. It also reiterated its spill risk estimates filed as part of the OH-001-2014 hearing. Concerned Professional Engineers Society said that with all mitigation in place, there is a 10 per cent probability of at least one spill in 50 years greater than 8 250 cubic metres and a 19 per cent probability of a spill of any size over a 50 year period.

Trans Mountain said that the spill risk calculations provided by Concerned Professional Engineers Society did not consider refined risk assessment values included as part of the OH-001-2014 hearing. Trans Mountain said that with all mitigation imposed, the likelihood of an oil spill of 8 250 m^3 or more in 50 years for the entire regional study area is 8.4 per cent, the likelihood of a large oil spill of 16 500 m^3 in 50 years for the entire reginal study area is 1.7 per cent and the likelihood of an oil spill of any size in Vancouver Harbour from a Project-related vessel during vessel transit is once in 19,286 years or 0.3 per cent in 50 years.

Concerned Professional Engineers Society said that there has not been a proper analysis of the potential for a collision of fully loaded or empty Aframax-type tankers with the Ironworkers Memorial Bridge or Canadian National Railway Bridge spanning the second narrows in Burrard Inlet. It filed a report prepared in 2018 for the BC Ministry of Transportation and Infrastructure assessing vessel collision risk and mitigation for the Ironworkers Memorial Bridge at Second Narrows in Burrard Inlet. The report stated that there have been no commercial vessel collisions with the Ironworkers Memorial Bridge since it was built in 1960 and that there has been one collision with the adjacent CN Rail bridge in 1979 by a cargo ship as it attempted to transit during heavy fog. This collision lead to development of the Second Narrows Traffic Control Zone and associated mitigation measures. There have been no collisions with the CN Rail bridge since the Traffic Control Zone measures were implemented. The report discussed additional potential mitigation to enhance protection of the bridge.

Trans Mountain said that it did not agree with the Concerned Professional Engineers Society's interpretation of the report prepared for the BC Ministry of Transportation and Infrastructure. It also said that potential tanker collisions with the Ironworkers Memorial Bridge were fully adjudicated in the OH-001-2014 hearing and that nothing has changed since the closing of that record that would make a Project-related tanker collision with the bridge, or an oil spill, more likely. It said

that with mitigation in place for transit of the Second Narrows, a collision event of a Project-related tanker with the bridge is unlikely.

Gerald Graham noted the sinking of the MV Sanchi in the East China Sea in January 2018. Mr. Graham noted that this incident involved the sinking and complete loss of cargo of the double hulled tanker. He said that this incident now makes the possibility of the complete loss of cargo from a Project-related, double-hulled tanker eminently credible, on the grounds that a spill of this magnitude has already happened to another double-hulled tanker. Mr. Graham said that a total loss of cargo should be considered a credible worst scenario.

Based on his review of Trans Mountain's marine shipping risk analysis, conducted by Det Norske Veritas, and the TERMPOL review process, the Board's Marine Technical Advisor said that he was of the view that the marine operational risk assessments are complete and adequately reflect the associated risks and associated risk mitigation in marine operations. He also said that he does not agree that the risk of vessel collision with the Second Narrows bridges invalidates the Det Norske Veritas spill risk assessment. He said that the evidence shows that the risk of such a collision is extremely low.

Trans Mountain's additional mitigation measures

In the OH-001-2014 hearing, Trans Mountain said that, with existing mitigation measures, a Project-related spill from a tanker would be an unlikely event. It said that its marine shipping risk analysis concluded that existing risk controls in the project area are comparable to global best practices. To increase shipping safety, Trans Mountain proposed a number of enhancements, including extended tug escort through the Strait of Georgia.

Trans Mountain identified the possibility of drift grounding[131] or collision with another vessel as key areas of navigation where additional mitigation would result in a significant improvement to navigational safety. To reduce oil cargo spill risk resulting from the Project, Trans Mountain proposed an increase in the existing level of tug escort for laden Project-related tankers during their entire passage from the WMT to Buoy J, near the limit of Canada's territorial sea. This would be outside of the Pacific Pilotage Authority and Vancouver Fraser Port Authority's geographical jurisdiction.

Trans Mountain said that, if the requirements for enhanced tug escort are not mandated under federal regulation, it would develop a tug matrix for inclusion as part of its Tanker Acceptance Standard. This standard would prescribe minimum tug capabilities required upon departure of the tanker from the WMT. The tug matrix would define the capabilities and number of tugs required for foreseeable meteorological and ocean conditions and would be based on tanker and cargo size. Trans Mountain said that, should weather conditions be forecast to exceed the criteria established in the tug matrix or the capabilities of available tugs, a tanker would be required to delay its departure until the weather subsides or a sufficient escort was available. This situation was not expected to be common.

The TERMPOL Review Committee supported Trans Mountain's proposed enhanced tug escort requirements and recommended that a tug matrix should be developed in consultation with the Pacific Pilotage Authority, British Columbia Coast Pilots and Transport Canada.

Trans Mountain said that its Tanker Acceptance Standard requires that vessels departing Canada via the Strait of Juan de Fuca take the most direct route out of the Canadian Exclusive Economic Zone (EEZ) (200 NM from coast of Canada). This reduces the exposure to circumstances where a disabled tanker could run aground on Canada's coastline, as the tanker's risk for drift grounding steadily declines as its distance from shore increases. Trans Mountain said that within 61 km (33 nautical miles) of leaving Buoy J (i.e., within about three hours) the tanker is beyond the limits of the Voluntary Tanker Exclusion Zone which is considered by Transport Canada as the point where there is sufficient time and distance to secure external marine resources to prevent grounding in an emergency. Prior to this, the escort tug would be available to return to assist the tanker.

San Juan County Council recommended that prior to Project approval, a prepositioned emergency towing vessel capable of responding to any vessel that has lost power be located in the area of Boundary Pass and Haro Straits.

The Pacific Pilotage Authority submitted information regarding its tug escort requirements and recent changes and amendments to those requirements. The Pacific Pilotage Authority concluded that it had done "exemplary work in determining the requirements for tethered escort tug on the West Coast" and they "will continue to use these principles for all new liquid bulk proposals."

Trans Mountain said that with the implementation of its proposed mitigation of additional dedicated tug escort and other risk reduction measures, the return period for a spill of any size from Project-related tanker traffic would be 1 in 284 years

[131] A tanker losing power and drifting on to a rocky shore.

and return periods for the mean case spill volume and credible worst-case spill scenario would be 1 in 568 years and 1 in 2841 years, respectively. Trans Mountain said that this would maintain the potential oil spill risk associated with the increased tanker traffic resulting from the Project at close to the level associated with the current level of tanker traffic.

Trans Mountain's expert consultant, Det Norske Veritas, said that, with implementation of Trans Mountain's proposed extra risk controls, the level of care and safety in the study area would be raised well above globally accepted shipping standards.

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Trans Mountain said that it is part of a Project Shippers Marine Sub-committee, working on a process to ensure that an adequate level of tug services is available on the west coast to accompany laden tankers in the future during their transits through the Strait of Juan de Fuca. It noted that the process was currently on hold given the Federal Court of Appeal Decision regarding the Project.

Transport Canada and the Pacific Pilotage Authority provided their views on the Board potentially recommending to the Government of Canada that the proposed voluntary enhanced tug escort for Project-related tankers be made mandatory under relevant federal legislation. Transport Canada said that new regulatory requirements under the *Canada Shipping Act, 2001* would be needed to make enhanced tug escort mandatory with respect to oil tankers. Before proceeding with the regulatory process, Transport Canada would need to assess the proposed measure to determine whether mandatory enhanced tug escorts for all oil tankers, whether in the waters within the limits of a port or elsewhere, would result in an overall benefit to marine safety and the environment and what effects it would have on navigation. Transport Canada's assessment would also consider the national implications of implementing such a measure. It said that it would also widely consult with affected stakeholders, including the United States, industry and First Nations, before and during any regulatory process.

The Pacific Pilotage Authority said that if a particular measure is endorsed by federal regulators, be it voluntary or otherwise, it would be prudent for applicable authorities to monitor its application and use.

Transport Canada said that it continues to support Trans Mountain's commitment for enhanced tug escort for Project-related tankers being made mandatory through the certificate terms and conditions through the Board's permitting process.

Conclusions of the TERMPOL Review Committee

As submitted in the OH-001-2014 hearing, the TERMPOL Review Committee supported key risk reduction measures proposed by Trans Mountain and concluded that it did not consider the overall increase in marine traffic levels to be an issue. The Committee said that while there will always be some risk in any project, after reviewing Trans Mountain's studies and taking into account its commitments, it had not identified any regulatory concerns, associated with Project-related tankers, for the tankers, tanker operations, the proposed routes, navigability, other waterway users and the marine terminal operations. The Committee said that implementation of its findings and recommendations, in conjunction with Trans Mountain's commitments, would provide for a higher level of safety for tanker operations commensurate with the increase in traffic.

Trans Mountain said that it supported and agreed to adopt each of the Committee's findings and recommendations.

Trans Mountain said that it would appropriately implement, monitor and enforce adherence to marine shipping best practices, commitments such as enhanced tug escort, and other requirements through its Tanker Acceptance Program, as a member of the Board of Directors of WCMRC, regular shipper meetings and close liaison with marine authorities.

Views of the Reconsideration Panel

The Board accepts the evidence filed by Trans Mountain regarding marine shipping navigation and safety, including the reports filed as part of the TERMPOL Review Process. The Board finds that Trans Mountain's application met the requirements outlined in the Board's 10 September 2013 "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities" and the Board's 12 October 2018 Filing Requirements for the MH-052-2018 hearing regarding spill prevention.

Marine shipping regulatory framework

In Section 14. 3, the Board summarized the existing regulatory regime related to marine shipping navigation, safety, spill prevention, environmental protection, emergency response and preparedness. These areas are not under its regulatory jurisdiction.

The evidence before the Board indicates that there are competent authorities responsible for this regime and that these jurisdictions cooperate with each other and other organizations in facilitating the safety of marine shipping. The

evidence indicates that the regime is functioning appropriately. The evidence indicates that the regime is reviewed periodically and that there are completed, ongoing, and planned improvements to the marine shipping regulatory framework since the Board's OH-001-2014 Report. These regulatory improvement initiatives have been summarized in Section 14.3 and elsewhere in Chapter 14. Any changes to the existing regime would be the responsibility of those competent authorities.

The Board acknowledges the work of the TERMPOL Review Committee and, as it said in its 10 September 2013 marine shipping filing requirements, the Board did not duplicate the work undertaken by the TERMPOL Review Committee.

The Board is of the view that completed and planned regulatory improvement initiatives will contribute to the overall safe conduct of marine shipping, including for Project-related vessels, within the Salish Sea. The Board considers that with the significant number of initiatives since the OH-001-2014 Report, there is a better understanding of the marine shipping issues. While a number of the regulatory improvements are not completed, substantial and detailed progress has been made since the OH-001-2014 Report and is expected to continue.

Safety measures

The Board accepts Trans Mountain's evidence that the global safety record in the marine industry, particularly for oil tankers, has improved continuously over the past 40 years due to regulatory changes, improved safety procedures, and improved tanker design such as double hulls.

The Board accepts the evidence filed about tanker construction, design and operations. The Board acknowledges the legal requirements governing vessels entering Canadian waters and also, the requirements set out in Trans Mountain's Vessel Acceptance Standard. To monitor future developments of Trans Mountain's Vessel Acceptance Standard, the Board would impose Condition 134 requiring Trans Mountain to file the Standard and future updates with the Board.

The Board notes that the TERMPOL Review Committee made a number of findings and recommendations in its report, and that Trans Mountain said that it supported and agreed to adopt each finding and recommendation. The Board recognizes the work conducted by Trans Mountain since the issuance of its OH-001-2014 Report with the BC Coast Pilots Ltd., Pacific Pilotage Authority, Transport Canada, Canadian Coast Guard and the Vancouver Fraser Port Authority to complete its commitments under the TERMPOL Review Committee's Findings and Recommendations.

The Board recognizes the safety record and expertise of the Pacific Pilotage Authority and the involvement of the Pacific Pilotage Authority and BC Coast Pilots Ltd. in marine safety planning for Project-related vessels. The Board gives considerable weight to the views offered by these participants that Project-related marine shipping can be carried out safely, including the safe handling of increased shipping volume related to the Project. The Board also accepts the view of its Marine Technical Advisor as to the importance of the role of competent pilots in vessel transit safety and incident mitigation. While intervenors raised numerous concerns about what they perceived to the risks from increased tanker volume, none provided compelling evidence that brought into question the skills and competency of the pilots that would be on Project-related vessels. The Board puts significant weight on the evidence of the pilots that they are the local marine experts that utilize their skill and training to safely navigate vessels in and out of port.

Some participants raised the need for additional tugs to escort Project-related vessels and Trans Mountain made a voluntary commitment to implement enhanced tug escort measures that exceed regulatory requirements. Evidence filed by Trans Mountain, Transport Canada and the Pacific Pilotage Authority indicates that tug escort is an important mitigation measure. In its report, the TERMPOL Review Committee supported the implementation of Trans Mountain's key risk reduction measures, including but not limited to, enhanced tug escort. The Board agrees.

The Board notes that Transport Canada said in the MH-052-2018 hearing that it continues to support Trans Mountain's commitment for enhanced tug escort for Project-related tankers being made mandatory through the certificate terms and conditions through the Board's permitting process. As it said in its OH-001-2014 Report, the Board expects Trans Mountain to follow through on its voluntary commitment for enhanced tug escort for Project-related tankers. For any Certificate issued, the Board would impose Condition 133 requiring Trans Mountain to demonstrate that it has included in its Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide a requirement for tankers nominated to load at the Westridge Marine Terminal to have a suitable arrangement for the proposed enhanced tug escort between the Westridge Marine Terminal and Buoy J prior to departure. The Board notes that its Marine Technical Advisor supported the Board's inclusion of Condition 133.

If the Project is approved and Trans Mountain decides to proceed, it would be required to comply with all conditions that are included in the Certificates and associated regulatory instruments. However, as the Board does not regulate marine shipping, its regulatory authority is limited to the construction and operation of the pipeline and Westridge Marine Terminal and its authority to enforce the implementation of the enhanced tug escort is limited. Therefore, to bolster regulatory oversight over enhanced tug escort, the Board recommends that the GIC develop a regulatory

framework for making such tug escort mandatory for Project-related tankers (Recommendation 8). GIC should also consider mandatory enhanced tug escort for other vessels as appropriate.

Should Trans Mountain's voluntary commitment regarding enhanced tug escort be made mandatory through an alternate marine shipping regulatory framework, if appropriate, Trans Mountain could apply to the Board to have its certificate varied accordingly.

The Board is of the view that the evidence filed by those bodies that regulate marine shipping and by Trans Mountain indicate that there is an acceptable level of safety in place regarding marine shipping associated with the Project.

Marine shipping risk analysis

The Board accepts the evidence filed by Trans Mountain regarding potential spill risks associated with Project-related marine shipping. The Board notes that, in its report, the TERMPOL Review Committee did not identify any concerns regarding Trans Mountain's marine shipping risk analysis. Instead, the Committee said that it had not identified any regulatory concerns related to the marine shipping component of the project and that it did not consider the overall increase in marine traffic levels to be an issue.

The Board acknowledges the evidence filed by participants who raised concerns about Trans Mountain's marine shipping risk analysis. Several participants criticized Trans Mountain's risk assessment methodology and said that the risk of a catastrophic oil spill is too great to allow the Project to proceed. Others said that, even with double hulled tankers and tugs escorts, the probability of such a major oil spill cannot be completely eliminated.

During the OH-001-2014 hearing, participants such as the Tsawout First Nation and Concerned Registered Professional Engineers commented on interpreting the results of Trans Mountain's marine shipping risk analysis. The Tsawout First Nation said that Trans Mountain's estimates should not be relied upon as an accurate estimate of tanker spill risk. Concerned Registered Professional Engineers said that the spill return periods estimated by Trans Mountain are mathematically equivalent, for example, to a 10 per cent probability that a spill of 8.25 million or more litres will occur in a 50 year operating period, even taking into account all the proposed mitigation strategies (e.g., use of escort tugs).

During the MH-052-2018 hearing, the Board also heard concerns from intervenors such as the Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, the City of Vancouver, the City of Burnaby, and Concerned Professional Engineers Society regarding Trans Mountain's marine shipping risk analysis and potential oil spill risks. The Board notes that much of the evidence filed by intervenors in the MH-052-2018 hearing regarding marine shipping risk was the same or similar to that filed during the OH-001-2014 hearing. The Board has examined new evidence filed by intervenors and is of the view that it confirms the conclusions from the OH-001-2014 Report regarding the adequacy of Trans Mountain's marine shipping risk analysis.

The Board recognizes the difference in opinion between Drs. Gunton and Joseph in their report and Trans Mountain as to the appropriate application of the United States Bureau of Ocean Energy Management's Oil Spill Risk Assessment Model. The Board accepts Trans Mountain's position that Gunton and Joseph's application of the United States Bureau of Ocean Energy Management's Oil Spill Risk Assessment Model to the Project was an overly simplistic method that did not consider specific geography and mitigation. Trans Mountain also said that the Gunton and Joseph report should not change the findings or conclusions of the Board's OH-001-2014 Report. The Board has given additional weight to Trans Mountain's position based on:

- The fact that Gunton and Joseph did not consider specific geography and mitigation relevant to Project-related marine shipping as noted by Trans Mountain;
- The safety record of oil tankers transiting US waters as noted by Trans Mountain;
- The fact that experts on the TERMPOL Review Committee did not identify any concerns regarding Trans Mountain's marine shipping risk analysis; and
- The views of its Marine Technical Advisor who said that he was of the view that the marine operational risk assessments are complete and adequately reflect the associated risks and associated risk mitigation in marine operations.

The Board has given little weight to the views expressed by Concerned Professional Engineers Society regarding potential tanker collisions with the Ironworkers Memorial Bridge or Canadian National Railway Bridge spanning the second narrows in Burrard Inlet. The Board is of the view that potential tanker collisions with the Ironworkers Memorial Bridge were considered in the OH-001-2014 hearing and considering the mitigation measures in place, were found to be an unlikely event. Further, the Board notes that the vessel collision and risk assessment mitigation report prepared for the BC Ministry of Transportation and Infrastructure states that there have been no commercial vessel

collisions with the Ironworkers Memorial Bridge since it was built in 1960 and that there has been one collision with the adjacent CN rail bridge in 1979. This collision lead to development of the Second Narrows Traffic Control Zone and associated mitigation measures and there have been no collisions with the CN Rail Bridge since the Traffic Control Zone measures were implemented.

Further, the Board notes that the Concerned Professional Engineers Society is expressing potential concerns on behalf of third parties, that is, BC Ministry of Transportation and Infrastructure and CN Rail. Evidence filed by the Concerned Professional Engineers Society states that the Ministry of Transportation and Infrastructure did not intend to file the report as part of the MH-052-2018 hearing. The Board notes that if the BC Ministry of Transportation and Infrastructure or CN Rail had similar concerns as that expressed by the Concerned Professional Engineers Society, the opportunity to express those concerns and file evidence was available to them. Evidence before the Board indicates that both organizations are aware of the Project, that the BC Ministry of Transportation and Infrastructure has consulted with the Vancouver Fraser Port Authority and Pacific Pilotage Authority during the development of the vessel collision risk assessment and mitigation study, and that Trans Mountain has met with CN Rail regarding the Project. The Board expects that BC Ministry of Transportation and Infrastructure and CN Rail would consider any potential effects the Project may have on the bridges as appropriate, and raise any concerns with Trans Mountain and the appropriate regulatory authorities.

Regarding the comments made by Dr. Short that a large spill is a likely event where the Duke-Point-Tsawwassen ferry route intersects with the marine shipping route, the Board does not agree. In the OH-001-2014 hearing, the Board accepted the marine shipping quantitative risk analysis conducted by Trans Mountain which was prepared as part of Trans Mountain's submission to the TERMPOL Review Committee. The Committee did not identify any concerns regarding Trans Mountain's marine shipping risk analysis which was prepared by Trans Mountain's expert consultant Det Norske Veritas with input from the Committee using a methodology considering specific geography and mitigation associated with the Project. The risk analysis concluded that there was a low probability of an accident occurring at this location due to the lower number of ferry crossings per day and the increased sea room for vessels to evade or reduce impact. The Board considers the evidence filed by Trans Mountain on this issue to be thorough and credible. Further, the Board finds that although Dr. Short alleged that a spill is equally likely at this location as the location further south at the main ferry crossing between Tsawwassen and Swartz Bay, he provided no concrete evidence to support this view.

Gerald Graham said that the complete loss of an oil tanker's cargo should be considered a credible worst-case scenario. The Board does not agree. As already discussed, the Board accepted Trans Mountain's marine shipping quantitative risk analysis in the OH-001-2014 hearing. Although an unfortunate incident, the Board is of the view that the sinking of the MV Sanchi does not materially affect its acceptance of Trans Mountain's marine shipping risk analysis which was prepared in the specific context of assessing the safety of Project-related tanker traffic. The Board also notes that in its OH-001-2014 hearing, it found that Trans Mountain's application met the requirements outlined in the Board's 10 September 2013 "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities" regarding spill prevention. These filing requirements included the need to describe a credible worst-case spill scenario.

The Board understands that marine shipping risk assessment is challenging, as acknowledged in the Gunton and Joseph report filed by the City of Vancouver, Tsleil-Waututh Nation and others. Having considered participants' comments, the Board accepts Trans Mountain's evidence that there are no proposed or widely accepted risk acceptance criteria for marine oil spills. The Board understands that the marine shipping risk assessment performed for the Project-related tankers and the marine shipping risk assessment undertaken for Transport Canada and the report of the Tanker Safety Expert Panel do not recommend stoppage of marine shipping in the area. Rather, such risk assessments are intended to inform mitigation to lessen the potential for an accident to occur, and for spill response planning. That is, the Board does not view the results of these risk assessments as absolute indicators of the actual probability of a spill occurring. However, the Board does find that the marine shipping quantitative risk analysis conducted by Trans Mountain does provide a relative indication as to the actual probability of a spill occurring. This finding has informed the Board's conclusions regarding the likelihood of a spill from a Project-related tanker as discussed in the next section, Marine Shipping Risk.

The Board's understanding of marine shipping risk assessment is further supported by the Vessel Traffic Risk Assessment and statements made by the Washington State Department of Ecology. To the extent that risk assessments conducted in Washington State and associated recommended marine shipping mitigation may be relevant to safe shipping in the Salish Sea, the Board expects that the appropriate competent authorities such as Transport Canada and Canadian Coast Guard would review and consider such information.

The Board notes the Makah Tribal Council's recommendation regarding development of a Canada/United States Transboundary Vessel Traffic Risk Assessment. To the extent that such a risk assessment would contribute to the safety of marine shipping within the Salish Sea, the Board has recommended that the GIC consider the need for a

transboundary vessel traffic risk assessment in conjunction with relevant United States regulatory authorities (Recommendation 9). The Board's Marine Technical Advisor supported this recommendation.

The Board notes that participant's comments on Conditions 91, 133, and 144 and Recommendations 8 and 9 are addressed in Section 14.11.3.

Marine shipping risk

The Board recognizes that the south coast of B.C. has been identified as a high risk area in the marine shipping risk assessment prepared for Transport Canada and the report of the Tanker Safety Expert Panel. The Board understands that this designation is based on both the environmental sensitivity of the area and the probability of a tanker spill occurring. The Board has considered the probability as well as the consequences of a spill in its assessment of the evidence before it. The Board's views on the consequences associated with tanker spills are included in Sections 14.9 and 14.10.

The Board notes that Trans Mountain said that with the implementation of its proposed mitigation of additional dedicated tug escort and other risk reduction measures, the return period for a spill of any size from Project-related tanker traffic would be 1 in 284 years and return periods for the mean case spill volume and credible worst-case spill scenario would be 1 in 568 years and 1 in 2841 years, respectively. Trans Mountain said that this would maintain the potential oil spill risk associated with the increased tanker traffic resulting from the Project at close to the level associated with the current level of tanker traffic.

The Board is of the view that although a large spill from a tanker associated with the Project would result in significant adverse environmental and socio-economic effects, such an event is not likely. For clarity, the Board notes that a large spill would include the credible worst-case and mean spill volumes considered in the marine shipping quantitative risk analysis. The Board has not defined the volume associated with a large spill but it notes that a large spill could also be considerably less than these volumes. The Board's view is based on the totality of evidence before the Board, including, but not limited to:

- the regulatory framework in place and associated regulatory improvement initiatives;
- continuous improvement in the global safety record for oil tankers over the past 40 years due to regulatory changes and improved safety procedures;
- all shipping associated with the Project would occur within established shipping routes;
- the results of Trans Mountain's marine shipping risk analysis;
- existing and enhanced safety measures that would apply to the Project;
- the findings and recommendations of the TERMPOL Review Committee; and
- the results of marine shipping risk assessment work conducted for Transport Canada and the Tanker Safety Expert Panel.

The Board is of the view that although possible, smaller spills from Project-related tankers of a size that would result in significant environmental effects are not likely. This view is informed by its acceptance of the marine shipping risk analysis conducted by Trans Mountain and the spill probabilities estimated therein, including the probability of a spill of any size, and the mitigation measures that would be in place for Project-related marine shipping. However, as discussed in Section 14.9.4, the Board is of the view that the environmental effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time, the effectiveness of containment and clean-up, the valued components that are impacted, and the weather and time of year of the spill.

Specific to potential spills in Burrard Inlet, the Board heard considerable concern regarding potential spill risk, the resultant potential effects from a large spill, and Trans Mountain's exclusion of assessment of those effects from its environmental effects assessment. As discussed further in this chapter and Chapter 10, the Board finds that based on evidence filed by Trans Mountain and intervenors, a large spill in Burrard Inlet would result in significant adverse environmental and socio-economic effects. Evidence filed by parties such as the City of Vancouver, City of Burnaby and the Tsleil-Waututh First Nation indicate the potential extent of such effects. However, based on the evidence before it, the Board finds that a large spill in Burrard Inlet is not a likely event.

The Board does not accept the assertion made by participants that spill volumes ranging from 8 000 m^3 at the Westridge Marine Terminal to 16 000 m^3 at other locations in Burrard Inlet are credible worst-case scenarios. The Board notes that Trans Mountain's risk assessments, which the Board accepts, show a very low likelihood of major oil spills within Burrard Inlet and English Bay. No credible large oil spill scenarios in these segments of the transit were

identified and this view is supported by the TERMPOL Review Committee's report. Further, in response to a question from Vancouver Fraser Port Authority, Trans Mountain filed additional evidence indicating that an incident in Burrard Inlet would not be likely to puncture a double-hulled tanker. Trans Mountain also discussed specific marine safety mitigation measures within Burrard Inlet and area such as pilotage, tug escort, and traffic restrictions. The Board accepts Trans Mountain's evidence in response to the assertion made by Tsleil-Waututh Nation, City of Vancouver and the City of Burnaby that a potential large spill for a tanker at anchor in English Bay is not credible. Among other reasons, Trans Mountain said that there is no incident on record of a vessel being struck by another while at anchor in English Bay; in the event of a collision, there would not be sufficient energy to puncture both hulls of a double hull tanker; and a laden tanker would not be likely to anchor in English Bay.

In reaching its conclusions regarding the potential risk of a spill from Project-related marine shipping, the Board has been guided by the precautionary principle. The Board finds that the spill prevention measures proposed by Trans Mountain for Project-related vessels, along with other marine safety measures already in place for all vessels, adequately address potential spill risk associated with the Project. This does not mean that there is a zero incident risk, nor is that possible to achieve. Rather, the potential negative environmental and socio-economic consequences resulting from an incident including spills, although not fully possible to predict, have informed the mitigation for the Project. In the Board's view, this mitigation has driven the risk of a tanker incident down to an acceptable level.

Considering the existence of a comprehensive marine shipping regulatory scheme under the jurisdiction of competent authorities and the mitigation proposed by Trans Mountain to lessen the probability of an incident occurring, the Board remains of the view that there is an acceptable level of safety in place regarding marine shipping associated with the Project. The comments of the Board's Marine Technical Advisor support this view.

14.11.3 Emergency preparedness and response

In the OH-001-2014 hearing, Trans Mountain said that in the event of an accident resulting in an oil spill from a vessel in Canadian waters, the master of the tanker, as the responsible party and in accordance with the law, would notify Canadian Coast Guard as per the procedure in the approved Shipboard Oil Pollution Emergency Plan. If the tanker operator were unable or unwilling to assume the role of incident commander, the role would automatically transfer to the Canadian Coast Guard. The responsible party would then activate the response organization, WCMRC, to provide the equipment and resources to respond to the spill.

The District of North Vancouver said a spill response study prepared for the British Columbia Ministry of the Environment concluded that " while all parties should strive for excellence in designing and implementing a marine spill prevention and response system, it should be acknowledged that spills can happen even with the best possible measures in place and that even the best possible spill response system cannot guarantee that resources at risk will be protected from negative impacts if a spill occurs. "

Similarly, Dr. Lance Barrett-Lennard said that based on past spill events, a large spill could never be entirely or even largely contained, with even the best equipment, training and will in the world. He said that real-world conditions of the west coast of B.C. would cause a fraction of any oil to sink and become impossible to clean up. The fraction of sunken oil would be higher for crude, bunker C or diluted bitumen.

During the MH-052-2018 hearing, many participants such as the Cities of Vancouver and Burnaby, Cowichan Tribes, Pacheedaht First Nation and numerous other First Nations, Washington State Department of Ecology, District of North Vancouver, Friends of Ecological Reserves, Living Oceans Society and the Province of B.C. continued to raise concerns regarding the ability to respond to an oil spill and appropriate spill response planning.

Current marine oil spill preparedness and response measures on the west coast

In the OH-001-2014 hearing, Trans Mountain said that Canada's marine spill response regime is built on the principle of cascading resources, which means that in the event of a spill, the resources from a specific area can be supplemented with those from other regions or from international partners, as needed.

The Canadian Coast Guard said that under Canada's Marine Oil Spill Preparedness and Response Regime, the polluter is ultimately responsible for cleaning up and paying for its own marine spills.

Transport Canada and Trans Mountain said that the Response Organizations and Oil Handling Facilities Regulation under the *Canada Shipping Act, 2001* establishes certified response organizations to provide emergency response capability, leadership and support in the case of an oil spill in a marine environment.

Western Canada Marine Response Corporation is the Transport Canada-certified response organization to respond to oil spills on the West Coast of Canada. Vessels and oil handling facilities, such as the WMT, must have an arrangement with a certified response organization. Transport Canada and Trans Mountain said that vessels must also have a Shipboard Oil

Pollution Emergency Plan and that oil handling facilities such as the WMT, must have an Oil Pollution Emergency Plan and an on-site Oil Pollution Prevention Plan.

Western Canada Marine Response Corporation maintains its certification by undertaking a number of equipment deployment exercises, tabletop exercises, and oil spill response training courses and scenarios within the certification period.

Trans Mountain described Transport Canada's National Aerial Surveillance Program for vessels within Canadian waters. Under this program, Transport Canada performs aerial surveillance over all Canadian waters to detect pollution from ships, deterring potential polluters from dumping oil and other pollution while transiting Canadian waters. Trans Mountain stated that there is an obligation for owners of vessels and operators of oil handling facilities to report marine spills to the Canada Coast Guard. Transport Canada said that, as a part of its World-Class Tanker Safety System measures, it would expand the National Aerial Surveillance Program to deter potential polluters, and identify any pollution incidents early.

Trans Mountain said that WCMRC's area of operation for oil spill recovery and clean-up covers all of Canada's West Coast and all internal navigable waters and is referred to as the Geographic Area of Response. Within the Geographic Area of Response, there are particular areas designated by Transport Canada as needing more rigorous planning standards given the increased risks associated with greater traffic density, convergence of vessels, and volume of oil transported. These areas are termed Designated Ports, Primary Area of Response and Enhanced Response Areas (Figure 30). A more rapid response is mandated for a designated port.

Trans Mountain said that within the Port of Vancouver (a Designated Port), WCMRC is required to maintain a dedicated package of response equipment that is capable of responding to a 150 tonne spill within 6 hours. The WMT is within this area. Trans Mountain said that it would be responsible for undertaking a response at the WMT using Trans Mountain's own, and WCMRC, resources.

Trans Mountain said that the majority of spills greater than 1,000 tonnes occur outside port boundaries where shipping lanes converge. The Primary Area of Response for the Port of Vancouver extends from the Port boundary to a distance of 50 nautical miles in all directions.

Trans Mountain said that an Enhanced Response Area covers areas not within the Designated Port or Primary Area of Response but that still have a higher risk of oil spills due to traffic convergence and volume of shipping.

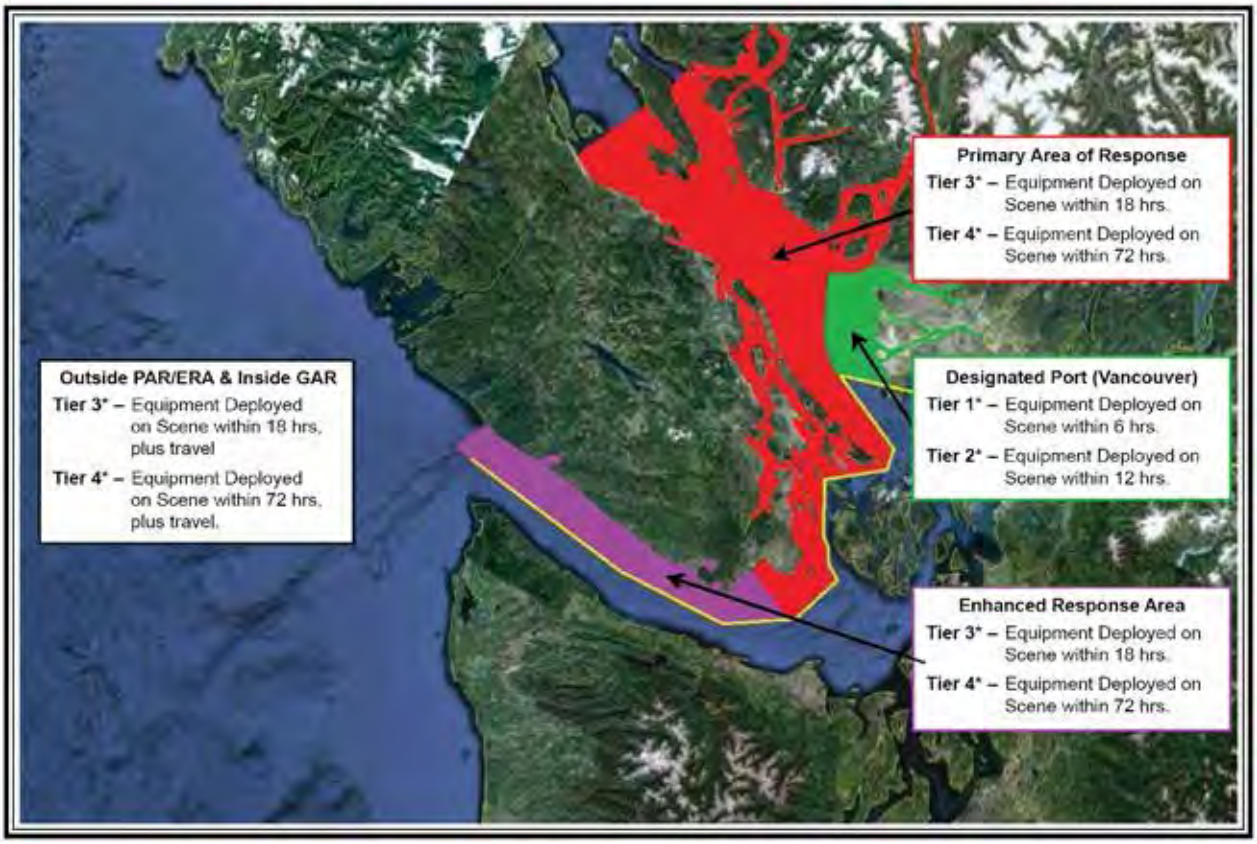
Trans Mountain said that WCMRC would respond, under the guidance of the Incident Command System, to a spill of any size. It said that, although WCMRC is government-certified for a 10,000 tonne response capacity, its current equipment capacity is actually rated at 27,000 tonnes. Additional support for a large spill would be cascaded through contractors and mutual aid partners.

The Canadian Coast Guard said that it has bilateral agreements or administrative arrangements with the United States, France and Denmark and can call upon all signatories to the International Convention on Oil Pollution Preparedness, Response and Cooperation to provide mutual aid in the event that a spill exceeds the capacity for Canada to respond. The level of support and equipment provided by each nation depends on availability of resources.

Trans Mountain described WCMRC's resources to enable it to meet Transport Canada's mandated response planning standards. Trans Mountain said that Transport Canada inspects the entire WCMRC equipment inventory over a continuous 3-year cycle. Trans Mountain described the mutual aid agreements that WCMRC has in place with Canadian and US counterparts. These provide WCMRC with the ability to call on those resources for assistance and equipment in case of a large oil spill. It said that as a result of these agreements, organizations train and exercise together, ensure equipment is compatible, and share communication frequencies and best management practices.

The Village of Belcarra said that WCMRC should develop a geographic response plan for the Central Burrard Inlet. Trans Mountain said that WCMRC, in collaboration with federal government agencies, local governments, First Nations, and other stakeholders, has been developing new coastal Area Plans to prepare responders for the unique aspects of the B.C. coastline. A subset of Area Plans is Geographic Response Plans which are created to reduce the time needed to make decisions during the initial response, and provide information about the site and strategies needed to protect sensitive resources and promote a fast and effective response.

Figure 30: Western Canada Marine Response Corporation areas of response



Trans Mountain said that WCMRC was updating its coastal sensitivity maps with an enhanced coastal mapping system for the B.C. Coast. This system will include coastal sensitivities and associated Geographic Response Strategies and all associated logistical support information. Trans Mountain said that the coastal mapping program was being extended to the entire tanker-shipping route, with a planned completion date of 2017. The program began in 2013 with the initial focus on higher traffic areas such as Vancouver Harbour, southern Georgia Strait, Haro Strait/ Strait of Juan de Fuca, associated Douglas Channel passages, and Prince Rupert. Pre-spill Shoreline Cleanup Assessment Technique requirements, for high-risk areas, would also be addressed concurrently with the geographic response plan planning process.

Washington State Department of Ecology said that Trans Mountain should be required to fund and help develop, test and implement a joint geographic response plan with Washington State Department of Ecology to address the risk from vessels carrying diluted bitumen through shared waters in the Salish Sea.

The District of North Vancouver, the City of North Vancouver and the District of West Vancouver said they fund the North Shore Emergency Management Office. This office supports municipal and regional response capabilities for the North Shore area. These intervenors expressed concerns regarding the level of cooperation in spill response planning and actual spill response between municipalities such as themselves and the Canadian Coast Guard and WCMRC.

The City of Port Moody and the City of Vancouver raised concerns regarding the level of information shared with them by Trans Mountain and WCMRC regarding resources and response expectations in the event of an emergency, and emergency response planning documents.

The Georgia Strait Alliance surveyed emergency planning personnel from coastal local governments in the Georgia Strait region. The respondents expressed concerns regarding information sharing from WCMRC on the local government's role in marine spill response and the lack of engagement on spill response planning initiatives such as geographic response strategies and training and exercises.

The Capital Regional District expressed concerns that local governments along the tanker routes have legal obligations to respond to emergencies within their jurisdiction but may not have sufficient resources to respond to a major oil spill.

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The Canadian Coast Guard said that it is the on-water federal lead agency for marine pollution response. It provides oversight of every marine incident and is responsible for ensuring the cleanup of ship-source and mystery-source spills of oil and other pollutants into Canadian waters. Should the polluter be unable, unwilling, or unknown, the Canadian Coast Guard would assume command of the situation and ensure an appropriate response to the incident.

Canadian Coast Guard said that environmental response planning in the Lower Mainland and South Coast is ongoing as part of regular Coast Guard spill response preparedness activities. The Canadian Coast Guard Marine Spills Contingency Plan – National Chapter establishes the requirement for Geographically Specific Response Planning, and the Coast Guard is working directly with Indigenous communities and other partners on the Lower Mainland and South Coast to develop Geographically Specific Response Plans, like the Greater Vancouver Integrated Response Plan.

Canadian Coast Guard said that it maintains a close working relationship with WCMRC. When an incident occurs, the Coast Guard advises WCMRC of the developing situation to initiate any required preparation for response. This enables the WCMRC to mobilize and deploy staff, vessels and equipment accordingly. The Coast Guard and WCMRC maintain regular communication as the incident evolves.

The Canadian Coast Guard and other federal participants discussed a number of response planning initiatives under the Oceans Protection Plan and other improvements to federal prevention, preparedness and response capabilities since 2015 including:

- Implementation of the Incident Command System and associated training and exercising across federal departments and with external stakeholders. The Canadian Coast Guard could act as the sole Incident Commander or within a Unified Command structure that could include the polluter, First Nations and other levels of government when appropriate and when required.
- Reopening of the Kitsilano Coast Guard Station in 2016 to ensure that an additional layer of marine search and rescue and emergency and environmental response capacity is available in the Vancouver area.
- The Regional Response Planning pilot project running from 2017-2019 in Northern British Columbia. Canadian Coast Guard said that Regional Response Planning is a collaborative and integrated approach to environmental response planning for marine spills. Parties involved include the Canadian Coast Guard, Fisheries and Oceans Canada, Transport Canada, Environment and Climate Change Canada, the Province of British Columbia, Indigenous and coastal communities, industry and other stakeholders. Canadian Coast Guard said that the methodology being developed and lessons learned in the Northern British Columbia Pilot are applicable to ongoing environmental response planning efforts in the rest of the country, including southern B.C.
- Increased emergency response staffing and improved interoperability and coordination between Canadian Coast Guard, Transport Canada, and Environment and Climate Change Canada.
- Modernization of the Canadian Coast Guard's environmental response assets including mobile incident command posts and pollution response equipment and a new logistics depot near Port Hardy, B.C.
- Development of The Greater Vancouver Integrated Response Plan for Marine Pollution Incidents. This plan serves as the guide for multi-agency on-water response to serious oil pollution events in the area of English Bay and Burrard Inlet. It was developed cooperatively by Federal Departments, First Nations, Provincial Ministries, Municipalities, the Port Authority, industry (including the Western Canada Marine Response Corporation), and non-governmental organizations, such as the Vancouver Aquarium.
- Collection of pre-shoreline cleanup and assessment technique shoreline data sets by Environment and Climate Change Canada.
- Revision of the Canada-United States Joint Marine Pollution Contingency Plan in 2017 by the Canadian Coast Guard and the United States Coast Guard to include an International Coordinating Officer position. Canadian Coast Guard said that the International Coordinating Officer role will be built into future exercises and this position will be utilized during transboundary spills where necessary.

The Vancouver Fraser Port Authority said that it co-chairs the Marine Emergency Response Coordination Committee with Canadian Coast Guard. The Marine Emergency Response Coordination Committee provides a venue for interested organizations to dialogue on the coordination of marine assets in the Metro Vancouver area during emergency or security response and recovery activities. Under the Marine Emergency Response Coordination Committee is the Environmental Response Sub-Committee which addresses emergency response planning in the Greater Vancouver area. The Environmental Response Sub-Committee also serves as the primary source of subject matter expertise relating to any changes to the Greater Vancouver Integrated Response Plan.

The Vancouver Fraser Port Authority noted that it cooperates with the Canadian Coast Guard, Western Canada Marine Response Corporation, first responders, and other agencies in emergency response through training and exercises and by providing information through its operations centre and patrol boats.

Trans Mountain said that it has made numerous enhancements to its Emergency Management Program since the date of the Board's OH-001-2014 Report. These enhancements strengthen marine oil spill prevention, emergency preparedness, and response measures. It noted that its Westridge Marine Terminal Emergency Response Plan has been updated to be operationally aligned with the Greater Vancouver Integrated Response Plan.

The Pacheedaht First Nation said that it and Makah Tribal Council were part of the Transboundary Indigenous Caucus of the Canada-United States Joint Marine Pollution Contingency Plan, Annex 3, Pacific Geographical Annex. The purpose of the Annex is to identify the processes to be used by the Canadian and US Coast Guards to communicate, consult and coordinate in response to spills in contiguous waterways. Pacheedaht also said that emergency response capacity in the Port Renfrew area is "grossly insufficient" and needs to be significantly improved, particularly if the Project was to be approved.

Washington State Department of Ecology said that vessel traffic separation lanes in the Strait of Juan de Fuca require all ships en route to Canadian or U.S. ports to navigate inbound predominately within U.S. waters and predominantly within Canadian waters when exiting the U.S. This scheme requires ships entering the Strait bound for Canada to comply with Washington State law when inbound; vessels must comply with Canadian law when outbound. It said there is a reciprocal arrangement between the Washington State Maritime Cooperative, the National Response Corporation, and the Western Canada Marine Response Corporation to facilitate vessel operators meeting the oil spill contingency plan requirements of both the *Canada Shipping Act, 2001* and the Washington State oil spill contingency plan regulations, respectively. The agreement ensures that contingency plan coverage exists for all vessels transiting in and out, and ensures an immediate response to spills.

The District of North Vancouver expressed concerns regarding potential effects on human health during oil spill response activities. Health Canada and Canadian Coast Guard said that they prioritize the health and safety of first responders and the public during spill response. Within the Incident Command System, air quality impacts on health and safety, are the direct responsibility of the Safety Officer within the Command Staff of the Incident Command organization. The Safety Officer is responsible for developing and recommending measures to ensure personnel safety and occupational health of not only response workers, but also the public, and to anticipate, recognize, assess, and control hazards and unsafe conditions or situations. Canadian Coast Guard noted that potential members of the Environmental Unit and Health Unit within the Incident Command System structure include Environment and Climate Change Canada, BC Ministry of Environment and Climate Change Strategy, Health Emergency Management BC, Health Canada, First Nations Health Authority, Vancouver Coastal Health, and other agencies as needed. These agencies ensure that the health and safety of First Responders and the public are taken into consideration with regard to all aspects of the incident, including air quality impacts.

Western Canada Marine Response Corporation said that it is developing site specific geographic response strategies for the coast of B.C. WCMRC said that geographic response strategies are operational documents that detail the location of vulnerable and sensitive shoreline areas and describe how to protect them. It said that the geographic response strategies align with the federal government's transition to a risk-based approach to response planning. To date, more than 400 have been developed for the Salish Sea and they are publically available on WCMRC's website. WCMRC also noted its use of oil spill trajectory models to continually inform responders as to an incident's potential credible worst-case.

WCMRC discussed response exercises required as part of its certification by Transport Canada. These include on-water equipment deployment exercises and table top exercises conducted on a three year cycle. It said that WCMRC personnel and contractors also regularly participate in WCMRC member exercises as well as exercises hosted by the Canadian Coast Guard, Department of Defense and Emergency Management BC, and by regional partners and entities in the United States.

Response measures

In the OH-001-2014 hearing, The Cowichan Tribes said that the physical properties associated with weathered diluted bitumen significantly reduce response tactic options and effectiveness in areas such as mechanical recovery, shoreline cleanup and reduced natural recovery. It said that there is a high likelihood that weathered bitumen-based crude oil will either sink or submerge in conditions of the Salish Sea or Pacific Ocean. The Cowichan Tribes said that there are no practical on-water solutions to contain and recover a large oil release if it sinks or submerges. It also said that a much higher number of shore-based workforce personnel would be needed for cleanup of a bitumen-based crude oil that has emulsified, than compared to a conventional crude oil. This is because of the need for more labour -intensive shoreline cleanup using shovels, rakes and buckets.

Mechanical recovery - booms and skimmers

In the OH-001-2014 hearing, Trans Mountain said that the existing response planning standards focus on mechanical recovery such as booming and skimming.

Trans Mountain said that in spill response, booms have three purposes: to protect resources; to concentrate oil into thicker patches; and to increase the encounter rate between the oil and skimmer.

The Village of Belcarra said that it is important that Trans Mountain consider wind and wave conditions within Burrard Inlet in its design and selection of containment booms for deployment around tankers when loading at the WMT. In response, Trans Mountain said that the boom deployed around the tanker could contain up to 12 000 m^3 of oil depending on the type of boom used and environmental conditions. Trans Mountain said its risk assessment had not identified any viable circumstance that could require the containment to hold more than 103 m^3, which is the credible worst-case scenario spill volume during cargo transfer.

Spill treating agents and in-situ burning

In the OH-001-2014 hearing, Trans Mountain said dispersants and in-situ burning have proven effective in minimizing environmental harm in the event of a spill. Trans Mountain said that pre-approval for the use of other response techniques would avoid delays that diminish the effectiveness of these techniques in situations where their use would offer a desirable means of diminishing environmental harm. Trans Mountain submitted that response organizations should be empowered with conditional pre-approvals for in-situ burning, the use of dispersants and beach-cleaning agents.

Trans Mountain said that dispersants are not approved for use in Canada and in-situ burning is not pre- approved. In the event of a spill response, strategies for use of these counter-measures would be developed under an Incident Command System structure and approved by Unified Command. This structure would be expected to include ECCC and the B.C. Ministry of Environment who would provide advice on environmental priorities. Any decision to use dispersants or in-situ burning would be based on a net environmental benefit analysis and would need approval of the appropriate regulatory authorities. Trans Mountain said that a net environmental benefits analysis assesses the net environmental benefits gained by clean-up and remediation, in consideration of the environmental injuries caused by those activities, with the objective of enhancing recovery outcomes while minimizing further environmental damage.

Trans Mountain said that its research indicated that dispersants tested were only marginally effective on free-floating diluted bitumen for up to six hours, and were not effective on diluted bitumen that had weathered for over one day.

Trans Mountain said that because in-situ burning creates a dense smoke plume, burning in or near population centers is unlikely to be approved. It said that the effectiveness of in-situ burning can diminish as weathering of the oil progresses.

In the MH-052-2018 hearing, Raincoast Conservation Foundation submitted a report, prepared by toxicologist Kate Logan, on the potential impacts of dispersant use on the marine environment. Raincoast noted that since publication of the Board's OH-001-2014 Report, the chemical dispersant Corexit 9500 had been approved for use in Canadian waters. Raincoast said that research conducted by the Government of Canada and Trans Mountain indicates that use of dispersants on a diluted bitumen spill, particularly after weathering, is not likely to be an effective oil spill response tool. NS NOPE also filed a report prepared by Dr. Riki Ott on potential human health effects related to dispersant use, particularly in urbanized areas such as Burrard Inlet.

Trans Mountain said that use of chemical dispersants in response to any oil spill would only be considered on a case by-case basis, in consultation with federal regulators, local authorities and other experts, and where this use would result in net environmental benefit. It also said that the use of Spill Treating Agents in Canadian waters is prohibited under federal law except under certain conditions in relation to offshore oil exploration and production.

Environment and Climate Change Canada also said that the use of spill treating agents is limited by legislation and that they would not be used as a response tool under Canada's existing Marine Oil Spill Preparedness and Response Regime. It noted that the Government of Canada is considering legislative changes to strengthen environmental response to oil spills in water by expanding the available response options to include Alternative Response Measures such as spill treating agents. The use of any Alternative Response Measures would be subject to a Net Benefit Analysis test on a case-by-case basis.

Response to marine vessel fires

In the OH-001-2014 hearing, Trans Mountain said that all tankers are required to carry firefighting systems that consist of water, foam, and other chemicals. It said that private tug operators operate fire-fighting capable tugs from their bases in Vancouver Harbour.

The City of Vancouver said that in the event of an oil spill resulting in a fire or explosion on board a tanker, the City does not currently have the training or equipment to fight shipboard fires on tankers. It said that it was in the process of finalizing an

agreement with Vancouver Fraser Port Authority that it would provide fire-fighting support (e.g., external hull cooling, and supply delivery) for vessels over 75 feet. Firefighting support would be on a response-available basis.

Response to diluted bitumen spills

In the OH-001-2014 hearing, Trans Mountain filed information from WCMRC which said that submerged oils are defined as those products that are either neutrally buoyant or have slight negative buoyancy such that they lie below the surface of the water, often migrating vertically in the water column. Sunken oils are those products that have fallen to the bottom; some submerged oils eventually become sunken oils. Spilled heavy oils, including heavy crudes and fuels such as Bunker C, have the potential to become submerged or sunken during weathering when exposed to the right combination of overwash, sediment load and mixing energy. Exposure to a single condition is unlikely to cause heavy oils to become submerged or to sink. Oils that have fallen below the surface of the water can also resurface elsewhere in the water plane as environmental conditions influencing the oil change its fate and behavior. Heavy oils can submerge or sink in both freshwater and marine environments.

WCMRC said that since any type of oil could eventually submerge, responding to floating oil has the highest priority. At the same time, technologies and techniques are used to track submerged oils so that appropriate response tactics can be applied. Depending on the level of submergence, some oil may be within the recovery range of conventional technologies such as brush skimming systems. Otherwise, based upon tracking results, a response can be set up at suitable containment, impoundment and recovery locations to intercept submerged oil.

The Shxw'ōwhámel First Nation said that when spilled oil sinks, or becomes submerged in the water column, it can often be very difficult to detect. It also provided information on various detection and recovery methods for submerged and sunken oil. It said that there are varying degrees of success with the use of such methods.

The Living Oceans Society submitted an overview of spill response technologies for viscous oils that submerge. The report concluded there is a need to improve countermeasures for these oils. It outlined the challenges in locating, containing and removing submerged oil and said that, if spilled oil becomes suspended between the water's surface and the bottom, it is unlikely that any commercially available response technologies can be successfully applied to significantly control the spill. Shoreline cleanup operations would have to be initiated in the event the oil stranded on shore. It said that there are some possible recovery techniques for sunken oil, but it noted that each has specific limitations.

Trans Mountain said that its spill contingency plans for the expanded Trans Mountain Pipeline system would consider mitigation and remediation of suspended or sinking oil for spills in a marine environment. It said that various studies and tests indicate that responding to a diluted bitumen spill is no different than responding to a spill of bunker fuel or other heavy crude oil. Trans Mountain said that WCMRC maintains, and will continue to maintain in future, the capability and capacity to respond to all types of oil spills[132].

Trans Mountain said that relative to oil that remains floating, locating oil that has sunk or submerged is more difficult and that the difficulty increases in proportion with the difficulty of accessing the submarine environment. Where it is extremely difficult to access the submarine environment it would be extremely difficult to locate oil that has submerged. If located, Trans Mountain summarized potential recovery technologies and techniques for submerged and sunken oil. Trans Mountain said that remediation of submerged and sunken oil would likely carry on after the emergency phase of a spill response.

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Federal departments and agencies referred to research on the fate and behaviour of diluted bitumen (see Chapter 8) and said that like conventional oil products, diluted bitumen has a range of potential fates within different environmental components and that environmental conditions affect the fate and behaviour of the product. They said that existing response measures are effective on diluted bitumen, in general, to the same extent as they would be for other petroleum products of similar properties.

Natural Resources Canada said that there is consensus that the behaviour of diluted bitumen products falls within the range of behaviours found for petroleum crude oils and products and so current spill response technologies for recovery of both floating and sunken oils can be used. However, as diluted bitumen viscosity increases relatively quickly after a spill, use of spill treatment agents such as dispersants have relatively short windows of opportunity for use. Equipment for recovery of floating viscous oil will be needed. It also noted that research approximating field spill scenarios has shown that although portions of spilled diluted bitumen have submerged, the majority has been found to float allowing time for surface recovery.

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[132] Additional information on the fate and behavior of diluted bitumen is provided in Chapter 8 of this Report.

Environment and Climate Change Canada said that the potential for submergence of diluted bitumen is influenced by several factors including oil density, water and oil temperature, salinity, sediment loading, wave and current energy. Research has found that diluted bitumen products will generally not sink or become submerged under the water surface in marine conditions. It noted that extensive evaporation may result in some diluted bitumen submerging or even sinking in fresh water. Interaction with sediment has also been found to result in oil/sediment aggregates that provide a mechanism for sinking or submergence. Environment and Climate Change Canada noted the need to consider the possibility for a portion of any spill of diluted bitumen to sink or submerge.

Environment and Climate Change Canada noted research that it has undertaken to advance the collective understanding of the fate and behaviour of diluted bitumen on shoreline sediments and a review of response tactics. It said that it makes its research available to Transport Canada and the Canadian Coast Guard to support risk assessments. Environment and Climate Change Canada also works with Response Organizations and the Canadian Coast Guard to conduct exercises specific to spills of diluted bitumen.

In its annotated bibliography of heavy oil fate and effects literature, the Province of B.C. highlighted challenges in detecting and cleaning up submerged and sunken oil. It also highlighted ongoing research in this area and the need to consider sunken and submerged oil in response planning.

Based on the findings in Dr. Short's report (see Chapter 8) which said that diluted bitumen could sink or submerge within 24 hours of a spill, in its report prepared for Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, and the City of Vancouver, Nuka Research and Planning Group stressed the need for appropriate planning and specialized equipment and resources to support tracking, containment, and recovery of sunken or submerged oil.

Numerous participants, such as Living Oceans Society, noted the need for rapid spill response measures based on the potential fate and behavior of spilled diluted bitumen and the potential for submergence and sinking.

WCMRC said that it is widely known, and supported by research, that diluted bitumen spills will float at least for days to weeks. It noted that it had completed a draft Sunken and Submerged Oil Plan and that it had enhanced its knowledge in sunken and submerged oil cleanup through participation in the development of a methodology for the identification and delineation of sunken oil. WCMRC discussed the techniques, tools and equipment that it would rely on for detection and tracking and recovery of submerged and sunken oil. WCMRC also noted that the issue of recovery of submerged and sunken oil was adjudicated in the OH-001-2014 hearing.

Trans Mountain filed a copy of its Submerged and Sunken Oil Plan. It said that the Submerged and Sunken Oil Plan was exercised in September 2018 as part of the Westridge Marine Terminal full-scale exercise conducted to fulfill the requirements of NEB Condition 136(a)(i).

Trans Mountain said that equipment used to recover submerged and sunken oil resides within the existing inventories of WCMRC, supplemental oil spill response contractors, Trans Mountain and the marine construction industry. Trans Mountain's inventory of emergency and spill response equipment includes a Submerged Oil Response Trailer, which contains emergency and spill response equipment specifically selected for water-based spill containment and recovery.

Proposed improvements to marine oil spill preparedness and response measures on the west coast

In the OH-001-2014 hearing, the Mayne Island Conservancy Society recommended that, if the Project is approved, oil spill response capacity be greatly improved along the entire shipping route. These improvements should include stationing equipment in the Southern Gulf Islands and providing training to locals to ensure an ability to deploy equipment at a spill site within one tide change, as compared to the 72-hour standard contained in regulation. Mr. Paul Petrie and Mayne Island Conservancy Society said that sufficient response capacity should be in place to respond to entire loss of cargo from an Aframax tanker.

Trans Mountain said that it engaged WCMRC to review its risk assessment and fate and behavior studies, and to describe enhancements to the existing planning standards that would better accommodate the tanker traffic resulting from the Project. It said that the results of studies indicate that a prompt response can significantly reduce the consequences of a spill. As diluted bitumen tested during Trans Mountain's studies remained floating over the 10-day test period, Trans Mountain said that to be effective, planning standards for on-water operations should be based on removing free oil within 10 days.

Trans Mountain said that it asked WCMRC to develop emergency response measures capable of handling one credible worst-case oil spill of 16 500 m^3 (15,500 tonnes) at any location along the tanker route within Canada's territorial sea. Trans Mountain said that WCMRC, in consultation with Trans Mountain, examined its current equipment locations and capacity, the mandated response times against the results of the Gainford study, the results of the quantitative risk assessment, known meteorological and oceanographic data, and hypothetical accidental oil spill locations and concluded that certain improvements could be undertaken to improve the effectiveness of its current emergency preparedness and response capacity with respect to the increase in Project-related tankers.

Due to other potential tanker traffic in the area, WCMRC based its assessment on a potential 21 000 m^3 or a 20,000 tonne release of heavy crude oil. WCMRC and Trans Mountain also consulted with other spill and response organizations including other response organizations in Canada, the US and Norway. Trans Mountain outlined a number of potential enhancements to current planning standards and WCMRC's current response capacity to achieve a more effective response to a 21 000 m^3 spill. More stringent response times formed part of the proposed enhancements.

The enhanced response regime would be capable of delivering 20,000 tonnes of capacity within 36 hours with dedicated resources staged within the study area. Trans Mountain noted that this would represent a response capacity that is double, and a delivery time that is half, the existing planning standards. These enhancements would reduce times for initiating a response to two hours within Vancouver Harbour, and six hours for the remainder of the study area and parts of the West Coast of Vancouver Island. These reduced times would be achieved by creating new base locations along the tanker route. Trans Mountain noted that meeting the response capacities within the designated times would require redundancy of equipment, and as a result of the redundancy, the overall capacity of dedicated response equipment available in the Salish Sea region would be in excess of 30,000 tonnes equivalent when calculated under the current Federal guidelines for response organizations. Trans Mountain said that while the probability of the total loss of containment for an Aframax tanker is so low that it is not a credible planning scenario, such an event could be addressed by cascading equipment from other areas. Trans Mountain said that the enhanced response regime would cost approximately $100 million. Trans Mountain said that its commitment to enhancing marine spill response capacity in the region would benefit the entire shipping community in the Salish Sea.

Trans Mountain said that it had undertaken a project to collect, update and store information about the shoreline and backshore environment in the vicinity of the WMT. The data collected would be used to inform the Shoreline Cleanup Assessment Technique process and the shoreline protection and cleanup response functions in the event of a future oil spill.

Trans Mountain said that it agreed with the Tanker Safety Expert Panel, which recommended the need for Canada to tailor its preparedness efforts for each sector of the country, as the risks across the country are demonstrably different. The Tanker Safety Expert Panel recommended that the Government of Canada implement a risk-based area response planning model to prepare for ship-source oil spills. Trans Mountain submitted that the planning process described by the Panel is similar to that used to develop the marine spill response enhancements described by Trans Mountain and would be expected to result in similar standards.

The TERMPOL Review Committee said that it supported risk-based area response planning and WCMRC's efforts to increase capacity and reduce response time to ensure it is prepared to respond to a credible worst-case scenario as identified by Trans Mountain. The Committee also said that as part of measures to achieve a world-class tanker safety system, appropriate authorities would work with WCMRC and other stakeholders to develop and implement response plans tailored to the southern portion of B.C. The plans would help to ensure the appropriate spill cleanup equipment is in place and readily available.

The Canadian Coast Guard said that in assessing the proposed project and by participating on the TERMPOL Review Committee, it does not foresee undue burdens placed on its response capability. It considers the current configuration and placement of the response organization and its own assets to be sufficient to meet the demands of increased tanker traffic. It noted that the TERMPOL Review Committee did not identify any regulatory concerns with the proposed oil spill preparedness and response procedures at this time. It also said that Trans Mountain proposed a number of enhanced marine oil spill prevention and preparedness measures in its submission to the Board and these were reviewed by the TERMPOL Review Committee. It said that although these measures are voluntary in nature, the Canadian Coast Guard supports any such enhancements.

In the MH-052-2018 hearing, Trans Mountain said that it provided comments on requirements for oil spill response organizations to Transport Canada in 2018, as part of the government's consultation on the Oceans Protection Plan. Trans Mountain had proposed that the planning standard for response times of response organizations in a local area should be commensurate to the level of risk contributed by industry in the local area. Trans Mountain submitted that this was Trans Mountain's approach in facilitating the largest-ever expansion of spill response personnel and equipment on the B.C. coast by WCMRC.

Enhanced marine oil spill response regime

Trans Mountain and Western Canada Marine Response Corporation provided an update on the status and implementation of the enhanced marine oil spill response regime that was the subject of Condition 133 in the OH-001-2014 Report. Trans Mountain noted:

- the regime is focused on early response including containment of the casualty, which remains the primary countermeasure to mitigate and limit the effects of a large or credible worst-case spill in the Salish Sea;
- that it had entered into a funding agreement with WCMRC in 2017 to allow WCMRC to proceed to implement the enhanced regime; and

- since the Board's OH-001-2014 Report, the estimated cost for implementation of the regime has risen from $100 million to $150 million.

Trans Mountain noted several programs, bases, personnel and equipment that are currently suspended due to suspension of Project activities. Trans Mountain has instructed WCMRC to maintain a caretaker status over the work done so far so that work on the enhanced response regime can be revived should the Project proceed.

WCMRC said that unless certified by Transport Canada, the enhanced response regime would be verified by Lloyds Register Consulting, an independent third party, to verify final implementation of the enhancements. It said that it had completed extensive work in areas related to project management, development of plans and base and equipment designs, human resources and training, and procurement planning and processes. It also noted that work on the regime has been suspended and will remain so until it is revived by Trans Mountain.

WCMRC said that the planning standards for the enhanced response regime require that response is initiated within 2 hours for spills in Vancouver Harbour and within 6 hours for the remainder of the Salish Sea shipping route to the 12-nautical-mile limit. It noted that the regime would be available to all users of the marine network in B.C. for any type of oil spill.

WCMRC said the regime would be comprised of the following (Figure 31):

- 43 new response vessels, doubling the current WCMRC fleet to 88 vessels. Vessels would include coastal response vessels, response barges, mobile skimmers, an offshore response vessel, landing craft, storage barges, and work boats.
- Eight new spill response bases in the Salish Sea. The proposed bases would include 24/7 onwater bases in Vancouver Harbour and North Saanich.
- Approximately 120 new employees, most of who would be assigned to new bases on Vancouver Island.
- Operating infrastructure to integrate the enhancements into a functional system.

WCMRC said that the following programs and plans would be reviewed and updated during implementation of the regime:

- International Safety Management System
- Convergent Volunteers Guide
- Geographic Response Strategies Program
- Shoreline Cleanup Plan
- Sunken and Submerged Oils Plan
- Waste Management Plan to address potential increased waste volumes
- Wildlife Management Plan (including birds and marine mammals)
- Vessels of Opportunity Program (VOO) that uses nearby vessel to support spill responders

Referencing the sinking of the MV Sanchi, as discussed in Section 14.11.2, Gerald Graham said that the Board's Condition 133 should require Trans Mountain to confirm that the enhanced marine oil spill response regime is sufficient to clean up a marine oil spill involving a total loss of cargo plus bunker fuel.

The federal government departments and agencies said that Environment and Climate Change Canada, because it supports Canada's marine spill prevention and response regime, and Parks Canada Agency, because it manages potentially affected lands and waters, should be added to the list of departments in Condition 91 that Trans Mountain must consult with in developing a plan describing how it will meet the requirements of Condition 133. Numerous participants such as the T'Sou-ke Nation, Ditidaht First Nation, Malahat First Nation, and the IAMC Indigenous Caucus recommended that Condition 91 be amended to also include the requirement for consultation with Indigenous groups and the IAMC in developing the plan. The IAMC said that it should be given a formal role in co-developing the Condition 91 plan.

Figure 31: Enhanced Response Regime Bases and Equipment Allocation

Spill response from enhanced tug escort

As part of its commitment for enhanced tug escort, Trans Mountain said that it was evaluating the feasibility of using escort tugs to assist with spill response. Since the tug would be in close proximity of the tanker, the tug may facilitate booming the casualty even before the six-hour response time of the WCMRC. Trans Mountain noted planning for escort tugs to assist in spill response was currently on hold as result of the Federal Court of Appeal decision regarding the Project.

In its reports prepared for the Cowichan Tribes, EnviroEmerg Consulting raised concerns regarding the lack of regional based salvage services to prevent or reduce oil release.

Trans Mountain said that escort tugs that accompany loaded tankers from the Westridge Marine Terminal provide equivalent support as salvage vessels. It noted Canadian Coast Guard plans to have two emergency response vessels with towing and fire-fighting capability for the west coast of Canada. Trans Mountain also said that given the level of current risk mitigation measures in place and proposed future risk mitigation measures, including increased tug escort of the tankers, the probability of a tanker requiring salvage is not a credible risk.

Transport Canada said that salvage operations take place after the threat of a spill has been addressed. Salvage operation are the responsibility of the ship owner. Transport Canada assumes an oversight role to ensure that the ship owner is meeting their obligation and that the salvage operation takes place in a safe manner that aims to minimize any further pollution risk. It noted potential legislative changes regarding salvage requirements and it said that issues related to salvage are also addressed in the National Places of Refuge Contingency Plan.

On-water recovery, response effectiveness, and response time

For the OH-001-2014 hearing, using its oil spill model, Trans Mountain assessed the effectiveness of the proposed enhanced response regime. A 16 500 m^3 spill event resulting from a tanker grounding incident at Arachne Reef near Turn Point was compared with and without spill response mitigation. Trans Mountain said that the oil spill model was revised to include consideration of various response measures and techniques over the four day simulation period. Trans Mountain noted that the four day simulation period was selected based on the slick thickness on water. After the end of the fourth day, the slick became too thin to be efficiently recoverable and although some oil could still be recovered, it became difficult to

quantify. Trans Mountain said that a primary response technique assessed was double booming[133] of the tanker. Trans Mountain said that this tactic is highly effective in containing the spread of oil and assisting in its recovery, since oil within the boom would be thick and fresh and amenable to skimming and pumping.

The City of Vancouver, Tsleil-Waututh Nation and Tsawout First Nation prepared a marine oil spill response capacity analysis. This work estimated the percentage of a worst-case oil spill that could be recovered at each site modeled during the first 72 hours of the response, showing how response capacity varies by location and time of year. Spill volumes modeled were 8 000 m^3 for a ship at berth at the WMT and 16 000 m^3 for four locations along the tanker routes. The estimate included the additional resources that Trans Mountain noted that WCMRC would be obtaining. The participants said that the modelling approach does not incorporate other limiting factors, such as the likelihood that oil will strand on shorelines before it can be recovered, or the potential for diluted bitumen to submerge or sink so that it cannot be recovered using oil skimmers. The highest recovery estimate was for a summer spill at the Central Harbour site in Burrard Inlet, with the model showing that 78 per cent of the oil could be recovered using skimmers. The lowest modeled recovery estimates were for winter spills at Georgia Strait and Haro Strait, where the model estimates that only 15-16 per cent of a 16 000 m^3 spill would be recovered within 3 days of the spill. Overall the work concluded that on-water oil spill recovery capacity is reduced during winter months by as much as 50 per cent compared to summer and that the spill response forces currently available in Southern B.C. have the capacity to recover only 10-20 per cent of a worst-case oil spill under favourable conditions.

The Shxw'ōwhámel First Nation noted that during the Deepwater Horizon spill response, approximately 3 per cent of the oil spilled was recovered in open water.

Trans Mountain said summer weather conditions were simulated for the hypothetical incident. It said that the weather conditions selected were based on the representativeness of the resulting spill in terms of environmental and human-health consequences. In the summer season, warmer water and air temperatures would facilitate more rapid dissolution or volatilization of lighter pseudo-components of the oil into water or air, respectively. It said that this was a conservative approach, as the concentration in water or air would be increased by rapid dissolution or volatilization. Generally lower wind speeds during the summer would result in less wave action and hence, less vertical mixing of the water column and higher concentrations of dissolved hydrocarbons in the surface water layer. Trans Mountain said that there would also be less dilution of vapours in air. Trans Mountain said that the weather conditions modeled were amenable for response activities.

Under the conditions modeled, Trans Mountain said that, after 4 days, there was almost no oil inside the containment boom as a result of recovery operations and less than 10 per cent of the spilled oil was left on the water. The fraction of spilled oil that contacted shorelines was reduced from about 70 per cent in the unmitigated case after 15 days, to 25 per cent in the mitigated case. Over half the oil was recovered from the water surface during Trans Mountain's modelling analysis. Trans Mountain said that this amount was very high compared to historical recoveries at large spill incidents. Trans Mountain and the Province of British Columbia referred to information from the International Tanker Owners Pollution Federation that said that oil recovery rates at sea vary depending on circumstances but typically, they range from 10-15 per cent or less. Trans Mountain noted a few reasons explaining the high rate of recovery in its study including proper planning, the addition of equipment staging and additional bases along the shipping route, and the use of leading edge oil spill modelling.

Transport Canada said that it is not possible to provide a standard estimate of the percentage of oil recovered from a spill. The size of the spill, oil type, response methods and the environmental conditions at the time of the incident all affect how much oil is recovered. Depending on the type of product, a significant portion is lost to evaporation. Similarly, ECCC said as there are many factors that affect recovery rates and due to the fact that each spill incident is unique, it is extremely difficult to predict recovery rates.

Trans Mountain said that the key to meeting proposed response thresholds is reaching the spill site quickly and responding to the spill in an effective manner. Trans Mountain provided a response gap analysis which found that the annual percentage of time that on-water oil spill response in the marine environment may be halted, or limited in effectiveness due to environmental conditions such as wind, waves and tides/ currents varies based upon the location along the shipping route. The analysis indicated that effective on- water response could be mounted the majority of time along the tanker routes with potential effectiveness diminishing towards the western portion of the route in the Strait of Juan de Fuca. In the event that environmental conditions temporarily limit on-water response operations, Trans Mountain outlined other spill response activities that could occur away from the spill site.

The City of Vancouver, Tsleil-Waututh Nation and Tsawout First Nation also prepared a response gap analysis that concluded that on-water recovery efforts combined with aerial reconnaissance would be limited to varying degrees throughout the tanker routes. Depending on the location assessed, a response gap (i.e., no response possible) ranged from

[133] Primary and secondary containment, essentially sufficient boom to wrap the stranded vessel twice.

56 to 78 per cent of the time in the winter and 34 to 49 per cent of the time in the summer. Response conditions were generally more favorable in the Burrard Inlet inner harbour area as compared to open water sites.

The District of North Vancouver said that the weathering characteristics of spilled diluted bitumen indicate the importance of a rapid response time to a spill within Burrard Inlet. Without a rapid, effective response and quick containment and recovery of a spill within the first few hours, it is likely impossible to avoid the formation of tar balls and the spread of oil on the water surface and sub-surface with subsequent shoreline impacts as well. The Cowichan Tribes and District of North Vancouver said that initial spill response could be delayed due to health and safety concerns for responders resulting from chemical characteristics of spilled dilbit. Trans Mountain said that site safety and health procedures for spilled dilbit are no different than for any other spill of heavy crude oil and it outlined procedures to safeguard personnel working on- water and on-shore.

Canadian Coast Guard said that weather conditions, including rough sea-states, strong winds, snow, and ice coverage can all impact response operations, and Canadian Coast Guard, in collaboration with its response partners, supported by scientific expertise coordinated through ECCC, takes weather conditions into consideration as part of all response activities.

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The Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, and the City of Vancouver submitted an updated assessment of oil spill response capabilities and limitations associated with marine shipping prepared by Nuka Research and Planning Group. The report considered the times within which marine spill response could occur (marine oil spill response gap analysis) and the required resources (marine oil spill response capacity analysis). Nuka said that the conclusions it reached in its 2015 report continue to apply to the Project which said that there are periods of time when response may not be possible due to environmental and other conditions and that there is a lack of resources available for spill response. Nuka said that even with implementation of the enhanced marine oil spill response program, the on-water recovery capacity in the Canadian Salish Sea region would still be less than half the present capacity in the US Salish Sea. Nuka also discussed additional approaches and methodologies to spill response planning based on work completed since the Board's OH-001-2014 Report.

Trans Mountain compared oil spill response regulations in Canada and the US. Trans Mountain concluded that with implementation of its proposed enhanced marine oil spill response regime, WCMRC's response capacity would be commensurate with the legislated worst-case discharge planning standards in the US. It said that the intent of the Canadian regime is to ensure that a level of preparedness exists such that a suitable response is in place and ready to be deployed in the event of any spill, regardless of size and condition. National and international mutual aid agreements are also part of a response organization's capability for spills that exceed their capacity.

Georgia Strait Alliance expressed similar concerns regarding environmental conditions that could limit on-water response. It provided an analysis as to wind, wave, and tidal conditions that could lead to potential containment boom failure. Georgia Strait Alliance said that the regulations governing Response Organizations such as WCMRC are broad rather than prescriptive, and do not set out the amount and type of resources that WCMRC must maintain. It said that a lack of assessment or prescription of the amount or type of response capacity for equipment and personnel does not allow for an effective response. Georgia Strait Alliance recommended that the federal government should assess regulatory requirements for marine spill response related to areas such as response capacity, prescription of requirements, response gap analysis, and clean-up standards.

WCMRC discussed concerns that it had with Georgia Strait Alliance's assessment of the effectiveness of booms under certain environmental conditions. It did not agree with the wave and wind data used or how it was interpreted. WCMRC said that it believes that intervenors should be "cautious" in relying on the information contained in the Georgia Strait Alliance report. It also said that questions related to response limitations due to environmental conditions were considered in the OH-001-2014 hearing.

A recent spill event on the West Coast that WCMRC responded to was the grounding and subsequent sinking of the tug Nathan E. Stewart near Bella Bella, B.C. in October 2016. WCMRC said that response operations were halted due to weather conditions for 11 days out of 40 (27.5 per cent). It said that during the response, WCMRC boom, vessels and skimmers were positioned correctly and continually adjusted according to the prevailing conditions. WCMRC said that on two occasions, containment boom around the Nathan E. Stewart was damaged due to wave action during stormy weather and required replacement. WCMRC said that the weather conditions encountered during the Nathan E. Stewart were not unusual and are well within the Planning Standards for Response Organizations. It said that it would be able to implement an effective spill response in case of a spill from a Project-tanker under similar circumstances. In its report on the incident, the Transportation Safety Board said there was no delay by Canadian Coast Guard and WCMRC in their reaction to the incident and the oil spill response, and that the recovery efforts of both organizations met the prescribed time standards.

The Lyackson First Nation also expressed concerns regarding unfavorable weather conditions and difficult access limiting or halting spill response efforts.

In its reports prepared for the Cowichan Tribes, EnviroEmerg Consulting said that there is significant uncertainty regarding the efficacy and efficiency of current response technologies and tools used to manage a spill of diluted bitumen, an unconventional oil, in the Salish Sea. It said that there may be periods of time where oil response activities cannot be undertaken due to environmental conditions and for responder safety reasons. Among other topics, the reports also expressed concerns regarding oily waste management. EnviroEmerg provided updated evidence to support its conclusions from its report filed in the OH-001-2014 hearing. EnviroEmerg said that the new evidence does not fundamentally change the issues and concerns that it raised in the OH-001-2014 hearing and that rather, it intensifies them.

WCMRC discussed potential oil spill recovery rates and associated oily waste management. It said that current recovery technologies are more efficient in terms of oil to water recovery ratio. It noted that each oil spill is unique and the response would be commensurate with many factors including those which may affect recovery rates and oily waste management. In addition to its own resources for storage of oily waste, it said that it maintains relationships with certified waste haulers and disposal facilities as well as shore and floating storage providers. These resources would be assigned as per the Waste Management Plan approved by Unified Command.

Canadian Coast Guard said that it maintains storage capacity in the region to store and transport oily waste and that additional Canadian Coast Guard capacity could be cascaded to the impacted area from other regions of Canada, if required. Additional storage capacity, such as tankers and barges, could also be contracted during a response operation to meet any anticipated volume of oily waste. It said that incident-specific waste management plans are developed at the time of an incident based on the specific products, volumes and locations, and are reviewed to ensure that they meet local, provincial and federal laws and regulations. Canadian Coast Guard also described methods for transferring highly viscous oils such as weathered diluted bitumen as part of oily waste management.

Transport Canada noted that a response organization must demonstrate that it has sufficient storage capacity to maintain oil/oil water waste recovery operations 24 hours a day. In addition, through mutual aid agreements and arrangements with other response organizations and contractors, responders have access to cascading resources that expand capabilities beyond the Transport Canada-mandated spill threshold of 10,000 tonnes

Environment and Climate Change Canada said that the recovery rate or efficacy for any spill is a challenge to quantify. Each incident is unique and the response efficacy varies with the circumstances of the incident. It said that the recovery of oil from shorelines can be quite high under favourable conditions but that the actual recovery rate will depend on spill conditions and aggressiveness of clean-up operations. The selection of clean-up objectives and endpoints is key in determining the extent of recoverable oil. Environment and Climate Change Canada noted that clean-up objectives and endpoints are established based on net environmental benefit analysis in consultation with the responsible party, regulatory agencies and operational group.

Inclusion of Indigenous peoples in oil spill planning and response

During the MH-052-2018 hearing, evidence was filed regarding initiatives aimed at including Indigenous people in marine spill response planning since the Board's OH-001-2014 Report.

A number of First Nations such as the Cheam, Chawathil, Kwantlen, Seabird Island Band, and Pacheedaht Nations and Stó:lō Tribal Council noted the importance of including Indigenous people in marine oil spill planning and response.

The IAMC Indigenous Caucus said that Indigenous peoples and interests must be fully integrated into the oversight of the Project, including in areas related to emergency preparedness and response. It noted the work of the IAMC Marine Shipping Subcommittee which addresses meaningful Indigenous inclusion in spill preparedness and response and Indigenous inclusion in marine Stewardship, planning, and monitoring.

Government of Canada initiatives

The federal departments and agencies discussed a number of initiatives aimed at strengthening partnerships and launching co-management practices with Indigenous communities under the Oceans Protection Plan. They said that partnerships and agreements will be jointly developed, reflect the priorities and interests of Indigenous communities and Canada, advance common issues and achieve tangible outcomes that meaningfully contribute to reconciliation.

The Canadian Coast Guard said that it has been working with First Nations communities to build capacity for incident response and it noted the following:

- Indigenous Community Response Training - This initiative under the Oceans Protection Plan is enhancing Canada's community-based marine emergency preparedness and response capacity by providing training to the individuals who are frequently the first responders to a marine emergency in B.C., particularly in remote/northern coastal

areas. It has funded a variety of training programs, including Coastal Nations Search and Rescue, Marine Advanced First Aid, Small Vessel Operators' Proficiency, Incident Command System (ICS) and Marine Oil Spill Response. Canadian Coast Guard listed a number of coastal B.C. nations that had participated in the training. This training is then applied in joint operational exercises that incorporate all on-water first response partners, such as the Coast Guard Auxiliary, First Nations communities, Parks Canada, other federal, provincial, and municipal partners and any other implicated organizations.

- Indigenous Coast Guard Auxiliary – The Coastal Nations Coast Guard Auxiliary was established in 2018. This organization enhances the already established Auxiliary capacity in B.C. It has two units that are operational in the Ahousaht and Gitxaala Nations. Each community represents an Auxiliary unit with vessels and volunteer crews that are trained and ready to respond to marine emergencies/Coast Guard taskings. Establishment of units on the south coast will be based on an analysis of the maritime search and rescue needs in that area, and take into account the interest and capacity of Indigenous Nations to participate in the Auxiliary.
- Geographically Specific Response Plans - The Canadian Coast Guard is working directly with Indigenous Groups to develop Geographically Specific Response Plans in the South Coast. This process is ongoing and as plans are developed, they will be jointly exercised, updated, and collaboratively maintained going forward. For alerting and notification purposes, the Canadian Coast Guard maintains a contact list for Indigenous groups throughout coastal waters of B.C. The Coast Guard will notify Indigenous groups directly during an incident, as/when appropriate.
- Environmental Response Internship – This pilot program between 2016 and 2018 trained eight members of seven First Nations to date (Gitga'at, Gitxaala, Tsawwassen, Tsleil-Waututh, Pacheedaht, Musqueam, and Beecher Bay First Nations). The objectives were to increase a community's capacity and capability to respond to pollution incidents, reduce response times to pollution incidents, enable Coast Guard to expand its network of trained personnel to assist with incidents, and support long-term collaboration between the Coast Guard and coastal First Nations. At the end of each internship, the participating communities were provided with funding to secure a container of response equipment to enable it to respond and integrate with Coast Guard and other response partners on clean-up and monitoring operations. These First Nations were also offered the opportunity to participate in Incident Command System and marine oil spill response training for additional community members.

Canadian Coast Guard said that as a result of training and exercise programs and response planning initiatives, Indigenous groups are pre-established as Incident Commanders in Canadian Coast Guard contingency response plans. Consequently Indigenous governments may choose to participate and lead in environmental response operations activated by the Canadian Coast Guard within their traditional territories in B.C.

WCMRC initiatives

WCMRC said that it works closely with First Nations and coastal communities in order to integrate their input into areas of spill response pre-planning and readiness in their area. There are many ways communities become involved, including participating in response training, contributing local knowledge and expertise, storing specialized spill response equipment caches in their communities (Coastal Response Packages), becoming a response contractor, or helping to identify local sensitivities to ensure vital resources are accounted for. WCMRC noted:

- Training – WCMRC offers training opportunities to interested Indigenous nations to support their understanding of spill response and the Incident Command System.
- Geographic Response Strategies - WCMRC said that it is committed to ongoing engagement with interested groups to develop geographic response strategies for sites that are important to them. WCMRC has reached out to all Indigenous Nations with traditional marine territory with offers to collaborate on the development of geographic response strategies. WCMRC has had representatives from six different First Nations during actual geographic response strategies field deployments and it has engaged with numerous other First Nations during data collection and when identifying sensitive sites.
- Capacity Building and Employment - WCMRC has a number of Indigenous Nations as long term contractors and intends to develop an oil spill response base in the traditional territories of the Sc'ianew (Cheanuh) First Nations' at Beecher Bay. WCMRC has reached out to other Indigenous Nations to assess the practicality of locating response bases on their reserves and it has discussed other employment and contracting opportunities such as those available in the Vessels of Opportunity (VOO) programs including marine contractors. WCMRC said that it works with and employs members of First Nations and coastal communities along B.C.'s entire coastline.
- Coastal Response Program – WCMRC launched the Coastal Response Program in 2017 to ensure coastal communities are integrated into spill response. As part of the program, WCMRC works with First Nations, local communities and governments to ensure they are prepared should a spill occur in their area. Opportunities for community involvement include supporting spill responders during an incident, deploying coastal protection

strategies, contributing local marine expertise, and participating in the mapping of coastal areas to ensure vital resources are accounted for. WCMRC currently has custodial agreements with First Nations and coastal communities to store coastal spill response packages throughout the geographic area of response. WCMRC owns the equipment in these packages and trains local Vessels of Opportunity members to properly deploy, store and maintain the equipment. A Vessel of Opportunity is a vessel whose crew is trained by WCMRC to respond to marine oil spills. Vessels of Opportunity support spill responders, deploy coastal protection strategies and provide invaluable marine expertise during a spill. WCMRC said that it has begun the process to identify locations for packages in the Increased Response Area of the enhanced marine oil spill response regime and will begin to deploy packages in 2019.

Views of the Reconsideration Panel

The Board finds that Trans Mountain's application met the requirements outlined in the Board's 10 September 2013 "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities" and the Board's 12 October 2018 Filing Requirements for the MH-052-2018 hearing regarding marine emergency preparedness and response planning.

As noted in Section 14.11.2, the evidence indicates that tanker spills are not likely events. Nonetheless, it is prudent and standard practice to prepare an appropriate response to small and large spill events in any industrial endeavor, such as the Project and related marine shipping.

General principles of marine spill response

The Board accepts evidence filed by Trans Mountain and numerous participants, which in its view, indicates that there are principles that are generally applicable to marine spill response. For example, the Board agrees with The District of North Vancouver which said that spills can happen even with the best possible measures in place and even the best possible spill response system cannot guarantee that resources at risk will be protected from negative impacts if a spill occurs. The Board summarizes these principles as follows and notes that these statements are applicable broadly, and are not necessarily limited to spills associated with the Project and related marine shipping or to a diluted bitumen spill:

- The circumstances associated with each spill event would affect the success of the response and there is no guarantee that a spill response would result in the on-water recovery of a significant portion of the oil spilled.
- On water spill response may not always be possible due to environmental conditions but during such times, other response measures such as shoreline protection and clean-up or tracking of oil would likely be possible.
- Response could be delayed due to responder safety.
- Even with response efforts, any large spill event would result in significant adverse environmental and socio-economic effects.

In providing the following views, the Board has considered these General Principles of Marine Spill Response.

Marine spill response regulatory framework

The Board recognizes the regulatory framework that applies to marine oil spill preparedness and response. The Board summarized this framework in Section 14.3.

As previously noted, the evidence before the Board indicates that there are competent authorities responsible for the marine oil spill preparedness and response regime and that the regime is functioning appropriately. Any changes to the existing regime would be the responsibility of these competent authorities. The evidence indicates that the regime is reviewed periodically and in fact, evidence filed by the federal government departments and agencies and WCRMC during the MH-052-2018 hearing indicates that there have been improvements to the regulatory framework since the Board's OH-001-2014 Report. Some of these improvement initiatives have been completed and some are ongoing. The Board accepts that such improvements will further contribute to spill response associated with Project and non Project-related vessels and recognizes that a number of initiatives are still ongoing.

Trans Mountain does not own the ships associated with the Project-related shipping and therefore, has limited control over the ship owner's pollution response planning. Evidence filed by Trans Mountain, Transport Canada and Canadian Coast Guard confirms that vessel owners must have an agreement in place for spill response WCMRC and that the vessels must also have a Shipboard Oil Pollution Emergency Plan.

Oil handling facilities, such as the Westridge Marine Terminal, must have an agreement in place with WCMRC, an Oil Pollution Emergency Plan and an on-site Oil Pollution Prevention Plan. As the Westridge Marine Terminal is regulated by the National Energy Board, it would also be subject to the response planning requirements contained within the *National Energy Board Onshore Pipeline Regulations*.

In addition to the regulatory framework improvement initiatives discussed by participants, the Board also heard concerns from participants such as Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, the City of Vancouver, Georgia Strait Alliance, and the Cowichan Tribes regarding oil spill response planning for Project-related tankers and other vessels.

The Board recognizes that participants such as the T'Sou-ke Nation and the Friends of Ecological Reserves said that there is a need for the Government of Canada to revise the existing response organization standards. The Board notes that Transport Canada said that it is currently reviewing these standards.

Further, to increase transparency of information, the Board recognizes that the Vancouver Fraser Port Authority recommended that an annual report be filed to Parliament by the Canadian Coast Guard that addresses marine oil spill response planning and preparedness activities.

To promote continued improvement in the marine oil spill response regulatory framework, the Board included Recommendation 7 which would require that the GIC review and update federal marine shipping oil spill response requirements. This recommendation has been crafted such that it would include consideration of the concerns noted by the above parties.

Responding to a diluted bitumen spill

The Board heard concerns raised by parties such as Cowichan Tribes, Shxw'ōwhámel First Nation and Living Oceans Society regarding challenges in responding to submerged or sunken diluted bitumen. The Board agrees there is the potential for diluted bitumen to submerge in water but it notes that sinking of diluted bitumen in large, contiguous amounts is not likely. The potential fate and behavior of diluted bitumen is discussed in Chapter 8.

The Board acknowledges that the physical and chemical characteristics of diluted bitumen, like other similar heavier oil products, present response challenges. The Board is of the view that Trans Mountain has provided sufficient information as to how the potential fate and behavior of diluted bitumen would be considered in spill response planning. Evidence filed by Trans Mountain and parties such as Living Oceans Society and the Shxw'ōwhámel First Nation indicates that there are tools and techniques available for responding to heavy oils like diluted bitumen. These tools and techniques are primarily focused on detection and recovery, on-water mechanical recovery and shoreline clean-up. The success of each would depend on the specific circumstances associated with the spill.

The Board found in Chapter 8 that diluted bitumen is likely to weather quite quickly to a Group IV oil state for response purposes. The Board also found that weathered diluted bitumen has potential to emulsify or potentially submerge in water. Due to its weathered state, and the physical geography within Burrard Inlet and along the tanker routes, diluted bitumen would also likely strand on shorelines if not recovered on water. A portion could also submerge and wash up on shore some distance from the spill site. A rapid on-water response would assist in mitigating shoreline impacts. The Board notes that Trans Mountain's proposed marine oil spill response improvements would substantially reduce response times along the tanker routes and within Burrard Inlet.

Based on the report by Logan, the Raincoast Conservation Foundation said that the use of dispersants on a weathered diluted bitumen spill is not likely an effective response tool. The Board agrees. The Board notes that in its OH-001-2014 Report, it concluded as follows: "... the Board is of the view that diluted bitumen could pose particular challenges in response and clean-up due to its potential for submergence and emulsion formation, persistent chemical and physical properties, and potential for shoreline stranding. These characteristics also lessen the potential for use of counter measures, such as dispersants and in-situ burning. Environmental conditions and spill-specific factors would influence the use of such response tactics. The Board is of the view that these response challenges are not unique to diluted bitumen spills, but can be associated with heavier oil products in general." Upon consideration of the relevant evidence from the OH-001-2014 hearing, MH-052-2018 hearing and findings in Chapter 8, the Board affirms this view.

The Province of B.C. and other participants stressed the need to consider sunken and submerged oil in response planning. The Board agrees that this is an important consideration. The Board finds that evidence presented by Trans Mountain, WCMRC, and the federal departments and agencies confirms that the potential for submerged and sunken oil has been considered in response planning.

Proposed improvements to spill preparedness and response measures

The Board notes that the Canadian Science Advisory Secretariat concluded that prompt response actions are of upmost importance for any spill (Chapter 8). Other evidence presented in Chapter 8 indicates that the physical and

chemical properties of diluted bitumen can change relatively rapidly once spilled in water and that viscosity and density change more rapidly for diluted bitumen compared to conventional oil.

The Board is of the view that Trans Mountain, in conjunction with WCMRC, is proposing appropriate measures to respond to potential oil spills from Project-related tankers. The enhanced oil spill response regime committed to by Trans Mountain was informed by Trans Mountain's marine shipping risk assessment and would result in a substantial improvement to marine oil spill response on the west coast that exceeds current regulatory requirements. This enhanced marine oil spill response regime would be capable of delivering 20,000 tonnes of capacity within 36 hours of notification, with dedicated resources staged within the study area in place. The regime would also be capable of initiating response within 2 hours for spills in Vancouver Harbour and within 6 hours for the remainder of the Salish Sea shipping route to the 12-nautical-mile limit. Implementation of the enhanced response regime would result in a response capacity that is double, and a delivery time that is half, that required by the existing planning standards.

The Board is of the view that the marine spill response measures proposed by Trans Mountain are in line with the Board's application of the precautionary principle. Although an oil spill from Project-related vessels that would result in significant environmental effects is not likely, this does not mean that the risk of an oil spill is zero. Thus, it is imperative that appropriate spill response measures are in place to mitigate the potential negative effects associated with a spill.

The Board has already concluded that there are competent authorities responsible for the marine oil spill preparedness and response regime and that the regime is functioning appropriately. In light of this, the Board gives substantial weight to the evidence presented by the parties primarily responsible for marine shipping spill response (Canadian Coast Guard, WCMRC, and Environment and Climate Change Canada) regarding marine shipping spill response planning and implementation, including that for Project-related tankers. The Board recognizes the expertise of these parties.

The Board notes that oil spill response would be further augmented by oil spill response improvements discussed by the federal departments and agencies, particularly the Canadian Coast Guard, that have occurred since the Board's OH-001-2014 Report. The Board recognizes Trans Mountain's efforts to date to also evaluate the feasibility of using escort tugs to assist with spill response to further contribute to enhanced spill response measures. Should it come to fruition, spill response from the escort tugs would further contribute to enhanced spill response measures by reducing response times with readily available equipment on the escort tugs. However, the Board notes that this was only at the stage of early consideration and this work is currently on hold.

In Section 14.11.2, the Board said that the purpose of marine shipping risk assessments is to inform marine shipping safety and spill response planning. Trans Mountain used its marine shipping risk assessment to inform its enhanced marine spill response measures. As noted in Section 14.3, the Board does not have regulatory jurisdiction over marine emergency preparedness and response planning. However, the Board would impose Conditions 91, 133, and 144 to ensure implementation of Trans Mountain's proposed emergency preparedness and response measures that exceed regulatory requirements.

Evidence filed by Trans Mountain and WCMRC confirms that appropriate planning was being undertaken to implement the enhanced marine oil spill response regime. The Board requires that this planning would continue should the Project receive approval.

The Board heard concerns that sufficient resources should be in place to respond to the complete loss of a tanker's cargo. The evidence presented in Section 14.11.2 indicates that complete loss is not a likely scenario. However, should such an event occur, evidence filed by Trans Mountain, WCMRC, and the Canadian Coast Guard indicates that WCMRC and the Canadian Coast Guard have the ability to mobilize resources to respond to a spill that is larger than the credible worst-case scenario. Such resources could be mobilized from around the world, if necessary.

Many participants, such as Georgia Strait Alliance, Lyackson First Nation, Tsleil-Waututh Nation, Squamish Nation, and the City of Vancouver expressed concerns regarding spill response under varying environmental conditions. The Board notes that response gap analyses were prepared by Nuka and Trans Mountain and issues pertaining to potential response gaps were considered in the OH-001-2014 hearing. The Board recognizes the need to consider potential response gaps in response planning and in fact, Trans Mountain's response gap analysis was provided at the request of the Board through an information request. The Board is of the view that Nuka's response gap analysis supports the Boards conclusions in its 2016 report regarding general principles of marine spill response as noted above. The Board is of the view that the response gap analyses indicate that environmental conditions are conducive to oil spill response the majority of time along the tanker routes depending on location, time of year, and site-specific environmental conditions. It is a generally accepted principle of marine spill response that the circumstances associated with each spill event would affect the success of the response and there is no guarantee that a spill response would result in the on-water recovery of a significant portion of the oil spilled. Further, on water spill response may not always be possible due to environmental conditions but during such times, other response measures

such as shoreline protection and clean-up or tracking of oil would likely be possible. To the extent that response planning approaches and methodologies noted by Nuka would further enhance marine oil spill response, the Board recommends that the GIC consider such approaches and methodologies as part of any work undertaken in response to Recommendation 7.

The Board is of the view that most of the issues raised in the updated technical evaluation report prepared by EnviroEmerg Consulting and filed as part of the MH-052-2018 hearing are not materially different than those included in the report filed in the OH-001-2014 hearing. These include concerns related to response technologies for diluted bitumen spills, response gaps, and oily waste management which were considered by the Board in the OH-001-2014 hearing and informed its views and recommended conditions regarding response planning. Updated evidence filed in the MH-052-2018 hearing also included information that related to oil fate and behaviour and associated response planning and response gaps. The Board's views on the environmental behaviour of spilled oil are provided in Chapter 8. Its views regarding response planning and response gaps are discussed throughout this section. The evidence provided by EnviroEmerg, on behalf of Cowichan Tribes, has also informed the Board's Recommendation 7 as discussed below.

The evidence in Section 14.11.2 indicates that a large spill of 8 000 m^3 for a tanker at the WMT or a 16 000 m^3 spill within Burrard Inlet and English Bay area are not credible worst-case spill scenarios. The Board has therefore given little weight to evidence showing potential effects associated with such a scenario or the response capacity analysis commissioned by the City of Vancouver, Tsleil-Waututh Nation and Tsawout First Nation for these areas. Any spill in these areas would also be subject to response efforts.

The Board notes that some participants appear to have misunderstood Trans Mountain's commitment regarding enhanced marine oil spill response and the intent of the related Conditions 91, 133, and 144.

NS NOPE said that a 36 hour response time was inadequate as such a time period would encompass three entire tidal cycles. Barkley Sound Stewardship Alliance said that the 36 hour response time is too long to facilitate an effective response. The Board notes that the 36 hours is in reference to delivering 20,000 tonnes of capacity within 36 hours of notification. Under the enhanced response regime, the time for initiating a response within Vancouver Harbour would be a maximum of two hours and for the rest of the shipping route, response would be initiated within 6 hours. The Board has clarified this commitment through revisions to Condition 133.

Many participants referred to the need to include Indigenous groups as a party to be consulted with in Condition 91. The federal government departments and agencies said that Environment and Climate Change Canada and Parks Canada Agency should be added to the list of parties to be consulted. The Board notes that the intent of Condition 91 is to ensure proactive planning on the part of Trans Mountain as to how it will meet the requirements of Condition 133 which addresses two specific commitments of Trans Mountain regarding enhanced tug escort and enhanced marine oil spill response that exceed regulatory requirements. Condition 91 does not address an assessment of specific plans associated with these commitments. Further, the Board notes that the parties listed for consultation are government bodies with specific regulatory authority and expertise for marine safety and spill response and those that were involved in the TERMPOL Review Committee or previous discussions with Trans Mountain regarding its commitments. Therefore, the Board does not see the need to broaden the list of parties to be consulted with in Condition 91. The Board notes that all filings associated with any Conditions will be publically available on its website.

The Indigenous Caucus for the IAMC said that it should be given a formal role in co-developing the Condition 91 plan and it made a number of suggested revisions to Condition 91. The Board notes that the Terms of Reference for the IAMC were co-developed amongst the parties comprising the IAMC. Among other things, the Terms of Reference address the potential inclusion of the IAMC in condition compliance monitoring for the Project. The Board is of the view that it would not be appropriate to specifically include the IAMC in condition compliance and monitoring activities beyond those that have already been agreed to or currently under discussion amongst the broader membership of the IAMC.

The Board notes that it has also developed Recommendations 7 and 11 that speak specifically to the inclusion of Indigenous people in marine safety and spill response initiatives.

Gerald Graham recommended that the Board's Condition 133 should require Trans Mountain to confirm that the enhanced marine oil spill response regime is sufficient to clean up a marine oil spill involving a total loss of cargo plus bunker fuel. The Board does not agree that Condition 133 needs to be revised in this regard. The Board notes that Condition 133 addresses a specific commitment made by Trans Mountain regarding implementation of the enhanced marine oil spill regime as defined. The Board notes that, although not a likely event, it considered the issue of response to the complete loss of a tanker's cargo in the OH-001-2014 hearing. Further, as discussed above, the Board notes that Transport Canada is reviewing the Response Organization Standards and the Board has included this in its Recommendation 7 regarding marine oil spill response.

In response to comments received from parties such as the Province of B.C., Georgia Strait Alliance, Living Oceans Society, T'sou-ke First Nation, and the Cowichan Tribes, the Board has revised Recommendation 7. The need to consider response planning for SARA-listed species, salvage requirements, and oil fate and behaviour research has been added. These parties also expressed concerns regarding issues such as response times, waste management, and recovery capacity. The Board notes that the Response Organizations Standards address these issues and it expects that they will be considered as part of Transport Canada's ongoing review of the Response Organizations Standards.

The Board heard several comments from municipal governments and the North Shore Emergency Management Office that they were not sufficiently engaged in the marine spill response planning process and that they were not receiving sufficient information regarding their potential role in marine spill response. The Board shares the view of these participants that engagement with local governments, including Indigenous groups and emergency responders, is important and those potentially involved in the response should be engaged, to the extent that they choose, in the planning process. Therefore, the Board would impose Condition 90 requiring Trans Mountain to engage with various parties when preparing its Emergency Management Program as it applies to the WMT.

The Board has no jurisdiction to compel consultation regarding marine spill response planning with potentially affected municipal governments and Indigenous groups along the Project-related tanker routes. The Board is of the view that engagement with competent authorities, such as Canadian Coast Guard and Transport Canada, WCMRC, municipal governments and Indigenous groups, would further inform the spill response planning process. The evidence indicates that such consultation is ongoing.

Inclusion of Indigenous peoples in oil spill planning and response

The evidence before the Board indicates that since its OH-001-2014 Report, there have been substantial investments made by the federal departments and agencies and WCMRC aimed at including Indigenous people in marine oil spill planning and response. The Board also heard concerns from First Nations regarding the actual implementation of such initiatives. The Board notes that the IAMC has been operational since 2017 and as discussed in Chapter 5, is already participating in emergency management and marine exercises. The Board sees value in the role of this existing committee and encourages its participation in ongoing spill planning and response efforts.

To promote the continued participation of Indigenous people in marine oil spill planning and response, the Board has specifically included the need for such inclusion in Recommendation 7. Recommendation 11 addresses engagement with, and feedback from, the Indigenous Advisory and Monitoring Committee on the marine safety system and Project-related marine shipping activities that intersect with Canadian Coast Guard operational programs.

Future spill response research and initiatives

The Board notes that evidence filed by Trans Mountain, WCMRC, and the federal departments and agencies indicates that there has been substantial progress in spill response research and initiatives since the Board's OH-001-2014 Report. This includes work related to geographic-specific response plans, geographic response strategies and coastal mapping, oil fate and behaviour (see Chapter 8) and response strategies research, and inclusion of Indigenous people in response planning.

The Board is of the view that this work has already contributed to marine spill response planning for the Project and future work should continue to do so.

The Board notes Washington State Department of Ecology's suggestion regarding establishment of a joint geographic response plan with Washington State Department of Ecology for vessels carrying diluted bitumen through shared waters in the Salish Sea. The Board understands that Trans Mountain would not be responsible for completing this task. Competent authorities such as Canadian Coast Guard and Transport Canada, and the certified response organization WCMRC, could engage Washington State further should they see merit in this suggestion.

Chapter 8 includes a discussion on research related to the fate and behaviour of spilled oils and how this research could inform spill response planning.

14.12 Financial responsibility, liability, and insurance

14.12.1 *Marine Liability Act* - Financial responsibility and compensation

In the OH-001-2014 hearing, Transport Canada and Trans Mountain said that the *Marine Liability Act* establishes the framework for marine liability and compensation in Canada and reflects Canada's role as a signatory to the International Oil Pollution Compensation Funds and the Civil Liability Convention. The *Marine Liability Act* also establishes the Ship-source Oil Pollution Fund that provides funding for spills from all classes of vessels in Canadian waters. The Ship-source Oil Pollution

Fund provides funding in addition to the funding available under the international funds. The classes of claims for which the Ship-source Oil Pollution Fund may be liable include:

- claims for oil pollution damage;
- claims for costs and expenses of oil spill cleanup, preventive measures and monitoring; and
- claims for oil pollution damage and cleanup costs where the cause of the oil pollution damage is unknown.

Trans Mountain said that there is also a widely defined class of parties in the Canadian fishing industry that may claim against the Ship-source Oil Pollution Fund for loss of otherwise unrecoverable income caused by an oil spill from a vessel under the *Marine Liability Act*.

Transport Canada and Trans Mountain said that both the Canadian and international frameworks are based on the "polluter pays" principle, which makes the polluter liable for all response costs and damages associated with an oil spill. In the event of an oil spill from a tanker in Canadian waters, the owner of a tanker (i.e., the Responsible Party) would be liable for the cost of cleanup and compensation to affected parties subject to the limits of their liability.

Trans Mountain described co-insurance or cost-sharing provisions that may apply in the circumstances of a spill at WMT where there is ambiguity as to the source of the spill. Trans Mountain said that co-insurance refers to the sharing of costs associated with a spill event among responsible parties, insurers, and others. It said that co-insurance does not affect or complicate response to the spill but cost sharing among insurers may not be settled until long after claimants have been paid compensation or damages.

Trans Mountain acknowledged the concern raised by several intervenors, that tanker spills would have long- term to permanent effects on their resource-based economy, commercial and traditional harvest activities, culture, and community well-being. It also said that intervenors expressed concern that tanker spills would affect city parks and public spaces, recreational marine use, human health, cultural and historic resources, municipal services, and community well-being. Trans Mountain noted that some intervenors provided estimates of potential spill related damages. Trans Mountain said that the estimates of magnitude and duration provided by intervenors appear to reflect worst-case assumptions and that the effects of a spill would depend on the unique circumstances of a spill, were one to occur.

Trans Mountain said that it is not liable for a tanker-based marine spill and that it had not estimated any costs associated with such a spill. It said that the responsibility for a tanker-based marine spill lies with the tanker owner. Trans Mountain said that, because each spill is different, it is not possible to provide breakdowns or aggregates of costs for a hypothetical event.

Trans Mountain noted the NEB's September 2013 filing requirements regarding environment and socio- economic effects for increased marine shipping activities that specified: "The assessment of accidents and malfunctions must also provide a description of the liability and compensation regime that would apply in the case of a spill." It noted where this information could be found in its application. Trans Mountain submitted that Canada's marine shipping liability and compensation regime is among the most robust in the world and it would be further improved through proposed amendments.

The City of Vancouver said there are a number of potential costs to the City arising from a catastrophic spill. It concluded that a catastrophic spill could present significant costs to the City government of close to $1 billion. In addition, Vancouver said that ocean-economic activities could suffer total losses in excess of $1 billion in the event of a 16 000 m^3 oil spill at the First or Second Narrows within Burrard Inlet.

The City of Vancouver critiqued a number of gaps in the existing national and international compensation regimes, as well as several factors which limit the regime's effectiveness in compensating for the full socio-economic costs of an oil spill. It said that in the event of a large oil spill in Burrard Inlet, the existing compensation regime would be inadequate to fully compensate Vancouver, its businesses and residents, for the associated socio-economic impacts. It said that Vancouver would be only one of many claimants who would be submitting significant compensation claims.

The Tsawout First Nation said costs of tanker spills can vary significantly depending on the characteristics of the area impacted, the conditions at the time of the spill, the spill response and the characteristics of the oil spilled. The Tsawout estimated costs of tanker spills associated with the Project and said that tanker spills from the project could result in significant damage costs that exceed existing compensation schemes. For a tanker spill, it estimated a worst-case spill of 103,782 bbl and that such a spill could exceed available compensation from domestic and international spill compensation funds by $2.9 billion.

Conversations for Responsible Economic Development said that in the case of a major tanker spill, taxpayers would likely be responsible for the burden of costs, as a company's liability is limited to $1.3 billion and a major spill could easily cost ten times this amount.

Trans Mountain reviewed the spill cost estimate reports provided by intervenors and submitted that none of the reports should be used to provide reliable costs potentially associated with a tanker spill. Among other reasons for this conclusion, Trans Mountain said:

- the past incidents used in estimating spill costs were not appropriate;
- inappropriate methods and assumptions were used for estimating spill costs;
- passive use values and ecosystem goods and services were overestimated and inappropriately included in spill cost estimates; and
- spill costs were based on potential spill volumes which were deemed to not be credible.

MH-052-2018 hearing

In October 2018, the Government of Canada introduced legislation to modernize Canada's Ship-Source Oil Pollution Fund, which includes a number of changes from what was described in the OH-001-2014 Hearing.

- First, the Ship-Source Oil Pollution Fund's per-incident limit of liability would be removed, ensuring that unlimited compensation would be available to all eligible claims from victims and responders of oil spills from ships. The Ship-Source Oil Pollution Fund would compensate any eligible costs above the amounts available from ship owner's insurance and the international funds, instead of pro-rating compensation based on the total amount of claims and the amount of funding available.
- Second, if the Ship-Source Oil Pollution Fund contained insufficient funds to fully pay for a spill, then the Minister of Finance could grant a loan to the Ship-Source Oil Pollution Fund to pay all eligible claims. This loan would be repaid through a levy paid by oil receivers and exporters.
- Third, the Ship-Source Oil Pollution Fund can be replenished through an annual levy on oil receivers and exporters, as well as providing the option to impose a temporary supplementary levy if the annual levy is insufficient. However, there is no proposal to reinstate the annual levy unless the Fund is depleted.
- Fourth, the Ship-Source Oil Pollution Fund would provide emergency funding to the Canadian Coast Guard to respond to a significant oil spill. The Canadian Coast Guard would use these funds to respond to the oil spill and compensate third parties for their response activities under its direction.
- Finally, a simplified and expedited process for claims under $35,000 would be established, allowing the Ship-Source Oil Pollution Fund to accept small claims without conducting a full investigation and assessment.

Transport Canada described the types of losses and damages compensable under the *Marine Liability Act* to include measures to prevent or minimize damage; clean-up and containment costs; property damage; environmental damage limited to loss of profit, post-spill studies and costs of reasonable measures of reinstatement undertaken or to be undertaken; and economic losses. An economic loss occurs when oil pollution has caused a loss of earnings to persons whose property has not been polluted. Transport Canada listed a number of examples: individuals who derive income from fishing, from the production, breeding, holding or rearing of fish, or from the culture or harvesting of marine plants; owners of fishing vessels, derives income from the rental of fishing vessels to holders of commercial fishing licenses issued in Canada; individuals who derives income from the handling of fish on shore in Canada directly after they are landed from fishing vessels; any person who rents or charters boats in Canada for sport fishing; and workers in a fish plant in Canada.

In the case of an incident, Transport Canada noted that any person, entity, or organization, including local governments, may make a claim for costs or damages resulting from a ship-source oil pollution spill either directly to the ship owner and their insurer, or with the Ship-Source Oil Pollution Fund.

Some parties commented on the *Marine Liability Act* and the compensation available in the case of a marine spill.

Heiltsuk Nation said that Canada's current oil spill compensation regime does not compensate for Indigenous food, social and ceremonial losses, nor does it address communal rights. Heiltsuk Nation argued that, regardless of the fact that Canada has removed the cap on compensation under the Ship-Source Oil Pollution Fund these amendments are meaningless in that they do not change the limited definition of what is compensable in the event of a spill, specifically excluding natural resource damage and other non-market commercial losses that affect Indigenous people's rights and title. Heiltsuk Nation argued that the federal spill compensation regime excludes compensation for Indigenous food, social, ceremonial and other cultural losses, and therefore, the Board cannot reasonably rely on that regime as a mitigation measure.

The Maa-nulth First Nations, Equimalt Nation, Scia' new First Nation and Pauquachin First Nation supported proposed amendments to the *Marine Liability Act* in Bill C-86, currently before Parliament, to modernize the Ship-Source Oil Pollution Fund.

T'Sou-ke Nation argued that current compensation regimes do not cover harms to Treaty and Indigenous rights, including Indigenous title. T'Sou-ke Nation urged the NEB to recommend the establishment of a compensation fund to guarantee compensation to coastal Indigenous Nations should an oil spill occur from the marine shipping associated with the Project. In the case of a spill, T'Sou-ke Nation said that the compensation fund should extend to harms to section 35 rights, as well as non-pecuniary harms. By establishing a compensation fund in advance, Indigenous Nations would not be obliged to pursue damages through uncertain and expensive court litigation.

The City of Vancouver said that it has not received any compensation for its costs related to the Marathassa spill four years later. The City of Vancouver argued that the likelihood of compensation as well as the percentage of actual costs recovered from any Project-related oil spill remained uncertain in view of the outstanding claims related to the Marathassa spill.

Tsleil-Waututh Nation, Squamish Nation, Stz'uminus First Nation, Snuneymuxw First Nation, and the City of Vancouver filed a report by Dr. Gunton and Dr. Joseph titled "Trans Mountain Expansion Project Reconsideration Hearing: Assessment of Oil Spill Risks" (Gunton-Joseph Report). The Gunton-Joseph Report discussed the costs from a marine oil spill. The Gunton-Joseph Report estimated the cost of spill from a Project marine tanker would range from $2.3 to $4.7 billion (2018 $CDN) excluding passive use losses, or $3.8 to $26.8 billion (2018 $CDN) including passive use losses. Spill size ranged from 51,891 bbl to 103,782 bbl. Damage costs were $37,500 per bbl (2012 $CDN) comprised of $15,000 per bbl clean-up costs and $22,500 per bbl damage costs. Estimates of passive use damage costs relied on a report filed by Tsleil-Waututh Nation, Tsawout First Nation, and Upper Nicola Band in the OH-001-2014 hearing entitled An Assessment of Spill Risk for the Trans Mountain Expansion Project by Dr. Gunton and Dr. Broadbent.

The Gunton-Joseph Report estimated the damage costs, excluding passive use damages, from a credible worst-case tanker spill to exceed the funds explicitly identified for tanker spill compensation by between approximately $750 million and $3.1 billion. While Canada has attempted to address current compensation limits and related concerns through proposed amendments to relevant legislation, like removing the cap on the liability for marine spills and covering any damage liability that exceeds the amount available in the compensation funds, the Gunton-Joseph Report concluded that the proposed federal changes do not fully mitigate the deficiency that the responsible party may lack sufficient financial resources to cover damage costs of a credible worst-case scenario. Instead, any shortfall will be covered by Canada, with no assurance that it will be able to fully recoup the costs from the responsible parties via additional levies on the shippers in the event of a large oil spill. The Gunton-Joseph Report argued that the only means to ensure that the polluter pay principle is met is to require the responsible party to provide financial assurances equivalent to the credible worst-case damage costs.

Views of the Reconsideration Panel

The Board finds that Trans Mountain's application met the requirement to provide a description of the liability and compensation regime that would apply in the case of a spill.

As outlined in Sections 14.3 and 14.11, there is an existing regulatory regime in place related to marine financial liability and compensation in the event of a spill event. As stated throughout this hearing process, this area is not under the Board's regulatory jurisdiction.[134]

On 13 December 2018, Bill C-86 received Royal Assent and amendments to the *Marine Liability Act* came into force, including the changes to the Ship-Source Oil Pollution Fund described the Government of Canada's evidence. The changes to the *Marine Liability Act* should strengthen the Government of Canada's ability to compensate any person, entity, or organization for oil pollution damage resulting from a ship.

The Board heard from Indigenous communities who supported changes to the *Marine Liability Act* and Ship-Source Oil Pollution Fund, as well as Indigenous communities who were concerned about the exclusion of Indigenous food, social, ceremonial, other cultural losses and losses to section 35 rights from eligibility under the Ship-Source Oil Pollution Fund. The Board notes that the *Marine Liability Act* allows individuals who fish or hunt for food or animal skins for their own consumption or use to claim for losses under the Ship-Source Oil Pollution Fund. The Board notes that Transport Canada held consultations with Indigenous groups regarding the recent changes to the *Marine Liability Act*, where concerns regarding the scope of the Ship-Source Oil Pollution Fund was discussed.

The Board also heard a request for a recommendation for the establishment of a compensation fund to guarantee compensation to coastal Indigenous Nations should an oil spill occur from the marine shipping associated with the Project. The Board is of the view that the Ship-Source Oil Pollution Fund is a compensation fund where Indigenous communities who have sustained loss or damage, or incurred costs and expenses, in respect of oil pollution may file a claim.

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[134] In the event of a spill originating at the Westridge Marine Terminal (WMT), Trans Mountain would be responsible for costs associated with the spill.

However, the Board agrees that it is unclear if all losses are eligible to be claimed under the Ship-Source Oil Pollution Fund. The Ship-Source Oil Pollution Fund does not appear to compensate for losses to non-use values, for Indigenous and non-Indigenous communities. In the event of an oil spill from a ship, not just a Project-related tanker, these losses may occur. The Board notes that section 48.12 of the NEB Act establishes that pipeline operators are liable for the loss of non-use values relating to a public resource affected by a release and that the Crown may institute proceedings to recover the loss of non-use values. Thus, the Board has included Recommendation 15, which encourages GIC to work with Transport Canada to determine how a federal marine oil spill compensation regime, existing or otherwise, can include compensation for non-use values, for Indigenous and non-Indigenous communities, including any non-coastal communities that may be impacted as a result of a marine oil spill.

In the OH-001-2014 hearing, there were concerns expressed that the cost of a marine oil spill from a Project-related vessel may exceed available compensation. Some intervenors filed evidence regarding the potential cost of a spill from Project-related vessels. Trans Mountain argued that there were inappropriate methodological and technical assumptions associated with intervenor evidence which resulted in overly hypothetical or inflated potential spill costs. These include the reliance on costs associated with past spill incidents that were not tanker-based spills; the assumption that a large spill event is likely to occur; the use of hypothetical passive use values; and emphasis on extreme spill events.

In the MH-052-2018 hearing, new evidence regarding the cost of a credible worst-case oil spill from a tanker was filed as part of the Gunton-Joseph Report, estimating the cost of the spill to be $2.3 to $4.7 billion (2018 $CDN) without passive use values included. The Board is of the view that these cost estimates are of significantly less importance in the MH-052-2018 hearing. Changes to the *Marine Liability Act* have eliminated the per-incident limit of liability for an oil spill originating from a vessel. Parties damaged will be compensated fully and the Government of Canada has the ability to recover any funds that exceed the Ship-Source Oil Pollution Fund through an annual levy on oil receivers and exporters and, if the annual levy is insufficient, a temporary supplementary levy. Therefore, the Board is of the view that concerns expressed in the OH-001-2014 hearing regarding the cost of a spill exceeding available compensation have been addressed.

14.13 Other CEAA 2012 factors

14.13.1 Effects of the environment on the Project

This section addresses the requirements of the CEAA 2012 paragraph 19(1)(h) regarding any change to the designated project that may be caused by the environment. The evidence indicates that there are effects of the environment on Project-related shipping. The effects of the environment include navigational hazards along the shipping routes and weather-related considerations such as wind, waves, and fog.

The TERMPOL Review Committee said that Project-related tanker traffic would use established shipping routes. Transport Canada said that the shipping routing tied to the project was selected by Transport Canada to ensure the safest passage for all vessels, and as it focuses on prevention, it reduces the probability of groundings. Trans Mountain said that the sailing route from the Westridge Terminal to the high seas outside the mouth of the Strait of Juan de Fuca is a relatively uncomplicated route. The most challenging part of the route is from the Westridge Terminal to the Second and First Narrows in the Movement Restricted Area (Traffic Control Zones) within Vancouver Harbour.

Trans Mountain said the proposed route is deep and wide enough to ensure that geographic and geological factors are not a concern. In addition, weather conditions and oceanographic factors along the route are considered to be mild and should not cause delays or alterations to the vessel route, except for reduced visibility due to fog.

The Federal departments and agencies said that Environment and Climate Change Canada is able to provide weather conditions in advance, and tankers would be advised by Marine Communications and Traffic Services (MCTS) to take appropriate measures. The TERMPOL Review Committee noted a number of factors that an oil tanker crew considers when dealing with poor weather conditions and rough seas. Such factors include the vessel's performance characteristics; the shipping route's navigation characteristics; long-term weather forecasts; real-time weather; vessel owner requirements; terminal operator requirements; and pilot and Vessel Traffic Services advice and guidance. Establishing weather and environmental restrictions on vessel operations can help ensure vessels do not exceed safe operating limits and take undue risks as wind, visibility, and sea conditions deteriorate.

The TERMPOL Review Committee said that with respect to the oil tanker transits, there are no restrictions in place along the proposed route aside from those within Port Metro Vancouver's Movement Restriction Area (Traffic Control Zones), where vessels are not permitted to continue transit if weather prevents them from staying on course. The Pacific Pilotage Authority said that since its inception, it has not aborted a transit due to poor weather, and ensures its pilots exercise the practices of good seamanship in adverse weather conditions. The TERMPOL Review Committee found weather related restrictions beyond existing requirements were not currently necessary.

The Vancouver Fraser Port Authority filed its updated Port Information Guide detailing practices and procedures to establish safe limits for the vertical, horizontal and under keel clearances of each respective Traffic Control Zone within the Port of Vancouver. The Port Information Guide also details other Traffic Control Zone established practices and procedures impacting the timing and movement of tankers including restrictions related to tidal current windows, vessel transit restrictions, speed, visibility and wind.

Environment and Climate Change Canada described its Marine Weather Information Services Demonstration Project which involves enhanced marine weather services to support marine traffic operations and improve safety in higher-risk areas. Environment and Climate Change Canada said its forecasts provide mariners with a two-day forecast and an outlook to five days based on winds, weather and sea-state information. Under this Oceans Protection Plan initiative, Environment and Climate Change Canada will give mariners enhanced weather information, including a short-term forecast of wind speed, wind direction and wave height. Information from buoys, coupled with the most advanced numerical models, will be used to develop the new forecasts.

Trans Mountain said that it would develop a tug matrix to define the capabilities and number of escort tugs required for foreseeable meteorological and ocean conditions such as wind, waves, and currents, based on tanker and cargo size. Trans Mountain said should conditions be forecast to exceed the criteria established in the tug matrix or the capabilities of available tugs, a tanker will be required to delay its departure until the weather subsides or a sufficient escort is available and that such delays are expected to be brief and infrequent.

See Sections 14.11.1 and 14.11.2 and related Views of the Board for additional discussion regarding concerns and mitigation related to the effects of the environment on marine shipping:

- Pilotage;
- Marine Communications and Traffic Services (MCTS) improvements;
- Emergency Towing and Places of Refuge;
- Vancouver Fraser Port Authority requirements; and
- Tug Escort.

Views of the Reconsideration Panel

As discussed in Section 14.11, the Board is of the view that there is an acceptable level of safety in place regarding marine shipping associated with the Project. This includes consideration of potential effects of the environment on Project-related marine shipping.

The Board accepts Trans Mountain, the TERMPOL Review Committee, B.C. Coast Pilots, Canadian Marine Pilots' Association and Pacific Pilotage Authority's views that shipping along the south coast of B.C. is accomplished safely the vast majority of the time under a variety of weather conditions, in the absence of many of the mitigation measures that would be in place for the Project. The Board is satisfied with the findings and recommendations of the TERMPOL Review Committee.

The TERMPOL Review Committee said it did not identify regulatory concerns for the tankers, tanker operations, the proposed route, navigability, other waterway users and the marine terminal operations associated with tankers supporting the Project. The Board finds that Trans Mountain's commitments and enhancements to the existing marine safety regime will provide for a higher level of safety for tanker operations commensurate with the increase in traffic. These would include reduced vessel speeds, escort tugs, redundant navigational systems, enhanced marine traffic and weather communication services and avoiding congestion in the narrower parts of the shipping channels.

The Board notes that some participants expressed concerns regarding the effects of the environment on Project-related vessels based on their personal experiences in smaller craft such as fishing boats. The evidence before the Board indicates that there is a significant difference in the effect of wind and waves on smaller vessels, compared with the vessels proposed for the Project-related marine shipping.

14.13.2 Requirements of follow-up programs

As noted in Chapter 10, paragraph 29(1)(b) of the CEAA 2012 requires a follow-up program. This is intended to verify the accuracy of the predictions regarding potential environmental effects and to determine if mitigation measures are working as intended.

The Board notes that the monitoring recommended to the GIC in Recommendations also satisfies the requirement of monitoring under section 79 of the SARA.

For the Project-related marine shipping, the follow-up program is discussed in each section for each valued component, it is embedded in the recommendations, and includes all the monitoring, determining further mitigations, and adaptive management over time. Specifically, Recommendation 2 requires GIC to report, on an annual basis, on the progress on implementing all recommendations, including results of monitoring to determine the effectiveness of measures and any adaptive management as part of a follow-up program.

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Appendix 1: Lists of Issues

1.1 OH-001-2014 hearing

The Board has decided on a list of 12 issues it will consider during the hearing process.

1. The need for the proposed project.
2. The economic feasibility of the proposed project.
3. The potential commercial impacts of the proposed project.
4. The potential environmental and socio-economic effects of the proposed project, including any cumulative environmental effects that are likely to result from the project, including those required to be considered by the NEB's Filing Manual.
5. The potential environmental and socio-economic effects of marine shipping activities that would result from the proposed Project, including the potential effects of accidents or malfunctions that may occur.
6. The appropriateness of the general route and land requirements for the proposed project.
7. The suitability of the design of the proposed project.
8. The terms and conditions to be included in any approval the Board may issue.
9. Potential impacts of the project on Aboriginal interests.
10. Potential impacts of the project on landowners and land use.
11. Contingency planning for spills, accidents or malfunctions, during construction and operation of the project.
12. Safety and security during construction of the proposed project and operation of the project, including emergency response planning and third-party damage prevention.

The Board does not intend to consider the environmental and socio-economic effects associated with upstream activities, the development of oil sands, or the downstream use of the oil transported by the pipeline.

1.2 MH-052-2018 hearing

The National Energy Board's (Board) Reconsideration hearing will consider any necessary changes or additions to its May 2016 Recommendation Report (Report), in light of the inclusion of Project-related marine shipping between the Westridge Marine Terminal and the 12-nautical-mile territorial sea limit in the "designated project" under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). This includes issues related to factors described in paragraphs 19(1)(a) through (h) and subsection 19(3) of the CEAA 2012, and to section 79 of the *Species at Risk Act* (SARA).

1. The environmental[135] effects of Project-related marine shipping, and the significance of these effects.

   This includes adverse effects on species at risk, the environmental effects of malfunctions or accidents that may occur, and any cumulative environmental effects.

2. Measures that are technically and economically feasible, and that would mitigate any significant adverse environmental effects of Project-related marine shipping.

   Given that the Board found four significant adverse effects related to Project-related marine shipping in its previous assessment[136] (i.e., greenhouse gas emissions, Southern resident killer whale, traditional Indigenous use associated with Southern resident killer whale, and the potential effects of a large or credible worst-case spill), the consideration of mitigation measures will include these four matters. This issue will also include consideration of whether the mitigation measures will change the Board's previous significance findings.

3. Alternative means of carrying out Project-related marine shipping that are technically and economically feasible, and the environmental effects of such alternative means.

4. Requirements of any follow-up program in respect of Project-related marine shipping.

5. Measures to avoid or lessen the adverse effects of Project-related marine shipping on SARA-listed wildlife species and their critical habitat, monitoring of the measures, and consideration of how to ensure the measures and monitoring are undertaken.

   The Board's previous assessment identified the SARA-listed marine fish, marine mammal, and marine bird species that could be found in the area of, or affected by, Project-related marine shipping.[137] Consideration will also be given to any species that have been newly listed or have seen a change to their designation since the issuance of the Board's Report and that could be affected by Project-related marine shipping.

6. The potential impacts of Project-related marine shipping on Indigenous[138] interests.

7. Whether there should be any changes or additions to the Board's recommendations set out in its Report, or to the recommended terms or conditions, including Conditions 9, 13 to 134, 144, and 151.

   Parties are expected to limit their evidence filings to new or updated evidence (including comments from the public, community knowledge, and Indigenous traditional knowledge) relevant to the above issues. Parties are not required to re-file or re-test evidence on the record of the OH-001-2014 hearing. It is recommended that Parties focus their evidence on aspects of the above issues that were not fully canvassed in the OH-001-2014 hearing. The Board's Filing Requirements for Trans Mountain, and its requests for specialist or expert information or knowledge in the possession of Federal Authorities pursuant to paragraph 20(a) of the CEAA 2012, reflect this.

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[135] All references to environmental effects in this List of Issues include health and socio-economic matters as described in section 5 of the CEAA 2012.

[136] See the Board's Report at pages 337, 350-351, 363, 378, and 397-398.

[137] See the Board's Report at pages 338, 341, and 352.

[138] The Board's use of the term "Indigenous" or "Indigenous peoples" in this hearing has the meaning assigned by the definition of "aboriginal peoples of Canada" in subsection 35(2) of the *Constitution Act, 1982*.

Appendix 2: Overview of work/activity authorized by individual legal instruments

This table is provided as an overview and guide only. The legal instruments themselves provide the actual authorizations. Appendix 3 sets out the list of 156 conditions and illustrates which conditions would attach to each instrument.

	Instrument	Work / activity being authorized
1	Line 2 CPCN (CPCN)	**Add to Line 2 CPCN (transfer from existing Trans Mountain Pipeline system and put into service on Line 2):** • active 150 km NPS 36 pipeline segment from Hinton to Hargreaves • active 43 km NPS 30 pipeline segment from Darfield to Black Pines **Authorization to expand the Westridge Marine Terminal (WMT):** • tanker loading dock complex at the WMT, with a total of three Aframax-capable berth faces and a utility dock **Authorization to construct and operate:** • two new parallel NPS 30 delivery pipelines from the Burnaby Terminal to the Westridge Marine Terminal **Authorization to construct and operate:** • 339 km NPS 36 pipeline from Edmonton to Hinton • 121 km NPS 42 pipeline from Hargreaves to Blue River • 158 km NPS 36 pipeline from Blue River to Darfield • 368 km NPS 36 pipeline from Black Pines to the Burnaby Terminal
2	CPCN OC-2 (OC2)	**Authorization to Decommission:** • one existing tank at the Edmonton Terminal West Tank Area • one existing tank at the Burnaby Terminal **Authorization to Reactivate:** • 150 km NPS 24 pipeline segment from Hinton to Hargreaves • 43 km NPS 24 pipeline segment from Darfield to Black Pines • Niton Pump Station **Remove from CPCN OC-2 (transfer from Line 1 and put into service on Line 2):** • 43 km NPS 30 pipeline segment from Darfield to Black Pines
3	CPCN OC-49 (OC49)	**Remove from CPCN OC-49 (transfer from Line 1 and put into service on Line 2):** • 150 km NPS 36 pipeline segment from Hinton to Hargreaves **Deactivate** • Wolf Pump Station
4	NEB Act, s.58 Order (Temp)	**Authorization for temporary construction lands and infrastructure**: • development of camp locations, stockpile sites, • contractor staging areas (i.e., co-located with camps or stockpile sites), • construction yards, borrow pits, and • access roads for the first 10 km of each pipeline spread (including temporary, clear-span bridges associated with these access roads)

5	NEB Act, s.58 Order (Pump1)	**Line 1 Pump Stations** **Authorization to construct and operate:** • Black Pines Pump Station on Line 1 **Authorization to:** • drag reducing agent (DRA) injection at Jasper Pump Station • add one pump unit to Kamloops Pump Station • add one pump unit to Sumas Pump Station
6	NEB Act, s.58 Order (Pump2)	**Line 2 Pump Stations** **Authorization to construct and operate:** • Edmonton Pump Station • Gainford Pump Station • Wolf Pump Station • Edson Pump Station • Hinton Pump Station • Blue River Pump Station • McMurphy Pump Station • Blackpool Pump Station • Black Pines Pump Station • Kamloops Pump Station • Kingsvale Pump Station
7	NEB Act, s.58 Order (Tanks)	**New Tanks (Line 1 and Line 2)** **Authorization to construct and operate:** • five new tanks at the Edmonton Terminal West Tank Area • one new tank at the Sumas Terminal • 14 new tanks at the Burnaby Terminal
8	Deactivation order (Deact)	**Authorization to deactivate:** • Blue River Pump Station

Appendix 3: Conditions applied to legal instruments

In these conditions, the following terms are defined as:

Appropriate Government Authorities	Federal, Provincial, Regional or Municipal government departments or agencies with jurisdiction, statutory obligations, regulatory oversight or a decision-making role in relation to the subject-matter of the specific condition. For location-specific conditions or phased filings, this is limited to those with such a role in relation to the geographic location to which the condition filing applies. (Indigenous groups are treated separately and listed separately in each applicable condition.)
Commencing operations	The Project is opened for oil storage and transmission. Unless otherwise specified, "prior to commencing operations" means an action must be completed prior to commencing operation of **any** component of the Project, and "after commencing operations" means an action must be completed after **all** components of the Project are operating.
Construction	Any in-field activity that may have an effect on the environment and that is necessary for installing, deactivating, reactivating[139] or decommissioning, or preparing to install, deactivate, reactivate[1] or decommission, **any** component of the Project. Construction activities include, clearing, mowing, grading, trenching, drilling, boring, and blasting. Construction activities do not include activities associated with routine surveying operations or data collection activities, such as geotechnical investigations (e.g., geophysical surveys, bore holes, and test pits), activities required to obtain integrity information on the reactivation pipeline segments, or operations and maintenance activities (to which NEB "Operations and Maintenance Activities on Pipelines under the *National Energy Board Act* – Requirements and Guidance Notes" apply). Construction at the Westridge Marine Terminal also includes construction activities occurring in the marine environment that are necessary for installing, or preparing to install, any component of the Westridge Marine Terminal expansion. This includes dredging, blasting, and pile drilling.
Consultation	Unless otherwise specified in a condition, Trans Mountain's consultation must be carried out in a manner that: a) provides, to those to be consulted: i) notice of the matter in sufficient form and detail to allow them to prepare their views or information on the matter; ii) a reasonable period for them to prepare those views or information; and iii) an opportunity to present those views or information to Trans Mountain; b) considers, fully and impartially, the views or information presented; c) provides, to those in a) who request it, a draft summary of the consultation undertaken with that party, and a reasonable period for them to provide feedback to Trans Mountain; and d) provides, to those in a) who request it, a copy of the NEB filing receipt for, or notice of, the condition filing to which the consultation pertained.
Dry commissioning	Dry commissioning involves the systematic inspection and testing of mechanical, piping, electrical, instrumentation, control, and communications systems**, prior to the introduction of process fluids,** to ensure that they are ready for the introduction of fluids and are expected to function as intended.
For approval	Where a condition requires a filing or filings for NEB approval, Trans Mountain must not commence the indicated activity until the NEB issues its written approval of that filing or filings.
Including	Use of this term, or any variant of it, is not intended to limit the elements to just those listed. Rather, it implies minimum requirements with the potential for augmentation, as appropriate.
Line 1	After the expansion, the 1 147 km Line 1 pipeline will consist of, combined, the following pipeline segments, including segments to be reactivated and currently operating TMPL segments: · the existing 229 km of 609.6 mm outside diameter (NPS 24) and 89 km of 762.0 mm outside diameter (NPS 30) pipeline segments from Edmonton, AB, to Hinton, AB; · the reactivated 150 km of NPS 24 pipeline segment from Hinton, AB, to Hargreaves, B.C. (built in 1957); · the existing 273 km of NPS 24 pipeline segment from Hargreaves, B.C., to Darfield, B.C.; · the reactivated 43 km of NPS 24 pipeline segment from Darfield, B.C., to Black Pines, B.C. (built in 1953); · the existing 325 km of NPS 24 and 38 km of NPS 30 pipeline segments from Black Pines, B.C., to the Burnaby Terminal, B.C.

[139] Excluding engineering assessment and operations and maintenance activities required to meet Conditions 19 and 31.

Line 2	After the expansion, the approximately 1,180 km Line 2 pipeline will consist of, combined, the new transmission pipeline segments and the two currently operating TMPL segments transferring to Line 2 service: · approximately 339 km of new 914 mm outside diameter (NPS 36) pipeline from Edmonton, AB, to Hinton, AB; · the existing 150 km of NPS 36 pipeline segment from Hinton, AB, to Hargreaves, B.C. (built in 2008); · approximately 121 km of new 1 067 mm outside diameter (NPS 42) pipeline from Hargreaves, B.C., to Blue River, B.C.; · approximately 158 km of new NPS 36 pipeline from Blue River, B.C., to Darfield, B.C.; · the existing 43 km of NPS 30 pipeline segment from Darfield, B.C., to Black Pines, B.C. (built in 1957); and · approximately 368 km of new NPS 36 pipeline from Black Pines, B.C., to the Burnaby Terminal, B.C.
Monitoring	Observing the environmental and socio-economic effects of the Project for the purposes of assessing and measuring the effectiveness of mitigation measures undertaken, identifying unanticipated environmental and socio-economic issues, and, based on the results of these activities, determining any remedial actions required. From an engineering perspective, monitoring involves regularly observing pipelines, terminals and pump stations (e.g., through surveys, patrols, inspections, testing, instrumentation) to ensure their operation is within defined parameters, with the goal of identifying any issues or potential concerns (e.g., pipeline integrity, geohazards, erosion, security) that may compromise the protection of the pipelines, terminals, pump stations, property, persons, and the environment.
Monthly (in relation to a condition filing or posting)	Unless otherwise specified in a condition, a monthly filing shall be made on the 5th working day of the calendar month following the month to which the filing pertains.
NEB or Board	National Energy Board
New delivery pipelines	Collectively, the two new NPS 30 oil delivery lines between Trans Mountain's Burnaby Terminal and its Westridge Marine Terminal (approximately 2.6 km for the tunnel option and 3.6 km for the street option).
Officer of the company	Where a condition requires a filing to be signed by an officer of the company, the filing must include a statement confirming that the signatory to the filing is an officer of the company duly authorized for that purpose.
Project	The Trans Mountain Expansion Project in all its components, including pipeline construction, reactivation, and changes to operating conditions resulting in operation as Line 1 and Line 2; deactivation, reactivation, construction and operation of or at the respective pump stations; decommissioning of 2 tanks and construction and expanded operation at the existing Edmonton, Sumas and Burnaby Terminals and the Westridge Marine Terminal; construction and operation of the new delivery pipelines; and all infrastructure. The Project does **not** include Project-related marine shipping.
Quarterly (in relation to a condition filing or posting)	Unless otherwise specified in a condition, a quarterly filing shall be made on the 10th working day of the quarter following the quarter to which the filing pertains.
Temporary infrastructure	All structures or sites necessary for pipeline, terminal and pump station construction, reactivation, deactivation, modification and expansion approved as part of the Project. Examples of infrastructure include construction camps, stockpile sites, contractor yards, laydown areas, borrow pits, roads, bridges, snow pads, and temporary power supply lines necessary for operating infrastructure and equipment during the construction phase.
Third party (in relation to a report, review or assessment)	An independent consultant, expert, or contractor that, except for receiving payment for acting as a third party, is unaffiliated with Trans Mountain, Kinder Morgan Canada Inc., the principal consultants of either, or any other corporate entity with a financial interest in the Project. A third party is, because of their knowledge, training, and experience, qualified and competent to perform an assessment or review, and was not involved in developing the manual, report, plan, program, or policy being assessed or reviewed.
TMPL	The existing operating Trans Mountain Pipeline system.
Trans Mountain	Trans Mountain Pipeline ULC, as general partner of Trans Mountain Pipeline L.P.

Government authorities are mentioned in certain conditions. If a particular authority's name changes in the future, Trans Mountain's requirements relating to that authority would rest with its successor. Similarly, if a particular authority's function is assumed by another authority, Trans Mountain's requirements relating to that function would rest with the new authority.

Note: Appendix 2 provides a summary of work/activities authorized under each legal instrument.

No.	Overarching conditions	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
1	**Condition compliance** Trans Mountain must comply with all of the [certificate/order] conditions, unless the NEB otherwise directs.	X	X	X	X	X	X	X	X
2	**Compliance with commitments** Without limiting Conditions 3, 4 and 6, Trans Mountain must implement all of the commitments it made in its Project application or to which it otherwise committed on the record of the OH-001-2014 proceeding, as well as the MH-052-2018 proceeding.	X	X	X	X	X	X	X	X
3	**Environmental protection** Trans Mountain must implement or cause to be implemented, at a minimum, all of the policies, practices, programs, mitigation measures, recommendations, and procedures for the protection of the environment included or referred to in its Project application or to which it otherwise committed on the record of the OH-001-2014 proceeding.	X	X	X	X	X	X	X	X
4	**Engineering and safety** Trans Mountain must cause the Project to be designed, located, constructed, installed, and operated in accordance with, at a minimum, the specifications, standards, policies, mitigation measures, procedures, and other information included or referred to in its Project application or to which it otherwise committed on the record of the OH-001-2014 proceeding.	X	X	X	X	X	X	X	X
5	**Certificate expiration (sunset clause)** Unless the NEB otherwise directs **prior to 30 September 2021,** this [certificate/order] will expire on **30 September 2021**, unless construction of the Project has commenced by that date.	X	X	X	X	X	X	X	X
No.	**Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)**	**CPCN**	**OC2**	**OC49**	**Temp**	**Pump1**	**Pump2**	**Tanks**	**Deact**
6	**Commitments tracking table** Without limiting Conditions 2, 3 and 4, Trans Mountain must implement the commitments contained within its commitments tracking table and must: a) file with the NEB, at the following times, an updated commitments tracking table including the status of each commitment: i) **within 3 months after the [certificate/order] date**; ii) **at least 30 days prior to commencing construction**; iii) **monthly, from the commencement of construction until the first month after commencing operations**; and iv) **quarterly thereafter until**: 1. **all commitments on the table are satisfied** (superseded, complete or otherwise closed), at which time Trans Mountain must file confirmation, signed by an officer of the company, that the commitments on the table have been satisfied; or 2. **6 years after commencing operations**, at which time Trans Mountain must file with the NEB a summary of any outstanding commitments and a plan and implementation timeline for addressing these commitments; whichever comes earlier; and b) post on its company website the same information required by a), using the **same indicated timeframes**; and c) maintain at each of its construction offices: i) the relevant environmental portion of the commitments tracking table listing all of Trans Mountain's regulatory commitments, including those from the Project application and subsequent filings, and environmental conditions or site-specific mitigation or monitoring measures from permits, authorizations, and approvals for the Project issued by federal, provincial, or other permitting authorities; ii) copies of any permits, authorizations, and approvals referenced in i); and iii) copies of any subsequent variances to permits, authorizations, and approvals referenced in i).	X	X	X	X	X	X	X	X

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
7	**Environmental and socio-economic assessment - route re-alignments** As applicable, Trans Mountain must file with the NEB for approval, **concurrent with its filing of the Plan, Profile and Book of Reference pursuant to section 33 of the *National Energy Board Act***, an environmental and socio-economic assessment for each proposed detailed route re-alignment that extends beyond the applied-for corridor width of Trans Mountain's preferred route in proximity to: · Ohamil Indian Reserve 1; · Tzeachten Indian Reserve 13; and · Surrey Bend Regional Park. Any assessment must include: a) environmental alignment sheets at an appropriate scale, clearly depicting the proposed route re-alignments; b) results of any pre-construction surveys within the areas that were not previously subject to such surveys, and an indication of potential residual effects; c) all associated mitigation measures that are beyond those identified during the OH-001-2014 proceeding; d) analysis supporting the use of the measures in c), including any supplementary reports; e) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information based on any supplemental surveys completed; and f) a summary of consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants, as well as copies of all written comments that may be provided to Trans Mountain by those consulted. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the assessment.	X			X				
8	**Design temperatures – terminals and pump stations** Trans Mountain must file with the NEB, **at least 3 months prior to ordering pipe for terminals and pump stations**, confirmation, with rationale, that: a) the selected maximum and minimum design temperatures are in accordance with CSA Z662-15, Clause 5.2.1; b) the selected design temperatures are based on historical, location-specific extreme daily maximum and minimum temperatures, as opposed to average temperatures; and c) the extent of the historical weather data used is commensurate with the expected operational life of the Project.	X				X	X	X	
9	**Quality Management Plan** Trans Mountain must file with the NEB, **at least 4 months prior to manufacturing any pipe and major components for the Project,** a Project-specific Quality Management Plan that includes: a) material/vendor qualification requirements; b) quality control and assurance of pipe, fittings, and components that ensure all materials meet Trans Mountain's specifications (i.e., processes, procedures, specifications, random testing, inspection, and test reports); c) mandatory documentation of process conditions during manufacture and verification of the conformance of manufacturer material test reports with Trans Mountain's requirements; d) mandatory inspection requirements, inspector competency training, and qualifications; e) non-conformance reporting and correction procedures; f) change management process; g) commissioning requirements; and h) material handling requirements during transportation.	X				X	X	X	
10	**Phased filings** Due to the Project's large spatial extent, Trans Mountain may wish to commence Project construction activities at specific locations at different times (i.e., using a phased approach). This may entail doing so on the basis of pipeline spreads of defined lengths, or by regions, or work areas of Trans Mountain's choosing (such as terminals or pump stations). If Trans Mountain intends to use a phased approach for Project construction, it must undertake the following: a) Trans Mountain must file with the NEB, **at least 7 months prior to commencing construction**, a complete list of construction spreads, regions, or work areas that, for the duration of Project construction, will serve as the basis by which Trans Mountain may submit condition filings in a phased approach. Each spread, region, or work area must be clearly delineated (e.g., by	X	X	X	X	X	X	X	X

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	kilometre posts). b) **As part of its filing for a)**, to aid the NEB in anticipating future submissions, Trans Mountain must indicate the specific conditions and related spread(s), region(s) or work area(s) for which it expects to apply this phased approach. Trans Mountain must file updates to this list **as they are available**. c) When submitting a filing for any condition using this phased approach, Trans Mountain must clearly indicate which spread(s), region(s), or work area(s) that filing applies to. d) Construction of a particular spread, region, or work area **must not** proceed until all pre-construction conditions using this phased approach have been satisfied for that spread, region, or work area. Prior to commencing construction of the initial spread, region, or work area, all applicable conditions with more general pre-construction timing elements must also be satisfied.								
11	**Indigenous, local, and regional skills and business capacity inventory** a) Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction**, an Indigenous, local, and regional skills and business capacity inventory for the Project. The skills and capacity inventory must include: i) a description of the information and data sources; ii) a summary of Indigenous, local, and regional skills and business capacity; iii) an analysis of the Indigenous, local and regional capacity for employment and business opportunities for the Project; iv) plans for communicating employment and business opportunities to Indigenous, local, and regional communities; v) a description of identified or potential skills and business capacity gaps, and any proposed measures to address them or to support or increase skills or capacity; and vi) plans for communicating identified gaps regarding skills and business capacity with Indigenous, local, and regional communities and businesses, and any proposed measures to support or increase skills or capacity. b) Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction**, any updates to the elements of the inventory described in a)i) through vi).	X							
12	**Training and Education Monitoring Plan** a) Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**, a plan for monitoring the implementation and outcomes of Indigenous, local, and regional training and education measures and opportunities for the Project. The plan must include: i) a description of, and rationale for selecting, the indicators that will be monitored to track the implementation of training and education measures and opportunities; ii) the monitoring methods and schedule, including information and data sources for the indicators being monitored; iii) plans for consulting and reporting on the implementation and outcomes of training and education measures and opportunities with Appropriate Government Authorities, potentially affected Indigenous groups, business, industry, and education and training organizations; and iv) a summary of consultations with Appropriate Government Authorities, potentially affected Indigenous groups, business, industry, and education and training organizations on the development of the plan. b) Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction**, any updates to the elements of the Training and Education Monitoring Plan described in a)i) through iii) above.	X							
13	**Socio-Economic Effects Monitoring Plan** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**, a plan for monitoring potential adverse socio-economic effects of the Project during construction. The plan must include the following: a) the factors or indicators to be monitored; b) the methods and rationale for selecting the factors or indicators; c) a description of the baseline, pre-construction socio-economic conditions; d) the monitoring methods and schedule, including third party data source identification; e) data recording, assessment, and reporting details;	X	X		X	X	X	X	

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	f) a discussion of how measures will be implemented to address any identified adverse effects, including: i) the criteria or thresholds that will require measures to be implemented; ii) how monitoring methods and measures implementation to address adverse effects, as necessary, are incorporated into Construction Execution Plans; and iii) a description of the roles and responsibilities of construction prime contractors, sub-contractors, and community relations staff in monitoring socio-economic effects and implementing measures to address adverse effects; g) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners / tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and h) plans for regular consultation and reporting on effects during construction with potentially affected communities, Indigenous groups, local and regional authorities, and service providers.								
14	**Technical working group (TWG) – Terms of Reference** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction,** Terms of Reference for TWGs established in order to address specific technical and construction issues with affected municipalities. The Terms of Reference must be developed in consultation with participating municipalities, and facility owners and operators that will be affected by the Project. The Terms of Reference must, at a minimum: a) identify how TWG membership will be determined; b) identify the TWG structure; c) identify an officer of the company who will be accountable for implementing the Terms of Reference; d) describe the scope and mandate to be addressed or implemented by the TWG, including: i) the TWG's goals; ii) the issues and activities that will be within the TWG's mandate; iii) the protocols and mechanisms for implementing TWG recommendations or decisions; and iv) the protocols for reporting and communicating with TWG members, and other potentially-affected or interested parties; and e) provide a summary of any outstanding concerns raised by participating municipalities, and facility owners and operators regarding the Terms of Reference.	X							
15	**Pipeline risk assessment** Trans Mountain must file with the NEB**, at least 6 months prior to commencing construction**, the following information for Line 2 and the new delivery pipelines: a) the results of the updated risk assessment in a tabular format similar to that provided in its Line 2 Consequence Report (Filing A3Z8G5). The risk assessment tables must also include: i) any updates to High Consequence Areas; ii) the risk mitigation method(s); iii) the mitigated Environmental Risk Scores; iv) pre-mitigation maximum outflow volumes; and v) the outflow volumes after mitigation; b) Environmental Risk Score acceptance criteria, with supporting rationale; and c) a detailed description of the adequacy of the following from its Line 2 Consequence Report (Filing A3Z8G5): i) the coefficients used in the scoring system equations; and ii) the values from the scoring tables.	X							
16	**Quantitative Geohazard Frequency Assessment** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction**, an updated Quantitative Geohazard Frequency Assessment for the new Line 2 and delivery pipeline segments that contains a re-assessment of the Frequency of Loss of Containment (FLoC) values based on the results of site-specific field assessments and any required mitigation as determined in the detailed engineering and design process. Trans Mountain must provide in the assessment a plan to manage and mitigate geohazards at any location where the FLoC value is greater than 10^{-5} events per year to reduce the level of risk to As Low As Reasonably Practicable (ALARP), including a detailed explanation of how the ALARP level has been attained at each location.	X							

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
17	**Valve locations on Line 2** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**, its final valve location assessment for Line 2. This assessment must include: a) a table showing each valve's location, function, and description (the description must include valve type, valve closure time, and whether the valve can be remotely controlled by the control centre); b) confirmation that the valve closure times provided in a) will not cause unsafe transient pressures according to the final transient analysis, along with a summary of the analysis; c) calculated volume release and elevation plots in a format similar to that provided by Trans Mountain in its Oil Spill Outflow Model Results for Line 2 for May 2014 Route (Filing A3Z8G6); d) clarification of how the Outflow Volume Score for Non-Watercourse Intersects ($S_{v,Nonwatercourse}$) is considered in identifying and prioritizing pipeline segments for valve optimization; e) for each 5-kilometre-long section of Line 2, information demonstrating that the release volumes are minimized to manage risks within the section to a level that is ALARP, based on the valve locations provided in a); f) an outflow volume versus chainage graph illustrating the effectiveness of the valve locations provided in a) showing the outflow limit in a format similar to that provided in Figure 4 of Attachment 2 to Trans Mountain's response to NEB Information Request No. 3.050b) (Filing A4H2D7); g) mitigation measures for the locations shown to exceed the outflow limit in the graph provided in f); and h) full-bore release and spill extent mapping that identifies and plots all geohazards with a FLoC greater than 10^{-5} events per year after mitigation identified by Trans Mountain at the time of its submission, in a format and scale similar to the maps provided by Trans Mountain in Filing A3Z8G7.	X							
18	**Valve locations and upgrades – Line 1** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**, its final valve location assessment for Line 1. This assessment must include: a) a plan for upgrading existing manual block valves to automated or remotely operable valves, and a plan for adding new valves, including initiation and completion dates for the required activities; b) a table showing each valve's location, function, and description (the description must include valve type, valve closure time, and whether the valve can be remotely controlled by the control centre); c) confirmation that the valve closure times provided in b) will not cause unsafe transient pressures according to the final transient analysis, along with a summary of the analysis; d) calculated volume release and elevation plots in a format similar to that provided by Trans Mountain in its Oil Spill Outflow Model Results for Line 2 for May 2014 Route (Filing A3Z8G6); e) an outflow volume versus chainage graph illustrating the effectiveness of the valve locations provided in b), in a format similar to that provided in Figure 4 of Attachment 2 to Trans Mountain's response to NEB Information Request No. 3.050b) (Filing A4H2D7); f) full-bore release and spill extent mapping that identifies and plots all geohazards identified by Trans Mountain in its Natural Hazards Management Program or otherwise, at the time of its submission, in a format and scale similar to the maps provided by Trans Mountain in Filing A3Z8G7; and g) the associated Line 1 risk assessment used to determine the new valve locations and planned valve upgrades in a).		X						

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
19	**Pipeline segment reactivation (Hinton to Hargreaves; Darfield to Black Pines) – engineering assessment and certificate** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**: a) an engineering assessment for the above two pipeline segments, in accordance with Canadian Standards Association (CSA) Z662-15, Clauses 3.3 and 10.15.2; and b) a certificate with a supporting report issued by an independent certification body,[140] stating unconditionally that the above two pipeline segments: i) are fit for service for the specified operating conditions;[141] ii) meet all applicable requirements of CSA Z662-15; and iii) will meet the hydrostatic test requirements outlined in CSA Z662-15, Clause 8, at any time during the certified period. The certificate must be valid for at least 5 years and be validated on an annual basis during the certified period. The supporting report must include the qualifications of the independent certification body, the justification used to grant the certificate, and the expiry date of the certificate.		X						
20	**Existing NPS 24 delivery pipeline location** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction,** its decision on whether it intends to "relocate" the existing NPS 24 delivery pipeline to the Burnaby Mountain tunnel (i.e., replace it with a new third pipeline in the Burnaby Mountain tunnel) and, if so, provide: a) details of any required changes to the design, construction, and operation of the proposed Burnaby Mountain tunnel; b) a discussion of the factors Trans Mountain considered in deciding to replace/relocate the existing NPS 24 delivery pipeline; and c) an indication of when Trans Mountain expects to apply for NEB approval to relocate/replace the existing NPS 24 delivery pipeline.	X							
21	**Transient hydraulic analysis on the existing NPS 24 delivery pipeline** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction**, the conclusions of the transient hydraulic analysis undertaken on the existing NPS 24 delivery pipeline from the Burnaby Terminal to the Westridge Marine Terminal. The filed conclusions must: a) demonstrate that the analysis considered the occurrences of maximum surge pressure in the existing NPS 24 delivery pipeline; and b) support Trans Mountain's decision to either retain or eliminate the proposed relief tank at the Westridge Marine Terminal.	X							
22	**Updated terminal risk assessments** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**, **and at the same time as Trans Mountain's filings for Conditions 23, 24 and 25**, updated risk assessments for the Edmonton Terminal West Tank Area, the Sumas Terminal, and the Burnaby Terminal. The updated risk assessments must quantify and/or include the following: a) the effect of any revised spill burn rates; b) the potential consequences of a boil-over; c) the potential consequences of flash fires and vapour cloud explosions; d) the cumulative risk based on the total number of tanks in the terminal, considering all potential events (pool fire, boil-over, flash fire, vapour cloud explosion);							X	

[140] For Conditions 19, 122 and 152, an "independent certification body" is an internationally recognized company or organization, such as Lloyd's Register or Det Norske Veritas, which is able to certify compliance to statutory requirements. The independent certification body must have expertise in pipeline integrity. The NEB reserves the right to accept or reject the certificate. In addition, the NEB's decision is not contingent on the results of the certificate.

[141] For Conditions 19, 122 and 152, "operating conditions" must include the Project-specific operating conditions, possible transient flow conditions, slack flow conditions, and effects on operating pressure due to temperature changes.

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	e) the domino (knock-on) effect caused by a release of the contents of one tank on other tanks within the terminal's common impoundment area(s), or other tanks in adjacent impoundment areas; and f) risk mitigation measures, including ignition source control methods. For those risks that cannot be eliminated, Trans Mountain must demonstrate in each risk assessment that mitigation measures will reduce the risks to levels that are ALARP while complying with the Major Industrial Accidents Council of Canada (MIACC) criteria for risk acceptability. The quantitative risk analysis must be based on recognized methodology, models, and software. Product release frequencies and event probabilities must be based on recent, documented data sources. The effect of mitigation measures on the risk results must be justified and documented.								
23	**Secondary containment – Edmonton Terminal** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**, the final design of the Edmonton Terminal West Tank Area, including a report demonstrating the following: a) the drainage system's capability to rapidly and safely channel a significant release from any tank in the West Tank Area Common Impoundment to the Remote Impoundment Annex and Remote Impoundment at the same time that a design precipitation event is occurring, without overtopping the diked areas; b) the adequacy of the design in mitigating the following consequences of an accidental release and/or ignition of hydrocarbons, both within and beyond the Edmonton Terminal property boundary: i) harm to personnel and the public; ii) environmental damage; and iii) damage to facilities; and c) the ability of the Common Impoundment, Remote Impoundment Annex, and Remote Impoundment to contain a release of hydrocarbons from a rupture of the largest tank within the West Tank Area concurrent with a 1-in-100 year, 24-hour storm event. The scenario must include an allowance for water generated from potential firefighting activities and the maximum potential amount of standing water in all areas of the secondary containment system.							X	
24	**Secondary containment – Burnaby Terminal** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction,** the final design of the Burnaby Terminal, including a report demonstrating the following: a) the drainage system's capability to rapidly and safely channel a significant release from either Tank 96, 97, or 98 to the Partial Remote Impoundment at the same time that a design precipitation event is occurring, without overtopping the diked areas; b) the adequacy of the proposed design in mitigating the following consequences of an accidental release and/or ignition of hydrocarbons, both within and beyond the Burnaby Terminal property boundary: i) harm to personnel and the public; ii) environmental damage; and iii) damage to facilities; and c) the ability of the individual secondary containment areas, Common Impoundment areas, Intermediate Stormwater Retention, Partial Remote Impoundment, and Tertiary Containment to contain a release of hydrocarbons from a multiple-tank rupture scenario concurrent with a 1-in-100 year, 24-hour storm event. The scenario must include an allowance for water generated from potential firefighting activities and the maximum potential amount of standing water in all areas of the secondary containment system. The assessment may include a calculation of the probability of exceedance of on-site containment considering all possible tank rupture combinations, excluding those tanks with sufficient individual secondary containment. The calculation may be based on a tank utilization histogram most representative of the expanded terminal operations, similar to that provided in Attachment 1 of Trans Mountain's response to NEB Information Request No. 4.24a) (Filing A4K4X3).							X	

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
25	**Secondary containment – Sumas Terminal** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction**, the final design of the Sumas Terminal, including a report demonstrating the following: a) the adequacy of the proposed design in preventing the following consequences of an accidental release and/or ignition of hydrocarbons, both within and beyond the Sumas Terminal property boundary: i) harm to personnel and the public; ii) environmental damage; and iii) damage to facilities; and b) the ability of the secondary containment system to contain a release of hydrocarbons from a multiple-tank rupture scenario concurrent with a 1-in-100 year, 24-hour storm event. The scenario must include an allowance for water generated from potential firefighting activities and the maximum potential amount of standing water in all areas of the secondary containment system. The assessment may include a calculation of the probability of exceedance of on-site containment considering all possible tank rupture combinations, excluding those tanks with sufficient individual secondary containment. The calculation may be based on a tank utilization histogram most representative of the expanded terminal operations, similar to that provided in Attachment 1 of Trans Mountain's response to NEB Information Request No. 4.24b) (Filing A4K4X4).							X	
26	**Burnaby Mountain tunnel option – design, construction, and operation** For the tunnel between the Burnaby Terminal and the Westridge Marine Terminal and related delivery pipelines, **at least 6 months prior to commencing Burnaby Mountain tunnel construction activities**, Trans Mountain must: a) file with the NEB for approval: i) a description of the selected tunnel lining method with the rationale for its selection; and ii) tunnel confined space entry procedures during construction and visual inspections, and, if applicable, following construction; and b) file with the NEB: i) the results of any geotechnical or geophysical feasibility surveys completed since the evidence filed in the OH-001-2014 hearing; ii) a description of the tunnel portals and permanent road access, if applicable; iii) a description of the selected tunnel excavation method with rationale for its selection; iv) a description of the tunnel backfilling method with rationale for its selection; v) a description of the methods to be used for pipe handling and welding; vi) a discussion on the adequacy of the pipe support methods for the new delivery pipelines during construction, commissioning, hydrostatic testing and operation, if applicable; vii) a discussion on the adequacy of the selected leak detection methods; viii) information demonstrating how the precautionary design of the new delivery pipelines would mitigate issues related to limited accessibility for future maintenance and repairs; and ix) the final tunnel cross-sectional design drawings.	X							
27	**Burnaby Mountain tunnel option – backfilling** Trans Mountain must file with the NEB, **at least 6 months prior to commencing Burnaby Mountain tunnel construction activities**, the following information on backfilling the tunnel between the Burnaby Terminal and the Westridge Marine Terminal: a) a discussion of the adequacy of the measures to be taken during tunnel backfilling to eliminate or mitigate potential damage to the delivery pipelines; b) the method(s) that will be used to confirm the consistency and continuity of the tunnel backfill (i.e., backfilling is completed without any spatial gaps); c) the method(s) that will be used for holiday detection and coating repair prior to backfilling; d) the methods that will be used to confirm the integrity of the delivery pipelines in the tunnel, both prior to and after backfilling, but prior to commissioning; and e) the methods that will be used for monitoring, maintaining, and repairing backfill during operations, considering conditions such as fill deterioration and a potential increase in permeability.	X							

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28	**Burnaby Mountain tunnel option – cathodic protection** Trans Mountain must file with the NEB, **at least 6 months prior to commencing Burnaby Mountain tunnel construction activities**, the following information on the cathodic protection system for the delivery pipelines in the tunnel between the Burnaby Terminal and the Westridge Marine Terminal: a) a description of the cathodic protection system design; b) risk mitigation measures for all potential cathodic protection performance issues, such as shielding from the backfill material; and c) a method for verifying the effectiveness of the cathodic protection system during operations.	X							
29	**Burnaby Mountain tunnel option – rock mass and waste rock management** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing Burnaby Mountain tunnel construction activities,** the following details on rock mass expected to be encountered during construction of the tunnel between the Burnaby Terminal and the Westridge Marine Terminal: a) the characterization of the rock mass quality; b) waste rock management methods during construction and operations, if applicable; c) proposed acid rock mitigation measures, such as the treatment or disposal of acid rock, if encountered; d) the locations, sizes, and designs of all confirmed waste rock disposal areas; and e) plans for disposing any waste rock that is not expected to be stored in the confirmed waste rock disposal areas.	X							
30	**Power system protection for pump stations and terminals** Trans Mountain must file with the NEB the following details of its electrical power system design for each pump station and each of the following: Westridge Marine Terminal, Burnaby Terminal, Edmonton Terminal, and Sumas Terminal: a) Descriptions of the overcurrent and ground fault protection schemes including: i) a summary of coordination studies between the upstream and downstream protective devices, **at least 3 months prior to commencing dry commissioning**; ii) relay settings and time-current curves, **at least 3 months prior to commencing dry commissioning**; iii) the specification of neutral grounding resistors, **at least 6 months prior to commencing construction**; iv) specifications of contactors, fuses, and circuit breakers, **at least 6 months prior to commencing construction**; and v) a description of other electrical protections, relay settings, and trip characteristics, **at least 3 months prior to commencing dry commissioning**. b) Consistent with the NEB's Safety Advisory SA-2015-03, dated 4 May 2015, **at least 6 months prior to commencing construction**, information confirming that Trans Mountain has performed the ground fault and arcing fault protection designs for each pump station and terminal, including: i) a means to clear ground faults without intentional time delay if the fault currents exceed the design limit set by the neutral grounding resistance; and ii) a means to block the stored energy from other running motors from feeding an electrical fault in another motor running from the same bus. This filing must include a description of the ground fault and arcing fault protection designs including the above measures. c) **At least 6 months prior to commencing construction**, either: i) a written confirmation that Trans Mountain determined during detailed design that electrical faults will not exceed their design limits and migrate to an arcing fault; or ii) for a station or a terminal for which Trans Mountain determined during detailed design that an electrical fault could exceed its design limit and migrate to an arcing fault, the electrical configuration of that station or terminal and the additional equipment and devices that will be used to mitigate the adverse effects of such arcing faults. d) Single-line diagrams of the electrical power systems**, at least 6 months prior to commencing construction**.	X				X	X	X	

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31	**Reactivation of the Niton Pump Station** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing any pump station construction,** an engineering assessment for the Niton Pump Station, in accordance with CSA Z662. The engineering assessment must demonstrate that the pump station is fit for its intended service, and meets all applicable requirements of CSA Z662.		X						
32	**Sumas Terminal Geotechnical Report** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction at the Sumas Terminal,** a geotechnical report that provides feasibility-level geotechnical design recommendations for the proposed expansion at the Sumas Terminal.							X	
33	**Westridge Marine Terminal Onshore Geotechnical Report** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction at the Westridge Marine Terminal,** a geotechnical report that provides feasibility-level geotechnical design recommendations for the proposed new onshore facilities at the Westridge Marine Terminal**,** including consideration of the potential for seismic damage.	X							
34	**Westridge Marine Terminal Offshore Geotechnical Report** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction at the Westridge Marine Terminal**, the final Preliminary Geotechnical Report on the offshore portion of the Westridge Marine Terminal, based on the selected pile design option, including consideration of the potential for seismic damage.	X							
35	**Marine Sediment Management Plan** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction at the Westridge Marine Terminal**, confirmation whether or not dredging is required at the Westridge Marine Terminal. In the event that dredging is determined to be unavoidable during the expansion of the Westridge Marine Terminal, Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction**, and also include as part of its Westridge Marine Terminal Environmental Protection Plan, a Marine Sediment Management Plan. This plan must include: a) a summary of any supplemental marine sediment survey results; b) quantification of the area and the volume of marine sediment to be dredged along with an explanation of the measures that have been taken to eliminate or reduce the dredge footprint and volume proposed for disposal at sea; c) results of sediment plume modelling for any areas to be dredged; d) options for dredged sediment management, including the volumes of sediment that will be re-used or disposed of at sea or on land, as well the criteria and methods for determining how the dredged sediment will be disposed of at sea or on land; e) criteria and methods for determining how the dredged sediment will be managed recognizing that any proposed disposal at sea will only be considered for approval under the *Canadian Environment Protection Act*, 1999, if it is demonstrated to be the most technically and environmentally preferable option; f) confirmation that Trans Mountain will update the Westridge Marine Terminal Environmental Protection Plan to include any relevant information from the Marine Sediment Management Plan; g) details of monitoring that will be undertaken during construction; h) details of monitoring (both abiotic and biotic parameters) that will be undertaken during operations, including a discussion on evaluating the level of contaminants in the marine environment and any changes from pre-construction levels, as well as a proposed reporting schedule; and i) a summary of its consultations with Appropriate Government Authorities and potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan.	X							
36	**Pre-construction caribou habitat assessment** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction of any Project component potentially affecting each caribou range**, a detailed caribou habitat assessment of the Project right-of-way through each caribou range traversed by the Project, including a 500 metre buffer on either side. The framework of the habitat assessment must use the updated critical habitat polygons delineated by the Southern Mountain Caribou Recovery Team and components of critical habitat outlined in the *Recovery Strategy for the Woodland Caribou, Southern Mountain Population in Canada (2014)*. The habitat assessment must include: a) map(s) indicating the location of the habitat;	X	X		X	X	X		

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	b) a description of the amount of habitat and the existing habitat alteration, in hectares; c) a description of how Trans Mountain has taken available and applicable Indigenous traditional ecological knowledge into consideration into the assessment including demonstration that those Indigenous persons and groups that provided Indigenous traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; d) a description of how Trans Mountain has incorporated input from Appropriate Government Authorities and species experts into the assessment methodology; and e) a description of the type of habitat characterized by the biophysical attributes of critical habitat, as defined in the applicable Recovery Strategy.								
37	**Caribou Habitat Restoration Plan (CHRP)** Trans Mountain must file with the NEB for approval, in accordance with the timelines below, preliminary and final versions of a CHRP for each caribou range potentially affected by the Project. a) Preliminary CHRP – to be filed **at least 6 months prior to commencing construction of any Project component potentially affecting each caribou range**. This version of the CHRP must include the following: i) the CHRP's goals and measureable targets for each caribou range, including the goal of avoidance of critical habitat destruction; ii) a detailed description of measures that will be used to avoid or lessen Project activities that impact critical habitat, and the rationale for selecting the measures; iii) a list of criteria used to identify potential caribou habitat restoration sites; iv) conceptual decision-making tree(s) or decision framework(s) that will be used to identify and prioritize potential caribou habitat restoration sites, and mitigative actions to be used at different types of sites, including consideration of typical site factors that may constrain implementation; v) a literature review upon which the decision-making tree(s) or decision framework(s) are based, including: 1) an identification of applicable temporal and spatial caribou habitat restoration methodologies; 2) an assessment of the relative effectiveness of the identified methodologies; and 3) a detailed methodology of how the literature review was conducted. vi) the quantifiable targets and performance measures that will be used to evaluate the extent of predicted residual effects, CHRP effectiveness, the extent to which the goals and measurable targets have been met, and the need for further measures to offset unavoidable and residual effects on caribou habitat; vii) a schedule indicating when mitigation measures will be initiated and their estimated completion dates; viii) a description of how Trans Mountain has taken available and applicable Indigenous traditional ecological knowledge studies into consideration in identifying potential caribou habitat restoration sites including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and ix) a summary of its consultations with Appropriate Government Authorities and any potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the preliminary CHRP. b) Final CHRP – to be filed **on or before 1 November after the first complete growing season after completing final clean-up**. This version of the CHRP must include the following: i) the preliminary CHRP, with any updates identified in a revision log that includes the rationale for any changes to decision-making criteria; ii) a complete tabular list of caribou habitat restoration sites, including locations, spatial areas, habitat quality descriptions, site-specific restoration activities, and challenges; iii) a description of how selected restoration measures are consistent with the *Recovery Strategy for the Woodland Caribou, Southern Mountain Population in Canada (2014);* iv) maps or updated Environmental Alignment Sheets showing the site locations; v) specification drawings for the implementation of each restoration method; vi) a qualitative and quantitative and assessment of the total area of direct and indirect disturbance to caribou habitat that will be restored, the duration of spatial disturbance,	X	X		X	X	X		

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	and the area-based extent of the resulting unavoidable and residual effects to be offset, including indirect disturbance; and vii) a summary of its consultations with Appropriate Government Authorities and any potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the final CHRP.								
38	**Sowaqua Spotted Owl Mitigation Plan** Trans Mountain must file with the NEB for approval, **at least 6 months prior to commencing construction of any Project component within the Sowaqua spotted owl wildlife habitat area**, a Sowaqua Spotted Owl Mitigation Plan that includes: a) a summary of results from supplemental surveys conducted in the Sowaqua spotted owl wildlife habitat area; b) the area of habitat potentially directly and indirectly affected by the Project; c) a description of how an avoidance, mitigation, and offset hierarchy was considered in the plan; d) mitigation measures to be implemented, including all relevant measures committed to throughout the OH-001-2014 proceeding, any new mitigation measures resulting from supplementary surveys, detailed criteria using clear and unambiguous language that describes the circumstances under which each measure will be applied, and measurable goals for evaluating mitigation success; e) an evaluation of offset options within or outside of the Sowaqua spotted owl wildlife habitat area, an indication of the selected option, and the rationale for the selected option; f) details on post-construction monitoring of mitigation measures and offset measures, including survey methods, corrective measures, detailed criteria using clear and unambiguous language that describes the circumstances under which each measure will be applied, any adjustments to the offset measures, and a proposed reporting schedule; g) a commitment to include results of the monitoring in the post-construction environmental monitoring reports filed under Condition 151; h) details on how the mitigation and monitoring measures are consistent with applicable Recovery Strategies and Action Plans; i) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the mitigation plan including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; j) a summary of its consultations with Appropriate Government Authorities, any species experts and potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the mitigation plan; and k) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the mitigation plan.	X	X		X	X	X		
39	**Hydrogeological study at Coldwater Indian Reserve (IR) No. 1** Trans Mountain must file with the NEB, **at least 6 months prior to commencing construction between Veale Road and Kingsvale Pump Station**, a hydrogeological report relating to the aquifer at Coldwater IR No. 1 in British Columbia. The report must: a) describe the methodology and information sources used, including any field investigations; b) delineate the extent of the aquifer in the area of Coldwater IR No. 1; c) characterize the aquifer recharge sources and aquifer confinement; d) characterize the direction and speed of groundwater movement to wells on Coldwater IR No. 1; e) quantify the risks posed to groundwater supplies on Coldwater IR No. 1 in the event of leaks, accidents or malfunctions from the Project; f) based on the assessment of risks, describe proposed measures to address identified risks, including but not limited to considerations related to routing, Project design, operational measures, or monitoring; g) provide justification for the measures proposed to address identified potential risks to groundwater supplies on Coldwater IR No. 1; and h) include a summary of consultations undertaken with the Coldwater First Nation and Appropriate Government Authorities, as well as copies of all written comments that may be provided to Trans Mountain by the Coldwater First Nation or Appropriate Government	X			X		X		

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	Authorities. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from the Coldwater First Nation or Appropriate Government Authorities, into the assessment.								
40	**Rare Ecological Community and Rare Plant Population Management Plan** Trans Mountain must file with the NEB for approval, **at least 5 months prior to commencing construction**, an updated Rare Ecological Community and Rare Plant Population Management Plan for ecological communities of concern, rare plants and lichens, and early draft, candidate, proposed, or final critical habitat for plant and lichen species under the *Species at Risk Act*, that are potentially affected directly or indirectly by the Project during construction or operations, that includes: a) a summary of supplementary survey results, and a demonstration of the overall adequacy of the rare ecological community and rare plant surveys, including the adequacy for the identification of biophysical attributes for any early draft, candidate, proposed, or final critical habitat under the *Species at Risk Act*; b) avoidance and mitigation measures to be implemented during construction and operations, including all relevant measures committed to throughout the OH-001-2014 proceeding and any new measures resulting from supplementary surveys, with rationales and unambiguous criteria explaining under what circumstances each measure will be applied, and measurable goals against which the success of each measure will be evaluated; c) a description of how the avoidance, mitigation, and offset hierarchy was considered in developing the plan, with rationales for progressing from avoidance to mitigation to offsets; d) details on post-construction monitoring, including survey methods, the appropriate number of years of monitoring to determine the success of each type of avoidance and mitigation measure, corrective actions that might be necessary, and the circumstances under which each such action would be taken; e) a Preliminary Rare Ecological Community and Rare Plant Population Offset Plan for any ecological communities and rare plant and lichen species that have an at-risk status of S1, S1S2 or S2, or that are listed under federal or provincial legislation for protection, and for any early draft, candidate, proposed, or final critical habitat under the *Species at Risk Act*, and that, after five years of operations, have ongoing effects. This preliminary plan must include: i) a rationale for why the community, species, or critical habitat cannot be avoided by a sufficient distance to avoid both direct and indirect residual effects; ii) the expected residual effects on that community, species, or critical habitat, including a discussion of the potential for time lags between when Project effects occur and when mitigation measures would become fully functional, and taking into account the success on past projects of the proposed mitigation and corrective measures in b) and d) above; iii) an analysis of the appropriateness of offsets for the community, species or critical habitat, taking their specific features into account, and of any potential limitations on offset effectiveness; iv) a description of how the avoidance, mitigation, monitoring, corrective and offset measures are consistent with any applicable recovery, action or management strategies or plans for the community, species or critical habitat; v) an explanation with rationales of how the need for offset measures will be determined and how quantitative offset objectives will be developed, including the use and selection of offset ratios, with the aim of achieving no-net-loss; vi) the potential types of offset measures, the process for selecting which will be implemented, an estimation of the probability of their success, and how compensation sites will be selected; and vii) a discussion of how the effectiveness of offset measures will be monitored, assessed, and reported on, and problems corrected; f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; g) a summary of its consultations with Appropriate Government Authorities, any species experts and any potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and h) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Rare Ecological Community and Rare Plant Population	X	X		X	X	X	X	

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	Management Plan, including confirmation that the avoidance, mitigation, monitoring, corrective, and offset measures in the Rare Ecological Community and Rare Plant Population Management Plan will be implemented to the extent feasible in the case of discovery via their inclusion in the Rare Ecological Communities or Rare Plant Species Discovery Contingency Plan.								
41	**Wetland Survey and Mitigation Plan** Trans Mountain must file with the NEB for approval, **at least 5 months prior to commencing construction**, a pre-construction Wetland Survey and Mitigation Plan for wetlands potentially affected directly or indirectly by the Project during construction or operations, that includes: a) a summary of supplementary survey results and a demonstration of the overall adequacy of the wetland surveys; b) a description of any wetlands for which ground-based surveys were not possible, an explanation as to why not, attempts made to obtain access, and what further information on each wetland will be collected immediately prior to or during construction; c) a description of the functional condition of each wetland for comparison during post-construction monitoring, including individual functional conditions (e.g., habitat, hydrology and biogeochemistry, including the presence and abundance of migratory birds and species at risk), and a description of the methods used to determine the type and amount of each individual wetland function and the overall functional condition; d) a description of the crossing methods, mitigation measures and reclamation measures to be implemented during construction and operations, with rationales and unambiguous criteria explaining under what circumstances each such method and measure will be applied; e) measurable goals against which the success of wetland mitigation and reclamation will be evaluated, including a description of how such goals incorporate the aim of returning wetlands to their original functionality while allowing for reasonable natural variation, and including measurable goals for each of the first-, third- and fifth-year post-construction monitoring reporting stages for any wetland to which no-net-loss under the Federal Policy on Wetland Conservation applies; f) a description of how the i) avoidance, mitigation, and offset hierarchy; and ii) the goal of no-net-loss of wetland function, were considered in developing the plan, with rationales for progressing from avoidance to mitigation to offsets; g) details of the post-construction monitoring plan for wetlands for the first five years of operations, including corrective actions that might be necessary and the circumstances under which each such action would be taken; h) a Preliminary Wetland Offset Plan for any wetland that has not achieved reclamation success in terms of overall wetland function after five years of operations, and for any wetland to which no-net-loss under the Federal Policy on Wetland Conservation applies and that has had a temporary or ongoing loss in any individual functional condition – this plan must include: i) the expected residual effects on the wetland, including a discussion of the potential for time lags between when Project effects occur and when mitigation measures would become fully functional, taking into account the success on past projects of the proposed mitigation, reclamation and corrective measures in d) and g) above; ii) an analysis of the appropriateness of offsets for the wetland, taking its specific features into account, and of any potential limitations on offset effectiveness; iii) an explanation with rationales of how the need for offset measures will be determined and how quantitative offset objectives will be developed, including the use and selection of offset ratios and indicator species, with the aim of achieving no-net-loss; iv) the potential types of offset measures, the process for selecting which will be implemented, an estimation of the probability of their success, and how compensation sites will be selected; v) a discussion of how the effectiveness of offset measures will be monitored, assessed, and reported on, and problems corrected; and vi) for any wetland to which no-net-loss under the Federal Policy on Wetland Conservation applies, details with rationales on the offset measures that will be implemented before or during the first five years of operations to compensate for expected temporary or ongoing losses to individual functional conditions, including the amount and type of offsets required, the selection of compensation sites, identification of the parties involved in planning and implementation and their respective roles and responsibilities, a timeline for implementation, and the methods and schedule for monitoring and reporting to demonstrate offset success;	X	X		X	X	X	X	

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	i) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; j) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and k) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Wetland Survey and Mitigation Plan.								
42	**Grasslands Survey and Mitigation Plan** Trans Mountain must file with the NEB for approval, **at least 5 months prior to commencing construction**, a pre-construction Grasslands Survey and Mitigation Plan for native grasslands in the B.C. interior that are potentially affected directly or indirectly by the Project during construction or operations, that includes: a) a summary of survey results for such grasslands, including but not limited to native plant species diversity, species at risk, the density and distribution of existing invasive plant species, and the presence of cryptogamic crust, together with a demonstration of the adequacy of such surveys and a summary of existing and ongoing land management impacts; b) a description (including quantification) of overlap of the Project with grasslands and of expected residual effects; c) a description of the mitigation and reclamation measures to be implemented for grasslands during construction and operations, including the extent to which native seed will be used, with rationales and unambiguous criteria explaining under what circumstances each such measure will be applied; d) measurable goals against which the success of grassland mitigation and reclamation will be evaluated, including goals related to cryptogamic crust recovery, invasive species control, and access control, and how existing and ongoing land management impacts and land-use changes by landowners outside the control of Trans Mountain will be taken into account; e) a description of how the i) avoidance, mitigation, and offset hierarchy, and ii) the goal of no-net-loss for grasslands, were considered in developing the plan, with rationales for progressing from avoidance to mitigation to offsets; f) details of the post-construction monitoring plan for grasslands for the first ten years of operations, including corrective actions that might be necessary and the circumstances under which each such action would be taken; g) a Preliminary Grasslands Offset Plan for those grasslands that, after ten years of operations, have not achieved reclamation success. This plan must include: i) expected residual effects on the grasslands, including a discussion of the potential for time lags between when Project effects occur and when mitigation measures would become fully functional, taking into account the success on past projects of the proposed mitigation, reclamation and corrective measures in c) and f) above; ii) an analysis of the appropriateness of offsets for the grasslands, taking their specific features into account, and of any potential limitations on offset effectiveness; iii) an explanation with rationales of how the need for offset measures will be determined and how quantitative offset objectives will be developed, including the use and selection of offset ratios, with the aim of achieving no-net-loss; iv) the potential types of offset measures, the process for selecting which will be implemented, an estimation of the probability of their success, and how compensation sites will be selected; and v) a discussion of how the effectiveness of offsets measures will be monitored, assessed, and reported on, and problems corrected; h) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information;	X	X		X	X	X		

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	i) a summary of its consultations with Appropriate Government Authorities, any species experts, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and j) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Grasslands Survey and Mitigation Plan.								
43	**Watercourse crossing inventory** Trans Mountain must file with the NEB, **at least 5 months prior to commencing <u>any</u> watercourse crossing construction activities**, the following: a) an updated inventory of all watercourses to be crossed, including, for each crossing: i) the name of the watercourse being crossed and an identifier for the crossing; ii) the location of the crossing; iii) the primary and contingency crossing methods; iv) planned construction timing; v) information on the presence of fish and fish habitat; vi) information on the composition of riparian habitat; vii) the provincial instream work window; viii) the proposed least risk biological window and the rationale to support the proposed least risk biological window if it differs from the provincial instream work window; and ix) an indication of whether any of Fisheries and Oceans Canada's applicable "Measures to Avoid Causing Harm to Fish and Fish Habitat" cannot be implemented; b) detailed generic design drawings of trenchless, dry open-cut, frozen open-cut, and isolation crossings of various watercourse types; c) site-specific information for each watercourse crossing where **<u>any</u>** of Fisheries and Oceans Canada's applicable "Measures to Avoid Causing Harm to Fish and Fish Habitat" cannot be implemented for the primary pipeline construction method: i) detailed crossing-specific design drawings; ii) photographs up-stream, down-stream, and at the crossing location; iii) a description of the fish species and habitat that is present at the crossing location, and if fish spawning is likely to occur within the immediate area; iv) a description of the composition of the riparian habitat at the crossing location and an indication if the riparian habitat has a limiting effect on the productive capacity of the watercourse, and if its removal or disturbance represents a potential influence on fish communities; v) the site-specific mitigation and habitat enhancement measures to be used to minimize impacts; vi) any potential residual effects; vii) proposed reclamation measures; and viii) a discussion of the potential impacts to local fisheries resources within the immediate area as a result of the crossing's construction; d) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the inventory, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and e) a summary of consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted.	X	X						
44	**Wildlife Species at Risk Mitigation and Habitat Restoration Plans** Trans Mountain must file with the NEB <u>for approval</u>, **at least 4 months prior to commencing construction**, Wildlife Species at Risk Mitigation and Habitat Restoration Plans for each species whose draft, candidate, proposed, or final critical habitat is directly or indirectly affected by the Project. Each plan must include: a) a summary of supplementary pre-construction survey results, including surveys for biophysical	X	X		X	X	X		

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	attributes of critical habitat; b) the location and type of critical habitat, for those wildlife species with early draft and candidate critical habitat, including a description of the biophysical attributes, potentially directly and indirectly affected by the Project; c) the location, types and total spatial area for each type of critical habitat for those wildlife species with proposed or final critical habitat, including a description of the biophysical attributes, potentially directly and indirectly affected by the Project; d) a detailed description of measures that will be used to avoid the destruction of critical habitat; e) a detailed description of mitigation and habitat restoration measures to be implemented to reduce direct and indirect Project effects on critical habitat, including all relevant measures committed to throughout the OH-001-2014 proceeding, any new mitigation measures resulting from supplementary surveys, detailed criteria using clear and unambiguous language that describes the circumstances under which each measure will be applied, and measurable targets for evaluating mitigation and critical habitat restoration success; f) identification and review of alternative mitigation and habitat restoration measures to avoid or lessen direct and indirect Project effects on critical habitat, and the rationale for the selected measure(s); g) detailed description of how selected mitigation and critical habitat restoration measures address the potential for time lags between when the Project impacts occur and when mitigation and critical habitat restoration measures are implemented and are fully functional; h) details on post-construction monitoring of mitigation measures and critical habitat restoration measures, including survey methods, corrective measures, detailed criteria using clear and unambiguous language that describes the circumstances under which each measure will be applied, and a proposed reporting schedule; i) details on how the mitigation, critical habitat restoration measures, and monitoring measures are consistent with applicable Recovery Strategies and Action Plans; j) a commitment to include the results of the monitoring in the post-construction environmental monitoring reports filed under Condition 151; k) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plans including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; l) a summary of its consultations with Appropriate Government Authorities, any species experts, potentially affected Indigenous groups and affected landowner/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and m) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Wildlife Species at Risk Mitigation and Habitat Restoration Plans.								
45	**Weed and Vegetation Management Plan** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction**, an updated Weed and Vegetation Management Plan for the Project that includes: a) a summary of supplementary survey results, including pre-construction weed surveys, and a demonstration of the adequacy of such surveys; b) measurable goals; c) criteria describing when and where problem vegetation will be managed for each Project phase, including pre-construction, construction, post-construction, and operations; d) a description of potential adverse effects related to treatment measures; e) management procedures and a decision-making framework for selecting appropriate prevention and treatment measures, including a description of relevant specific habitats, land uses and land management plans and how each will be considered and kept up-to-date in selecting prevention and treatment measures; f) the methods and schedule for short- and long-term vegetation monitoring; g) a summary of its consultations with Appropriate Government Authorities, invasive plant councils or committees, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and	X	X	X	X	X	X	X	X

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	h) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Weed and Vegetation Management Plan.								
46	**Contamination Identification and Assessment Plan** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction**, a Contamination Identification and Assessment Plan that includes: a) a description of the procedures that have been implemented to-date, and that will be implemented prior to or during construction, to identify and assess pre-existing solid, liquid or gaseous contamination that could be disturbed by, or affect, the Project, including whether site investigations have been or will be undertaken; b) a demonstration of the adequacy of the procedures in a) with reference to relevant standards, guidelines, and best practices, including how historical land use has been taken into account and a discussion of the potential for chemicals of concern to not be detectable by smell or by sight; c) the information that has been or will be reported by Trans Mountain, including to whom and when, concerning pre-existing contamination; d) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and e) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Contamination Identification and Assessment Plan.	X	X	X	X	X	X	X	X
47	**Access Management Plan(s)** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction**, an Access Management Plan(s) to be included within the updated Environmental Protection Plans required by Conditions 72 and 78. Each plan must address issues related to soil, vegetation, fish and fish habitat, and wildlife and wildlife habitat. Each plan must also describe access control measures proposed to control both human and predator access during construction and operations, and include: a) objectives of the plan; b) measurable goals for evaluating the plan's success in achieving its objectives; c) a summary of any related baseline information that has been or will be collected to aid in evaluating the plan's success, and justification of the adequacy of this baseline information, or a rationale if no baseline information has or will be collected; d) a list of sites where access control measures will be implemented for construction and those that will remain in place throughout operations, the control measure(s) proposed at those sites, and the rationale for selecting those sites and measures; e) the methods for monitoring the effectiveness of access control measures implemented during construction and operations, and justification of the adequacy of such monitoring; f) a description of available adaptive management measures and of the criteria Trans Mountain will use to determine if and when adaptive management measures are warranted based on monitoring results; g) a commitment to report, as part of Trans Mountain's post-construction environmental monitoring reports (required by Condition 151), on the control measures implemented, monitoring undertaken, and the success of control measures in meeting Access Management Plan goals and objectives, as well as a schedule, with rationale, for reporting throughout operations; h) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge studies into consideration including demonstration that those Indigenous persons and groups that provided Indigenous traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and i) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the Plan/Report.	X	X		X	X	X		
48	**Navigation and navigation safety plan** Trans Mountain must file with the NEB, for approval, **at least 4 months prior to commencing construction**, a Navigation and Navigation Safety Plan that includes: a) an updated list of navigable waterways to be crossed by or affected by the Project (including power lines, marine terminal, temporary or permanent bridge crossings, or other ancillary works that are physically or operationally connected to the Project);	X	X		X	X	X		

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	b) an updated listing of effects of the Project on navigation and navigation safety for each of the identified waterways identified in a); c) proposed mitigation measures to address Project effects on navigation and navigation safety for each of the identified waterways, including adherence to codes and standards (such as the CSA); and d) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and waterway users, regarding their navigational use of each of the identified waterways. In its summary, Trans Mountain must: i) describe the Appropriate Government Authorities, potentially affected Indigenous groups, and commercial and recreational waterway users consulted; ii) describe how Trans Mountain identified those consulted; and iii) provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan.								
49	**Technical working group (TWG) reports** Trans Mountain must file with the NEB, **at least 4 months prior to commencing construction and every 6 months thereafter until after commencing operations,** a report describing the activities undertaken by the TWGs during the reporting period and the outcomes of these activities. The reports must include, at a minimum: a) a list of all members of each TWG; b) the methods, dates and location of all TWG activities or meetings; c) a summary of all issues or concerns raised or addressed during the TWG activities; d) a description of outcomes or measures that were or will be implemented to address the issues identified or concerns raised; or, if any measures will not be implemented, a rationale for why not; and e) a description of any unresolved issues or concerns, and a description of how these will be addressed, or a rationale for why no further measures will be required.	**X**							
50	**High-voltage alternating current (AC) interference** Trans Mountain must file with the NEB, **at least 4 months prior to commencing construction:** a) a report confirming that Trans Mountain has achieved an engineered solution to mitigate possible damage to pipeline segments caused by the power line fault current from power line footings and other below ground fault current discharge facilities of B.C. Hydro's unshielded transmission power lines that are located less than 30 metres from those segments. The report must include: i) a summary of the above-mentioned engineered solution and an explanation of how the engineered solution adequately mitigates possible damage to the pipeline; ii) a list of pipeline segments where mitigation will be applied; and iii) an explanation of measures taken by Trans Mountain to reach an agreement with B.C. Hydro towards implementing the engineered solution. Trans Mountain must provide a copy of the report to B.C. Hydro at the same time that it is filed with the NEB; b) a report detailing how Trans Mountain's design reduces hazardous induced voltages on its pipeline segments to meet a maximum 15 VAC under all steady state operating conditions; and c) a report demonstrating how Trans Mountain would comply with the requirements of IEEE Standard 80 to limit touch and step potentials to all points of contacts to pipeline segments due to power line faults or switching surges, and include a list of affected pipeline segments.	**X**							
51	**Field changes manual for geohazard mitigation** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction**, a field changes manual for geohazard mitigation. This manual must include: a) decision criteria for implementing mitigation for any geohazards identified during construction; b) specific criteria for implementing changes to the designs, grading, special materials, protective structures, burial depth, installation procedures, erosion mitigation measures, and monitoring; and c) details regarding the required qualifications of the field staff that will implement the manual.	**X**							
52	**Air Emissions Management Plan for the Westridge Marine Terminal** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction at the Westridge Marine Terminal**, an Air Emissions Management Plan for the Westridge Marine Terminal that includes:	**X**							

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	a) locations of air monitoring sites (on a map or diagram), including the rationale for the locations selected; b) confirmation that the new fixed air monitoring stations will be installed and operating at least one year prior to commencing operations at the Westridge Marine Terminal to establish robust local baseline data; c) the methods and schedule for ambient monitoring of contaminants of potential concern in air (e.g., particulate matter [including diesel particulate matter and speciation of $PM_{2.5}$], nitrogen oxides (including NO_2), sulphur dioxide, hydrogen sulphide, ozone, mercaptans, reduced visibility and volatile organic compounds) following a recognized protocol (e.g., National Air Pollution Surveillance program or U.S. Environmental Protection Agency), and emissions source tracking; d) representative meteorological data (e.g., wind speed, wind direction, air temperature and relative humidity) for the monitoring period; e) description of monitoring equipment and procedures for monitoring station data recording, assessment, quality assurance and reporting details, including a description of how the real time and non-continuous air quality monitoring data will be made available to the public; f) a particulate matter management plan; g) a description of the public and Indigenous communication and complaint response processes; h) the criteria or thresholds that, if triggered or exceeded, would require implementing additional mitigation measures; i) a description of additional mitigation measures that would be implemented as a result of the monitoring data or ongoing concerns; and j) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners / tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan.								
53	**Fugitive Emissions Management Plan for the Westridge Marine Terminal** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction at the Westridge Marine Terminal**, a Fugitive Emissions Management Plan for the Westridge Marine Terminal that includes: a) a description of the sources of the fugitive emissions that will be generated from the Westridge Marine Terminal during construction and operations; b) a description of the emission and odour controls that will be employed to reduce fugitive emissions during tanker loading and other sources identified in a); c) procedures for verifying, tracking, and reporting on: i) fugitive emissions during tanker loading; ii) volatile organic compound collection efficiency; iii) the vapour recovery unit's hydrogen sulphide and mercaptan removal efficiency, as well as its BTEX reduction efficiency; and iv) the vapour combustion unit's hydrogen sulphide and mercaptan; removal efficiency, as well as its combustion efficiency; d) procedures for identifying any leaks or equipment malfunctions during operation of the vapour recovery and vapour combustion units; e) methods for quantifying emissions of particulate matter and volatile organic compounds (with vapour recovery and vapour combustion units in operation); f) any additional mitigation measures that will be employed to further reduce fugitive emissions; g) a description of Trans Mountain's program for addressing complaints with respect to fugitive emissions, including a communication and notification plan; and h) a summary of its consultations with Appropriate Government Authorities. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan.	X							

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54	**Fugitive Emissions Management Plan for Edmonton, Sumas and Burnaby Terminals** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction at each Terminal**, a Fugitive Emissions Management Plan for the Edmonton, Sumas, and Burnaby Terminals. This plan must include: a) a description of the fugitive emission sources within the terminals during construction and operations; b) a description of the emission and odour controls that will be employed to reduce fugitive emissions from the tanks, and any other sources identified in a); c) procedures for verifying the capture and destruction efficiency of tank vapour activation units or any other emission or odour control units at the terminals; d) quantification of fugitive emissions during operations, including the methods used; e) any additional mitigation measures that will be employed to further reduce the fugitive emissions; f) a description of Trans Mountain's program for addressing complaints with respect to fugitive emissions, including a public and Indigenous communication and complaint response process; and g) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners / tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan.							X	
55	**Fugitive Emissions Management Plan for pump stations** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction at any pump stations**, a Fugitive Emissions Management Plan for the pump stations associated with the Project that includes: a) a description of the procedures implemented for leak detection and the criteria used in selecting target leaking components; b) quantification methods considered and the rationale for the selected method(s); c) monitoring frequency for each target leaking component and the parameters that will be measured; d) a decision framework that will be implemented to repair or replace leaking components; e) a description of record-keeping procedures; and f) a discussion of additional mitigation measures that will be employed to minimize fugitive emissions.		X			X	X		
56	**Grizzly Bear Mitigation Plan** Trans Mountain must file with the NEB for approval, **at least 4 months prior to commencing construction in each vulnerable grizzly bear population unit / grizzly bear management area**, a Grizzly Bear Mitigation Plan for each of these areas. Trans Mountain must provide a rationale for why any vulnerable grizzly bear population units / grizzly bear management units potentially affected by the Project are not addressed in the plan. The Grizzly Bear Mitigation Plan(s) must include: a) a summary of results from any supplemental surveys conducted; b) potential direct and indirect effects of Project activities on vulnerable grizzly bear population units and grizzly bear management units; c) mitigation measures to be implemented, including all relevant measures committed to throughout the OH-001-2014 proceeding, any new mitigation measures resulting from supplementary surveys, detailed criteria using clear and unambiguous language that describes the circumstances under which each measure will be applied, and measurable targets for evaluating mitigation success; d) details on post-construction monitoring of mitigation measures, including survey methods, corrective measures, detailed criteria using clear and unambiguous language that describes the circumstances under which each measure will be applied, and a proposed reporting schedule; e) a commitment to include results of the monitoring in the post-construction environmental monitoring reports filed under Condition 151; f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and / or pursuant to Condition 97, had the opportunity to review and comment on the information; g) a summary of its consultations with Appropriate Government Authorities, any species experts and potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its	X	X		X	X	X		

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	consultation, including any recommendations from those consulted, into the plan(s); and h) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Grizzly Bear Mitigation Plan, including confirmation that the mitigation, monitoring, and corrective measures in this plan will be implemented in the case of discovery via their inclusion in Trans Mountain's Wildlife Species of Concern Discovery Contingency Plan.								
57	**Commercial Support for the Project** Trans Mountain must file with the Board, **at least 3 months prior to commencing construction**, confirmation, signed by an officer of the company, that: a) the Project has secured agreements or contracts that remain in force with shippers for a minimum term of 15-years for no less than 60 per cent of its total capacity (890,000 barrels per day); and b) any rights to terminate held by shippers that may have existed in any agreements or contracts between Trans Mountain and shippers (which may have reduced the Project's contracted total capacity to less than 60 per cent for a minimum term of 15 years) have lapsed and or expired because their conditions precedent have been satisfied or waived.	X							
58	**Training and education monitoring reports** a) Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction**, **and every 6 months thereafter until after commencing operations**, monitoring reports for the implementation and outcomes of Indigenous, local, and regional training and education measures and opportunities for the Project. The reports must include the following: i) a description of each training and education measure and opportunity indicator that was monitored, including duration, participant groups, education and training organization, and intended outcomes; ii) a summary and analysis of the progress made toward achieving intended outcomes of each training and education measure and opportunity, including an explanation for why any intended outcomes were not achieved; and iii) a description of identified or potential training or education gaps, and any proposed measures to address them or to support or increase training and education measures and opportunities. b) Trans Mountain must file with the NEB, **within 6 months after commencing operations**, a final report.	X							
59	**Worker accommodation strategy** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction**, a worker accommodation strategy, developed in consultation with appropriate municipal or provincial authorities. The strategy must include: a) a final summary of all proposed accommodations, including the location of any temporary camp(s); b) the number of workers that will be housed; and c) a description of how the strategy addresses any concerns or requests raised in consultation with municipal or provincial authorities. In the event that temporary camp(s) are to be used, the strategy must also include: i) a description of how the potential environmental and socio-economic impacts have been assessed, and a description of all associated mitigation measures; ii) copies of, or reference to, any mitigation or operational plans that will be required or implemented for the camp(s), including a description of how Trans Mountain has incorporated any additional mitigation measures into relevant Environmental Protection Plan(s); iii) copies of any necessary municipal or provincial permits for any camp(s) that have been received 3 months prior to construction. If camp permits are not yet in place 3 months prior to commencing construction, provide: 1) a list of the outstanding camp permits and a schedule for when these camp permits will be in place; and 2) copies of any outstanding camp permits prior to commencing construction; iv) copies or excerpts of all policies relating to the rules of conduct for workers housed at the camp(s); v) confirmation that all policies relating to the camp(s) will be provided to workers; vi) confirmation that all policies relating to the camp(s) were made available to all local communities and other relevant service providers in proximity to any camp(s) that will be	X	X		X	X	X	X	

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	used for the Project; and vii) a summary of its consultations with affected landowners/tenants where any camp(s) will be located. Trans Mountain must provide: 1) a description of the information provided to landowners/tenants; and 2) description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the Strategy.								
60	**Environmental and socio-economic assessment - s.58 temporary construction lands and infrastructure** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction**, an environmental and socio-economic assessment for all temporary construction lands and infrastructure approved pursuant to this Order. The assessments must include: a) a list of the locations and dimensions of all temporary construction lands and infrastructure; b) environmental alignment sheets or as-built drawings at an appropriate scale, clearly depicting temporary construction lands and infrastructure; c) results of any pre-construction surveys within the areas that were not previously subject to such surveys, and an indication of potential residual effects; d) all associated mitigation measures that are beyond those identified during the OH-001-2014 proceeding; e) analysis supporting the use of the measures in d), including any supplementary reports; f) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information based on any supplemental surveys completed; and g) a summary of consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants, as well as copies of all written comments that may be provided to Trans Mountain by those consulted. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the assessment.				X				
61	**List of temporary infrastructure sites** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction**, a complete list of all temporary infrastructure sites to be constructed for the Project, and must file any **updates as they become available**. This list must include information on each site's location, structures to be installed, the anticipated date for commencing construction, and activities involved in its construction. The initial list and any updates must also include the condition numbers (those under the "prior to commencing construction" phase heading) that are applicable to each site and an indication of whether each of those conditions has been or remains to be satisfied.				X				
62	**Construction schedule** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction**, a construction schedule identifying the major construction activities expected and, **on a monthly basis, on the first working day of each calendar month from the commencement of construction until after commencing operations**, updated detailed construction schedules.	X	X	X	X	X	X	X	X
63	**Security Management Programs** Trans Mountain must file confirmation, signed by an officer of the company: a) **at least 3 months prior to commencing construction**, that it has developed a Security Management Program for the construction phase of the Project; and b) **at least 3 months prior to commencing operations**, that it has amended its operations phase Security Management Program to include operation of the Project; pursuant to the *National Energy Board Onshore Pipeline Regulations* and CSA Z246.1 (as amended from time to time).	X	X	X	X	X	X	X	X
64	**Construction safety manuals** Trans Mountain must file with the NEB: a) **at least 3 months prior to commencing construction**, the Health and Safety Management Plan for the Project; and b) **at least 2 months prior to commencing construction**, Construction Safety Manuals (Project-Specific Safety Plans) for the applicable Project components. These must include separate Construction Safety Manuals for pipeline construction, terminal and pump station construction, Burnaby Mountain tunnel construction, and Westridge Marine Terminal construction. These manuals must address routine construction activities, as well as blasting, tunneling, avalanche	X	X	X	X	X	X	X	X

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	safety, safe work in proximity to operational pipelines and facilities, and special access procedures that may be required in areas subject to activities other than Project construction.								
65	**Hydrology – notable watercourse crossings** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction,** revised flood frequency estimates for all notable watercourse crossings, as defined by Trans Mountain in its application. These estimates must incorporate the results of field investigations and bathymetric surveys completed since the Project application was filed, and be presented in a format similar to that presented in Application Volume 4A, Appendix I – Route Physiography and Hydrology Report, Appendix B – Notable Water Crossing Catchment Details (Filing A56000).	X							
66	**Risk Management Plan for geohazards** Trans Mountain must develop and file with the NEB**, at least 3 months prior to commencing construction,** an updated Risk Management Plan for addressing the threats of existing and potential geohazards during construction of the Project. This plan must be updated as additional site-specific geotechnical information is obtained through detailed investigations, and modified as geohazards are encountered during construction. Trans Mountain must make any updates or modifications available to the NEB **upon request.**	X			X				
67	**Outstanding horizontal directional drilling geotechnical and feasibility reports** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction**, Geotechnical Reports and Horizontal Directional Drilling Feasibility and Design Reports, along with final design drawings, for each of the following crossings: a) Coldwater River 4 crossing; b) North Thompson River 6 crossing; c) North Thompson River 7 crossing; d) Pembina River crossing. e) Raft River crossing; f) Sumas River crossing (suitability for Direct Pipe® installation); g) any additional river crossing along the new Line 2 pipeline segments where horizontal directional drilling or other trenchless crossing method is being considered; and h) the Coquitlam Landfill, if Horizontal Directional Drilling or other trenchless crossing method is being considered.	X							
68	**Seismic reports – liquefaction potential** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction,** a final report that identifies all sites along the Project, that have "Very High," "High," and "Moderate" liquefaction-triggered ground movement potential, and that describes how the potential for liquefaction-triggered ground movement will be mitigated at each site.	X							
69	**Fault studies** Trans Mountain must file with the NEB**, at least 3 months prior to commencing construction**, the results of fault-mapping studies that were ongoing during or undertaken after the OH-001-2014 proceeding, for use in the detailed design of the Project. This filing must include conclusions regarding possible seismic activity during the Holocene epoch for Sumas Fault, Vedder Mountain Fault, Fraser River-Straight Creek Fault and Rocky Mountain Trench, and other possible hidden faults, as well as the potential for compounding risks due to the proximity of the Vedder Mountain and Sumas Faults.	X							
70	**Strain-based design** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction**, the following information related to strain-based design, where it is applied: a) the location and rationale for selecting strain-based design in each location; b) a report summarizing the adequacy of the strain-based design for various loading scenarios during pipeline construction and operation for each location provided in a); and c) a list of standards and Project-specific specifications, including testing procedures, used in the strain-based design.	X							
71	**Riparian Habitat Management Plan** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction,** a Riparian Habitat Management Plan that would apply to all defined watercourses crossed by the Project. The plan must be supported with rationales and unambiguous criteria explaining under what circumstances each such measure and strategy would apply, and must include the following.	X	X						

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	a) a description of the methods used to determine pre-construction functionality (e.g., for fish, wildlife, and rare plants) of the riparian habitat, including a justification how such functionality is assessed; b) a description of the mitigation measures and the watercourse reclamation strategies (reclamation method, reclamation measures, and application criteria) for the range of defined watercourses crossed by the Project; c) a description of the generalized vegetation planting plans for the range of defined watercourses crossed by the Project; that includes the diversity and density of species to be planted, planting locations, and application criteria; d) clearly defined measureable reclamation goals and targets for years 1, 3, and 5, post-construction, to determine whether riparian habitat has returned, or is on a sufficient trajectory to return, to pre-construction functionality; e) a discussion of how the mitigation measures, reclamation strategies, and vegetation planting plans are anticipated to return riparian habitat to pre-construction functionality, using the goals and targets provided in d); f) a summary of the information in a)-d) for each defined watercourse crossing, that includes: i) watercourse crossing ID; ii) a defined riparian habitat buffer; iii) a catalogue of the pre-construction species diversity and density of the riparian habitat; iv) classification of riparian habitat functionality; v) area of the riparian habitat to be impacted; vi) the mitigation measures, reclamation strategy, and vegetation planting plan to be implemented; and vii) the measureable goals and targets; g) details of the post-construction monitoring plan for the first five years of operations, including evaluations of reclamation activities, and potential corrective actions and enhancement measures that might be necessary and the circumstances under which each such action would be taken; h) a Preliminary Riparian Habitat Offset Plan, that would apply to all defined watercourse crossings located in watersheds identified as being above the riparian habitat disturbance threshold (>18 per cent of riparian habitat disturbed in the watershed) or classified as High Sensitive fish-bearing by Trans Mountain during the OH-001-2014 proceeding, and, where, after the fifth complete growing season, riparian habitat has not returned, or is not trending towards sufficient pre-construction functionality. The plan must include: i) how the need for offset measures will be determined, including offset ratios; ii) potential offset measures, the process for selecting which will be implemented, and an evaluation of the probability of their success; and iii) how the effectiveness of offset measures will be assessed, monitored, and reported on; i) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and j) a summary of consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its plan, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan of updates.								
72	**Pipeline Environmental Protection Plan** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction**, an updated Project-specific Pipeline Environmental Protection Plan for the construction of the pipeline. The updated Pipeline Environmental Protection Plan must be a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in Trans Mountain's Project application, its subsequent filings, or as otherwise committed to during the OH-001-2014 proceeding. The updated Pipeline Environmental Protection Plan must describe the criteria for implementing all procedures and measures using clear and unambiguous language that confirms Trans Mountain's intention to implement all of its commitments. The updated Pipeline Environmental Protection Plan must include the following: a) environmental procedures (including site-specific plans), criteria for implementing these	X	X						

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	procedures, mitigation measures, and monitoring applicable to all Project phases and activities; b) policies and procedures for environmental training and the reporting structure for environmental management during construction, including the qualifications, roles, responsibilities, and decision-making authority for each job title identified in the updated Pipeline Environmental Protection Plan; c) any additional measures arising from supplemental pre-construction studies and surveys; d) updated contingency plans and management plans; e) updated alignment sheets; f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the Pipeline Environmental Protection Plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and g) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the Pipeline Environmental Protection Plan.								
73	**Traffic Control Plans for public roadways** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction of the pipeline and at least 2 months prior to commencing construction at each terminal and pump station**, Traffic Control Plans for the use of public roadways for the Project. The plans must include: a) information regarding the timing and location of key construction activities (including equipment mobilization and staging, pipe stockpiling, pipeline and pump station construction, and equipment demobilization); b) current traffic volumes and anticipated traffic volumes during the construction period for both day and night times; c) a description of the predicted traffic flows, including vehicle types and volumes, at key construction points, marshalling areas, access roads, and public roadways; d) an assessment of the potential impacts associated with the increased volume of construction-related traffic (e.g., safety hazards, noise, light, dust, etc.) and associated mitigation measures; and e) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plans.	X	X	X	X	X	X	X	X
74	**Horizontal directional drilling (HDD) Noise Management Plan** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction of each HDD crossing**, a site-specific HDD Noise Management Plan that includes: a) proposed hours of daytime and nighttime work; b) baseline daytime and nighttime ambient sound levels at noise sensitive areas within 500 metres of the HDD entry and exit sites; c) predicted noise levels caused by HDD at the most affected receptors without mitigation measures implemented; d) proposed HDD noise mitigation measures, including all technologically and economically feasible mitigation measures; e) predicted noise levels at the most affected receptors with mitigation measures implemented, including noise contour map(s) showing potentially affected receptors; f) an HDD noise monitoring program, including locations, methodology, and schedule; g) a description of the public and Indigenous communication and complaint response process; h) a contingency plan that contains proposed mitigation measures for addressing noise complaints, which may include the temporary relocation of specific residents; and i) confirmation that Trans Mountain will provide notice to nearby residents in the event that a planned blowdown is required, and that the planned blowdown will be completed during daytime hours whenever possible.	X							

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75	**Nooksack Dace and Salish Sucker Management Plan** a) Trans Mountain must construct all watercourse crossings located within nooksack dace or salish sucker proposed or final critical habitat, as defined by Fisheries and Oceans Canada Recovery Strategies for the species, using trenchless crossing methods with entry and exit points located outside of the riparian habitat area, unless demonstrated to be not feasible. b) **At least 3 months prior to commencing construction of any watercourse crossing located within nooksack dace or salish sucker proposed or final critical habitat**, Trans Mountain must file a list of these watercourse crossings, and, for each, indicate whether or not a trenchless crossing method is feasible. c) For each watercourse crossing in b) where a trenchless crossing method is not feasible, **at least 3 months prior to commencing construction of that crossing,** Trans Mountain must file the following with the NEB for approval: i) a summary of the trenchless crossing feasibility studies completed and a discussion of the risks and constraints associated with the trenchless watercourse crossing, and the rationale for not employing a trenchless method; ii) the updated watercourse crossing method, location of crossing, planned construction timing, and the provincial instream work window; iii) any site-specific mitigation and reclamation measures, and species-specific habitat enhancement measures; iv) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include measures listed in iii); v) a discussion of how the site-specific mitigation and reclamation measures, and species-specific enhancement measures, relate to Fisheries and Oceans Canada Recovery Strategies and Action Plans; vi) details on any monitoring to be undertaken and a commitment to include any results in the post-construction environmental monitoring reports filed under Condition 151; vii) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and viii) a summary of consultations with Appropriate Government Authorities and any species experts. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan. d) For any watercourse crossing identified in b) where Trans Mountain will employ a trenched contingency crossing method, Trans Mountain must file with the NEB, for approval, the information listed in c), **at least 30 days prior to commencing construction of the contingency watercourse crossing**.	X							
76	**Old Growth Management Areas Mitigation and Replacement Plan** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction within old growth management areas**, an Old Growth Management Areas Mitigation and Replacement Plan for these areas that are potentially affected directly or indirectly by the Project during construction or operations, that includes: a) avoidance and mitigation measures to be implemented during construction and operations, with rationales and unambiguous criteria explaining under what circumstances each measure will be applied, and measurable goals against which the success of each measure will be evaluated; b) a description of how the avoidance, mitigation, and offset hierarchy was considered in developing the plan, with rationales for progressing from avoidance to mitigation to offsets; c) details on post-construction monitoring, including corrective actions that might be necessary and the circumstances under which each such action would be taken; d) the expected residual effects (including quantification) on old growth management areas, including a discussion of the potential for time lags between when Project effects occur and when mitigation measures would become fully functional; e) replacement or other offset measures that will be implemented to compensate for residual effects with the aim of no-net-loss to old growth forests within old growth management areas overall, including: i) discussion of the appropriateness of compensation for the old growth management area, taking its specific features into account, and of any potential limitations of the effectiveness of such replacement or offset measures;	X			X	X	X		

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	ii) an explanation with rationales on the amount and type of replacements or other offsets required; iii) a timeline for their implementation; iv) the selection of compensation sites; v) identification of the parties involved in planning and implementation and their respective roles and responsibilities, and vi) a description of the methods and schedule for monitoring and reporting to demonstrate compensation success; f) a summary of its consultations with Appropriate Government Authorities and any potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; and g) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the Old Growth Management Areas Mitigation and Replacement Plan.								
77	**Archaeological and cultural heritage assessment – Lightning Rock** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction of the pipeline between the Sumas Terminal and the Sumas Pump Station**, a report on archaeological and cultural heritage field investigations undertaken to assess the potential impacts of Project construction and operations on the Lightning Rock site at Sumas, British Columbia. The report must include: a) a detailed description of the assessment plan that was developed, in consultation with the Stó:lō Collective, for the involvement of the Stó:lō Collective in designing and undertaking surveys; b) a description of the pre-construction archaeological and cultural heritage surveys conducted at the site, including: i) survey methodologies used; and ii) data and information sources, including information and Indigenous traditional knowledge provided by the Stó:lō Collective; c) a site description, including maps at appropriate scales and levels of detail, confirming the site boundaries; d) an assessment of the potential environmental and socio-economic impacts of Project construction and operations on the archaeological resources and cultural heritage of the site; e) all associated mitigation measures that are beyond those identified during the OH-001-2014 proceeding to address any identified impacts; f) analysis supporting the use of the measures in e), including any additional relevant reports; g) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) and Environmental Alignment Sheets to include any relevant information based on the surveys completed; and h) a summary of consultations undertaken with the Stó:lō Collective, and Appropriate Government Authorities, as well as copies of all written comments that may be provided to Trans Mountain by the Stó:lō Collective or government authorities. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from the Stó:lō Collective or government authorities, into the assessment.	X			X				

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78	**Facilities Environmental Protection Plan** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction at the facilities (terminals, pump stations, temporary facilities, and associated infrastructure),** an updated Project-specific Facilities Environmental Protection Plan for the construction at the facilities. The updated Facilities Environmental Protection Plan must be a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in Trans Mountain's Project application, its subsequent filings, or as otherwise committed to during the OH-001-2014 proceeding. The updated Facilities Environmental Protection Plan must describe the criteria for implementing all procedures and measures using clear and unambiguous language that confirms Trans Mountain's intention to implement all of its commitments. The updated Facilities Environmental Protection Plan must include the following: a) environmental procedures (including site-specific plans), criteria for implementing these procedures, mitigation measures, and monitoring applicable to all Project phases and activities; b) policies and procedures for environmental training and the reporting structure for environmental management during construction, including the qualifications, roles, responsibilities, and decision-making authority for each job title identified in the updated Facilities Environmental Protection Plan; c) any additional measures arising from supplemental pre-construction studies and surveys; d) updated contingency plans and management plans; e) updated facility drawings including relevant site-specific resources and mitigations; f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the Environmental Protection Plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and g) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the Facilities Environmental Protection Plan.		X	X	X	X	X	X	X
79	**Air Emissions Management Plan for the Edmonton, Sumas and Burnaby Terminals** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction at each of the Edmonton, Sumas, and Burnaby Terminals**, an Air Emissions Management Plan for each of those terminals that includes: a) a description of the baseline, pre-construction conditions informed by relevant modelling results and recent existing monitoring data; b) descriptions of the locations of air monitoring sites (on a map or diagram), including the rationale for the locations selected; c) the timing for installing air monitoring stations; d) the methods and schedule for monitoring ambient ground-level concentrations of potential concern (e.g., volatile organic compounds, ozone, hydrogen sulphide, mercaptans, criteria air contaminants, secondary ozone and particulate matter, and reduced visibility) and emissions source tracking; e) procedures for monitoring station data recording, assessment, and reporting details, including a description of how the real time and non-continuous air quality monitoring data will be made available to the public; f) a description of the public and Indigenous communication and complaint response process; g) the criteria or thresholds that, if triggered or exceeded, will require implementing additional emissions reduction measures; h) possible measures that will be implemented as a result of the monitoring data or ongoing concerns; and i) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan.							X	

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80	**Noise Management Plan for construction at terminals and pump stations** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction at each terminal and pump station**, a Noise Management Plan for construction, where residences are within 300 metres of the proposed construction activities. The plan must include: a) proposed hours of daytime and nighttime work; b) noise mitigation measures, including all technologically and economically feasible mitigation measures; c) a noise monitoring program, including locations, methodology, and schedule; d) a description of the public and Indigenous communication and noise complaint response process; and e) a contingency plan that contains proposed mitigation measures for addressing noise complaints, which may include the temporary relocation of specific residents.	X				X	X	X	
81	**Westridge Marine Terminal Environmental Protection Plan** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing construction at the Westridge Marine Terminal**, an updated Project-specific Westridge Marine Terminal Environmental Protection Plan for the construction at the Westridge Marine Terminal. The updated Environmental Protection Plan must be a comprehensive compilation of all environmental protection procedures, mitigation measures, and monitoring commitments, as set out in Trans Mountain's Project application, its subsequent filings, or as otherwise committed to during the OH-001-2014 proceeding. The updated Westridge Marine Terminal Environmental Protection Plan must describe the criteria for implementing all procedures and measures using clear and unambiguous language that confirms Trans Mountain's intention to implement all of its commitments. The updated Westridge Marine Terminal Environmental Protection Plan must include the following: a) environmental procedures (including site-specific plans), criteria for implementing these procedures, mitigation measures, and monitoring applicable to all Project phases and activities; b) policies and procedures for environmental training and the reporting structure for environmental management during construction, including the qualifications, roles, responsibilities, and decision-making authority for each job title identified in the updated Environmental Protection Plan; c) any additional measures arising from supplemental pre-construction studies and surveys; d) updated contingency plans and management plans; e) updated facility drawings including relevant site-specific resources and mitigations; f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the Westridge Marine Terminal Environmental Protection Plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and g) a summary of its consultations with Appropriate Government authorities and any potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the Westridge Marine Terminal Environmental Protection Plan.	X							

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82	**Light Emissions Management Plan for the Westridge Marine Terminal** Trans Mountain must file with the NEB**, at least 3 months prior to commencing construction at the Westridge Marine Terminal**, a Light Emissions Management Plan for the Westridge Marine Terminal that includes: a) a summary of the results of an area lighting study, including how potential impacts on surrounding communities and safety and operational requirements were considered; b) a description of the mitigation and best practice measures considered for the terminal lighting design and how the proposed design and operation will minimize the impacts from light on land-based residents and marine users; c) a summary of its consultations with Port Metro Vancouver, as well as copies of all written comments that may be provided to Trans Mountain by Port Metro Vancouver. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from Port Metro Vancouver, into the plan; and d) a plan for how Trans Mountain will communicate its proposed terminal lighting design and associated mitigation measures to limit any nuisance lighting disturbances to land-based residents and marine users.	X							
83	**Westridge Marine Terminal (offshore) – pile design** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction at the Westridge Marine Terminal**, the final design basis for the offshore pile foundation layout of the Westridge Marine Terminal.	X							
84	**Emergency release system at the Westridge Marine Terminal** Trans Mountain must file with the NEB, **at least 3 months prior to commencing construction at the Westridge Marine Terminal**, its conclusions on the necessity of an emergency release system for the loading arms at the Westridge Marine Terminal. The conclusions must be supported by a comprehensive study describing the advantages and disadvantages of incorporating an emergency release system. This study must: a) consider the application of: i) emergency release couplers; and ii) an emergency release system, during both normal operating conditions and under abnormal conditions such as seismic events; and b) include a description of the final emergency release system design, if applicable.	X							
85	**Air Emissions Management Plan – Burnaby Mountain tunnel construction** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing Burnaby Mountain tunnel construction activities**, an Air Emissions Management Plan for tunnel construction. The plan must include: a) proposed hours for daytime and nighttime work; b) sources that would generate air emissions; c) an Air Emissions and Dust Emissions Management Plan that includes mitigation measures, their predicted effectiveness, and implementation timeframes; and d) a description of Trans Mountain's program for addressing complaints received during tunnel construction with respect to air and dust emissions, including a communication and notification plan.	X							
86	**Burnaby Mountain Tunnel Construction Noise Management Plan** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing Burnaby Mountain tunnel construction activities**, a Burnaby Mountain Tunnel Construction Noise Management Plan that includes: a) proposed hours of daytime and nighttime work; b) baseline daytime and nighttime ambient sound levels at noise sensitive areas within 500 metres of the entry and exit sites for the tunnel; c) predicted noise levels at the most affected receptors caused by tunnel construction without mitigation measures implemented; d) proposed noise mitigation measures, including all technologically and economically feasible mitigation measures; e) predicted noise levels at the most affected receptors with mitigation measures implemented, including noise contour map(s) showing the potentially affected receptors; f) a tunnel construction noise monitoring program, including locations, methodology, and schedule;	X							

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	g) criteria that will be used to determine when tunnel construction would be shut down due to noise; h) a summary of its consultations with Appropriate Government Authorities and any potentially affected receptors (residences and businesses), as well as copies of all written comments that may be provided to Trans Mountain by those consulted. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the plan; i) a description of the public and Indigenous communication and noise complaint response processes; and j) a contingency plan that contains proposed mitigation measures for addressing noise complaints, which may include the temporary relocation of specific residents.								
87	**Groundwater Seepage Management Plan – Burnaby Mountain tunnel construction** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing Burnaby Mountain tunnel construction activities**, a Groundwater Seepage Management Plan for tunnel construction. The plan must include: a) an estimate quantifying the anticipated average and maximum amounts of groundwater seepage into the tunnel, and an assessment of any potential impacts on the water table; b) a discussion of Trans Mountain's proposed pumping, treatment, and disposal options; c) a description of the potential effects of dewatering of bedrock aquifers, springs and streams on local groundwater and surface water resources, and of measures that Trans Mountain would implement to mitigate such effects; and d) a description of measures that Trans Mountain would implement during the operations phase in the event that there is groundwater seepage into the tunnel.	X							
88	**Project organizational structure for Project construction** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction**, a diagram of the Project's organizational structure (i.e., project management, design, and field staff) that clearly identifies roles, accountabilities, responsibilities, and reporting relationships for construction of the applicable Project components.	X							
89	**Emergency Response Plans for construction** Trans Mountain must file with the NEB**, at least 2 months prior to commencing construction**, a Project-specific Emergency Response Plan, including the Trans Mountain Expansion Project Emergency Response Plan and site-specific Emergency Response Plans as referenced in Volume 4B, Section 5.4.2 of its Project application (Filing A3S1K6), that would be implemented during the construction phase. The plan(s) must include spill contingency measures that Trans Mountain will employ in response to accidental spills attributable to construction activities, 24-hour medical evacuation, fire response, and security.	X	X	X	X	X	X	X	X
90	**Consultation on improvements to Trans Mountain's Emergency Management Program** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction**, a consultation plan for its review of its Emergency Response Plans and equipment (including its availability), as referenced in Volume 7, Section 4.8.2 of its Project application (Filing A3S4V5). This plan must include: a) the consultation plan's scope; b) the consultation plan's objectives; c) a preliminary list of Appropriate Government Authorities, first responders, potentially affected Indigenous groups and affected landowners/tenants with whom Trans Mountain will consult; d) a preliminary list of consultation locations and timing; and e) the methods that will be used to track commitments made during consultations and to incorporate them into Trans Mountain's Emergency Management Program, including its Emergency Response Plans.	X					X	X	
91	**Plan for marine spill prevention and response commitments** Trans Mountain must file with the NEB, **within 6 months from the issuance date of the Certificate**, a plan describing how it will ensure that it will meet the requirements of Condition 133 regarding marine spill prevention and response. The plan must be prepared in consultation with Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, Vancouver Fraser Port Authority, British Columbia Coast Pilots, Western Canada Marine Response Corporation, Fisheries and Oceans Canada and the Province of British Columbia, and must identify any issues or concerns raised and how Trans Mountain has addressed or responded to them. Trans Mountain must provide the plan to the above-mentioned parties at the same time as it is filed with the NEB.	X							

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
92	**Updates under the Species at Risk Act** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction,** a summary of any relevant updates under the *Species at Risk Act,* including new Schedule 1 listings and new or amended Recovery Strategies, Action Plans, and Management Plans for species that have the potential to be affected by the Project. For each species-specific update, the summary must include: a) a discussion of the Project activities' potential effects on the listed species or its critical habitat, including an explanation as to whether additional surveys are required to locate such critical habitat; b) identification of all reasonable alternatives to the Project activities referred to in a), including avoidance measures, and a discussion on the potential effects of the alternatives, the chosen approach, and the rationale for selecting the chosen approach; c) any additional site-specific mitigation; d) any monitoring to be undertaken and a commitment to include monitoring results as part of the post-construction environmental monitoring reports filed under Condition 151; e) an explanation as to how the responses to b), c) and d) above are consistent with applicable Recovery Strategies and Actions Plans; and f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the summary of updates, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information.	X	X		X	X	X		
93	**Water well inventory** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction**, an inventory of physically verified ("ground-truthed") water wells that are within 150 metres of either side of the centre of the pipeline right-of-way. The filing must contain confirmation that Trans Mountain will maintain and update the inventory until the Project is abandoned or decommissioned pursuant to the NEB Act. The inventory must include a description of the methods used to identify and physically verify wells, including: a) each well's location in proximity to the right-of-way, including its GPS coordinates; b) a description of each well's type or use (e.g., drinking water, agricultural use, use by Indigenous groups, any other uses); c) each well's tenure or ownership (e.g., private, municipal, Indigenous community); d) each well's operational status, including abandoned or decommissioned wells, and information about each well, including well depth, lithology, and water depth, if available; e) a plan for updating the inventory over the life of the Project, including: i) the methods for identifying and verifying abandoned or decommissioned wells, and new or replacement wells; and ii) the frequency of inventory updates; f) a list of any properties or sections of the right-of-way that were not physically verified, including; i) the reason why properties or right-of-way sections were not physically accessed; ii) an estimate of the potential number of wells that have not been physically verified; and iii) a proposed schedule for accessing properties or right-of-way sections; and g) a description of Trans Mountain's plans for communicating information about the locations of water wells to owners or affected users.	X							
94	**Consultation reports – protection of municipal water sources** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction**, **and on or before 31 January of each year during construction and of the first 5 years after commencing operations,** a report on Trans Mountain's consultations with municipalities and regional districts, communities, and Indigenous groups related to the protection of municipal and community water sources, including those sources currently relied upon and sources identified for potential future use. Each report must include: a) the name of the municipality, regional district, community, or Indigenous group consulted; b) the methods, dates, and locations of all meetings or consultations; c) a summary of all issues or concerns raised; and d) a summary of any steps or measures that have been or will be undertaken, including	X	X			X	X	X	

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	groundwater modelling or monitoring, as a result of consultations with municipalities, regional districts, communities, or Indigenous groups. This summary must include: i) any updates or amendments to maintenance policies, systems, programs, procedures, practices, and activities aimed at preventing pipeline releases; ii) the criteria used to identify and select modelling or monitoring locations and parameters; iii) results of any modelling or monitoring; iv) any measures that have been taken to address modelling or monitoring results; and v) any measures to share or to make accessible to municipalities, regional districts, communities, or Indigenous groups data or issues that arise regarding drinking water (aquifers, groundwater, and well water supplies); or in the alternative to i)-v) above, an explanation why no further action is required to address or respond to issues or concerns raised.								
95	**Visual Impact Plan** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction**, a Visual Impact Plan that includes: a) the results of any supplemental visual modelling surveys conducted of select locations that are highly visible to the public, identified in consultation with Appropriate Government Authorities, and potentially affected Indigenous groups and affected landowners/tenants, where the proposed pipeline corridor deviates from the existing TMPL system right-of-way; and b) mitigation measures to be implemented, including all relevant measures committed to throughout the OH-001-2014 proceeding, and any new mitigation measures resulting from supplementary surveys.	X							
96	**Reports on engagement with Indigenous groups – construction** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction and every 6 months thereafter until after commencing operations,** a report on the engagement activities it has undertaken with potentially affected Indigenous groups. Each report must include, at a minimum, for each Indigenous group engaged: a) the name of the group; b) the method(s), date(s), and location(s) of engagement activities; c) a summary of any issues or concerns raised; and d) the measures taken, or that will be taken, to address or respond to issues or concerns, or an explanation why no further action is required to address or respond to issues or concerns. Trans Mountain must provide a copy of each report to each group engaged (and identified in a) above) at the same time that it is filed with the NEB.	X	X	X	X	X	X	X	X
97	**Traditional Land Use (TLU) and Traditional Marine Resource Use (TMRU) Investigation Report** Trans Mountain must file with the NEB for approval, **at least 2 months prior to commencing construction,** a report describing pre-construction TLU and TMRU investigations that were not reported during the OH-001-2014 proceedings and that relate specifically to the Project (up to and including the foreshore lands and boundaries of the water lease for the Westridge Marine Terminal). The report must include: a) the name of the potentially affected Indigenous group to which each investigation pertains; b) a description of any identified potentially affected TLU or TMRU sites, resources, or activities; c) the methods used to identify the potentially affected TLU or TMRU sites, resources or activities; d) a summary of any mitigation measures that Trans Mountain will implement to reduce or eliminate (to the extent possible) Project effects on TLU or TMRU sites, resources or activities; e) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include mitigation measures (summarized in (d)) to reduce or eliminate (to the extent possible) Project effects on TLU or TMRU sites, resources or activities; f) a summary of consultations undertaken with or concerns raised by potentially affected Indigenous groups regarding investigations on Project effects on the current use of lands and resources or marine resource use for traditional purposes, as well as copies of all written comments provided to Trans Mountain by potentially affected Indigenous groups to which each investigation pertains. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those Indigenous groups to which each investigation pertains, into the report; g) a description of any outstanding concerns raised regarding potential Project effects on the current use of lands and resources or marine resource use for traditional purposes, including a description of how Trans Mountain will or address or respond to them, or an explanation why it	X							

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	will not address or respond to them; and h) a summary of any outstanding TLU or TMRU investigations or follow-up activities that will not be completed prior to commencing construction, including estimated completion date(s), if applicable, and a description of how Trans Mountain has already identified, or will identify, any potentially affected TLU and TMRU sites, resources or activities for these outstanding investigations. Trans Mountain must provide a copy of the report to each potentially affected group identified in a) at the same time that it is filed with the NEB.								
98	**Plan for Indigenous group participation in construction monitoring** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction,** a plan describing participation by Indigenous groups in monitoring activities during construction for the protection of traditional land and resource use for the pipelines, terminals and pump stations, and traditional marine resource use at the Westridge Marine Terminal. The plan must include: a) a summary of engagement activities undertaken with Indigenous groups to determine opportunities for their participation in monitoring activities; b) a list of potentially affected Indigenous groups, if any, that have reached agreement with Trans Mountain to participate in monitoring activities; c) the scope, methodology, and justification for monitoring activities to be undertaken by Trans Mountain and each participating Indigenous group identified in b), including those elements of construction and geographic locations that will involve Indigenous Monitors; d) a description of how Trans Mountain will use the information gathered through the participation of Indigenous Monitors; and e) a description of how Trans Mountain will provide the information gathered through the participation of Indigenous Monitors to the participating Indigenous group. Trans Mountain must provide a copy of the report to each potentially affected group identified in b) above at the same time that it is filed with the NEB.	X	X		X	X	X	X	
99	**Landowner and tenant consultation reports** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction, and every 6 months thereafter until 5 years after commencing Project operations**: a) a description of landowner and tenant consultations, including the consultation methods, dates, and a summary of any issues or concerns raised by landowners and tenants; b) a summary of actions that Trans Mountain has undertaken to address or respond to each of the issues or concerns raised, or an explanation for why no actions were taken, and any outstanding concerns; and c) confirmation that Trans Mountain will make available to a landowner or tenant, upon request, a copy of the consultation records related to that landowner or tenant.	X							
100	**Heritage resources** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction of individual Project components** as described in Condition 10(a): a) confirmation, signed by an officer of the company, that it has obtained all of the required archaeological and heritage resource permits and clearances from the Alberta Department of Culture and the British Columbia Ministry of Forests, Lands and Natural Resource Operations; b) confirmation that it has consulted with the British Columbia Ministry of Forests, Lands and Natural Resource Operations, and that the Ministry has reviewed and approved the mitigation measures for disturbance to impacted palaeontological sites within British Columbia; c) a description of how Trans Mountain will meet any conditions and respond to any comments and recommendations contained in the permits and clearances referred to in a) or obtained through the consultation referred to in b); and d) confirmation that Trans Mountain will update the relevant Environmental Protection Plan(s) to include any relevant information from the conditions or recommendations referred to in c).	X	X	X	X	X	X	X	X
101	**Uninterruptible Power Supply (UPS) and battery systems** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction at each terminal and pump station**, confirmation that the UPS system design and planned operation related to that facility, is in compliance with the requirements of CSA 22.1 – 15 or other applicable standard(s) that exceeds the requirements of CSA 22.1 – 15. If another standard is used, this filing must include the name of the standard and an explanation of why the standard was used and how it meets or exceeds the requirements of CSA 22.1 1 – 15.	X				X	X	X	

No.	Conditions with initial filings due prior to commencing construction, or prior to commencing construction of specified Project component(s)	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
102	**Landowner and tenant complaint process / system** Trans Mountain must file with the Board, **at least 30 days prior to commencing construction,** confirmation that it has created and will maintain, up until the Project is abandoned or decommissioned pursuant to the NEB Act, a process / system that chronologically tracks landowner and tenant complaints related to the Project. The filing must contain confirmation that the process / system will track: a) a description of each complaint; b) how each complaint was received (e.g., telephone, letter, email); c) the date each complaint was received; d) subsequent dates of all contact or correspondence with each complainant; e) records of any site visits, monitoring, or inspections; f) contact information for all parties involved in each complaint; g) the date of each complaint's resolution; and h) if a complaint remains unresolved, a description of any further actions to be taken or an explanation for why no further action is required. Trans Mountain must make available to a landowner or tenant, **upon request**, the records related to the complaint(s) that the landowner or tenant made to Trans Mountain, including any investigations, reports or surveys conducted in relation to the complaint.	X							
103	**Utility crossings** Trans Mountain must file with the Board, **at least 30 days prior to commencing construction,** a list of all underground utilities to be crossed by the Project. The list must include the location and owners of the utilities to be crossed, as well as confirmation that all the agreements or crossing permits for those utilities to be crossed have been acquired or will be acquired prior to construction.	X			X				
No.	**Conditions with initial filings due during construction / prior to commencing operations**	**CPCN**	**OC2**	**OC49**	**Temp**	**Pump1**	**Pump2**	**Tanks**	**Deact**
104	**Updated engineering alignment sheets and drawings** Trans Mountain must file with the NEB, **at least 3 months prior to commencing pipe installation**, updated engineering alignment sheets and drawings and, **as they become available and prior to their implementation**, any modifications to those sheets and drawings.	X							
105	**Quality assurance verification** Trans Mountain must file **monthly summary reports, from commencing construction until after commencing operations,** outlining non-conformances with its design, materials, and construction specifications and the disposition of these non-conformances.	X				X	X	X	
106	**Construction progress reports** Trans Mountain must file with the NEB **monthly construction progress reports from commencing construction until after commencing operations**. The reports must include information on the progress of activities carried out during the reporting period, including: a) safety, environmental and security issues or non-compliances that occurred during the reporting period; b) measures undertaken to resolve safety and environmental issues or non-compliances identified in a); c) confirmation that security issues identified in a) have been addressed; d) a description and the location of any change made to geohazard mitigation measures pursuant to Condition 51; and e) the location of any pressure tests carried out during the reporting period and a description of any unsuccessful pressure tests, including the reasons for the lack of success of each.	X	X	X	X	X	X	X	X
107	**Indigenous, local, and regional employment and business opportunity monitoring reports** a) Trans Mountain must file with the NEB, **within 3 months after commencing construction**, **and every 6 months thereafter until after commencing operations**, monitoring reports for Indigenous, local, and regional employment and business opportunities for the Project. The reports must include: i) a summary of the elements or indicators monitored; ii) a summary and analysis of Indigenous, local, and regional employment and business opportunities during the reporting period; and iii) a summary of Trans Mountain's consultation, undertaken during the reporting period, with	X							

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	relevant Indigenous groups and local, regional, community and industry groups or representatives, regarding employment and business opportunities. This summary must include any issues or concerns raised regarding employment and business opportunities and how Trans Mountain has addressed or responded to them. b) Trans Mountain must file with the NEB, **within 6 months after commencing operations**, a final report on employment during the construction phase.								
108	**Contingency watercourse crossings** a) For any watercourse crossing where Trans Mountain will employ a contingency crossing method instead of its proposed primary method, and where **any** of Fisheries and Oceans Canada's applicable "Measures to Avoid Causing Harm to Fish and Fish Habitat" cannot be implemented, Trans Mountain must file with the NEB **at least 30 days prior to commencing construction of the contingency watercourse crossing:** i) confirmation of the contingency watercourse crossing method that will be employed, the rationale for employing that method, and a summary of the differences between the primary and contingency watercourse crossing methods; and ii) the following site-specific information: 1) detailed crossing-specific design drawings; 2) photographs up-stream, down-stream, and at the crossing location; 3) a description of the fish species and habitat that is present at the crossing location, and if fish spawning is likely to occur within the immediate area; 4) a description of the composition of the riparian habitat at the crossing location and an indication if the riparian habitat has a limiting effect on the productive capacity of the watercourse, and if its removal or disturbance represents a potential influence on fish communities; 5) the site-specific mitigation and habitat enhancement measures to be used to minimize impacts; 6) any potential residual effects; 7) proposed reclamation measures; and 8) a discussion of the potential impacts to local fisheries resources within the immediate area as a result of the crossing's construction; and b) For all other instances where a contingency crossing method will be employed and all of Fisheries and Oceans Canada's applicable "Measures to Avoid Causing Harm to Fish and Fish Habitat" will be implemented, Trans Mountain must file with the NEB a notification, **at least 15 days prior to commencing the contingency crossing**, that the contingency method will be employed. With this notification, Trans Mountain must explain why the contingency method is being employed and provide a summary of the differences between the primary and contingency watercourse crossing methods. c) Trans Mountain must confirm, **within 30 days after commencing operations,** that any contingency watercourse crossing(s) identified to the NEB pursuant to a) and b) were the only contingency watercourse crossing(s) implemented for the construction of the pipeline.	X							
109	**Authorization(s) under paragraph 35(2)(b) of the *Fisheries Act* – Westridge Marine Terminal** a) In the event that Fisheries and Oceans Canada determines that the Westridge Marine Terminal expansion requires Authorization(s) under paragraph 35(2)(b) of the *Fisheries Act*, Trans Mountain must file with the NEB, **at least 10 days prior to commencing works specified in the respective Authorization(s),** a copy of the Authorization(s); and b) Trans Mountain must confirm, **within 30 days after commencing operations,** that any *Fisheries Act* Authorization(s) required for the Westridge Marine Terminal expansion were obtained from Fisheries and Oceans Canada and filed with the NEB pursuant to a), or notify the Board if no Authorization(s) was required.	X							
110	**Authorization(s) under paragraph 35(2)(b) of the *Fisheries Act* and Species at Risk permit(s) – pipeline** For instream activities, except for those related to the Westridge Marine Terminal: a) for any instream activities that will require Authorization(s) under paragraph 35(2)(b) of the *Fisheries Act,* Trans Mountain must file with the NEB, **at least 10 days prior to commencing the respective instream activities,** a copy of the Authorization under paragraph 35(2)(b) of the *Fisheries Act*. b) for any instream activities that will require a permit(s) under the *Species at Risk Act*, Trans Mountain must file with the NEB, **at least 10 days prior to commencing the respective instream**	X	X						

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	activities, a copy of the permit(s) issued under the *Species at Risk Act*. c) Trans Mountain must confirm, **within 30 days after commencing operations,** that: i) any required *Fisheries Act* Authorization(s) were obtained from Fisheries and Oceans Canada and filed with the NEB pursuant to a), or notify the Board if no Authorization(s) were required; and ii) any required *Species at Risk Act* permit(s) were obtained from the competent minister under the *Species at Risk Act* and filed with the NEB pursuant to b), or notify the Board if no permit(s) were required.								
111	**Joining Programs** Trans Mountain must develop Joining Programs and file them with the NEB **at least 45 days prior to commencing welding of, respectively**: a) field circumferential production, tie-in, and repair pipeline welds, including the tie-in welds between existing segments and Line 1 or Line 2; and b) terminals and pump stations. The Joining Programs must include: i) welder qualification requirements; ii) requirements for welding inspector qualifications and duties; iii) welding procedure specifications; iv) non-destructive examination (NDE) specifications; v) procedure qualification records for welding procedure specifications and NDE specifications; vi) a quality assurance program for field welds and welding procedures; and vii) any additional information that supports the Joining Program.	X	X			X	X	X	
112	**Pressure testing** a) Trans Mountain must pressure test the new and reactivated pipeline segments, terminals, and pump stations with a liquid medium. b) Trans Mountain must file with the NEB, **at least 3 months prior to commencing pressure testing**, a Pressure Testing Program that demonstrates compliance with applicable codes, standards, and regulatory requirements.	X	X			X	X	X	
113	**Hydrostatic Testing Plan** Trans Mountain must file with the NEB, **at least 3 months prior to commencing pressure testing of any Project component**, a Hydrostatic Testing Plan for the Project that includes: a) the locations of all water withdrawal and discharge sites; b) a discussion of any clearing activities or any other associated works, if required, that will allow for the transportation of the hydrostatic test water; c) water withdrawal rates; d) water withdrawal volumes; e) the flow rate/volume of water at the withdrawal sites; and f) site-specific mitigation measures to be implemented at the water withdrawal and discharge sites or at any other locations required to allow for the transportation of hydrostatic test water, including a description of the water quality monitoring methods to be used on hydrostatic testing water prior to discharge; and g) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information.	X	X			X	X	X	
114	**NDE of final tie-in welds** Trans Mountain must delay NDE of final tie-in welds (i.e.: welds which will not be subjected to hydrostatic testing) and any repairs to them **for at least 48 hours following weld completion**. Trans Mountain must include this requirement in the NDE specification of its Joining Program required by Condition 111.	X	X			X	X	X	

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
115	**SCADA and leak detection system design** Trans Mountain must file with the NEB, reports describing the final design of the expanded Trans Mountain Pipeline System's SCADA and leak detection systems. These reports must include: a) for the commercially available external leak detection systems resulting from Trans Mountain's participation in joint industry projects, **at least 45 days prior to commencing backfilling on Line 2 and the new delivery pipelines,** a status update, including a timeline for implementation; and b) **at least 3 months prior applying for leave to open the Project**: i) a status update for the following complementary leak detection technologies that Trans Mountain is considering, including a timeline for implementation: 1) a secondary Computational Pipeline Monitoring (CPM) system operating in parallel with the Project's proposed CPM; and 2) aerial surveillance systems resulting from Trans Mountain's participation in joint industry projects; ii) an explanation of how Trans Mountain's complementary leak detection system(s) supports the leak detection capabilities of the primary CPM system(s); iii) for all leak detection systems applicable to the Project, performance targets for: 1) sensitivity; 2) accuracy; 3) reliability; and 4) robustness; iv) a validation plan for the performance targets in iii), including alarm testing, to be implemented within the first year of Project operation; v) rationale for the selected time windows(s) (i.e., averaging periods) for the CPM system(s); vi) a copy of Trans Mountain's public awareness program on recognizing and reporting leaks; vii) a description of how the leak detection system and its relevant procedures comply with CSA Z662 Annex E; viii) a list of other best practices such as API (American Petroleum Institute) recommended practices related to leak detection and control centre management; ix) a description of how Trans Mountain's revised procedures have introduced a rule directing the Control Centre Operator to perform a controlled shut down of the pipeline when a leak cannot be ruled out in a given time period; and x) a plan, including a timeline for implementation, for upgrading the existing measurement and data acquisition instrumentation to improve the leak detection performance of Line 1.	X	X						
116	**Control system, SCADA, instruments, and communication** Trans Mountain must file with the NEB, **at least 2 months prior to completing dry commissioning activities**, the block diagrams of the control system for its proposed pipeline that include the interconnection between various devices and components such as: a) programmable logic controllers; b) flow meters, and pressure and temperature measuring devices; c) critical protective elements; d) emergency shut-down systems; e) variable frequency drives; f) control valves; g) block valves; and h) local human machine interface. The block diagrams must demonstrate the primary and backup communication systems, supervisory and control layers of software, firewalls, and how all elements are integrated with the SCADA system.	X							
117	**Reporting on improvements to Trans Mountain's Emergency Management Program** Trans Mountain must file with the NEB, **at least 2 years and 1 year prior to commencing operations**, detailed updates for the company's review of its Emergency Management Program (toward meeting the requirements of Condition 124). This filing must include: a) a summary of work undertaken to-date; b) the approximate timing for completing remaining work; and c) a summary of parties that were consulted (Condition 90) and how their comments and feedback were considered in improving the program.	X					X	X	
118	**Firefighting capacity at terminals**	X						X	

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	Trans Mountain must file with the NEB, **at least 1 year prior to commencing operations at the terminals:** a) the following information regarding developing appropriate firefighting capacity for a safe, timely, and effective response to a credible worst-case fire at the Westridge Marine Terminal and at the Edmonton, Sumas, and Burnaby Terminals: i) an assessment of necessary resources and equipment, including an explanation of how the assessment was informed by Trans Mountain's terminal risk assessments; ii) a summary of Trans Mountain's consultation with appropriate municipal authorities and first responders, that includes any issues or concerns raised regarding each municipality's respective firefighting capacity and how Trans Mountain has addressed or responded to them; iii) a Firefighting Capacity Framework, informed by the assessment in i) and consultation in ii), and that includes a list of and timeline for completing key activities and milestones leading to the establishment of appropriate firefighting capacity; and b) a plan for responding to a fire exceeding a credible worst-case scenario.								
119	**Emergency Preparedness and Response Exercise and Training Program** Trans Mountain must file with the NEB, **at least 1 year prior to commencing operations**, an Emergency Preparedness and Response Exercise and Training Program for the pipeline; the Edmonton, Sumas, and Burnaby Terminals; and the Westridge Marine Terminal. The program's objective is to demonstrate the continual improvement of responder competencies (including control centre personnel) at all levels of the company to prepare for, respond to, recover from, and mitigate the potential effects of emergencies of any type, including tank fires and earthquakes. The program must include the following: a) a defined scope, other objectives in addition to those noted above, and program targets that address responder turn-over and ensure responders' ongoing training and practice; b) a list of mandatory courses for responders; c) a discussion of how Trans Mountain will train its personnel to respond to all hydrocarbon spill scenarios in various seasons, including releases of hydrocarbons in mountain regions during winter conditions, into ice covered watercourses, into watercourses under varying flow conditions and into waterbodies (aquifers or streams) that are used as municipal water supply sources; d) a description of, and schedule for, all emergency response exercises (full-scale, tabletop, drills, functional) that Trans Mountain will conduct prior to operations to test a variety of scenarios; e) a plan, including rationales, for determining the schedule and frequency of all emergency response exercises (full-scale, tabletop, drills, functional) to test a variety of scenarios during the Project's operational life; f) a discussion of how emergency response exercises will meet the objectives of testing Trans Mountain's: i) emergency response procedures; ii) company personnel training; iii) communications systems; iv) response equipment; v) safety procedures; and vi) the effectiveness of its liaison and continuing education programs; g) a learnings implementation plan for exercises that considers how Trans Mountain will update and amend its Emergency Response Plans and related documents following exercises. The learnings implementation plan must consider three main purposes: i) to validate plans; ii) to develop Trans Mountain responder competencies (including control centre personnel) and provide them with the opportunity to carry out and understand their roles in emergency response; and iii) to test Project-specific emergency response procedures; h) a plan for addressing the training requirements contained within the *National Energy Board Onshore Pipeline Regulations*; and i) confirmation that an independent third party has reviewed and assessed the Emergency Preparedness and Response Exercise and Training Program and that Trans Mountain has considered and incorporated the comments generated by that review and assessment into the program.	**X**					**X**	**X**	

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120	**Notification and reporting on emergency response exercises** For any tabletop, functional, and full-scale emergency response exercises undertaken as part of its Emergency Preparedness and Response Exercise and Training Program required by Condition 119: a) Trans Mountain must notify the NEB and all potential exercise participants and observers, including Appropriate Government Authorities, first responders and potentially affected Indigenous groups, **at least 45 days prior to the date of each exercise**, of: i) the exercise's date and location(s); ii) the exercise's objectives; iii) the participants in the exercise; and iv) the scenario for the exercise. b) Trans Mountain must file with the NEB, and provide to Appropriate Government Authorities, first responders and potentially affected Indigenous groups, **within 3 months after completing each** full-scale exercise, a report on the exercise that includes: i) the results of the completed exercise; ii) areas for improvement; and iii) steps to be taken to correct deficiencies.	X					X	X	
121	**Financial Assurances Plan – operations phase** a) Trans Mountain must file with the NEB for approval, **at least 6 months prior to applying for leave to open Line 2,** a Financial Assurances Plan that includes details of the financial resources and secured sources of funds that will be necessary to pay, without limitation, all actual loss or damage, costs and expenses, including cleanup and remediation, and loss of non-use value relating to non-use of a public resource associated with an unintended or uncontrolled release from the Project during the operations phase.[142] These costs may arise from, among other things, potential accidents, malfunctions, and failures during the Project operations phase, including all spills originating from the pipeline and the terminals. The Financial Assurances Plan must be signed by an officer of the company, verifying that it is accurate, complete, and, at a minimum, meets the criteria and coverage levels described below: i) Criteria for financial assurance instruments and plan: 1) Any letter of credit that forms part of the Financial Assurances Plan must be unconditional and irrevocable, segregated from Trans Mountain's day-to-day business activities, and be dedicated to providing funds to cover the costs described in sub a) above, without limitation. 2) Third party liability insurance must be current, and broad, respecting the scope of environmental damages covered by the policy; the policy will be consistent with provisions available in the insurance market (i.e., only exceptional/non-standard perils, taking into account the Project's nature and scope, would be excluded from coverage). Such insurance must be structured on a multi-year basis, recognizing potential loss of income by persons sustaining damage caused by Trans Mountain, over a reasonable number of years after the event. 3) A portion of cash reserves or a portion of future cash flows of the Project may be included as instruments in the Financial Assurances Plan, provided they are secured by a commitment letter from an officer of the company confirming that the funds will be dedicated to the Financial Assurances Plan without restrictions for the period specified by the officer. 4) Parental and other third party guarantors must be registered within a Canadian jurisdiction and must have financial strength that is demonstrated in balance sheet values and ratios and credit ratings. For example, total assets less total liabilities of the guarantor should be several multiples of the liability assumed in the Trans Mountain guarantee. ii) Financial assurance components and coverage levels: Trans Mountain's Financial Assurances Plan must provide a total coverage, for the Project as a whole, of $1.1 billion[143] for the costs described in sub a) above, without limitation. The plan should include the following components and minimum coverage levels:	X	X			X	X	X	

[142] In the context of this condition, "operations phase" refers to the period after the Project receives leave to open approval and prior to it being fully abandoned.

[143] The NEB's basis for any final coverage level is described in its report to Governor in Council.

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact

1) Ready cash: Trans Mountain must have unfettered access to at least $100 million to cover costs, including compensation to third parties for losses and damages in the near term, while insurance claims are being processed. Once used, this source of cash must be replenished immediately to cover the costs of a potential future spill. This can be in the form of a letter of credit, surety bond or other form acceptable to the NEB.

2) Core coverage: Trans Mountain must put in effect and maintain current at all times a core financial coverage of at least $1 billion that includes third party liability insurance and other financial assurance instruments that comply with the criteria. Core coverage must be a portfolio approach with multiple financial instruments used and may not be composed of a single financial instrument (e.g., only third party liability insurance). At least one component of core coverage must be funds that are readily accessible to Trans Mountain (e.g., cash reserves held by the general partner and not distributed to the limited partners).

Trans Mountain may use a number of financial and insurance instruments in its Financial Assurances Plan. However, sales of Project assets used for transporting hydrocarbon commodities will not be eligible candidates. Below are some illustrative financial and insurance instruments that could be potential candidates for the Financial Assurances Plan:

- Irrevocable, unfettered letter of credit.
- Secured line of credit.
- Cash reserves held by the general partner and not distributed to the limited partners (and verifiable on Trans Mountain Pipelines Limited Partnership's balance sheet).
- Internal cash flow, committed by Trans Mountain to financial assurances.
- Industry pooled fund.
- Third party liability insurance with exclusions for only exceptional/non-standard perils.
- No fault third party liability insurance.
- Parental and other third party guarantees provided by parties demonstrating financial strength through balance sheets and credit ratings.
- Other instruments developed by Trans Mountain and the insurance and financial markets.

b) Trans Mountain must file the following with the NEB:

i) **At least 6 months prior to applying for leave to open Line 2**, a report from an independent third party that has assessed the Financial Assurances Plan and its key components against the criteria and actual experiences of industry damage claims. The report must summarize the key features of each financial and insurance instrument proposed for inclusion in the Financial Assurances Plan.

ii) **At least 3 months prior to applying for leave to open Line 2**, a supplement to the report described in b)i) that provides verification of any third party liability insurance coverage, a copy of the insurance certificate, and a summary of the insurance policy's key features. This summary must include: limits on insurance coverage, deductible amounts, the risks and perils and properties covered by the insurance policy, the exclusions from coverage, Trans Mountain's obligations, effective dates, and names of insurers and reinsurers.

iii) **With its first leave to open application for Line 2**, a report describing the steps it took to eliminate any deficiencies in its Financial Assurances Plan that were identified in the independent third party report referenced in b)i) and the NEB's subsequent review.

iv) **On or before 31 January of each year after commencing operations**, a letter signed by an officer of the company verifying that all components of the Financial Assurances Plan remain as the NEB approved and sufficient to meet the financial assurance coverage levels described in ii).

v) **At least 2 months prior to any intended change(s) to the Financial Assurances Plan during the Projects operations phase**, a letter, for approval, detailing the intended change(s) and how the change(s) provides the same or greater level of protection.

vi) **Within 30 days after accessing any component of the Financial Assurances Plan**, a report detailing the component accessed, the reason for accessing it, and Trans Mountain's plan to ensure that it continues to meet the requirements of its NEB-approved Financial Assurances Plan.

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
122	**Changing pipeline segment operating conditions (Hinton to Hargreaves; Darfield to Black Pines)** Trans Mountain must file with the NEB for approval, **at least 6 months prior to applying for leave to open Line 2**, the following: a) An engineering assessment in accordance with CSA Z662 for the above two pipeline segments which Trans Mountain proposes to change from operating on the existing TMPL to the proposed Line 2. The engineering assessment must demonstrate that the two pipeline segments are fit for their intended service under the operating conditions of Line 2, and that they meet all relevant requirements of CSA Z662. The engineering assessment must include a schedule of planned integrity monitoring activities. b) A certificate with a supporting report issued by an independent certification body[144], stating unconditionally that the 43-kilometre-long, 762 millimetre outside diameter (NPS 30) pipeline segment from Darfield to Black Pines, B.C. is fit for its intended service under the operating conditions[145] of Line 2. The supporting report must include the qualifications of the independent certification body and the justification used to grant the certificate.	X							
123	**Evacuation Plans** a) Trans Mountain must file with the NEB, **at least 6 months prior to commencing operations at the terminals**, an Evacuation Plan for people present in areas potentially affected by an incident at each of Trans Mountain's Edmonton, Sumas, and Burnaby Terminals as well as at the Westridge Marine Terminal. Each Evacuation Plan must, at a minimum: i) describe how areas for evacuation were determined; ii) describe the circumstances under which evacuation may be required, as well as the respective methods and procedures for public notification; iii) describe specific evacuation routes, methods, and destinations; iv) be prepared in consultation with Appropriate Government Authorities, first responders and potentially affected Indigenous groups with the authority to issue evacuation or shelter in place orders during an emergency; v) state how input from Appropriate Government Authorities, first responders and potentially affected Indigenous groups, with the authority to issue evacuation or shelter in place orders during an emergency, was considered in preparing the plan; vi) define the roles, responsibilities, and jurisdictional authority of all parties involved in implementing an evacuation; and vii) confirm that an independent third party has reviewed and assessed the plan and that Trans Mountain has considered and incorporated comments generated by the review and assessment into the plan. b) Trans Mountain must include with its Evacuation Plan for the Burnaby Terminal, a plan specific to Simon Fraser University that includes the requirements in a) i) to vii), above.	X						X	

[144] For Conditions 19, 122 and 152, an "independent certification body" is an internationally recognized company or organization, such as Lloyd's Register or Det Norske Veritas, which is able to certify compliance to statutory requirements. The independent certification body must have expertise in pipeline integrity. The NEB reserves the right to accept or reject the certificate. In addition, the NEB's decision is not contingent on the results of the certificate.

[145] For Conditions 19, 122 and 152, "operating conditions" must include the Project-specific operating conditions, possible transient flow conditions, slack flow conditions, and effects on operating pressure due to temperature changes.

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
124	**Implementing improvements to Trans Mountain's Emergency Management Program** Trans Mountain must file with the NEB, **at least 6 months prior to commencing operations**, a detailed summary of its review of its Emergency Response Plans (as noted in Conditions 125 and 126) and equipment (including its availability), as referenced in Volume 7, Section 4.8.2 of its Project application (Filing A3S4V5). This filing must include a description of changes made to Trans Mountain's Emergency Management Program, as required under the *National Energy Board Onshore Pipeline Regulations*, including changes to: a) the Pipeline Emergency Response Plan; b) Emergency Response Plans for the Edmonton, Sumas, and Burnaby Terminals, as well as the Westridge Marine Terminal; and c) site-specific plans and documents related to a) and b), such as Geographic Response Plans, Geographical Response Strategies, control point mapping, tactical plans for submerged and sunken oil and tactical plans for high consequence areas. The summary must demonstrate Trans Mountain's ability to prepare for, respond to, recover from, and mitigate the potential effects of emergencies of any type and in any geographic region or season and must include the following: i) a discussion of how the updated plans conform to the requirements contained within the *National Energy Board Onshore Pipeline Regulations*; ii) a discussion of how the plans consider, and would allow coordination with relevant federal, provincial, municipal and Indigenous community emergency response plans; iii) a discussion of how the results of research initiatives, such as the Scientific Advisory Committee work noted in Trans Mountain's response to NEB Information Request No. 1.63 (Filing A3W9H8) and other research noted during the OH-001-2014 proceeding, have been considered and incorporated into Trans Mountain's emergency response planning; iv) a description of the models used in response planning, including oil trajectory, fate and behavior, and air dispersion models; and v) confirmation that an independent third party has reviewed and assessed the Emergency Response Plans and that Trans Mountain has considered and incorporated the comments generated by the review and assessment into the plans.	X					X	X	
125	**Emergency Response Plans for the Pipeline and for the Edmonton, Sumas and Burnaby Terminals** Trans Mountain must file with the NEB, **at least 6 months prior to commencing operations**, updated Emergency Response Plans which must include: a) the following relevant emergency preparedness and response documents: i) an Emergency Response Plan to include the pipeline expansion; ii) updated Emergency Response Plans for the Edmonton, Sumas, and Burnaby Terminals; and iii) all related and accompanying site-specific plans and documents, such as control point mapping, Geographic Response Plans, tactical response plans, volunteer management plans, and fire safety plans; b) an emergency response and preparedness table for the pipeline (including facilities) indicating which plans and documents referenced in a) will be referred to in an emergency response for each 10-kilometre-long pipeline segment. For each pipeline segment, the table must also identify, at a minimum: i) high consequence areas, including environmentally sensitive areas (e.g., wetlands), heritage sites and water supply wells (Condition 93); ii) potentially affected persons or groups; iii) available access to the right-of-way and high consequence areas; iv) nearest control point(s); v) nearest available equipment cache(s); vi) response times for deployment of equipment and Trans Mountain personnel, mutual aid personnel, and third party contractors; vii) the available equipment and trained personnel, whether employed by Trans Mountain, contracted, or available through mutual aid (including contact information); and viii) geological, meteorological, and geographical hazards (e.g., snow avalanche, mud slides, rock slides, and steep slopes); and c) maps depicting the information identified in b).	X				X	X	X	

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
126	**Emergency Response Plan for the Westridge Marine Terminal** Trans Mountain must file with the NEB, **at least 6 months prior to commencing operations at Westridge Marine Terminal**, an updated Emergency Response Plan for the Westridge Marine Terminal which must include: a) all related and accompanying site-specific plans and documents, such as Geographic Response Plans, Geographic Response Strategies, tactical response plans, volunteer management plans, and fire safety plans; b) a list of high consequence areas, including environmentally sensitive areas; c) a list of potentially affected persons or groups; d) nearest available equipment cache(s); e) response times for deployment of equipment and personnel to the incident location and high consequence areas; and f) maps depicting the information identified in a) to e).	X							
127	**Terminal fire protection and firefighting systems** a) Trans Mountain must file with the NEB for approval, **at least 3 months prior to applying for leave to open of any Project component at each respective terminal**, an independent third party report confirming the adequacy of the proposed fire protection and firefighting systems implemented or planned to be implemented at the Edmonton Terminal West Tank Area, the Burnaby Terminal, the Sumas Terminal, and the Westridge Marine Terminal. The report must demonstrate that the resources and firefighting systems are capable of suppressing fires associated with all scenarios identified in the above-mentioned terminals' final risk assessments (required by Condition 129). b) Trans Mountain must file with the NEB for approval, **at least 2 months prior to beginning the assessment leading to the report in a),** the name and qualifications of the proposed independent third party that will prepare the report in a).	X						X	

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
128	**Offset Measures Plan for residual effects on caribou habitat** Trans Mountain must file with the NEB for approval, in accordance with the timelines below, an Offset Measures Plan for each affected caribou range, the goal of which is to offset all unavoidable and residual direct and indirect Project-related effects on caribou habitat, after taking into account the implementation of the measures identified in the relevant Environmental Protection Plan(s) for the Project and the Caribou Habitat Restoration Plan (see Condition 37) measures. The Offset Measures Plan must include: a) A preliminary version, to be filed **at least 3 months prior to applying for leave to open**, with the plan's criteria and measurable goals and that includes: i) an initial quantification of the area of caribou habitat directly and indirectly disturbed by the Project; ii) a list of the potential on-the-ground offset measures available; iii) each potential offset measure's appropriate offset ratio, based on consultation with expert federal and provincial authorities and on a review of the scientific literature on conservation offsets; iv) each potential offset measure's expected effectiveness including a discussion of uncertainty and how measures align with criteria specified in the scientific literature specific to conservation offsets; v) each potential offset measure's relative qualitative and quantitative value toward achieving the offset; and vi) a conceptual decision-making tree(s) or decision framework(s) that will be used to select which specific potential offset measures and accompanying offset ratios will be used under what circumstances. b) A final version, to be filed **on or before 31 January after the second complete growing season after completing final clean-up**, including: i) the contents of the preliminary Offset Measures Plan, with any updates identified in a revision log that includes the rationale for any changes; ii) a tabular list of the potential offset measures and appropriate offset ratios to be implemented or already underway, including site-specific details and maps showing the locations, and an explanation of how they meet criteria in the scientific literature for offsets; iii) a description of factors considered when determining the location of offset measures, including consideration of how the measures could maximize benefits to landscape variables; iv) a schedule indicating when potential offset measures will be initiated and their estimated completion dates; v) either an assessment of the predicted offset measures' effectiveness including a discussion of uncertainty and a quantitative compilation showing how the measures would offset the previously determined residual effects, or a plan for completing an assessment of the potential offset measures' effectiveness and value; and vi) an update on the restoration success to support offset measure decisions. Both the preliminary and final versions of the plan must also include the following: 1) a summary of its consultations with Appropriate Government Authorities and potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the Offset Measures Plan; 2) a description of how Trans Mountain has taken any available and applicable Indigenous traditional land use and traditional ecological knowledge studies into consideration in developing the plan including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and 3) evidence of Trans Mountain's consideration of any updates to the applicable Recovery Strategy, as well as to range boundaries and identified critical habitat made prior and up to the date on which leave to open is granted.	X	X		X	X	X		

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
129	**Final terminal risk assessments** Trans Mountain must file with the NEB for approval, **at least 3 months prior to applying for leave to open for each terminal**, final risk assessments for the Edmonton Terminal West Tank Area, the Sumas Terminal, the Burnaby Terminal, and the Westridge Marine Terminal, respectively, including all implemented mitigation measures. Trans Mountain must demonstrate in each risk assessment that mitigation measures will reduce the risks to levels that are ALARP while complying with the MIACC criteria for risk acceptability. The Edmonton Terminal West Tank Area, Sumas Terminal, and Burnaby Terminal must include the elements listed in Condition 22.	X						X	
130	**Groundwater Monitoring Program** Trans Mountain must file with the NEB for approval, **at least 3 months prior to commencing operations**, a Groundwater Monitoring Program that pertains to all terminals and pump stations, and for any vulnerable aquifers along the pipeline route. The program must include, at a minimum: a) locations of groundwater monitoring wells, their depths, the rationales for well locations (including how groundwater flow direction was considered), groundwater flow velocity, parameters to be monitored and frequency of monitoring; b) a description of any program changes required to meet this condition for facilities with an existing Groundwater Monitoring Program; c) methods, criteria and rationale for identifying vulnerable aquifers along the pipeline route; d) applicable regulatory criteria for comparing monitoring results, and a process outlining what steps will be followed should monitoring results indicate a negative change in groundwater quality; and e) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the program.	X	X			X	X	X	
131	**Marine Public Outreach Program** As an outcome of the Board's Reconsideration hearing (MH-052-2018), this condition was removed from the list of conditions.								
132	**Marine Mammal Protection Program** Trans Mountain must file with the NEB, **at least 3 months prior to commencing operations**, a Marine Mammal Protection Program that focuses on mitigating effects from the Project and associated cumulative effects, and on fulfilling Trans Mountain's commitments as a terminal operator with regard to Project-related marine shipping. The program must include: a) the goals and objectives of the program, including a discussion on how they align with the objectives of applicable Fisheries and Oceans marine mammal Recovery Strategies and Action Plans; b) a summary of the issues related to marine mammals from the Project and from Project-related marine vessels; c) a summary of the initiatives that Trans Mountain has supported or undertaken to-date, including the goals of each initiative and how they relate to the goals and objectives of the program; d) a discussion of the outcomes or progress updates of the initiatives identified in c), and how these outcomes have met or are contributing to the objectives of the program; e) any other initiatives that Trans Mountain intends to undertake or support in the future that are relevant to the program; and f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the program, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding, MH-05-2018 Reconsideration proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information.	X							
133	**Confirmation of marine spill prevention and response commitments** Trans Mountain must file with the NEB, **at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project**, confirmation, signed by an officer of the company, that: a) Trans Mountain has included in its Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide a requirement for tankers nominated to load at the Westridge Marine Terminal to have a suitable arrangement for the proposed enhanced tug escort between the Westridge Marine Terminal and Buoy J prior to departure. The tug escort should be suitable for foreseeable meteorological and ocean conditions and be based on tanker	X							

No.	Conditions with initial filings due during construction / prior to commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	and cargo size; and b) an enhanced marine oil spill response regime is in place that is capable of: i) delivering 20,000 tonnes of capacity within 36 hours of notification, with dedicated resources staged within the study area; and ii) initiating a response within 2 hours for spills in Vancouver Harbour, and within 6 hours for the remainder of the Salish Sea shipping route to the 12-nautical-mile territorial sea limit.								
134	**Updated Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide** Trans Mountain must file with the NEB, **at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project, and thereafter on or before 31 January of each of the first five years after commencing operations,** an updated Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide, and a summary of any revisions made to each.	X							
135	**Slack line flow conditions** Trans Mountain must file with the NEB, **at least 2 months prior to commencing operation of Line 1, and at least 2 months prior to applying for leave to open Line 2, respectively**, the following: a) a list of locations having potential for slack line flow when each of the pipelines is operated at 100 per cent of its maximum operating pressure (MOP), 80 per cent of its MOP, and 50 per cent of its MOP; and b) a description of the following regarding detecting and preventing slack line flow conditions: i) operational measures on Line 1 and Line 2; and ii) design measures on Line 2.	X	X						
136	**Pre-operations full-scale emergency response exercises** a) **Prior to commencing operations**, Trans Mountain must complete a full-scale exercise for each of the following scenarios: i) a 160-cubic-metre diluted bitumen release into Burrard Inlet as a result of a release from the Westridge Marine Terminal. The exercise must also consider emergency preparedness and response planning for a release that exceeds a credible worst-case scenario spill event; and ii) a credible worst-case release volume at the Burnaby Terminal. b) Trans Mountain must notify the NEB and all potential exercise participants and observers, including Appropriate Government Authorities, first responders, and potentially affected Indigenous groups, **at least 45 days prior to the date of each exercise in a)**, of: i) the exercise's date(s) and location(s); ii) the exercise's objectives; iii) the participants in the exercise; and iv) the scenario for the exercise. c) Trans Mountain must file with the NEB and provide to Appropriate Government Authorities, first responders and potentially affected Indigenous groups, **within 3 months after completing each exercise in a)**, a report on the exercise that includes: i) the results of the completed exercise; ii) areas for improvement; iii) steps to be taken to correct deficiencies; and iv) confirmation that an independent third party has evaluated and assessed the emergency response exercises and that Trans Mountain will consider the comments generated for future exercises.	X						X	
137	**Tank roof design for tanks at the Edmonton Terminal** Trans Mountain must install steel pontoon internal floating roofs and fixed roofs with odour control systems on all of its five proposed tanks at the Edmonton Terminal. Trans Mountain must file with the NEB, **at least 30 days prior to applying for leave to open the five proposed tanks,** a letter signed by an officer of the company that confirms that these roofs were installed.							X	
138	**Confirmation of firefighting capacity at terminals** Trans Mountain must file with the NEB, **at least 30 days prior to commencing operations at the terminal**, confirmation that appropriate firefighting capacity, in accordance with Condition 118, is in place.	X						X	

No.	Conditions with initial filings due after commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
139	**Project completion** Trans Mountain must file with the NEB, **within 30 days after commencing operations**, confirmation, signed by an officer of the company, that the Project was completed and constructed in compliance with all applicable [certificate/order] conditions. If compliance with any of the conditions cannot be confirmed, the officer of the company must include the reason(s) for this and the proposed course of action to achieve compliance.	X	X	X	X	X	X	X	X
140	**Post-construction greenhouse gas (GHG) assessment report** Trans Mountain must file with the NEB for approval, **within 2 months after commencing operations**, an updated GHG assessment report specific to the Project. The report must include: a) the methodology used for the assessment, including the sources of GHG emissions, assumptions, and methods of estimation; b) the total direct GHG emissions generated from Project construction, including land-clearing; c) a breakdown of direct GHG emissions generated by the construction of individual Project components (pipeline, pump stations, tank terminals and Westridge Marine Terminal) and by land-clearing activities; and d) a comparison and discussion of the direct GHG emissions calculated in b) with the predicted emissions in Trans Mountain's application and subsequent submissions.	X			X	X	X	X	
141	**Post-construction noise surveys** Trans Mountain must file with the NEB, **within 3 months after commencing operations,** the results of post-construction noise surveys conducted at the Sumas and Burnaby Terminals and at the Westridge Marine Terminal, demonstrating compliance with the British Columbia Oil and Gas Commission's *British Columbia Noise Control Best Practices Guideline (2009)*, and any further mitigation that Trans Mountain will undertake to achieve compliance.	X						X	
142	**GHG Emissions Offset Plan – Project construction** Trans Mountain must file with the NEB for approval, **within 4 months after commencing operations,** a plan for providing offsets for all direct GHG emissions generated from Project construction, as determined in Condition 140. The plan must include: a) a list and discussion of all possible offset options considered; b) the criteria against which each option was assessed for viability; c) a description of the offset option(s) selected for direct GHG emissions generated from Project construction, and the rationale for selecting the option(s); d) confirmation that the selected offset option is registered under the approved quantification protocols and has been verified by an accredited "verification body"[146]; e) a schedule indicating when the selected offset options(s) will be initiated; and f) an accounting of offsets confirming no net GHG emissions from Project construction.	X			X	X	X	X	
143	**Baseline inspections** a) Trans Mountain must conduct the following pipeline inspections on Line 2 and the new delivery pipelines, at the times indicated: i) a high-resolution in-line caliper inspection (i.e., a GEOPIG™ inspection) **within 6 months after commencing operations** to establish accurate pipeline position and to detect pipe deformations; ii) an in-line ultrasonic crack detection inspection **within 2 years after commencing operations**; iii) an in-line corrosion magnetic flux leakage inspection in both the circumferential and longitudinal directions **within 2 years after commencing operations**; iv) an in-line ultrasonic wall measurement inspection **within 2 years after commencing operations;** and	X							

[146] In these conditions, "verification body" means a competent and independent person, or persons, with responsibility for performing and reporting on the verification process (as defined by ISO 14064).

No.	Conditions with initial filings due after commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	v) a close interval survey **within 2 years after commencing operations**. b) Trans Mountain must file with the NEB, **within 6 months after completing each inspection in a)**, a report that includes a summary of the inspection results, the proposed re-inspection interval, and mitigation measures for the anomalies detected through any of the inspections, if required.								
144	**Ongoing confirmation of marine spill prevention and response commitments** Trans Mountain must file with the NEB, **on or before 31 January of each year after commencing operations,** confirmation, signed by an officer of the company, that it is continuing to meet the requirements of Condition 133 regarding Trans Mountain's marine spill prevention and response commitments. Trans Mountain must provide each filing to Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, Vancouver Fraser Port Authority, British Columbia Coast Pilots, Western Canada Marine Response Corporation, Fisheries and Oceans Canada and the Province of British Columbia at the same time as it is filed with the NEB. If a particular party mentioned above requests that it not be provided the annual filing, Trans Mountain may cease providing it to that party.	X							
145	**Community Benefits Program progress reports** Trans Mountain must file with the NEB, **on or before 31 January of each of the first 5 years after commencing operations,** a progress report summarizing the initiatives and activities undertaken as benefits that are in addition to compensation for access and potential impacts to community lands, and/or that exceed regulatory requirements. The report must summarize initiatives supported, at a minimum, in the areas of community programs and infrastructure improvements, environmental stewardship, and education and training during the reporting period, including local emergency management enhancements, improvements to community parks, as well as support for events. The filing must contain a commitment from Trans Mountain, and a description of how Trans Mountain will make progress reports publicly available until the Project is abandoned or decommissioned pursuant to the NEB Act. The progress reports must include: a) a description of the initiatives undertaken or supported; b) a list of participants or beneficiaries, including Indigenous groups, local and regional communities, service providers, or others; c) an update on the timing, status, and outcomes of each initiative, including its estimated completion date, if applicable; and d) a summary of Trans Mountain's consultation activities regarding the Community Benefits Program initiatives.	X							
146	**Reports on engagement with Indigenous groups – operations** Trans Mountain must file with the NEB, **on or before 31 January of each of the first 5 years after commencing operations,** a report on the engagement activities it has undertaken with Indigenous groups. Each report must include, at a minimum, for each Indigenous group engaged: a) the name of the group; b) the method(s), date(s), and location(s) of engagement activities; c) a summary of any issues or concerns raised; and d) the measures taken, or that will be taken, to address or respond to issues or concerns, or an explanation why no further action is required to address or respond to issues or concerns. Trans Mountain must provide a copy of each report to each group engaged (and identified in a) above) at the same time that it is filed with the NEB.	X	X		X	X	X	X	
147	**Natural hazard assessment** Trans Mountain must file with the NEB, **within 1 year after commencing operations**: a) the results of the baseline natural hazard assessment for the Project; and b) confirmation that the natural hazard assessment will be: i) updated at intervals not exceeding 5 years; and ii) integrated into the existing Natural Hazard Management Program for the Trans Mountain Pipeline system.	X				X	X	X	
148	**Pipeline Geographic Information System (radio) data** Trans Mountain must file with the NEB, **within 1 year after commencing operations**, Geographic Information System data in the form of an Esri® shape file that contains pipeline segment centre lines and right-of-way boundaries, where each pipeline segment has a unique outside diameter, wall thickness, MOP, external coating, field-applied girth weld coating, and pipe manufacturing specification. If the above values of the pipeline change at any point along the length of the Project, the pipeline(s) should be segmented at that point. Trans Mountain must also provide Geographic	X							

No.	Conditions with initial filings due after commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	Information System locations and names of all Project pump stations, terminals, custody transfer meters, tunnel entrances, pipeline bridges, check valves, and block valves, as applicable. The datum must be NAD83 and projection must be geographic (latitudes and longitudes).								
149	**Caribou Habitat Restoration and Offset Measures Monitoring Program** Trans Mountain must file with the NEB for approval, **on or before 31 January after the first complete growing season after commencing operations**, a program for monitoring and verifying the effectiveness of caribou habitat restoration and offset measures implemented as part of the final Caribou Habitat Restoration Plan (Condition 37) and the final Offset Measures Plan (Condition 128). This program must include: a) the scientific methods or protocols for short- and long-term monitoring of the restoration and offset measures, and effectiveness of the measures; b) monitoring frequency, timing, and locations, and the rationale for each; c) protocols for how restoration and offset measures will be adapted, as required, based on the monitoring results from the program's implementation; d) a summary of Trans Mountain's consultation with Appropriate Government Authorities and any species experts on the design of the monitoring program; and e) a proposed schedule for filing reports on monitoring results and adaptive management measures to the NEB, Environment and Climate Change Canada, and appropriate provincial authorities to be contained in the Caribou Habitat Restoration and Offset Measures Monitoring Program as well as at the beginning of each report filed.	X	X		X	X	X		
150	**Caribou habitat restoration and offset measures monitoring report(s)** Trans Mountain must file with the NEB, **based on the approved schedule for the Caribou Habitat Restoration and Offset Measures Monitoring Program** (required by Condition 149), a report(s) outlining the monitoring program's results, including the observed effectiveness of habitat restoration and offset measures for each affected caribou range, and how those measures will be adapted, as required, based on monitoring results. Any proposed changes to the NEB-approved reporting schedule must be included within the relevant report prior to any reporting on a revised schedule.	X	X		X	X	X		
151	**Post-construction environmental monitoring reports** Trans Mountain must file with the NEB, **on or before 31 January following the first, third, and fifth complete growing seasons after completing final clean-up,** a post-construction environmental monitoring report for the Project that must include: a) a description of the valued components or issues that were assessed or monitored; b) measurable goals for each valued component or issue; c) monitoring methods for each valued component or issue, results of the monitoring, and a comparison to the defined measurable goals; d) corrective actions taken, their observed success, and their current status; e) identification on a map or diagram of the locations where corrective actions were taken; f) any further corrective actions planned and a schedule for monitoring and reporting; and g) a summary of its consultations with appropriate government authorities and any potentially affected Indigenous groups and affected landowners / tenants. In the post-construction environmental monitoring report filed after the fifth full growing season after completing clean-up, Trans Mountain must include: i) an assessment of the effectiveness of mitigative and corrective actions and how learnings have been or will be applied to Trans Mountain's Environmental Protection Program; ii) a detailed description of all valued components or issues for which the measurable goals have not been achieved during the duration of the post-construction monitoring program; and iii) an evaluation of the need for any further corrective actions, measurable goals, assessments, or monitoring of valued components or issues, including a schedule for those. All filed post-construction environmental monitoring reports must address issues related, but not limited, to: soils; weeds; watercourse crossings; riparian vegetation; wetlands; rare plants, lichens and ecological communities; municipal tree replacement; wildlife and wildlife habitat; fish and fish habitat; marine fish and fish habitat; marine mammals; marine birds; and species at risk.	X	X	X	X	X	X	X	X

No.	Conditions with initial filings due after commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
152	**Pipeline segment reactivation (Hinton to Hargreaves; Darfield to Black Pines) – new certificate and certificate validation** Trans Mountain must file with the NEB**, before expiry of the previous certificate identified in Condition 19**, a new certificate with a supporting report issued by an independent certification body[147] for the two pipeline segments identified in Condition 19. The certificate and report must demonstrate that the two pipeline segments: a) are fit for service for the specified operating conditions;[148] b) meet all applicable requirements of CSA Z662; and c) will meet the hydrostatic test requirements outlined in CSA Z662, at any time during the certified period. The certificate must be valid for at least 5 years and be validated on an annual basis during the certified period. The supporting report must include the qualifications of the independent certification body, the justification used to grant the certificate, and the expiry date of the certificate.		X						
153	**Full-scale emergency response exercises during operations** a) **Within 5 years after commencing operations**, Trans Mountain must complete full-scale exercises to test each of the following five scenarios: i) a full-bore rupture under ice and snow conditions in the Coquihalla Mountain Range; ii) a full-bore rupture into the Athabasca River during high spring flow conditions; iii) a full-bore rupture into Fraser River at the Port Mann Bridge, under peak flow conditions; iv) a full-bore rupture into the North Thompson River during high spring flow conditions; and v) a tank fire at the Burnaby Terminal. b) Trans Mountain must notify the NEB and all potential exercise participants and observers, including Appropriate Government Authorities, first responders and potentially affected Indigenous groups **at least 45 days prior to the date of each exercise in a)**, of: i) the exercise's date and location(s); ii) the exercise's objectives; iii) the participants in the exercise; and iv) the scenario for the exercise. c) Trans Mountain must file with the NEB, and provide to Appropriate Government Authorities, first responders and potentially affected Indigenous groups, **within 3 months after completing each exercise in a)**, a report on the exercise that includes: i) the results of the completed exercise; ii) areas for improvement; iii) steps to be taken to correct deficiencies; and iv) confirmation that an independent third party has evaluated and assessed the emergency response exercises and that Trans Mountain will consider the comments generated for future exercises.	X						X	
154	**Riparian Habitat Reclamation Evaluation Report and Offset Plan** Trans Mountain must file with the NEB for approval, **on or before 31 January after the fifth complete growing season after completing final clean-up,** a Riparian Habitat Reclamation Evaluation Report and Offset Plan. a) The report must include, for each defined watercourse crossed by the Project: i) an evaluation of performed reclamation activities against the identified measureable goals and targets (required by Condition 71), that includes an identification of the defined watercourses where riparian habitat that has not returned to, or trending towards a sufficient, pre-construction functionality; ii) a description of the proposed enhancement measures and corrective actions selected and	X	X						

[147] For Conditions 19, 122 and 152, an "independent certification body" is an internationally recognized company or organization, such as Lloyd's Register or Det Norske Veritas, which is able to certify compliance to statutory requirements. The independent certification body must have expertise in pipeline integrity. The NEB reserves the right to accept or reject the certificate. In addition, the NEB's decision is not contingent on the results of the certificate.

[148] For Conditions 19, 122 and 152, "operating conditions" must include the Project-specific operating conditions, possible transient flow conditions, slack flow conditions, and effects on operating pressure due to temperature changes.

No.	Conditions with initial filings due after commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
	the rationale for the selected option(s); and iii) a schedule for when the enhancement measures and corrective actions will be initiated and an estimated timeline for completion, including any monitoring that will be required. b) The plan must include, for defined watercourses crossed by the Project located in watersheds identified as being above the riparian habitat disturbance threshold (>18 per cent of riparian habitat disturbed in the watershed) or classified as High Sensitive fish-bearing by Trans Mountain, during the OH-001-2014 proceeding, and, where, after the fifth complete growing season, riparian habitat has not returned, or is not trending towards sufficient pre-construction functionality: i) a description of the proposed offset measures selected that includes details with rationales on the amount and type of offsets required, how the offset measures would be implemented, and the location of offset sites; ii) a schedule for when the offset measures will be initiated, an estimated timeline for completion, including any monitoring that will be required, and a schedule for when the results of the offsets monitoring will be filed with the Board that demonstrate offset success. iii) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the report/plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and iv) a summary of consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the report/plan.								
155	**Rare Ecological Community and Rare Plant Population Mitigation Evaluation Report and Offset Plan** Trans Mountain must file with the NEB for approval, **on or before 31 January after the fifth complete growing season after completing final clean-up**, a Rare Ecological Community and Rare Plant Population Mitigation Evaluation Report and Offset Plan for ecological communities of concern, rare plants and lichens, and early draft, candidate, proposed, or final critical habitat for plant and lichen species under the *Species at Risk Act*, that includes: a) an evaluation of avoidance and mitigation success with reference to the measurable goals outlined in the Rare Ecological Community and Rare Plant Population Management Plan required by Condition 40; b) identification of communities, species, and critical habitats that have not yet achieved the intended degree of reclamation success, and an evaluation of the need for ongoing monitoring, reporting and corrective actions; c) identification of any ongoing effects to ecological communities and rare plant and lichen species that have an at-risk status of S1, S1S2 or S2, or that are listed under federal or provincial legislation for protection, or on any early draft, candidate, proposed, or final critical habitat under the *Species at Risk Act*; d) for the ongoing effects identified in c), a Final Rare Ecological Community and Rare Plant Population Offset Plan that updates the Preliminary Rare Ecological Community and Rare Plant Population Offset Plan required by Condition 40, and that also includes details with rationales on the amount and type of offsets required, the offset measures to be implemented, the selection of compensation sites, identification of the parties involved in planning and implementation and their respective roles and responsibilities, a timeline for implementation, and the methods and schedule for monitoring and reporting to demonstrate offset success; e) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and f) a summary of its consultations with Appropriate Government Authorities, any species experts and potentially affected Indigenous groups. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the report/plan.	X	X		X	X	X	X	

No.	Conditions with initial filings due after commencing operations	CPCN	OC2	OC49	Temp	Pump1	Pump2	Tanks	Deact
156	**Wetland Reclamation Evaluation Report and Offset Plan** Trans Mountain must file with the NEB for approval, **on or before 31 January after the fifth complete growing season after completing final clean-up**, a Wetland Reclamation Evaluation Report and Offset Plan that includes: a) the extent (in hectares), by wetland type, that was impacted by Project construction and associated activities; b) for each wetland impacted, an evaluation of mitigation and reclamation success with reference to the measurable goals outlined in the Wetland Survey and Mitigation Plan required by Condition 41; c) identification of any wetlands that have not yet achieved the intended degree of reclamation success, and an evaluation of the need for ongoing monitoring, reporting and corrective actions; d) for any wetland to which no-net-loss under the Federal Policy on Wetland Conservation applies, an evaluation of any temporary or ongoing loss of any individual functional condition (e.g., habitat, hydrology and biogeochemistry); e) for any wetland that has not achieved reclamation success in terms of overall wetland function, and for any wetland to which no-net-loss under the Federal Policy on Wetland Conservation applies and that has had a temporary or ongoing loss in any individual functional condition, a Final Wetland Offset Plan that updates the Preliminary Wetland Offset Plan required by Condition 41, and that also includes details with rationales on the amount and type of offsets required, the offset measures to be implemented, the selection of compensation sites, identification of the parties involved in planning and implementation and their respective roles and responsibilities, a timeline for implementation, and the methods and schedule for monitoring and reporting to demonstrate offset success; f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and g) a summary of its consultations with Appropriate Government Authorities, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the report/plan.	X	X		X	X	X	X	
157	**Grasslands Reclamation Evaluation Report and Offset Plan** Trans Mountain must file with the NEB for approval, **on or before 31 January after the tenth complete growing season after completing final clean-up**, a Grasslands Reclamation Evaluation Report and Offset Plan that applies to native grasslands in the British Columbia interior and that includes: a) the extent (in hectares) of grasslands that were impacted by Project construction and associated activities; b) an evaluation of reclamation success with reference to the measurable goals outlined in the Grasslands Survey and Mitigation Plan required by Condition 42; c) an identification of any grasslands that have not yet achieved the intended degree of reclamation success, and an evaluation of the need for ongoing monitoring, reporting and corrective actions; d) for those grasslands that have not yet achieved reclamation success, a Final Grasslands Offset Plan that updates the preliminary plan required by Condition 42, and that also includes details with rationales on the amount and type of offsets required, the offset measures to be implemented, the selection of compensation sites, identification of the parties involved in planning and implementation and their respective roles and responsibilities, a timeline for implementation, and the methods and schedule for monitoring and reporting to demonstrate offset success; e) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the plan, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information; and f) a summary of its consultations with Appropriate Government Authorities, species experts, potentially affected Indigenous groups and affected landowners/tenants. In its summary, Trans Mountain must provide a description and justification for how Trans Mountain has incorporated the results of its consultation, including any recommendations from those consulted, into the report/plan.	X	X		X	X	X		

Appendix 4: Technical details about the Project

Project overview

The general overview of the Project is found in Chapter 1 of this Report. Additional details are provided here:

The existing Trans Mountain Pipeline system transports a range of crude petroleum and refined products to multiple locations in B.C. These include refined product deliveries to Kamloops and Port Moody, and crude petroleum deliveries to Burnaby, the Westridge Marine Terminal (WMT) for offshore export, and Sumas for deliveries on the Trans Mountain Pipeline (Puget Sound) LLC pipeline to Anacortes, Ferndale, and Cherry Point in Washington State. The existing system has an operating capacity of approximately 47 690 m³/day (300,000 barrels/day) shipping 20 per cent heavy crude and 80 per cent light crude and refined products.

Trans Mountain proposes to ship a larger volume of these oils on the expanded system. Line 1 is expected to transport batches of primarily light crude oils and refined products while Line 2 will transport batches of primarily heavy crude oil.

- After the expansion, the 1 147 km Line 1 pipeline will consist of:
- the existing 229 km of 610 mm outside diameter (NPS 24) and 89 km of 762 mm outside diameter (NPS 30) pipeline segments from Edmonton, AB to Hinton, AB;
- a reactivated 150 km of 610 mm outside diameter (NPS 24) pipeline segment from Hinton, AB, to Hargreaves, B.C. (built in 1957);
- the existing 273 km of 610 mm outside diameter (NPS 24) pipeline segment from Hargreaves, B.C., to Darfield, B.C.;
- a reactivated 43 km of 610 mm outside diameter (NPS 24) 4 pipeline segment from Darfield, B.C., to Black Pines, B.C. (built in 1953); and
- the existing 38 km of 762 mm outside diameter (NPS 30) and 325 km of 610 mm outside diameter (NPS 24) pipeline segments from Black Pines, B.C., to the Burnaby Terminal, B.C.

After the expansion, the approximately 1 180 km Line 2 pipeline will consist of:

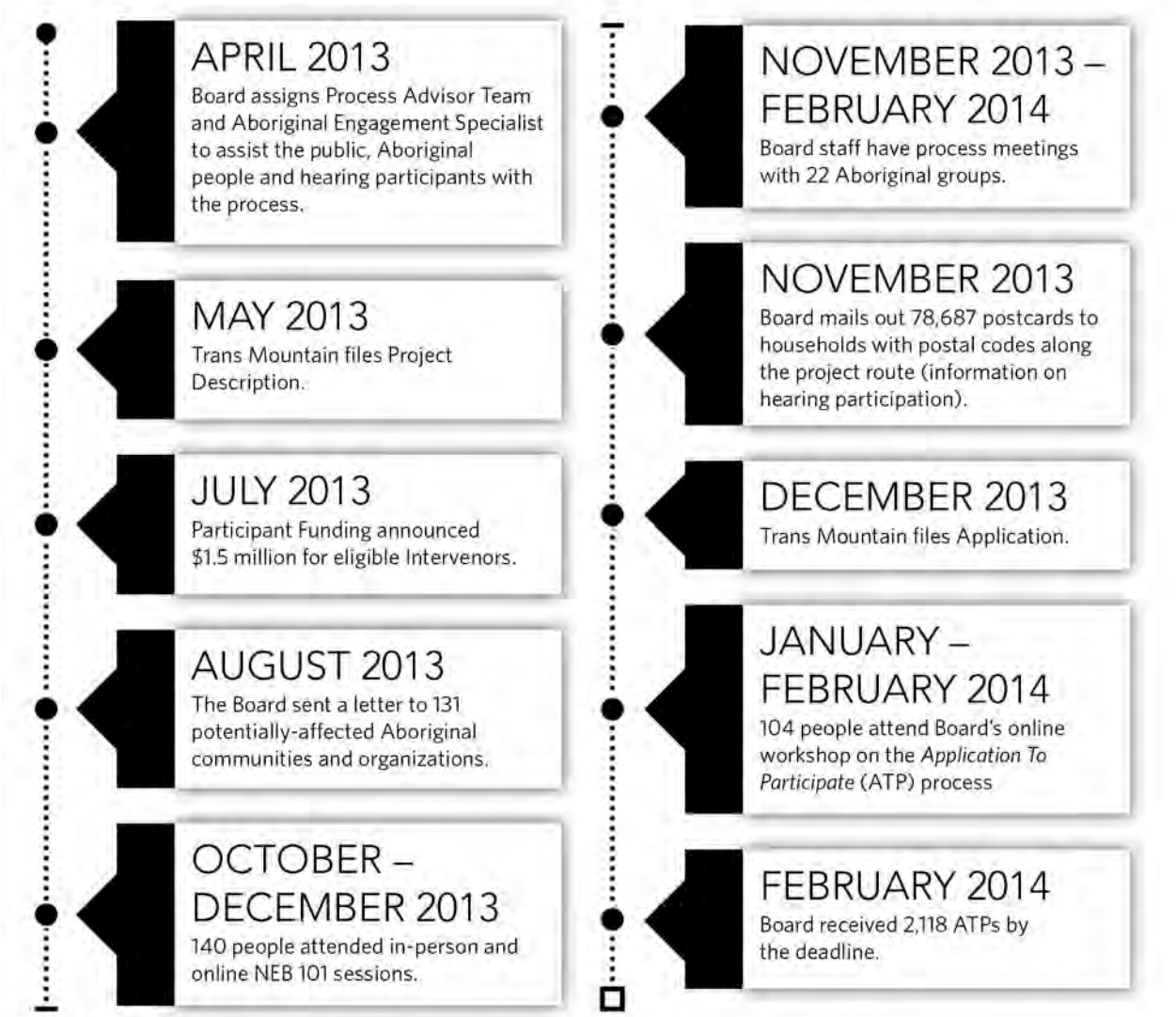
- approximately 339 km of new 914 mm outside diameter (NPS 36) pipeline from Edmonton, AB, to Hinton, AB;
- the existing 150 km of 914 mm outside diameter (NPS 36) pipeline segment from Hinton. AB, to Hargreaves, B.C. (built in 2008);
- approximately 121 km of new 1 067 mm outside diameter (NPS 42) pipeline from Hargreaves, B.C., to Blue River, B.C.;
- approximately 158 km of new 914 mm outside diameter (NPS 36) pipeline from Blue River, B.C., to Darfield, B.C.;
- the existing 43 km of 762 mm outside diameter (NPS 30) pipeline segment from Darfield, B.C. to Black Pines, B.C. (built in 1957); and
- approximately 368 km of new 914 mm outside diameter (NPS 36) pipeline from Black Pines, B.C., to the Burnaby Terminal.

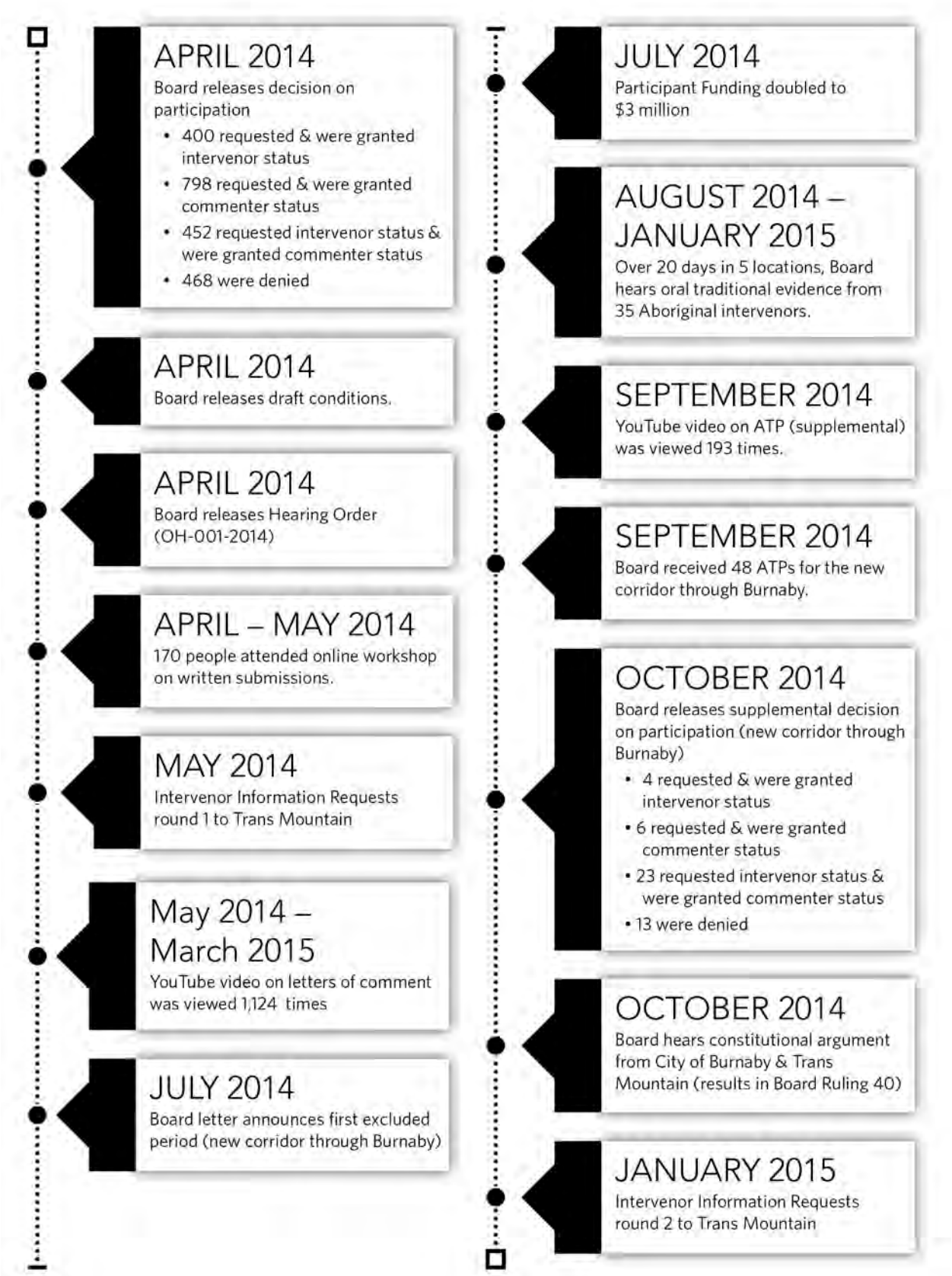
Other major components of the Project would include:

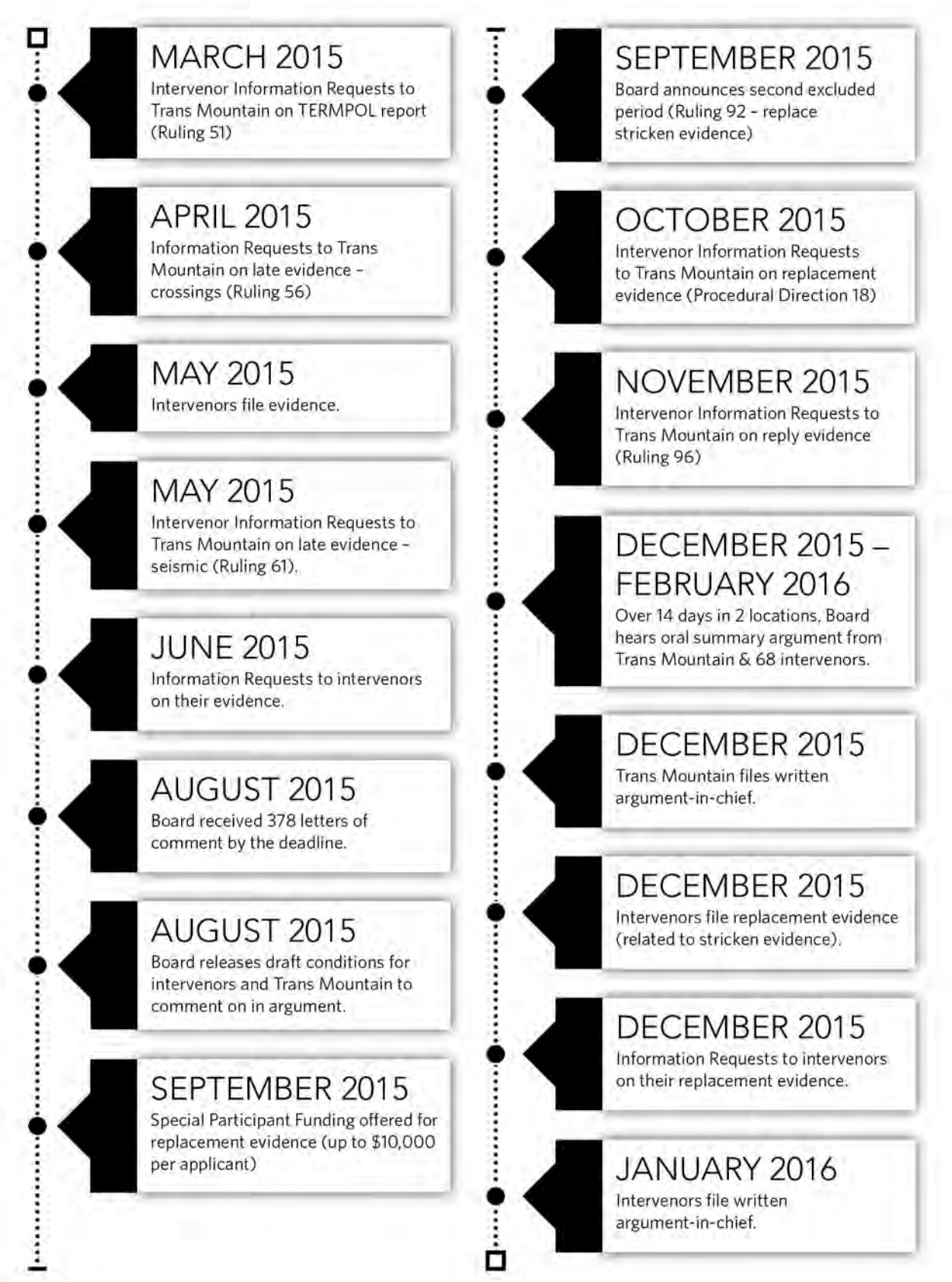
- two 762 mm outside diameter (NPS 30) delivery lines from the Burnaby Terminal to the WMT (Westridge Delivery Pipelines) in B.C. (lengths are approximately 2.6 km for the tunnel option and 3.6 km for the street option);
- adding 12 new pump stations, 10 at existing pump station sites and 2 at a new common pump station site at Black Pines;
- adding 34 new pump units at the new pump stations;
- reactivated existing pump station at Niton, AB;
- re-connecting Jasper Pump Station to Line 1 and adding drag-reducing agent (DRA) injection capability;
- adding one new pump unit at Sumas Pump Station to support additional deliveries to the Puget Sound Pipeline;

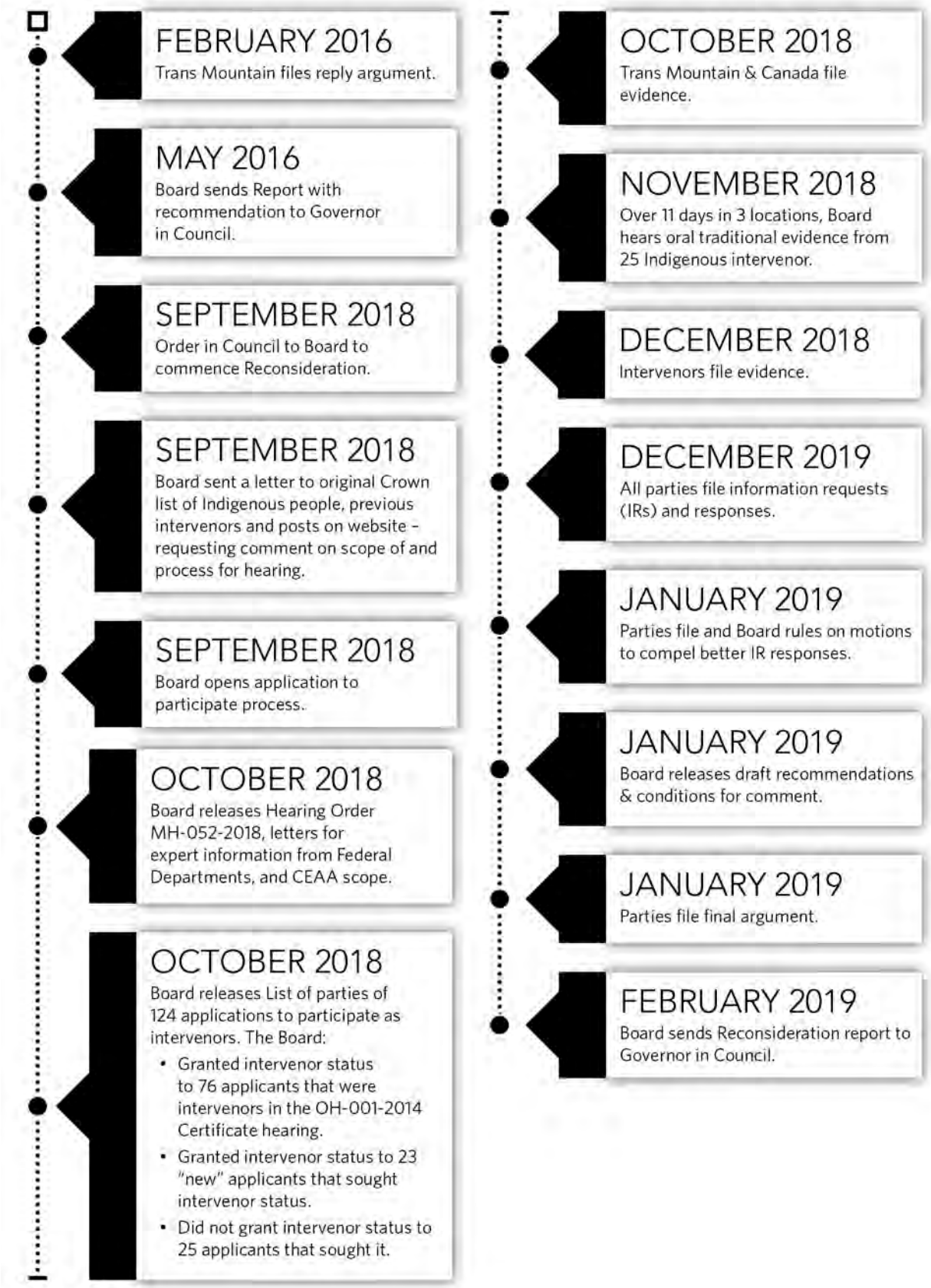
- 20 new tanks at the Edmonton (5), Sumas (1) and Burnaby (14) Terminals, preceded by the demolition of two existing tanks, one each at Edmonton and Burnaby, for a net total of 18 additional tanks;
- 25 new sending or receiving traps;
- deactivate and decommission several components of its existing facilities;
- constructing one new dock complex with a total of three Aframax-capable berth faces and a utility dock; and
- ancillary components and appurtenances, including mainline block valves, scraper traps, pressure reduction or relief stations, containment, power lines, access roads, and temporary infrastructure.

Appendix 5: Hearing steps




APRIL 2014
Board releases decision on participation
• 400 requested & were granted intervenor status
• 798 requested & were granted commenter status
• 452 requested intervenor status & were granted commenter status
• 468 were denied
APRIL 2014
Board releases draft conditions.
APRIL 2014
Board releases Hearing Order (OH-001-2014)
APRIL – MAY 2014
170 people attended online workshop on written submissions.
MAY 2014
Intervenor Information Requests round 1 to Trans Mountain
May 2014 – March 2015
YouTube video on letters of comment was viewed 1,124 times
JULY 2014
Board letter announces first excluded period (new corridor through Burnaby)
JULY 2014
Participant Funding doubled to $3 million
AUGUST 2014 – JANUARY 2015
Over 20 days in 5 locations, Board hears oral traditional evidence from 35 Aboriginal intervenors.
SEPTEMBER 2014
YouTube video on ATP (supplemental) was viewed 193 times.
SEPTEMBER 2014
Board received 48 ATPs for the new corridor through Burnaby.
OCTOBER 2014
Board releases supplemental decision on participation (new corridor through Burnaby)
• 4 requested & were granted intervenor status
• 6 requested & were granted commenter status
• 23 requested intervenor status & were granted commenter status
• 13 were denied
OCTOBER 2014
Board hears constitutional argument from City of Burnaby & Trans Mountain (results in Board Ruling 40)
JANUARY 2015
Intervenor Information Requests round 2 to Trans Mountain


MARCH 2015
Intervenor Information Requests to Trans Mountain on TERMPOL report (Ruling 51)
APRIL 2015
Information Requests to Trans Mountain on late evidence – crossings (Ruling 56)
MAY 2015
Intervenors file evidence.
MAY 2015
Intervenor Information Requests to Trans Mountain on late evidence – seismic (Ruling 61).
JUNE 2015
Information Requests to intervenors on their evidence.
AUGUST 2015
Board received 378 letters of comment by the deadline.
AUGUST 2015
Board releases draft conditions for intervenors and Trans Mountain to comment on in argument.
SEPTEMBER 2015
Special Participant Funding offered for replacement evidence (up to $10,000 per applicant)
SEPTEMBER 2015
Board announces second excluded period (Ruling 92 – replace stricken evidence)
OCTOBER 2015
Intervenor Information Requests to Trans Mountain on replacement evidence (Procedural Direction 18)
NOVEMBER 2015
Intervenor Information Requests to Trans Mountain on reply evidence (Ruling 96)
DECEMBER 2015 – FEBRUARY 2016
Over 14 days in 2 locations, Board hears oral summary argument from Trans Mountain & 68 intervenors.
DECEMBER 2015
Trans Mountain files written argument-in-chief.
DECEMBER 2015
Intervenors file replacement evidence (related to stricken evidence).
DECEMBER 2015
Information Requests to intervenors on their replacement evidence.
JANUARY 2016
Intervenors file written argument-in-chief.


FEBRUARY 2016
Trans Mountain files reply argument.
MAY 2016
Board sends Report with recommendation to Governor in Council.
SEPTEMBER 2018
Order in Council to Board to commence Reconsideration.
SEPTEMBER 2018
Board sent a letter to original Crown list of Indigenous people, previous intervenors and posts on website – requesting comment on scope of and process for hearing.
SEPTEMBER 2018
Board opens application to participate process.
OCTOBER 2018
Board releases Hearing Order MH-052-2018, letters for expert information from Federal Departments, and CEAA scope.
OCTOBER 2018
Board releases List of parties of 124 applications to participate as intervenors. The Board:
• Granted intervenor status to 76 applicants that were intervenors in the OH-001-2014 Certificate hearing.
• Granted intervenor status to 23 "new" applicants that sought intervenor status.
• Did not grant intervenor status to 25 applicants that sought it.
OCTOBER 2018
Trans Mountain & Canada file evidence.
NOVEMBER 2018
Over 11 days in 3 locations, Board hears oral traditional evidence from 25 Indigenous intervenor.
DECEMBER 2018
Intervenors file evidence.
DECEMBER 2019
All parties file information requests (IRs) and responses.
JANUARY 2019
Parties file and Board rules on motions to compel better IR responses.
JANUARY 2019
Board releases draft recommendations & conditions for comment.
JANUARY 2019
Parties file final argument.
FEBRUARY 2019
Board sends Reconsideration report to Governor in Council.

Appendix 6: List of intervenors

The list below does not include intervenors that withdrew from either hearing.

Intervenors in both the OH-001-2014 and MH-052-2018 hearings

Adams Lake Indian Band
Alexander First Nation
BC Nature and Nature Canada
BC Métis Federation
BP Canada Energy Group ULC
Burnaby Residents Opposing Kinder Morgan Expansion
Canadian Association of Petroleum Producers
Canadian Natural Resources Limited
Cenovus Energy Inc.
Chamber of Shipping
Chawathil First Nation
Cheam First Nation
City of Burnaby
City of Port Moody
City of Vancouver
City of Victoria
Coldwater Indian Band
Cowichan Tribes
Devon Canada Corporation
District of North Vancouver
District of West Vancouver
Ditidaht First Nation
Environment and Climate Change Canada
Ermineskin Cree Nation
Esquimalt Nation
Fisheries and Oceans Canada
First Nations of the Maa-nulth Treaty Society
Friends of Ecological Reserves
Friends of the Earth U.S.
Georgia Strait Alliance
Government of Alberta
Greater Vancouver Board of Trade
Hallson, Graham
Husky Energy
Imperial Oil Limited
Independent Contractors and Businesses Association
KGHM International Ltd.
Kingman, Brian L.
Kwantlen First Nation
Kwikwetlem First Nation
Living Oceans Society
Lyackson First Nation
MacVicar, Rod
Makah Tribal Council
May, Elizabeth
Métis Nation BC
Metro Vancouver
Musqueam Indian Band
Natural Resources Canada
Neskonlith Indian Band
New Democratic Party of Canada
Nooaitch Indian Band
North Shore No Pipeline Expansion
Olsen, Adam
Pacheedaht First Nation
Parks Canada
Pauquachin First Nation
Pavlovich, Don
Pro Information Pro Environment United People Network
Province of British Columbia
Raincoast Conservation Foundation
Samson Cree Nation
Scia'new First Nation
Shackan Indian Band
Shxw'ōwhámel First Nation
Simpcw First Nation
Snuneymuxw First Nation
Squamish Nation
Stand.earth (formerly ForestEthics Advocacy)
Stk'emlupsemc te Secwepmc of the Secwepmc Nation
Stó:lō Collective
Stz'uminus First Nation
Suncor Energy Marketing Inc.
Swinomish, Tulalip, Suquamish, and Lummi Indian Nations
Taplay, Calvin
Total E&P Canada Ltd.
Transport Canada
Tsartlip First Nation
Tsawout First Nation
Tsawwassen First Nation
Tsleil-Waututh Nation
T'sou-ke First Nation
Vancouver Fraser Port Authority
Washington State Department of Ecology
Weaver, Andrew
Whitefish (Goodfish) Lake First Nation #128
Yarrow Ecovillage

Intervenors* in the MH-052-2018 hearing only

* John A. Clarkson, the federal government-appointed marine technical advisor, entered into the hearing process in December 2018 and was afforded similar opportunities to the intervenors at that stage, as outlined in the Board's 13 December 2018 letter.

Barkley Sound Stewardship Alliance
BC Chamber of Commerce
BC Coast Pilots Ltd.
Blood Tribe (Kainai First Nation)
Business Council of British Columbia
Canadian Marine Pilots' Association
Concerned Professional Engineers Society
Driftpile Cree Nation
Dunster, Katherine
Graham, Gerald
Health Canada
Heiltsuk First Nation
Hoberg, George
Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee
Little Shuswap Lake Indian Band
Louis Bull Tribe
Malahat First Nation
MEG Enegy Corp.
Pacific Pilotage Authority
Papaschase First Nation #136
Peace, Ian
Resource Works Society
Saddle Lake Cree Nation #125
Seabird Island Band
Stewart, Stephen
Stó:lō Tribal Council
Surrey Board of Trade
Tsuut'ina Nation
Western Canada Marine Response Corporation
Whitefish Lake First Nation #459
Wilderness Committee

Intervenors in the OH-001-2014 hearing only

16580 – 104th Ave (Owners)
Aikman, Allan
Alberta Federation of Labour
Alexis Nakota Sioux Nation
Alfonso, Marc
Amy, Chris
Antoine, Janice
Aseniwuche Winewak Nation
Ashcroft Indian Band
Asini Wachi Nehiyawak Traditional Band
Aulakh, Rupinder
Azevedo, Andhra
Banerjee, Julieta
Barazzuol, Daniela
Bart, Nancy
Basic, Kata
BC Building Trades
BC Electoral District of Oak Bay Gordon Head
BC Wildlife Federation
Bereziak, Ed
Berrettoni, Pat
Bickle, Eric
Bilton, William E.
Black, John and Paetow, Andrea
Black, Robert
Boecking, Hartwig
Bolivar, Ursula
Borle, Thomas
British Columbia Hydro and Power Authority
Brooke, Doris
Burnaby Teachers' Association
Burrard Inlet Marine Enhancement Society
Burrard Inlet Oil Moratorium
Burton, Bruce
Byers, Michael
Canadian Oil Sands Partnership #1
Canadian Parks and Wilderness Society – BC Chapter
Carr, Goldie Z.
Castellanos, Erika
CCEC Credit Union
Chalmers, Don
Chalmers, Sheila
Chambers, William James
Chan, Cedric
Chan Wong, Sik
Chang, Li Chuan
Chateauneuf, Paul
Chen, Simon
Cheryl, Galandie
Chevron
Choi, Scott
Christensen, Paul
Chung, Vincent (and family)
City of Abbotsford
City of Coquitlam
City of Edmonton
City of Kamloops
City of New Westminster
City of North Vancouver
City of Richmond
City of Surrey
City of White Rock
Collaborative Group of Landowners Affected by Pipelines
Concerned Citizens of Henley Estates
Concerned Owners of Village del Ponte
Concerned Residents of Forest Knolls
Corcoran, Karen
Corcoran, Ward
Corpus Management Group
Costco Wholesale Canada Ltd.
Craig, Lisa
Crane, Mike
Cressey, John S.
Cui, Yubin
Cunningham, Christine
Dalla-Tina, Joy
Danysh, Maria
Develaar, Aubrey
Dean, Larry
Degrassi, Lucio
Deng, Tianmei
Dennert, Shauna
Deshaies, Ruth
Dimarzo, Mike
Dinunzio, Apollonia
District of Clearwater
District of Hope

Doherty, Dorothy
Dolgin, Noam
Dossa, Karim
Douglas, Catherine
Drummond, Jean
Dubuc, Sheri
Dubuc, Stephane
Earle, Thomas
Edmonton Chamber of Commerce
English, Karen
Enoch Cree Nation
Farmer, David
Farquhar, Edward
Finamore, Denise
Fofonoff, Christopher
Follette, Cecilia
Ford, Lily
Fraser River Sturgeon Conservation Society
Fraser Valley Regional District
Fraser Valley Watersheds Coalition
Fredette, Anne
Fung, Thomas
Gard, Barbara
Gibson, Terry
Ginetz, Sharon
Goettler, Sandy
Gordon, Elliott
Graduate Student Society at Simon Fraser University
Grasslands Conservation Council of BC
Guan, Hui
Hackett, Angelika
Hackett, Robert
Hale, Michael
Halston Hills Housing Co-op
Hansen, Laura
Hardie, Sabrina
Hastings Crossing Business Improvement Association
Hatch, Mary
Hawes, Frances
Hayden, Carlin
Hayden, Maurice
Healey, Cheryl
Heard, Kerri
Hennig Farms
Hilstad, Helen
Hong, Xing
Horse Lake First Nation
Howard, Pat
Hsu, Owen
Hunter-Tate, Kathryn
Hykaway, Ron
Indigenous and Northern Affairs Canada
Inskip, Terrence
Izzard, Kelly
Jackson, Art, operating as Alpine Art
Jan, David
Jan, Derrick
Jan, Sandy
Jensen, Catherine
Jessa, Nizaralli
Jessa, Rashida
Ji, Willmer
Johannesen, Patricia
Johnson, Michelle
Josok, Olav
Jukic, Petar
Jung, Ha Sung
Kain, Waltraud
Kardell, Jeysoca T.
Katzie First Nation
Katzmann, Carole
Kelly Lake Cree Nation
Kennedy, Terry
Kerr, Kandace
Klaassen, Chris
Klakowich, Ken
Koessler, Juergen
Kripalani, Anita
Lake Cowichan First Nation
Lang, Jing Cheng
Larson, Karen
Lau, Betty
Lau, Maria
Lau, Matthew
Ledgeview Golf Club
Lee, John C.Y.
Lee, Kevin
Lee, Naome
Leon Black, Michelle
Lheidli T'enneh First Nation
Li, Bei
Li, Long
Lin, Ping
Little Fort Group
Loeffler, Eric
Lotus Sports Club
Lower Nicola Indian Band
Luk, Helen
MacDonald, Sheilagh
Majid, Abdul
Mancinelli, Joyce
Mathias, Kevin
Mathias, Louella
Matsqui First Nation
MacDonald, Kenneth
Member of Parliament (Victoria), House of Commons
Métis Nation of Alberta Gunn Métis Local 55
Métis Regional Council – Zone IV of the Métis Nation of Alberta
Meung, Lihong
Michel First Nation
Mike Wiegele Helicopter Skiing
Milillo, Teresa
Millar, Richard
Miller, Brahm
Moncada, Bonnie
Moncada, Jorge
Montana First Nation
Moon, Kyung-Mee
Murillo, Marco Antonio
Murray, Karen
Nagy, Ed
Nexen Marketing
Nguyen, Phuoc Tat
Nicola Tribal Association
Niemzik, Ralf
Nix, Peter
Nonis, Silvia
Northern Gateway Pipelines Inc.
Northern Health
NWNA (Nestlé)
Oakey, Doug
O'Byrne, Brooke
O'Chiese First Nation
Okanagan Nation Alliance
Olsen, Joni

Pan, Qing
Pannu, Alex
Pantusa, Antonio
Pao, Jessica
Parents from Cameron Elementary School Burnaby
Parhar, Raminder
Paul, Dayson
Penelakut Tribe
Peters Band
Pine Ridge Housing Co-operative
Pitt-Brooke, Aidan
Popkum Indian Band
Porter, Glen
Porterfield, Doug
Portillo, Jennifer
Potvin, Kevin
Preston, Daniel
Punnett, Elizabeth
Rainbow Beach Developments Inc.
Redwoods Golf Course
Regional District of Fraser-Fort George
Riddle, Leilani
Roberts, Jeremy
Roberts, Tony
Rosen, Adam
Sacilotto, Enio
Sacilotto, Jeanne
Salmon River Enhancement Society
Sartori, Antonietta
Sartori, Clodine
Sartori, Serafino
Sayo, Carlo
Schrauwen, Ted
Shoji, Masanobu
Simon Fraser Student Society
Simon Fraser University
Simpson, Graham
Smid, Oeds
Smith, Gary
St. Pierre, Merle
Stafford, Tarah
Stanley Park Ecology Society
Statoil Canada Ltd.
Stewart, Marie
Stow, Andrée
Strata Council NW655
Strata NW313
Sucker Creek First Nation
Sugarloaf Ranches Ltd.
Sunchild First Nation
Surrey Teachers' Association
Syme, Neil
T. Buck Suzuki Environmental Foundation
Tang, Sylvia
Tartini, Gina
Taylor, Andrew M.
Taylor, B.
Tesoro Canada Supply & Distribution Ltd.
Thompson Drive Water Society
Thompson-Nicola Regional District
Tofino Long-Beach Chamber of Commerce
Township of Langley
Tseycum First Nation
Tunner, Greg
United Fishermen and Allied Workers' Union-Unifor
Unifor
Upper Nicola Band
Varto, Hannah
Veirs, Val
Vezina, Danielle
Village of Belcarra
Vincenzo, Milillo
Vogel, Thomas
Walker, Jackie
Walling, Janice
Wang, Wendy
Waterwealth Project
Webb, Peter
Wembley Estates Strata Council
Weng, Baichang
Westcoast Energy Inc., carrying on business as Spectra Energy Transmission
Whispering Pines First Nation / Clinton Indian Band
White, Ryan
Williams Lake Indian Band
Wong, Kitson
Wong, Miki
Wong, T.W.
Wright, Ken
Zhang, Aiping
Zhang, Willie
Zheng, Alison
Zhou and family

Appendix 7: Overview of notices of motion and rulings on other requests

Each notice of motion (motion) was decided on its own merit based on a review of the applicable legal test, evidence or information filed with the motion (or in response to the motion) and the arguments in favour or opposed to the motion. Specific motion decisions are located on the Board's public registry.

7.1 OH-001-2014 hearing

In total, the Board received approximately 291 motions and review applications as of 31 March 2016. During the course of the Board's review process, it issued 121 rulings on motions or review and variance applications. In some instances, such as motions to compel, there were numerous motions, and only one aggregate ruling.

The Board also responded to a number of letters and suggestions (not included in the numbers below). These letters included issues raised by Indigenous groups regarding Indigenous oral traditional evidence and section 18 of the *Canadian Environmental Assessment Act, 2012*. The descriptions below are meant to be summary only and numbers provided should be considered approximate in nature.

Motion category	General description	Number of motions
Late Applications to Participate (ATP) or requests to review and vary participation decisions	Request for an extension to the deadline of the ATP (4); Late application for ATP to request intervenors/commenters standing (18); review of the Board's ruling on participation denying intervenor status (3).	25
Extend Statutory timelines and excluded period or request to take no further steps in hearing process	Request to the Board to seek the Chairperson's approval to extend statutory timeline until Trans Mountain files detailed Quantitative Human Health Risk Assessments (2); request for an extension request until full details on selected and alternative corridors are received (1); section 74 determination – regarding the need for leave to transfer ownership (1); request to withhold issuing a certificate of public convenience and necessity and related approval for the Project until certain specified issues are corrected (1); request to dismiss certificate because no "company" holds the operating certificate (1); various other time to fulfil several requests (5)	11
List of Issues and Completeness of Application	Clarification request on the List of Issues and claim that the Application was incomplete (1); requests to expand List of Issues to include environmental and socio-economic effects associated with upstream and downstream activities (2).	3
Meeting request	One-on-one meeting request for the purpose of discussing issues related to the application.	1
Administrative matters	Replacement of documents with corrected version (2); request to supplement responses to Information requests (IRs) with filing ID number (1); visual aids (1); late filing of affidavit (1)	5
Oral Cross-Examination	Requests to amend the Hearing Order to include a phase for the oral cross-examination of witnesses on all evidence (2); request (after Trans Mountain reply argument filed) to have cross-examination on certain evidence (1).	3
Information requests (IRs) and letters of comment (LOC)	Several requests to extend (5) and further (4) extend the deadline of IRs of intervenors to Trans Mountain; disclosure from Trans Mountain for characteristics of product used in the Gainford study (1); Trans Mountain's request to extend deadline for response to IRs #1 from intervenors (1), striking of IRs (1); Extension of filing deadline for LOC (3), filing of late LOC (9); intervenor seeking leave to direct IRs to another intervenor (1); late filing of IR (1).	26

Motion category	General description	Number of motions
Requests to expand participation in Oct. 9 hearing regarding whether the Board should issue an access Order regarding Trans Mountain's access to City of Burnaby land	Request that the Board reconsider its decision to preclude intervenors from providing submissions regarding access to City of Burnaby lands.	3
Review of ruling	Review of Ruling 101 dated 7 December 2015	1
Constitutional matters	Request seeking a declaration that s. 55.2 of the *National Energy Board Act* (NEB Act) in unconstitutional as it is alleged to violate freedom of expression and notice of constitutional question and request an oral hearing of the Charter motion on procedural fairness and evidentiary grounds (1); Trans Mountain's rights under paragraph 73(a) of the NEB Act with respect to accessing lands for survey and examination purposes and Notices of Constitutional Question (1); review List of Issues on basis of infringement of section 7 of the *Canadian Charter of Rights and Freedoms* (1); motion on limited public access with freedom of expression raised (1); motion on independence of temporary Board Members.	5
Amending hearing/Oral Traditional Evidence dates	Requests that the Board reschedule the hearing of their oral traditional evidence to a late date.	4
Section 74	Ownership and certificate issue.	1
Evidence	Requests to remove certain evidence from the record (3); requests to file new evidence (6); filing of late evidence (7); extend the evidence filing deadline (2); replacement of evidence (5);	23
Compel further and better responses	Various requests that the Board compel full and adequate IR responses for first round IRs and second round IRs from Trans Mountain and on the TERMPOL Report by Transport Canada; late motion to compel for round 2 IRs; several motions to compel full and adequate responses from intervenors to IRs from other intervenors, late motion to compel (3).	129
Confidentiality	Various requests to file certain documents confidentially (15) and a request to identified information that was redacted (1).	16
Participant Funding Program concerns	Request to add a round of information requests if funding is provided and reconsider funding allocation.	4
Advertising Costs	Request that Trans Mountain file its advertising costs for the project, that Firm Service Fees collected not go towards advertisement etc.	1
Oral Traditional Evidence - audio recordings	Make audio recordings public and free.	1
Community benefits	Request to nullify and cease Trans Mountain from making Community Benefits Program Agreements with participants.	1
Hearing on argument	Request to attend hearing as a non-participant (1), request to have additional representatives (24), late oral summary argument request (1), motion on limited public access (1).	27
Panel	Allegation of apprehension of bias of Panel Chair – Mr. David Hamilton; request to recuse the Panel, quash the hearing, prevent Mr. Steven Kelly from communicating with Panel and a request to assign a new Panel.	2

Other relief requested and Board rulings

As part of closing argument, a number of intervenors made requests for relief other than requests that specifically addressed the intervenors' positions on the recommendation that the Board ought to make to the GIC under the NEB Act or specific findings under the provisions of the *Canadian Environmental Assessment Act, 2012* or the *Species at Risk Act* (SARA).

In some cases, these requests were presented as alternative requests to the intervenor's primary request that the Board recommend denial of the Project application. In other cases, the relief was advanced as the intervenor's primary position.

In Hearing Order OH-001-2014, issued on 2 April 2014, the Board provided direction that if a party wished to raise question of procedure or substance requiring a Board decision, it was required to file a notice of motion. The Hearing Order described the process for filing a notice of motion and also referenced section 35 of the *National Energy Board Rules of Practice and Procedure, 1995* for further information. In addition, in Procedural Direction No. 20 (PD No. 20), the Board provided direction with respect to motions and preliminary matters that could be raised during oral summary argument. The Board stated that matters should not be raised during oral summary argument which could have been raised with the Board in writing prior to the oral portions of the hearing.

Notwithstanding the Board's prior directions and the *National Energy Board Rules of Practice and Procedure, 1995,* a number of parties made requests for procedural and or substantive decisions within their written closing argument and/or oral summary argument without filing a notice of motion.

These relief requests, submitted as part of closing argument, were made in relation to:

a) Completeness.

b) Procedural requests relating to cross-examination and time extensions.

c) Abandonment of the existing TMPL and changes in the scope of the proposed Project, if approved.

In addition, several intervenors made specific relief requests in relation to Indigenous consultation matters. Indigenous matters are discussed in detail in Chapter 5 of this report and, as such, the Board's views in relation to Indigenous consultation are addressed within the Board's views in Chapter 5.

As part of its Reply Evidence, Trans Mountain requested approval for proposed route re-alignments in proximity to the Lewis Estates community in Edmonton, Alberta, and United Boulevard and Hartley Avenue in Coquitlam, B.C. For the reasons provided in Chapter 11, the Board denies this late request without prejudice to Trans Mountain filing an application for a variance under section 21 of the NEB Act.

In its Reply Evidence, Trans Mountain also sought an exemption from the detailed route approval process, under section 58 of the NEB Act, for clearing activities associated with the first 10 km of each Line 2 spread.

Views of the Board

With respect to Trans Mountain's request that clearing activities associated with the first 10 km of each Line 2 spread be exempt from the detailed route approval process, the Board finds that such clearing activities would not be temporary in nature. They would have lasting consequences and should therefore not take place unless and until a detailed route for Line 2 is approved. As a result, the Board denies this request.

With the exception of PIPE UP, none of the requests for other relief were consistent with the Hearing Order direction requiring a notice of motion. In PIPE UP's case where it filed a notice of motion, this occurred after the hearing record was closed.[149] *Most of the requests for other relief were also inconsistent with PD No. 20. For these reasons, all the requests for additional relief are dismissed.*

Additional reasons for denying specific requests for other relief are as follows.

a) Completeness

As part of closing argument, several parties made requests that the Board find the Application incomplete and that the Board therefore either decline to forward a recommendation on that basis, or that it dismiss the Application on the basis of being incomplete.

[149] Pursuant to Procedural Direction No. 18, the hearing record closed immediately after Trans Mountain filed its written argument.

On 2 April 2014, the Board made its finding in relation to completeness of the Application and found it to be complete. No party sought review of this determination. A finding of completeness is a prerequisite for the Board to be able to proceed with the assessment of an application for the purposes of preparing a report in accordance with s.52 of the NEB Act. The final argument stage is well beyond the appropriate time to raise questions about the completeness of a project application. The determination of completeness has already been made by the Board. The Board denies these requests.

b) Procedural requests relating to cross-examination and time extensions

As part of closing argument, the Board also received new requests for cross-examination and time extensions. B.C. Nature and Nature Canada requested that the Board amend its Hearing Order to allow for cross-examination and order Trans Mountain to provide oral testimony and be subject to cross-examination with a declaration that s.52(5) of the NEB Act applies for these purposes; or request to Minister or GIC to issue order under s.52(7) to extend time for NEB report to complete cross.

PIPE UP, as its alternative relief request in its closing argument, asked for cross-examination of experts by parties who have submitted evidence in key areas where expert evidence conflicts or there is uncertainty in respect of severe or irreversible harm. In addition, following the close of argument, on 18 February 2016, PIPE UP also filed a motion seeking this same relief. In its motion, PIPE UP stated that it was seeking a reconsideration of the Board's Ruling No. 14, the Board's ruling with respect to two motions requesting the Board amend its Hearing Order to allow for cross-examination.

In Ruling No. 14, dated 7 May 2014, the Board stated:

> *In the Board's view, the legislation makes it clear that the Board is master of its own procedure and can establish its own procedures for each public hearing with regard to the conduct of hearings. This includes the authority to determine for a particular public hearing the manner in which evidence will be received and tested. In the circumstances of this hearing, where there are 400 intervenors and much of the information is technical in nature, the Board has determined that it is appropriate to test the evidence through written processes. All written evidence submitted will be subject to written questioning by up to 400 parties, and the Board.*

B.C. Nature and Nature Canada stated that there were deficiencies in Trans Mountain's responses to IRs and that as a result, cross-examination was necessary to test the evidence.

PIPE UP argued that it had now emerged that there was conflicting expert evidence in areas which requires the Panel to re-consider its decision to proceed without cross-examination. PIPE UP cited, as examples, conflicting evidence in Muse Stancil and Gunton Reports; conflicting evidence respecting Tank Fire and Boilover; conflicting evidence respecting Trans Mountain's Environmental Record; conflicting evidence respecting the risk and cost of spill events; and Trans Mountain's ability and willingness to finance a credible worst-case scenario.

Trans Mountain provided a response to the PIPE UP motion on 29 February 2016. Trans Mountain stated that the hearing record was closed, that PIPE UP's late request was not properly before the Board, was without basis, and should be denied.

PIPE UP did not provide a reply.

Neither B.C. Nature and Nature Canada nor PIPE UP provided explanation for the delay in their bringing these requests. The appropriate application in the case of concerns that answers to IRs are deficient is a motion to compel full and adequate response, which B.C. Nature and Nature Canada brought, and upon which the Board ruled on 27 April 2015 in Ruling No. 63, denying B.C. Nature and Nature Canada's motion. Now, many months later, and after the close of the evidentiary record, B.C. Nature and Nature Canada say that Trans Mountain's responses to IRs should support their late request for cross-examination. With respect to PIPE UP's argument respecting conflicting evidence, the fact that there is conflicting evidence on the record on various technical issues has not recently emerged. It was apparent with the filing of intervenor evidence in May 2015 that there was conflicting evidence on various topics. PIPE UP does not explain why it waited until after the closing of the record to bring its motion requesting a reconsideration of Ruling No. 14.

The Board finds that these requests for re-opening of the hearing were filed too late and no explanation was given for the late filing. The Board also finds that considering these requests at this late date would result in significant prejudice to Trans Mountain.

In considering the conflicts in evidence, much of which is scientific or technical in nature and none of which involved the credibility of the person providing the sworn evidence, the Board is of the view it is able to determine the weight to give to various evidence filed on the hearing record.

The Board declines B.C. Nature and Nature Canada's request to amend the Hearing Order to allow for cross-examination, and declines PIPE UP's request for a reconsideration of Ruling No. 14.

c) Abandonment of the existing TMPL and changes in the scope of the proposed Project, if approved

The City of Surrey made these requests. In particular, it requested that if the Board recommended approval of the Project, that it also direct that the existing TMPL that runs through Surrey should be abandoned. The City of Surrey further requested that there be an order that the Project should be either twinned or upsized through Surrey.

These requests by the City of Surrey amount to requests that the Board change the scope of the application before it.

There is no application for leave to abandon a portion of the existing TMPL before the Board. Similarly, the Project proposal does not contemplate being twinned or upsized through the City of Surrey.

Such applications, if they were to come before the Board, would be considered on their merits and would require notice to potentially affected parties.

The Board declines to approve the City of Surrey's requests that if it recommends approval of the Project, that the Board direct abandonment of the existing TMPL that runs through Surrey, and that the Project be twinned or upsized for the portion of it that runs through the City of Surrey.

7.2 MH-052-2018 hearing

The Board issued 30 rulings on notices of motions. In some instances, a single ruling addressed multiple notices of motion.

Ruling No.	General description	Summary of decision
1	124 applications to participate received by the 3 October 2018 deadline	List of Parties to the hearing (**granted** intervenor status to 99 applicants; **did not grant** intervenor status to 25 applicants)
2	10 late applications to participate	· **Granted** intervenor status to nine applicants · **Did not grant** intervenor status to one applicant
3	Late application to participate from Alexis Nakota Sioux Nation	**Granted** intervenor status
4	Late application to participate from Káínai First Nation (Blood Tribe)	**Granted** intervenor status
5	Late application to participate from T'Sou-ke First Nation	**Granted** intervenor status
6	Late application to participate from Malahat First Nation	**Granted** intervenor status
7	Requests from various Indigenous intervenors regarding the location of oral traditional evidence sessions, and concerns about time limits	**Denied** main request to hold oral traditional evidence sessions in Lower Mainland, B.C.; however, the Board: • **added** Calgary as an additional location to facilitate hearing oral traditional evidence remotely • **allotted** additional presentation time for Indigenous intervenors representing more than one First Nation
8	Late applications to participate from Mr. Albert R. Bud Taylor and Hydrofuel Inc.	**Did not grant** intervenor status to either applicant
9	Requests from Squamish Nation and Tsleil-Waututh Nation for a 15-day extension to the deadline for intervenors to file opening statements and direct evidence	**Granted**
10	Late application to participate from Papaschase First Nation #136	**Granted** intervenor status
11	Late application to participate from Saddle Lake Cree Nation #125	**Granted** intervenor status
12	Late application to participate from Heiltsuk First Nation	**Granted** intervenor status

Ruling No.	General description	Summary of decision
13	Request from Mr. Gregory John (member of the public) to attend and observe the oral traditional evidence sessions in Victoria, B.C.	**Denied**
14	Request from Mr. David Slik for the Board to reconsider the restriction that commenters may not file letters of comment after 20 November 2018, and to limit commenters to a single letter of comment	**Denied**
15	Request from Tsleil-Waututh Nation to hold its oral traditional evidence hearing session confidentially	**Partially granted** (the Board would hear a portion of Tsleil-Waututh Nation's oral traditional evidence confidentially)
16	Late application to participate from Neskonlith Indian Band	**Granted** intervenor status
17	Request from Tsleil-Waututh Nation for confidential treatment of certain evidence	**Granted**
18	Request from Trans Mountain for a six-day extension to file reply evidence specifically related to intervenor evidence (including confidential evidence) that it had not received by the deadline	**Partially granted** (provided Trans Mountain with a four day extension to respond to confidential evidence; did not provide an extension to respond to certain evidence received one day late)
19	Request from Pacheedaht First Nation for confidential treatment of certain evidence	**Granted**
20	Request from Yarrow Ecovillage to file late evidence	**Denied**
21	Request from Little Shuswap Lake Indian Band to file late information requests	The Board directed Trans Mountain and Fisheries and Oceans Canada to either respond to the questions, or provide reasons why the Board should not allow them. The information requests were responded to.
22	Application for review from Tsleil-Waututh Nation regarding the Board's 12 October 2018 decisions around: i) the spatial extent for the assessment of Project-related marine shipping ii) not holding a *de novo* hearing iii) the "need for" and "socio-economic effects" in the List of Issues Living Oceans Society and Raincoast Conservation Foundation also filed a separate application for review in relation to i)	i) **Denied** on the merits ii) **Denied** on the threshold question, and also on the merits iii) **Denied** on the threshold question
23	Request from Tsuut'ina Nation to file late evidence	**Granted**
24	Request from Living Oceans Society and Raincoast Conservation Foundation to require Trans Mountain to conduct a new risk assessment of Project-related marine shipping	**Denied**

Ruling No.	General description	Summary of decision
25	Request from the Friends of Ecological Reserves to compel the Canadian Association of Petroleum Producers to respond to information requests asked of it when it did not file evidence	**Denied**
26	Request from Heiltsuk First Nation to file late evidence	**Denied** (public tribunal decision did not constitute evidence, but could be relied upon by Parties in final argument)
27	Request from Raincoast Conservation Foundation to file late evidence	**Denied**
28	Requests from 18 Parties to compel full and adequate responses to approximately 280 information requests, or portions of information requests, asked of other Parties	**Granted** nine specific requests
29	Request from Malahat First Nation to file revised evidence	**Granted**
30	Application for review of Ruling No. 25 (from the OH-001-2014 hearing) regarding the consideration of upstream and downstream impacts of the Project on greenhouse gas emissions and climate change	**Denied** for lack of timeliness and on the threshold question

Appendix 8: Sources of information and evidence from Indigenous participants

The table below identifies the sources of information provided by Indigenous intervenors and commenters in the OH-001-2014 hearing, and Indigenous intervenors in the MH-052-2018 hearing.

In the MH-052-2018 hearing, any individual or group that was not an intervenor could file a letter of comment. Further, prior to issuing Hearing Order MH-052-2018, the Board afforded the public an opportunity to provide comments related to the scope of the hearing, and on the hearing process design. Some Indigenous individuals and groups that were not registered intervenors filed letters with the Board through these broader opportunities; however, these letters are not included below.

All information listed can be found in the Project's folder within the Board's online public registry. To fully understand the context of the information filed, please consult the entire public record.

Indigenous participant[150]	OH-001-2014 hearing				MH-052-2018 hearing	
	As intervenors			As commenters	As intervenors	
	Written submissions[151] (Exhibit No.)	Oral traditional evidence (Transcript volume)	Oral summary argument (Transcript volume)	Letter of comment (Filing ID)	Written submissions[2] (Folder No.)	Oral traditional evidence (Transcript volume)
Adams Lake Indian Band	C003	15	-		3635142	11
Alexander First Nation	C006	24	37		3635470	-
Alexis Nakota Sioux Nation	C007	-	-			
Antoine, Janice	C011	13	-			
Aseniwuche Winewak Nation of Canada	C013	-	-			
Ashcroft Indian Band	C014	-	-			
Asini Wachi Nehiyawak Traditional Band	C015	-	-			
BC Métis Federation	C039	-	-		3647790	-
Blood Tribe (Kainai First Nation)					3642525	-
Canim Lake Band				A65490		
Chawathil First Nation	C400	-	29		3634816	4
Cheam First Nation	C400	-	29		3635031	4
Coldwater Indian Band	C078	14	27		3634920	-
Cowichan Tribes	C086	-	33		3634701	-
Ditidaht First Nation	C108	-	-		3635144	-
Driftpile Cree Nation					3646251	2

[150] Groups that participated as a single intervenor are listed together.

[151] Exhibit/Folder numbers in this column represent each intervenor's main folder that includes all evidence filed (e.g., written evidence, responses to information requests) and written argument-in-chief.

Indigenous participant[150]	OH-001-2014 hearing				MH-052-2018 hearing	
	As intervenors			As commenters	As intervenors	
	Written submissions[151] (Exhibit No.)	Oral traditional evidence (Transcript volume)	Oral summary argument (Transcript volume)	Letter of comment (Filing ID)	Written submissions[2] (Folder No.)	Oral traditional evidence (Transcript volume)
Enoch Cree Nation	C120	-	-			
Ermineskin Cree Nation	C122	-	-		3635583	-
Esquimalt Nation	C123	-	-		3635803	-
First Nations of Maa-nulth Treaty Society	C411	-	-		3634925	9
Heiltsuk First Nation					3690219	-
Horse Lake First Nation	C406	22	-			
Hwlitsum First Nation	C166	12	-			
Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee					3635367	5
Katzie First Nation	C187	10	27			
Kelly Lake Cree Nation	C189	-	-			
Kwantlen First Nation	C198	7	35		3634819	4
Kwikwetlem First Nation	C199	-	-		3635034	-
Lake Cowichan First Nation	C409	-	-			
Lheidli T'enneh First Nation	C209	18	-			
Little Shuswap Lake Indian Band					3635146	11
Louis Bull Tribe					3641960	1
Lower Nicola Indian Band	C217	14	-			
Lyackson First Nation	C219	21	31		3647020	10
Makah Tribal Council	C223	-	-		3635257	1
Malahat First Nation				-	3690147	-
Matsqui First Nation	C227	-	-			
Métis Nation of Alberta Gunn Métis Local 55	C232	1	-			
Métis Nation BC	C231	-	-		3646692	-
Métis Regional Council Zone IV of the Métis Nation of Alberta	C233	-	-			
Michel First Nation	C236	3	-			
Montana First Nation	C243	-	-			
Musqueam Indian Band	C246	8	26		3635805	10 (provided additional oral traditional evidence via a video file)

Indigenous participant[150]	OH-001-2014 hearing				MH-052-2018 hearing	
	As intervenors			As commenters	As intervenors	
	Written submissions[151] (Exhibit No.)	Oral traditional evidence (Transcript volume)	Oral summary argument (Transcript volume)	Letter of comment (Filing ID)	Written submissions[2] (Folder No.)	Oral traditional evidence (Transcript volume)
Nakcowinewak Nation of Canada	C248	-	-			
Neskonlith Indian Band	C250	16	-		3715856	-
Nicola Tribal Association	C254	-	-			
Nooaitch Indian Band	C258	15	-		3635368	-
O'Chiese First Nation	C265	4	-			
Okanagan Nation Alliance	C266	-	-			
Olsen, Adam	C267	20	29		3635258	8
Olsen, Joni	C268	19	-			
Pacheedaht First Nation	C269	22	-		3635475	-
Papaschase First Nation #136					3689742	3
Paul First Nation				A59856		
Pauquachin First Nation	C277	-	-		3635035	-
Penelakut Tribe	C279	-	-			
Peters Band	C399	9	-			
Popkum Indian Band	C282	-	-			
Saddle Lake Cree Nation #125					3690218	-
Samson Cree Nation	C302	3	-		3635369	-
Scia'new First Nation	C308	-	-		3635037	-
Seabird Island Band					3635149	4
Shackan Indian Band	C310	13	34		3646800	-
Shxw'ōwhámel First Nation	C312	6	-		3647240	9
Simpcw First Nation	C313	17	-		3635150	-
Snuneymuxw First Nation	C318	-	-		3634823	10
Squamish Nation	C319	12	28		3635476	7
Stó:lō Collective	C326	-	28		3634706	7
Stó:lō Tribal Council					3635259	4
Stz'uminus First Nation	C330	20	27		3635370	9
Sucker Creek First Nation	C331	-	-			
Sunchild First Nation	C333	2	38			

Indigenous participant[150]	OH-001-2014 hearing				MH-052-2018 hearing	
	As intervenors			As commenters	As intervenors	
	Written submissions[151] (Exhibit No.)	Oral traditional evidence (Transcript volume)	Oral summary argument (Transcript volume)	Letter of comment (Filing ID)	Written submissions[2] (Folder No.)	Oral traditional evidence (Transcript volume)
Swinomish, Tulalip, Suquamish, and Lummi Indian Nations	C336	10,11	29		3634824	6 (provided additional oral traditional evidence via video files)
Stk'emlupsemc te Secwepemc of the Secwepemc Nation	C325	16	-		3635590	11
T'Sou-ke First Nation	C359	19	32		3647798	-
Tsartlip First Nation	C354	19	-		3634707	6
Tsawout First Nation	C355	23	34		3635260	6
Tsawwassen First Nation	C356	-	-		364251O	-
Tseycum First Nation	C357	21	-			
Tsleil-Waututh Nation	C358	6	32		3635371	8
Tsuut'ina Nation					3635040	3
Upper Nicola Band	C363	18	34			
Whispering Pines/Clinton Indian Band	C384	-	-			
Whitefish (Goodfish) Lake First Nation #128	C386	-	-		3635593	-
Whitefish Lake First Nation #459					3647570	3
Williams Lake Indian Band	C388	-	-			

Appendix 9: List of Indigenous groups engaged by Trans Mountain

Edmonton to Alberta/British Columbia Border Region

Alexander First Nation
Alexis Nakota Sioux Nation
Aseniwuche Winewak Nation Canada
Asini Wachi Nehiyawak Traditional Band
Enoch Cree Nation
Ermineskin Cree Nation
Foothills Ojibway First Nation
Horse Lake First Nation
Louis Bull Tribe
Métis Nation of Alberta Gunn Métis Local 55
Métis Regional Council Zone IV of the Métis Nation of Alberta
Michel First Nation
Montana First Nation
Nakcowinewak Nation of Canada
O'Chiese First Nation
Paul First Nation
Saddle Lake Cree
Samson Cree Nation
Stoney Nakoda First Nation
Sturgeon Lake Cree Nation
Sucker Creek First Nation
Sunchild First Nation
Tsuu T'ina Nation
Whitefish (Goodfish) First Nation

Alberta/British Columbia Border to Kamloops Region

Adams Lake Indian Band
Ashcroft Indian Band
Canim Lake Band
Kelly Lake Cree Nation
Kelly Lake First Nation
Kelly Lake Métis Settlement Society
Ktunaxa Nation
Little Shuswap Indian Band
Lheidli T'enneh First Nation
Lhtako Dene Nation
Llenlleney'ten First Nation (High Bar)
Neskonlith Indian Band
Oregon Jack Creek Band
Shuswap Indian Band
Simpcw First Nation
Skeetchestn First Nation
Splatsin First Nation
Sts'wecem'cXgat'tem (Canoe Creek/Dog Creek)
Tk'emlups te Secwepemc
Toosey Indian Band
Whispering Pines/Clinton Band
Williams Lake (T'exelc) Band
Xat'sull First Nation (Soda Creek)

Kamloops to Hope Region

Boothroyd Band
Boston Bar Band
Coldwater Indian Bar
Cook's Ferry Indian Band
Kanaka Bar
Lower Nicola Indian Band
Lower Similkameen Indian Band
Lytton First Nation
Nicomen Indian Band
Nooaitch Indian Band
Penticton Indian Band
Shackan Indian Band
Siska Indian Band
Skuppah Indian Band
Spuzzum First Nation
St'uxwtews (Bonaparte Indian Band)
Upper Nicola Indian Band
Upper Similkameen Indian Band

Hope to Burnaby Terminal / Burrard Inlet Region

Aitchelitz First Nation
Chawathil First Nation
Cheam First Nation
Katzie First Nation
Kwantlen First Nation
Kwaw-kwaw-aplit First Nation
Kwikwetlem First Nation
Leq'a:mel First Nation
Matsqui First Nation
Musqueam Indian Band
Peters Band
Popkum First Nation
Qayqayt First Nation (New Westminster)
Scowlitz First Nation
Seabird Island Band
Semiahmoo First Nation
Shxw'ōwhámel First Nation
Shxwha:y Village
Skawahlook First Nation
Skowkale First Nation
Skwah First Nation
Soowahlie Indian Band
Squamish Nation
Squiala First Nation
Sts'ailes Band (Chehalis Indian Band)
Sumas First Nation
Ts'kwaylaxw (Pavillion Indian Band)
Tsawwassen First Nation
Tsleil-Waututh Nation
Tzeachten First Nation
Union Bar First Nations
Yakweakwioose Band
Yale First Nation

Marine Corridor

Cowichan Tribes
Ditidaht First Nation
Esquimalt Nation
Halalt First Nation
Huu-ay-aht First Nation
Hwlitsum First Nation
Lake Cowichan First Nation
Lyackson First Nation
Malahat First Nation
Pacheedaht First Nation
Pauquachin First Nation
Penelakut First Nation
Scia'new Indian Band (Beecher Bay)
Sechelt Indian Band
Snaw-Naw-As (Nanoose)
Snuneymuxw First Nation
Songhees Nation
Stz'uminus First Nation (Chemainus)
T'Sou-ke First Nation
Tsartlip First Nation
Tsawout First Nation
Tseycum First Nation

Non-Boundary Specific

BC Métis Federation
Métis Nation of BC

Associations, Councils and Tribes

Cowichan Nation Alliance
Maa Nulth First Nations
Nicola Tribal Association
Nuu-chah-nulth Tribal Council
Okanagan Nation Alliance
Sencot'en Alliance
Shuswap Nation Tribal Council
St'at'imc Chiefs Councils
Stk'emlupsemc te Secwepemc Nation (SSN)
Ts'elxweyeqw Tribe Management Limited (TTML)
Tsilhoqot'n National Government

Appendix 10: Amended Factors and Scope of the Factors for the Environmental Assessment pursuant to the *Canadian Environmental Assessment Act, 2012* (released on 12 October 2018)

1.0 Introduction

On 16 December 2013, Trans Mountain Pipeline ULC (Trans Mountain) filed an application with the National Energy Board (Board or NEB) proposing to construct and operate the Trans Mountain Expansion Project (Project). As the Project would require more than 40 kilometres of new pipeline and would be regulated under the *National Energy Board Act* (NEB Act), it is a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and requires a CEAA 2012 environmental assessment for which the NEB is the Responsible Authority. On 20 September 2018, through OIC P.C. 2018-1177, the Governor in Council (GIC) referred aspects of the Board's Report for the Project back to the Board for reconsideration.

For the purposes of the environmental assessment under the CEAA 2012, the designated project includes the various components and physical activities as described by Trans Mountain in its 16 December 2013 application submitted to the NEB. On 12 October 2018, the Board determined that Project-related marine shipping between the Westridge Marine Terminal and the 12-nautical-mile territorial sea limit is also part of the "designated project" under the CEAA 2012.

As noted in the List of Issues (attached to Hearing Order OH-001-2014), the Board does not intend to consider the environmental and socio-economic effects associated with upstream activities, the development of oil sands, or the downstream use of the oil transported by the pipeline.

In accordance with paragraph 79(2)(b) of the CEAA 2012, the following provides a description of the factors to be taken into account in the environmental assessment under the CEAA 2012 and of the scope of those factors.

2.0 Factors and scope of the factors

2.1 Factors to be considered

The CEAA 2012 environmental assessment for the designated project will take into account the factors described in paragraphs 19(1)(a) through (h) of the CEAA 2012:

a) the environmental effects[152] of the designated project, including the environmental effects of malfunctions or accidents that may occur in connection with the designated project and any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out;

b) the significance of the effects referred to in paragraph (a);

c) comments from the public or any interested party received in accordance with the CEAA 2012;

d) mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project;

e) the requirements of the follow-up program in respect of the designated project;

f) the purpose of the designated project;

g) alternative means of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alternative means; and

h) any change to the designated project that may be caused by the environment.

In addition, the environmental assessment will also consider community knowledge and Aboriginal traditional knowledge.

[152] Section 5 of the CEAA 2012 further describes the environmental effects that are to be taken into account.

2.2 Scope of the factors to be considered

The environmental assessment will consider the potential effects of the designated project within spatial and temporal boundaries within which the designated project may potentially interact with and have an effect on components of the environment. These boundaries will vary with the issues and factors considered, and will include, but not be limited to:

- construction, operation and maintenance, foreseeable changes, and site reclamation, as well as any other undertakings proposed by the proponent or that are likely to be carried out in relation to the physical works proposed by the proponent, including mitigation and habitat replacement measures;
- seasonal or other natural variations of a population or ecological component;
- any sensitive lifecycle phases of species (e.g., wildlife, vegetation) in relation to the timing of Project activities;
- the time required for an effect to become evident;
- the area within which a population or ecological component functions; and
- the area affected by the Project.

Any works and activities associated with additional modifications or associated with the decommissioning or abandonment phase of the Project would be subject to a future application under the NEB Act and assessed in detail at that time. Therefore, at this time, any works or activities associated with these phases of the Project will be examined in a broad context only. As indicated above, the environmental assessment will consider cumulative environmental effects that are likely to result from the designated project in combination with effects from other physical activities that have been or will be carried out.

Subsection 2(1) of the CEAA 2012 provides definitions potentially relevant to the scope of the factors, including:

“environment” which means the components of the Earth, including

a) land, water and air, including all layers of the atmosphere;

b) all organic and inorganic matter and living organisms; and

c) the interacting natural systems that include components referred to in paragraphs (a) and (b);

and

“mitigation measures” which means measures for the elimination, reduction or control of the adverse environmental effects of a designated project, and includes restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

Appendix 11: Study area boundaries for the Environmental and Socio-Economic Assessment

The following describes the study areas that Trans Mountain used in its Environmental and Socio-Economic Assessment of the Project, and which the Board adopted for its own assessment.

Study area boundaries are defined for both the terrestrial and marine aspects considered. Generally, three different study areas were used in assessing the potential effects on each valued component:

- **Footprint study area (FSA)** – The FSA is the fixed area that would be directly disturbed by the Project facilities and associated physical works and activities. This includes the 45-metre-wide construction right-of-way, permanent and temporary access roads, camp and stockpile sites, valves and power lines, pump stations, tanks, and the Westridge Marine Terminal.
- **Local study area (LSA)** – The LSA typically varies depending on the valued component assessed. The LSA is larger than the FSA. It reflects the area where Project construction and operations activities are most likely to affect the valued component assessed. The LSA is sometimes referred to as the "zone of influence."
- **Regional study area (RSA)** – The RSA typically varies depending on the valued component assessed. The RSA is larger than the LSA. It covers the area where potential effects on the valued component assessed might overlap with the direct and indirect effects of other activities on that valued component, causing cumulative effects.

Valued component	LSA	RSA
Terrestrial		
Soil and soil productivity	Extends 500 metres on either side of the pipeline centreline and surrounding facilities	n/a (potential effects not expected to extend beyond the LSA)
Wetland loss and alteration	Extends 150 metres on either side of the pipeline centreline, with site-specific tailoring to extend around larger wetland complexes	Generally the same as the Aquatics RSA, which includes all watersheds affected by the Project
Vegetation	Extends 150 metres on either side of the pipeline centerline.	Extends 1 kilometre on either side of the pipeline centreline
Wildlife	Area within a 1 kilometre buffer of the centre of the pipeline corridor and power lines, and around the boundary of facilities (pump stations/terminals)	Area within a 15 kilometre buffer of the centre of the pipeline corridor and power lines, and around the boundary of facilities (pump stations/terminals)
Grizzly bear		Defined by the Grizzly Bear Population Units traversed by the pipeline corridor
Caribou		The area where direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on caribou. Includes the Wells Gray and Groundhog caribou ranges, associated ungulate winter ranges and wildlife habitat areas.
Surface water quality and quantity Fish and fish habitat	Zone of influence likely to be affected by direct disturbance and sediment deposition during construction and operations. Also includes the area of riparian vegetation to a width of 30 metres back from each bank edge within the width of the construction right-of-way. Each watercourse to be crossed has an individually determined LSA.	Area where the direct and indirect influence of other land uses and activities could overlap with Project-specific potential effects and cause cumulative effects on fish and fish habitat indicators (includes all watersheds directly affected by the Project)

Valued component	LSA	RSA
Atmospheric environment (criteria air contaminants, volatile organic compounds)	Extends 500 metres on either side of the pipeline corridor and 5 kilometres in all directions around tank terminals (due to their proximity, the Westridge Marine Terminal and Burnaby Terminal are combined into one LSA).	Extends 2.5 kilometres on either side of the pipeline corridor and 10 kilometres in all directions around tank terminals (due to their proximity, the Westridge Marine Terminal and Burnaby Terminal are combined into one RSA).
Atmospheric environment (ozone, secondary particulate matter) and visibility	No LSA and RSA defined. Instead, a Lower Fraser Valley study area was used. Emission scenarios were implemented over the inner 4 kilometre domain (boundary: 36 x 12 kilometres) centred on the Lower Fraser Valley.	
Atmospheric environment (greenhouse gas emissions)	International	
Westridge Marine Terminal		
Marine sediment and water quality	Extends 500 metres from the proposed water lease expansion	Area of Burrard Inlet east of the First Narrows, including Indian Arm and Port Moody Arm
Marine fish and fish habitat		
Marine mammals	Extends 300 metres from the proposed water lease expansion	
Marine birds		
Marine transportation		
Marine birds	Extends 1 kilometre on either side of the shipping lanes	Generally centred on the shipping lanes, which extend from the Westridge Marine Terminal through Burrard Inlet; south through the southern part of the Strait of Georgia, the Gulf Islands, and Haro Strait; westward past Victoria and through the Strait of Juan de Fuca out to the 12-nautical-mile limit of Canada's territorial sea
Marine fish and fish habitat	Extends 2 kilometres on either side of the shipping lanes	
Marine mammals	n/a (all residual effects assessed within the RSA)	
Atmospheric environment (criteria air contaminants, volatile organic compounds)		150 x 150 kilometres – includes the shipping lanes from Westridge Marine Terminal in Burnaby, through the Burrard Inlet, south through the Strait of Georgia, Boundary passage and Haro Strait, then westward past Victoria to the end of the Strait of Juan de Fuca, close to the 12-nautical-mile limit.
Atmospheric environment (ozone, secondary particulate matter) and visibility	No LSA and RSA defined. Instead, a Lower Fraser Valley study area was used. Emission scenarios were implemented over the inner 4 kilometre domain (boundary: 36 x 12 kilometres) centred on the Lower Fraser Valley.	
Atmospheric environment (greenhouse gas emissions)	International	

Valued component	LSA	RSA
Terrestrial		
Human occupancy and resource use	For the proposed pipeline and facilities, the spatial boundary of the LSA is defined by a 2 kilometre wide band extending from the proposed Footprint (*i.e.*, the Footprint plus 1 kilometre on each side) and is based on the area that could be directly affected by localized, Project-specific effects. The LSA was established to provide adequate consideration to existing land and resource uses (*e.g.,* farming, livestock grazing, hunting, fishing, protected areas) in the Project area which may experience direct effects associated with the Project beyond the Footprint.	The spatial boundary for the RSA consists of the area extending beyond the LSA boundary and is defined as the area where the direct and indirect influence of other land uses and activities could overlap with Project-specific effects and cause cumulative effects on the HORU indicators. This includes the RSA boundaries of fish and fish habitat, wetlands, vegetation and wildlife. The RSA was selected to reflect the general Project setting and to describe resource use related elements that could be indirectly affected by the Project (*e.g.*, consumptive and non-consumptive recreation, hunting, trapping and fishing).
Infrastructure and services	No LSA was considered for infrastructure and services. The relevant study area is defined by the areas potentially directly disturbed by Project activities (*i.e.*, Footprint Study Area) and communities and regions in which people potentially affected by and benefitting from the Project reside.	The area where the direct and indirect influences of other land uses and activities could overlap with Project-related effects and cause cumulative effects on the social and cultural well-being indicators. The Socio-economic RSA considers communities close enough to the Project to potentially be a: source of labour; source of procured goods or services; location of community infrastructure/services influenced by the Project; accommodation or camp location for Project workers; or Project construction office location. This area includes the counties and regional districts crossed by the proposed pipeline corridor (or certain regional sub-areas) and communities approximately 50 kilometres from the proposed pipeline corridor that could participate in or be affected by the Project. It also includes Indigenous communities whose reserves or traditional territory is crossed by the proposed pipeline corridor.
Social and cultural well-being	N/A. The relevant study area is defined by communities and regions where people are potentially affected by and are potentially benefitting from the Project, not by a specific land area.	
Employment and economy	No LSA was considered for employment and economy. The relevant study area is defined by communities and regions in which people potentially directly and indirectly affected by and benefitting from the Project reside (not by a particular land area), as well as at the Provincial and National level.	
Heritage resources	The zone of influence in which heritage resources are most likely to be affected during construction and operations is the Footprint, including any temporary workspace. The potential for impacting archaeological, palaeontological or historical resources is limited to areas of potential clearing or ground disturbance (i.e., the Footprint). A separate Heritage Resources LSA has not been defined for the Project.	The spatial boundaries of the Heritage Resources RSA for the Project comprise an area extending beyond the Footprint and are defined as an area of intersecting Borden Blocks. A Borden Block measures 10 minutes of latitude by 10 minutes of longitude which is the accepted standard division of land used by archaeologists across Canada. For the Project, the Borden Blocks intersected by the proposed pipeline corridor measure approximately 12 kilometres east-west by 18 kilometres north-south.

Valued component	LSA	RSA
Traditional land and resource use (TLRU)	The TLRU LSA encompasses and extends beyond the Footprint to include the zones of influence of water quality and quantity, air emissions, acoustic environment, fish and fish habitat, wetland loss or alteration, vegetation, wildlife and wildlife habitat and heritage resources since TLRU is dependent on these resources. The TLRU LSA is the area where there is a reasonable potential for localized Project-related effects to affect existing uses of the land for traditional purposes (*e.g.,* trapping, hunting, fishing and gathering areas). The potential effects of the Project are primarily assessed within the Footprint and the TLRU LSA.	The TLRU RSA is the area where the direct and indirect influences of other land uses and activities could overlap with Project-related effects and cause cumulative effects on the TLRU indicators. The TLRU RSA includes the RSA boundaries of water quality and quantity, air emissions, acoustic environment, fish and fish habitat, wetland loss or alteration, vegetation, wildlife and wildlife habitat and heritage resources. Since in some cases, the focus of TLRU may be on lands within a few hundred metres of the Footprint, and in other cases broader territorial uses are identified extending several kilometres from the Footprint, the potential effects of the Project on TLRU are also assessed within the TLRU RSA.
Human health	Tank terminals: the area within a 5 kilometre radius of each of the terminals. The SLHHRA LSA represents the predicted spatial extent of the chemical emissions from the additional tanks to be installed to which people might be exposed.	Separate Air Quality RSAs apply to each of the existing tank terminals, each comprised of a 24 x 24 kilometre area centred on the terminal. The Burnaby Terminal Air Quality RSA was combined with the Westridge Marine Terminal Air Quality RSA due to the close proximity of the two terminals to one another (*i.e.*, less than 3 kilometres apart).
Westridge Marine Terminal		
Human occupancy and resource use	Extends 500 metres from the proposed water lease expansion.	Area east of the First Narrows, including Indian Arm and Port Moody Arm.
Traditional land and resource use		
Human health	The area in the immediate vicinity of the Westridge Marine Terminal where exposure to the chemical emissions from the terminal might be expected to occur. The SLHHRA LSA represents the predicted spatial extent of the chemical emissions from the expansion of the Westridge Marine Terminal to which people might be exposed. The SLHHRA LSA extends over a 5 kilometre radius centred on the Westridge Marine Terminal.	The Air Quality RSA for the Westridge Marine Terminal is a 24 by 24 kilometre area. The Burnaby Terminal Air Quality RSA was combined with the Westridge Marine Terminal Air Quality RSA due to the close proximity of the two terminals to one another (*i.e.*, less than 3 kilometres apart).
Marine transportation		
Marine commercial, recreational and tourism use	Extends 2 kilometres on either side of the shipping lanes.	Generally centred on the shipping lanes, which extend from the Westridge Marine Terminal through Burrard Inlet; south through the southern part of the Strait of Georgia, the Gulf Islands, and Haro Strait; westward past Victoria and through the Strait of Juan de Fuca out to the 12-nautical-mile limit of Canada's territorial sea.

Valued component	LSA	RSA
Traditional marine resource use	Generally the same as the LSA boundaries of marine fish and fish habitat, marine mammals and marine birds since TMRU is dependent on these resources.	Marine RSA encompasses a large portion of the Salish Sea and it generally extends from the western to eastern boundaries of the Salish Sea; however, it confines the northern and southern extents to exclude the central and northern Strait of Georgia and Puget Sound, respectively. Major waterways in the Marine RSA that overlap with the marine shipping lanes extending from the Westridge Marine Terminal through Burrard Inlet, south through the southern part of the Strait of Georgia, the Gulf Islands and Haro Strait, westward past Victoria and Strait of Juan de Fuca out to the 12-nautical-mile limit of Canada's territorial sea.
Human health	Includes the inbound and outbound marine shipping lanes, the area between the shipping lanes, where it exists, and a 5 km buffer extending from the outermost edge of each shipping lane. The shipping lanes extend from the Westridge Marine Terminal in Burnaby, through Burrard Inlet, south through the southern part of the Strait of Georgia, the Gulf Islands and Haro Strait, then westward past Victoria and through the Strait of Juan de Fuca out to the 12-nautical-mile limit of Canada's territorial sea. The LSA represents the predicted spatial extent of the chemical emissions from the Project-related marine vessel traffic to which people along the shipping lanes might be exposed.	A 150 x 150 kilometre area, generally centered on the marine shipping lanes, which extend from the Westridge Marine Terminal through Burrard Inlet, south through the southern part of the Strait of Georgia, the Gulf Islands and Haro Strait, westward past Victoria and the Strait of Juan de Fuca out to the 12-nautical-mile limit of Canada's territorial sea. The Marine Air Quality RSA was used for the purposes of assessing the cumulative health effects associated with the chemical emissions from the increased Project-related marine vessel traffic.

Appendix 12: Criteria, ratings and definitions used in evaluating the likelihood of significant effects

Criteria	Rating	Definition
All criteria	Uncertain	When no other criteria rating descriptor is applicable due to either lack of information or inability to predict.
Temporal Extent	Short-term	An effect, either resulting from a single project interaction or from infrequent multiple ones, whose total duration is usually relatively short-term and limited to or less than the duration of construction, or one that usually recovers immediately after construction. An effect usually lasting in the order of weeks or months.
	Medium-term	An effect, either resulting from a single or infrequent project interaction or from multiple project interactions each of short duration and whose total duration may not be long-term but for which the resulting effect may last in the order of months or years.
	Long-term	An effect, either resulting from a single project interaction of long lasting effect; or from multiple project interactions each of short duration but whose total results in a long lasting effect; or from continuous interaction throughout the life of the project. An effect usually lasting in the order of years or decades.
Reversibility	Reversible	An effect expected to, at a minimum, return to baseline conditions within the life of the Project.
	Permanent	An effect that would persist beyond the life of the project, or last in the order of decades or generations. Some social or cultural effects that persist beyond a single generation may become permanent.
Geographic Extent	Project Footprint	Effect would be limited to the area directly disturbed by the Project facilities and associated physical works and activities, including the width of the right-of-way and temporary work space.
	Local Study Area	Effect would generally be limited to the area in relation to the Project where direct interaction with the biophysical and human environment could occur as a result of construction or operation activities. This area varies relative to the receptor being considered (e.g., 150 metres on either side of the pipeline centerline for Wetlands and Vegetation).
	Regional Study Area	Effect would be recognized in the area beyond the Local Study Area that might be affected on the landscape level. This area also varies relative to the receptor being considered (e.g., for vegetation, the Regional Study Area extends 1 kilometre on either side of the pipeline centreline).
	Global	Effects would be recognized at the global level.

Criteria	Rating	Definition
Magnitude	Low	Effect is minimal, if any; restricted to a few individuals/species or only slightly affects the resource or parties involved; and would impact quality of life for some, but individuals commonly adapt or become habituated, and the effect is widely accepted by society.
	Moderate	Effect would impact many individuals/species or noticeably affect the resource or parties involved; is detectable but below environmental, regulatory or social standards or tolerance; and would impact quality of life but the effect is normally accepted by society.
	High	Effect would affect numerous individuals or affect the resource or parties involved in a substantial manner; is beyond environmental, regulatory or social standards or tolerance; and would impact quality of life, result in lasting stress and is generally not accepted by society.
Evaluation of Significance	Likely to be significant	Effects that are either: (1) of high magnitude; or (2) long-term, permanent, and of regional/global in extent.
	Not likely to be significant	Any adverse effect that does not meet the above criteria for “significant.”

Appendix 13: Federally listed terrestrial wildlife species at risk potentially affected by the Project

Species listed under Schedule 1 of the *Species at Risk Act*	Status	Status of critical habitat under the *Species at Risk Act*				
		Final	Proposed	Candidate	Early draft	Not yet identified by ECCC
American badger (*jeffersonii subspecies*)	Endangered				ü	
Little brown myotis	Endangered					ü
Northern myotis	Endangered					ü
Townsend's mole	Endangered		ü			
Pacific water shrew	Endangered	ü				
Western screech-owl (*macfarlanei subspecies*)	Endangered				ü	
Spotted owl	Endangered					ü [153]
Burrowing owl	Endangered	ü (none identified in Regional Study Area)				
Williamson's sapsucker	Endangered	ü				
Horned lark (*strigata subspecies*)	Endangered					ü
Vesper sparrow (*affinis subspecies*)	Endangered		ü (none identified in Regional Study Area)			
Western painted turtle (Pacific coast population)	Endangered					ü
Oregon spotted frog	Endangered		ü [154]		ü	
Oregon forestsnail	Endangered		ü			
Woodland caribou (southern mountain population)	Threatened	ü				
Northern goshawk (*laingi subspecies*)	Threatened					ü
Ferruginous hawk	Threatened					ü
Red knot (*roselaari subspecies*)	Threatened					ü
Common nighthawk	Threatened					ü
Lewis's woodpecker	Threatened			ü		
Olive-sided flycatcher	Threatened					ü

[153] As proposed, the Project would cross the Sowaqua Spotted Owl Wildlife Habitat Area (Long-term Owl Habitat Area).

[154] Proposed recovery strategy exists; however, at the time of this report, ECCC had identified two new sites as early draft critical habitat.

Species listed under Schedule 1 of the *Species at Risk Act*	Status	Status of critical habitat under the *Species at Risk Act*				
		Final	Proposed	Candidate	Early draft	Not yet identified by ECCC
Loggerhead shrike (prairie population)	Threatened	ü (none identified in Regional Study Area)				
Sprague's pipit	Threatened	ü (none identified in Regional Study Area)				
Canada warbler	Threatened					ü
Western rattlesnake	Threatened				ü	
Great basin gophersnake (*deserticola subspecies*)	Threatened				ü	
Coastal giant salamander	Threatened				ü	
Great basin spadefoot	Threatened				ü	
Dun skipper	Threatened					ü
Mountain beaver (*rufa subspecies*)	Special concern					ü
Spotted bat	Special concern					ü
Great blue heron (*fannini subspecies*)	Special concern					ü
Peregrine falcon (*anatum subspecies*)	Special concern					ü
Yellow rail	Special concern					ü
Long-billed curlew	Special concern					ü
Band-tailed pigeon	Special concern					ü
Barn owl (western population)	Special concern			ü		
Flammulated owl	Special concern					ü
Western screech owl (*kennicottii subspecies*)	Special concern				ü	
Short-eared owl	Special concern					ü
Rusty blackbird	Special concern					ü
Western painted turtle (Intermountain – Rocky Mountain population)	Special concern					ü
Western yellow-bellied racer	Special concern					ü
Northern rubber boa	Special concern					ü
Western toad	Special concern					ü
Coastal tailed frog	Special concern					ü
Northern red-legged frog	Special concern					ü
Monarch	Special concern					ü

Appendix 14: Summary of Indigenous concerns, and applicant, government, and NEB responses

This appendix provides a summary of the general and specific concerns and issues raised by Indigenous communities through the MH-052-2018 hearing, as well as summaries of the responses to these concerns provided by the applicant, responses by the Board (including conditions), comments from the Federal Authorities, and applicable requirements provided through regulation and/or legislation. The issues and concerns include those raised directly by Indigenous peoples through their participation in the hearing, as well as summaries of Indigenous concerns and interests as recorded by the applicant in its evidence. Appendix 8 refers to the written and oral submissions by Indigenous Intervenors who participated in the hearing. The Board notes that identifying and referring to issues and concerns as contained within the record (as provided in this appendix) may have resulted in some issues being categorized in a summary manner. Some direct and indirect references within the record of the hearing may therefore not be exhaustively listed in the issues below. Anyone wishing to fully understand the context of the information and evidence provided by Indigenous communities, as well as the applicable responses to these concerns by the applicant, should therefore familiarize themselves with the entire record of the hearing. The Board also notes that Indigenous communities raised concerns regarding the Project beyond marine-shipping related impacts. As these were beyond the scope of the issues being considered in this MH-052-2018 hearing, they are not captured in this chapter or elsewhere in the Report. Instead they have been tracked in a separate document which will be shared publicly with the Government of Canada directly through the Major Projects Management Office which the Board understands will then consider the information as part of its Phase III Consultation process.

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Consultation with Indigenous Communities					
Adequacy of Trans Mountain's engagement with Indigenous Communities	BC Métis Federation Blood Tribe (Kainai First Nation) Driftpile Cree Nation Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee (IAMC) Louis Bull Tribe Lyackson First Nation Musqueam Indian Band Neskonlith Indian Band Papaschase First Nation #136 Stó:lō Tribal Council Tsawwassen First Nation Tsuut'ina Nation Whitefish Lake First Nation #459	Trans Mountain confirmed that it continues to engage Indigenous communities affected by the Project and will continue to update the Board through compliance with Condition 96. Trans Mountain has started collaboration activities with the Federal Government in relation to the resumption of Phase III consultation, and will participate as appropriate in subsequent consultations with Indigenous groups, to provide proponent and project specific information. Trans Mountain is committed to participating in meaningful dialogue and consultation with Indigenous communities across the Project.	Canada has not delegated the procedural aspects of its Duty to Consult to Trans Mountain. However, it noted that representatives of Trans Mountain will be part of the consultation and accommodation process and participate in meetings with representatives of Indigenous communities, government and nations, where appropriate, although the ultimate responsibility for ensuring that the duty is adequately fulfilled remains with the Crown under the leadership of the Minister of Natural Resources.	In assessing the engagement undertaken by Trans Mountain with Indigenous peoples, the Board evaluated the implementation of Trans Mountain's ongoing engagement activities with regards to Project-related marine shipping. The Board considered the company's activities to engage Indigenous communities and to learn about their concerns and interests, as well as the concerns and views expressed by Indigenous communities within the MH-052-2018 hearing. Trans Mountain has engaged with Indigenous communities since the close of the OH-001-2014 Hearing, and has committed to continue to work with Indigenous communities. The Board expects Trans Mountain to continue to learn about the concerns that Indigenous communities may have about Project-related marine shipping and to discuss ways to address those concerns to the extent possible. The Board also encourages Indigenous communities with an interest in Project-related marine shipping to continue to engage with Trans Mountain. The Board is satisfied that, with Trans Mountain's commitments and the Board's Conditions 96 and 146, Trans Mountain will continue to engage with Indigenous communities in order to learn more about their interests and concerns and address issues raised by Indigenous communities throughout the Project's operational life. With respect to issues of concern raised by Indigenous communities that were beyond the scope of this MH-052-2018 hearing, The Board expects and encourages Trans Mountain to continue to engage with Indigenous communities on all aspects of the Project that are of concern to the communities themselves	5.2.2.1 5.2.2.6 5.2.6.1

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Crown's duty to consult and accommodate Indigenous peoples					
Adequacy of the Crown's consultation process	Blood Tribe (Kainai First Nation) Ditidaht First Nation Driftpile Cree Nation Lyackson First Nation Musqueam Indian Band Papaschase First Nation #136 Seabird Island Band Shxw'ōwhámel First Nation Stk'emlupsemc te Secwepmc of the Secwepmc Nation Stó:lō Collective Stz'uminus First Nation Tsartlip First Nation Tsawwassen First Nation Tsleil-Waututh Nation Whitefish Lake First Nation #459	Trans Mountain has continued to engage with all potentially affected Indigenous communities in relation to Project-related marine shipping since the conclusion of the OH-001-2014 hearing. Trans Mountain noted that the MH-052-2018 hearing provided opportunities for potentially affected Indigenous communities to learn more about Project-related marine shipping, to ask information requests of Trans Mountain and federal government agencies, file written evidence and present oral traditional evidence. Trans Mountain said that Indigenous communities have been provided with extensive opportunities to engage on all aspects of Project-related marine shipping. Trans Mountain noted that the Board's task is not to assess the adequacy of Crown consultation in its MH-052-2018 Report. Trans Mountain noted that the Government of Canada has indicated that it intends to carry out additional consultation beyond and outside the NEB process. Trans Mountain submitted that the adequacy of Crown consultation can only be assessed once all consultation has been completed and at such time when the Crown (in this case, Cabinet) renders its final decision on the Project. As such, while the Board can assess the adequacy of Trans Mountain's consultation for the purposes of this Reconsideration, Trans Mountain argued that the Board need not and cannot at this time assess the adequacy of Crown consultation overall. Trans Mountain argued that such an assessment would be premature and beyond the purview of the Board.	The Crown can rely on existing regulatory processes, to the extent possible, to fulfill the duty to consult. As such, the Crown may rely on the NEB MH-052-2018 hearing, to the extent possible, to identify, consider and address how the Crown's conduct in relation to Project-related marine shipping might adversely impact potential or established Indigenous and Treaty rights. NRCan said that this approach avoids duplication and ensures that the NEB, which has broad powers to set conditions for the Project, has full access to relevant information on potential adverse Project-related marine shipping impacts on Indigenous and Treaty rights. The Crown will also consult on Project-related marine shipping impacts in its re-initiated Phase III of the consultation process. The Minister of Natural Resources wrote to potentially impacted Indigenous communities, governments and nations following the announcement that it would re-initiate Phase III consultations on the Project, outlining the Crown's intentions to engage in a specific and focused dialogue on the Project. NRCan said that the Crown's Phase III consultation and accommodation process will work with Indigenous communities, governments and nations in a manner that aligns with the Crown's commitment to strengthen and renew its relationships with Indigenous peoples while respecting and upholding the rights of Indigenous peoples in Canada. A recommendation on whether to approve the Project will only be considered by the GIC once it is satisfied that: (1) the Crown has adequately fulfilled its duty to consult and that consultations with potentially impacted groups have been offered and/or carried out in a meaningful and responsive manner; and (2) accommodations have been considered, where appropriate, and responses have been provided to Indigenous communities, governments and nations.	Recognizing the role of the Board's hearing in the consultation process for this Project, as well as the Government of Canada's ongoing efforts relating to Phase III consultation, the Board is satisfied that its process was impartial and fair and is able to contribute, to the extent possible, to the Crown's obligation to consult and accommodate.	5.2.5.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Adequacy of Phase III Consultation / Accuracy of 2016 Consultation and Accommodation Report (CAR)	Blood Tribe (Kainai First Nation) Driftpile Cree Nation Louis Bull Tribe Lyackson First Nation Musqueam Indian Band Neskonlith Indian Band Papaschase First Nation #136 Squamish Nation Stoney Nakoda Nations Tsawout First Nation Tsleil-Waututh Nation Tsuut'ina Nation Whitefish Lake First Nation #459	Trans Mountain noted that the Government of Canada has indicated that it intends to carry out additional consultation beyond and outside the NEB process. Trans Mountain submitted that the adequacy of Crown consultation can only be assessed once all consultation has been completed and at such time when the Crown (in this case, Cabinet) renders its final decision on the Project. As such, while the Board can assess the adequacy of Trans Mountain's consultation for the purposes of this Reconsideration, Trans Mountain argued that the Board need not and cannot at this time assess the adequacy of Crown consultation overall. Trans Mountain argued that such an assessment would be premature and beyond the purview of the Board.	The Crown will re-engage in Phase III consultations, outside of the MH-052-2018 hearing, with all impacted Indigenous communities, governments and nations to meaningfully fulfill its duty to consult through understanding, and identifying measures to avoid, mitigate or accommodate, where appropriate, impacts of the project to Indigenous and Treaty rights. The NEB recommendations will inform the Crown's Phase III consultation. A recommendation on whether to approve the Project will only be considered by the GIC once it is satisfied that the Crown's obligation to consult and accommodate has been fulfilled. NRCan offered participant funding to impacted Indigenous communities, governments and nations in November 2018, to support participation in consultation activities with the Crown. The re-initiated Phase III consultation process will build on existing relationships, information submitted by Indigenous communities, governments, and nations to date, and the existing consultation record, while making improvements to ensure the duty to consult is appropriately fulfilled. This new process will result in an updated CAR that will be presented to the Governor in Council prior to a decision being made in accordance with section 54 of the *National Energy Board Act*, which includes provisions allowing the Crown to seek an extension beyond the mandated three month review period. Prior to completion, Indigenous communities, governments and nations' views and comments on this document will further inform the Crown's assessment, which will then be reflected in the report.	The Board acknowledges the concerns raised by Indigenous intervenors regarding the Crown's overall consultation process, including the 2016 CAR being filed on the Board's record by the Federal Authorities, as well as assertions that the information does not accurately capture the concerns that were raised with the government during the Original Phase III Consultations. The Board understands that this information was filed by the Federal Authorities in an effort to help make the Board aware of Indigenous interests and concerns related to the Project (and in particular to Project-related marine shipping) as they were understood by the Crown as of 2016. The Board notes that this MH-052-2018 hearing is not the appropriate venue to make a determination on the accuracy of the information in that document. The Board also notes that the MH-052-2018 hearing was an opportunity for Indigenous communities to provide information directly to the Board regarding their concerns about Project-related marine shipping through their participation as intervenors and commenters, and the Board has considered all of this direct evidence. The Board notes that as part of the re-initiated Phase III consultations on the Project, new information outlining the potential impacts to the rights and interests of Indigenous communities will be consolidated into an updated CAR, and prior to completion, comments on the CAR from Indigenous communities will be reflected in the document to further inform the Crown. Given that this Phase III Consultation Process is taking place outside the Board's MH-052-2018 hearing and will continue beyond the timelines of the MH-052-2018 hearing, the Board is not making a determination on the adequacy of the Phase III Consultation Process. The Board's mandate, as indicated in Order in Council P.C. 2018-1177, is to reconsider its recommendation taking into account the effects of Project-related marine shipping. It is the Governor in Council's role to make the final decision on the Project, taking into account the Board's Report and the information to be provided by the Federal Authorities regarding the adequacy of the Crown's consultation and accommodation.	5.2.5.3 5.2.2.6 5.2.6.3
Adequacy of the Reconsideration Process	Adam Olsen Adams Lake Indian Band Cowichan Tribes Driftpile Cree Nation	Trans Mountain stated that procedural fairness of the MH-052-2018 hearing was satisfied. Its arguments included the following points: • Procedural fairness varies with the context and interests at stake and here the	The Crown was following the guidance from the Federal Court of Appeal and the Crown Recognizes the MH-052-2018 hearing is operating within the broader context of the re-initiated Phase III consultation process. The NEB MH-052-2018 hearing provides a mechanism for	The time limit set out in OIC P.C. 2018-1177 required the Board to issue its Reconsideration report no later than 22 February 2019. Despite the expedited hearing process and narrow scope of the issues, the MH-052-2018 hearing had many steps that were similar to the OH-001-2014 Certificate Hearing. Evidence was	1.5.1 5.2.2.6

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Little Shuswap Lake Indian Band Louis Bull Tribe Malahat First Nation Neskonlith Indian Band Nooaitch Indian Band Shxw'ōwhámel First Nation Snuneymuxw First Nation Squamish Nation Stk'emlupsemc te Secwepmc of the Secwepmc Nation Stó:lō Collective Stz'uminus First Nation First Nations of the Maa-nulth Treaty Society Tsartlip First Nation Tsawout First Nation Tsawwassen First Nation Tsleil-Waututh Nation T'Sou-ke First Nation Tsuut'ina Nation Whitefish Lake First Nation #459	Reconsideration was narrow in scope which should inform procedural fairness. • Having a fair but expedited hearing was consistent with the NEB Act and the direction from both the Federal Court of Appeal and the OIC for a prompt redetermination. • All parties had an opportunity to fully and fairly present their case. • In response to a notice of motion from Squamish Nation and supported by other intervenors the Board granted the request for an additional 15 days for filing intervenor evidence. In contrast Trans Mountain had a very limited time to file its reply evidence.	Indigenous communities, government and nations to express their concerns regarding how Project-related marine shipping might adversely impacts potential or established Indigenous and Treaty rights, and related avoidance, mitigation and other accommodation measures. NRCan said that the Crown will rely on the NEB Reconsideration Process, to the extent possible, to consider all forms of mitigation to Project-related marine shipping and to assess the residual effects. The Crown will then assess the potential seriousness of any residual effects of the Project on Indigenous and Treaty rights, taking into account proposed mitigation and/or accommodation measures.	presented in writing and testing of that evidence was carried out through written IRs. Parties had the opportunity to ask the Board to compel other Parties to provide more complete responses to IRs and also to file final argument. The Board offered to hear oral traditional evidence in person at any of the announced locations, or remotely while it sat in Calgary While the Reconsideration time lines were expedited, the Board is satisfied that parties had a fulsome opportunity in the Reconsideration to make their case and challenge evidence from Trans Mountain and federal departments. As stated above, if there were particular circumstances requiring additional time, the Board was open to considering such requests. The Board is of the view that hearing process deadlines, as amended, allowed parties to fully and fairly present their case and challenge evidence, and resulted in a procedurally fair hearing.	1.4.2 1.4.5 1.5.1
Effects on interests, including asserted and established Treaty and Indigenous Rights of Indigenous Communities					
Anchorages in the Southern Gulf Islands	Cowichan Tribes Lyackson First Nation Snuneymuxw First Nation Stz'uminus First Nation	Trans Mountain said that vessels destined to the WMT do not currently anchor and will not anchor in the future, in the areas of concern raised by Indigenous intervenors. It also stated that it intends to manage arriving vessels to minimize the use of anchorages. Trans Mountain said it expected that tankers will anchor at the three anchorages east of Second Narrows, and pressure on anchorages will be reduced by holding tankers at the dock whenever a berth is available.	The Pacific Pilotage Authority confirmed that there were no WMT bound or departing vessels that anchored in the Southern Gulf islands in the last five years. Through the National Anchorages Initiative, Transport Canada is conducting research studies to inform the creation of a National Anchorages Framework, which are expected to be completed in 2019. Transport Canada said that it is consulting with stakeholders and Indigenous communities to develop an approach to identify anchorage sites. Traditional knowledge will be collected during this process. Transport Canada said that it will be undertaking a review and evaluation of the need for regulatory changes for oversight and management of anchorage sites. These activities will allow for the development of a national anchorage framework and best practice guide for ships at anchor.	The Board is satisfied with the evidence of the PPA that no transiting tankers to WMT have used anchorages in the Southern Gulf Islands in recent years, as well as Trans Mountain's evidence that Project-related vessels do not currently anchor and will not anchor in the future, in the areas of concern raised by Indigenous intervenors. The Board also notes that Transport Canada has initiatives underway to mitigate adverse effects due to the use of these anchorages and that these initiatives will include consultation with Indigenous peoples.	5.2.5.3 5.2.6.2

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Adequacy of government programs and initiatives, including Crown consultation on these	Adams Lake Indian Band Cowichan Tribes Ditidaht First Nation Heiltsuk First Nation Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee Lyackson First Nation Musqueam Indian Band Pacheedaht First Nation Squamish Nation Tsartlip First Nation First Nations of the Maa-nulth Treaty Society	Trans Mountain, as a pipeline operator with no direct control over Project-related marine shipping, believes that multi-party solutions with active collaboration between industry and government are required to ensure continued maintenance and advancement of the marine safety regime. Trans Mountain supports the approach proposed under the OPP, whether or not the Project proceeds.	Canada has a dedicated OPP engagement team that continues to support ongoing dialogue with South Coast First Nations. Transport Canada pointed to the recently launched Indigenous and Local Communities Engagement and Partnerships Program (ILCEPP) as a measure to support any future agreements on the South Coast. The objective of the ILCEPP is to support relationship building and encourage participation in longer-term engagement work on one or more OPP initiatives. Over $13 million is being made available to eligible Indigenous and local communities to be engaged and participate in the OPP. If Canada contemplates further actions related to Oceans Protection Plan initiatives, and these actions have the potential to impact Indigenous rights, Canada will consult with potentially affected Indigenous communities.	While the Federal Authorities have indicated that the OPP is not Project-specific, components of the OPP directly respond to marine safety concerns raised through previous public consultation, including those on the Trans Mountain Expansion Project, and that certain OPP initiatives apply to the Project's marine shipping components. The Federal Authorities presented evidence describing how these components of the OPP include consultation and partnerships with Indigenous communities that will provide opportunities for Indigenous communities to play a meaningful role in marine safety, including decision-making, and environmental protection. The Board acknowledges the concerns raised by Indigenous communities regarding the level and depth of consultation that is taking place regarding the many initiatives that form the OPP. The Board notes that it is not within the scope of this Reconsideration to assess the adequacy of consultation related to Canada's consultation related to the OPP or other broad initiatives related to marine shipping. That said, the Board is of the view that the OPP is a positive step to addressing concerns related to marine shipping on the south coast of B.C., and is encouraged by Canada's commitment to strengthen partnerships with Indigenous communities. The Board notes that the Federal Authorities have said that if Canada contemplates further actions related to Oceans Protection Plan initiatives, and these actions have the potential to impact Indigenous rights, Canada will consult with potentially affected Indigenous communities. The Board notes that the OPP is a large initiative with many programs and initiatives in various states of progression and encourages continued one-on-one discussions between the Federal Authorities and Indigenous communities so that they are able to understand all of the plans and programs, including how these may be appropriate to address community-specific concerns.	5.2.5.3 5.2.6.2
Involvement of Indigenous peoples in monitoring Project-related marine shipping / IAMC	Chawathil First Nation Cheam First Nation Ditidaht First Nation Driftpile Cree Nation Ermineskin Cree Nation Indigenous Caucus for the	Trans Mountain understands that the IAMC is an Indigenous-led committee, established with a goal to form the basis of a new relationship between Indigenous communities, the government and the NEB in respect of Trans Mountain's activities. Trans Mountain's understanding is that the IAMC is already advancing Indigenous interests with respect to	IAMC participation in the monitoring and oversight of Project-related marine shipping and its potential impacts to the marine environment is pursued primarily by the Marine Shipping subcommittee (the Subcommittee). Between October 2018 and March 2019, the Subcommittee will be engaging with Indigenous communities with interests related to the marine corridor	The Government of Canada established the IAMC as a measure that was to supplement Trans Mountain's commitments to Indigenous communities, the NEB conditions on the Project, and the commitments made by Canada in the OPP. The Board recognizes that the IAMC is not a consultative body and does not take the place of mandated one-on-one consultation between Trans	5.2.5.3 5.2.6.2

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Trans Mountain Indigenous Advisory and Monitoring Committee Kwantlen First Nation Louis Bull Tribe Lyackson First Nation Malahat First Nation Métis Nation BC Musqueam Indian Band Seabird Island Band Shackan Indian Band Squamish Nation Stk'emlupsemc te Secwepmc of the Secwepmc Nation Stó:lō Collective Stó:lō Tribal Council First Nations of the Maa-nulth Treaty Society Tsawout First Nation T'Sou-ke First Nation Whitefish Lake First Nation #459 Whitefish (Goodfish) Lake First Nation #128	guardianship and stewardship over land and water operations during the lifecycle of the Project. Trans Mountain said it is supportive of the IAMC's role as it pertains to the Project.	toward a number of marine-related objectives. Canada has committed $64.7 million to support the IAMC for the Project. So far, the Committee is reviewing or supporting 13 community projects related to the effects of Project-related marine shipping, including projects that analyze vessel traffic associated with the Project, the enhancement of emergency planning, the development of environmental management, and the hiring of emergency response personnel in individual First Nations, among others.	Mountain or the Crown and individual First Nations. That said, the Board is of the view that the existence of the IAMC is a valuable measure to address concerns from Indigenous communities regarding marine shipping activities, including facilitating further Indigenous involvement in the marine safety, inspection and enforcement regime. Thus the Board has included Recommendation 11 as part of this Report, which would require the GIC to work with Transport Canada and the Canadian Coast Guard, to facilitate opportunities, as appropriate, to engage and seek feedback from the Indigenous Advisory Monitoring Committee on the marine safety system, including on the marine inspections and enforcement regime, as well engagement opportunities for Project-related marine shipping activities that intersect with Canadian Coast Guard operational programs.	
SRKW critical habitat proposal for Swiftsure Bank	Ditidaht First Nation Pacheedaht First Nation		DFO explained that the identification of new critical habitat areas is based on scientific advice stemming from research carried out over the last 40 years. It also noted that there is no immediate plan to add new closures or change the fisheries closures that protect the key SRKW foraging areas. DFO will be reviewing its fishery closure approach with Indigenous communities going forward and through these discussions, DFO can address questions such as understanding the information used to inform management measures, considering how other threats interact with the threat of lack of available prey for SRKW, and understanding how best to include and incorporate Indigenous and local knowledge to adaptively manage the mitigation of these threats.	The Board does not have the ability within this proceeding to address the issue of the potential of future fisheries closures, but is of the view that the commitments from the Federal Authorities are appropriate and notes that this is an issue that can be further discussed as part of the Phase III consultation process.	5.2.5.3 5.2.6.2

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Issues beyond scope of the MH-052-2018 hearing	Adams Lake Indian Band Blood Tribe (Kainai First Nation) Driftpile Cree Nation Little Shuswap Lake Indian Band Louis Bull Tribe Stk'emlupsemc te Secwepmc of the Secwepmc Nation Tsuut'ina Nation Whitefish Lake First Nation #459	Trans Mountain noted that many intervenors raised issues and concerns that were fully canvassed and considered by the Board in the OH-001-2014 proceeding. Trans Mountain submitted that these issues were adjudicated in the OH-001-2014 Hearing and as such it did not provide a reply to these concerns.	NRCan stated that the government will re-engage consultations with all 117 Indigenous communities potentially impacted by the Project. On 5 October 2018, the Minister of Natural Resources communicated the Government's intentions to engage in a specific and focused dialogue with Indigenous communities on the Trans Mountain Expansion Project. It stated that the next round of consultations will lead to an updated CAR that will outline the potential impacts to rights and interests of Indigenous communities in relation to the Project, and how these impacts have been mitigated and, where appropriate, accommodated.	The Board recognizes that Indigenous communities have a broad range of matters and concerns that they wish to raise, discuss and resolve with both the federal and provincial governments. The Board is sharing those concerns it heard that are not in the scope of the Reconsideration with NRCan in a separate document, that will be available on the Major Projects Management Office website and can be used to assist NRCan in its Phase III consultations with Indigenous peoples.	5.2.5.3 5.2.6.2
Indigenous governance and stewardship	Tsawout First Nation Tsleil-Waututh Nation Little Shuswap Lake Indian Band Neskonlith Indian Band Stk'emlupsemc te Secwepmc of the Secwepmc Nation Shxw'ōwhámel Tsawout First Nation Tsuut'ina Nation First Nations of the Maa-nulth Treaty Society	Trans Mountain's understanding is that the IAMC is already advancing Indigenous interests with respect to guardianship and stewardship over land and water operations during the lifecycle of the Project. Trans Mountain noted that the IAMC provides for collaborative, inclusive and meaningful Indigenous involvement in the review and monitoring of environmental, safety and socio-economic issues, and Trans Mountain is supportive of the IAMC's role as it pertains to the Project.	The Federal Authorities noted that one of the measures for the Species at Risk Action Plan for Northern and Southern Resident Killer Whale (Orcinus orca) in Canada (2017) is to incorporate Indigenous Traditional Knowledge on the behaviour and distribution of Southern resident killer whales and their prey into measures for the recovery of the species. DFO said that Indigenous communities are being engaged through governance bodies such as the SRKW Indigenous and Multi-stakeholder Advisory Group, and the DFO-led SRKW prey availability working group. The Federal Authorities noted that Pillar 3 of the OPP is to strengthen partnerships and launch co-management practices with Indigenous communities, by building local emergency response capacity, marine training and governance strategies for northern shipping.	The Board recognizes that Project-related marine shipping has the potential to affect the rights of Indigenous communities, including those rights established through the Douglas Treaties, the Tsawwassen First Nation Final Agreement, and the Maa-nulth Final Agreement. The Board acknowledges the responsibilities expressed by many Indigenous communities to look after the land and water located within their traditional territories: to be stewards, protectors, and follow their laws and sacred responsibilities. As a result, the Board has included Recommendation 1 which would require the GIC to develop and implement a regional cumulative effects management plan implemented in consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders. The Board also notes that the marine shipping aspect of IAMC activities may not be as advanced as the work being done along the pipeline route and within the WMT, but it believes that the IAMC has a valuable role to play in sharing the capacity and knowledge of Indigenous communities in relation to spill preparedness and response, marine stewardship, planning and monitoring, including working with industry, regulators and other governmental bodies.	5.2.5.3 14.8.3 5.2.5.2 5.2.6.2
Salish Sea marine use planning and establishment of Marine Protected Areas	Chawathil First Nation Cheam First Nation Ermineskin Cree Nation	Trans Mountain said that it is advancing the concept of a Salish Sea Initiative as part of an existing commitment with marine Indigenous communities to enhance their stewardship over the Salish Sea. While conceptual at this	Marine Protected Areas (MPAs) established under section 35 (1) of *Oceans Act* may prohibit or impose restrictions on classes of activities, such as marine shipping, for the purpose of marine conservation through regulations. For example, the Hecate Strait and	The Board realizes the importance of establishing National Marine Conservation Areas (NMCA), and hence recommends the GIC to expedite the work in completing the feasibility study for establishing a Southern Strait of Georgia National Marine	14.8.3 14.7.5

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Heiltsuk First Nation Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee Kwantlen First Nation Malahat First Nation Seabird Island Band Squamish Nation Stó:lō Tribal Council Tsartlip First Nation Whitefish (Goodfish) Lake First Nation #128	time, the Salish Sea Initiative has been introduced to marine Indigenous communities with a focus on where there is an already existing commitment, and the intention is for the Initiative to be Indigenous-led and developed in partnership with Trans Mountain. Due to Project-uncertainty the long-term initiative was suspended, but pending the resumption of the Project, Trans Mountain said that it would re-engage with interested Indigenous marine communities in the design and scope of the initiative, together with, as appropriate, other marine organizations and authorities.	Queen Charlotte Sound Glass Sponge Reefs Marine Protected Areas Regulations (outside of the Marine RSA) enable navigation activities throughout the MPA, but no anchoring in the core protection zones. It said that no MPAs have yet been established in the Marine RSA, but under the *Oceans Act* the Minister retains the authority to recommend to the Governor in Council that regulations be made to designate new MPAs at a future time.	Conservation Area, and publicly report on the outcomes of that study, and (if considered feasible) proceed to establish it (Recommendation 4). The Board also notes that Recommendation 2 would also be relevant in that it includes a description of the progress on each of the recommendations. The Board recognizes Canada's commitment to meet marine conservation targets established under the Convention on Biological Diversity to conserve 10 percent of coastal and marine areas through effectively managed networks of protected areas and other effective area-based conservation measures by 2020. The Board notes that network planning has always been emphasized as one of the primary tools in fulfilling government mandates to protect conservation and the protection of the natural environment. The Board expects Government of Canada to consider the possibility of identifying and creating a network of marine protected areas in the Salish Sea as part of its implementation of Recommendation 1.	
Environmental effects of Project-related marine shipping					
Alternative means	BC Métis Federation Squamish Nation Tsleil-Waututh Nation	Trans Mountain said that during the initial Project scoping process, it considered six alternative marine terminal locations, including two locations in Washington State. Trans Mountain said that it assessed information about these locations in the OH-001-2014 hearing, and explained that the Washington locations were eliminated from future consideration early in the planning process because they would require a longer pipeline and would pose complex regulatory issues including additional permits required by Washington State and the United States federal government		The Board is of the view that Trans Mountain has provided an adequate assessment, including consideration of technical, socio-economic and environmental effects, of technically and economically feasible alternative marine terminal locations. The Board finds that Trans Mountain's assessment is consistent with the Board's Filing Manual and Canadian Environmental Assessment Agency guidance relating to alternatives means.	14.6.2
Air and Greenhouse Gas emissions from tankers	BC Métis Federation Tsuut'ina Nation Blood Tribe (Kainai First Nation) Driftpile Cree Nation Louis Bull Tribe Shackan Indian Band	Trans Mountain said that it has set the age limits for tankers that would be acceptable to call at the WMT, as part of its Vessel Acceptance Standards. Trans Mountain anticipates that the ongoing improvements to the global fleet with respect to emissions reduction requirements will apply to tankers that transit to and from the WMT. Trans Mountain said that it believes the authorities that regulate marine transportation (i.e., one or more of Transport Canada, Environment and Climate Change Canada, and	Transport Canada said that in 2017, the IMO Member States agreed on an initial strategy for reducing greenhouse gas emissions from ships, which targets at least a 50 per cent reduction from 2008 levels by year 2050. ECCC noted that a federal Clean Fuel standard is under development and will require producers and importers of fossil fuels to reduce the carbon intensity of the fuels they produce and import. ECCC said that pending the ultimate design of these regulations, the carbon intensity of marine fuels sold in Canada could be required to be lower, resulting in greenhouse gas	The Board finds that greenhouse gas emissions from Project-related marine vessels are likely to be significant. The Board recommends that the GIC should support the development and implementation of greenhouse gas reduction measures related to marine shipping that would align with the final International Maritime Organization Strategy in year 2023 for reducing greenhouse gas emissions (Recommendation 10). These measures could include, but not be limited to facilitating the use of low-carbon alternate fuels, use of energy efficient technologies, and market-based	14.7.1

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
		the Canadian Coast Guard), would be better placed to establish any requirements for greenhouse gas emissions, and to monitor and enforce such programs, for all vessels. Trans Mountain said that the IMO (under MARPOL Annex VI) has established emission control areas (ECAs) to reduce emissions of SO_x, NO_x and particulate matter in designated sea areas. Trans Mountain said that for large ships like oil tankers constructed after 1 January 2016, Tier III emission standards for NO_x must be met for a vessel to operate in an Emission Control Areas such as in the Port of Vancouver. It said that relative to Tier I emission standards from year 2000, the Tier III standards are expected to provide a significant reduction in NO_x emissions by 80 per cent or a factor of five. Trans Mountain said that an internationally registered oil tanker that would call at the WMT would be subject to this IMO reduction target. Trans Mountain said that the IMO regime includes two primary measures for improving energy efficiency: Energy Efficiency Design Index and Ship Energy Efficiency Management Plan (SEEMP).	emissions reductions. ECCC said that proposed regulations are planned for spring/summer 2019, to be published in the Canada Gazette, Part I.	measures, such as providing economic incentives for industry investment in the development and use of energy efficient technologies and offsetting any increases in ship emissions. The Board notes that Recommendation 2 would also be relevant in that it includes a description of the progress on each of the recommendations. If the GIC implements the Board's recommendation around development and implementation of GHG reduction measures related to marine shipping that aligns with the final IMO strategy by 2023, GHG emissions from Project-related shipping would be reduced. With the new energy efficiency standards adopted by the International Maritime Organization, and with proposed regulations for federal clean fuel standard planned for spring/summer 2019, GHG emissions will be further diminished.	
Effects on SRKW from Project-related marine traffic operations	Cheam First Nation Chawathil First Nation Ditidaht First Nation Driftpile Cree Nation Kwantlen First Nation Louis Bull Tribe Lyackson First Nation Makah Tribal Council Malahat First Nation Neskonlith Indian Band Nooaitch Indian Band Pacheedaht First Nation Shxw'ōwhámel First Nation Snuneymuxw First Nation Stó:lō Tribal Council Tsartlip First Nation Tsawout First Nation Tsleil-Waututh Nation T'Sou-ke First Nation Swinomish, Tulalip,	Trans Mountain observed that initiatives solely aimed at Project-related vessels would be inefficient and would have no material benefit to SRKW without also addressing the shipping industry in general.	Since the NEB's OH-001-2014 Report, the Government has advanced a comprehensive strategy to protect ocean ecosystems and to support the recovery of SRKW, which has advanced in three stages: · under the $1.5 billion national Oceans Protection Plan (OPP) launched in late 2016; · under the $167 million Whales Initiative launched in June 2018; and · an additional $61.5 million for additional measures announced in October 2018 designed to further address the imminent threats to the survival and recovery of SRKW Various research and data collection projects are underway, including a Coastal Environmental Baseline Program that will collect data at six pilot sites over the next four years, including in the port of Vancouver; and a national Cumulative Effects of Marine Shipping Initiative at six pilot sites, including one in South Coast B.C., which will include regional cumulative effects assessments at each pilot site and the identification of potential tools and strategies that can be applied to existing or future vessel movements.	The Board recommends that the additional underwater noise and strike risk created by Project-related marine vessels be offset by applying measures to all appropriate vessels, including Project-related marine vessels (Recommendation 5). While the Board maintains its recommendation that there are likely significant adverse effects on SRKW, this offset approach could allow for a reduction in that finding to non-significance if and when Project-related shipping effects have been effectively reduced to net-zero in each section of the shipping route. As noted in Recommendation 5, monitoring is necessary to track progress, and changes should be made if voluntary measures prove ineffective over time, including consideration of mandatory measures. The annual reporting recommended in Recommendation 2 would also be relevant given that it includes a description of progress on each of the other recommendations, as well as a description of consultation activities related to each. In Recommendation 6, the Board recommends that each of the following five mitigations be further considered and their feasibility be publicly reported on: 1. Slowdowns in each section of the marine shipping route.	14.7.2

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Suquamish, and Lummi Indian Nations (US Tribes) Whitefish (Goodfish) Lake First Nation #128			2. Limits on the impacts from whale watching boats. 3. Accelerate and confirm the schedule for noise reduction efforts for regularly operating ferries in the area. 4. Identification of specific congregation and migration areas for SARA-listed species, and consideration of mitigations in those areas. 5. Further incentives and requirements for quiet vessel design and refits to address underwater noise over the long term, including maximal international participation. The Board has included two recommendations that seek to address the broader issue of cumulative effects on the marine ecosystems through which Project-related vessels will pass: • In Recommendation 1, the Board recommends GIC develop and implement a regional cumulative effects management plan to assess the overall environmental state of, and cumulative effects on, the Salish Sea, including a long-term strategy to manage those cumulative effects. • In Recommendation 2, the Board recommends GIC annually report on the oversight, progress and status of initiatives and measures to address cumulative effects on, and to support the health of, the Salish Sea.	
Marine fish and fish habitat	Cheam First Nation Chawathil First Nation Heiltsuk First Nation Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee Louis Bull Tribe Kwantlen First Nation Little Shuswap Lake Indian Band Makah Tribal Council Malahat First Nation Musqueam Indian Band Seabird Island Band Snuneymuxw First Nation Stó:lō Tribal Council Squamish Nation	In the MH-052-2018 hearing, Trans Mountain referenced its previous individual assessments for eight marine fish species. Trans Mountain provided new individual assessments of potential residual effects of Project-related marine shipping on Longspine Thornyhead and on Leatherback sea turtle. For each species, Trans Mountain noted either no critical habitat identified in Canadian waters, or (for Northern abalone) no spatial overlap with identified critical habitat. Trans Mountain's assessments concluded that residual effects of routine operation of Project-related vessels on each SARA-listed marine fish are predicted to be negligible or low in magnitude, low in probability, and not significant.	DFO maintained its position that potential effects on marine fish and fish habitat from Project-related marine shipping are likely to be low risk (excluding potential accidents or malfunctions). DFO said, given that there have been no significant changes to the proposed marine shipping component of the Project, it does not anticipate any meaningful changes to its assessment of effects on marine fish and fish habitat, including potential effects on chinook salmon and species that have seen a change in designation, since the filing of its written evidence in the OH-001-2014 hearing.	The Board's recommendations to government concerning the overall cumulative effects on the Salish Sea (see Recommendations 1 and 2) include consideration of the cumulative effects on, and initiatives and measures for, salmon and other fish stocks. The Board is of the view that Project-related marine vessel traffic is not likely to cause significant adverse effects on marine fish and fish habitat.	14.7.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Stz'uminus First Nation Tsawout First Nation Tsartlip First Nation Swinomish, Tulalip, Suquamish, and Lummi Indian Nations (US Tribes)				
Marine birds	Driftpile Cree Nation Tsawout First Nation Tsleil-Waututh Nation	Trans Mountain said that it is committed to exploring ways to help collect monitoring data in cooperation with local communities, Indigenous groups, regulatory authorities, common marine users, and other stakeholders. Trans Mountain said that it would support an industry-wide marine bird monitoring program led, coordinated, financed (with industry support), and overseen for technical and scientific merit, by government agencies. Depending on the type of monitoring program adopted, and of the specific details required for implementation, Trans Mountain could provide support that might include, but not be limited to, financial support, technical expertise, and direct participation. Trans Mountain said that it remains interested in contributing if collaboration is through the OPP, managed by ECCC and/or TC, and with an emphasis on baseline monitoring on British Columbia's southern coast,. Trans Mountain said it envisions that its contribution to the OPP would be directly linked to establishing and growing the capacity of a local group by providing a means for them to undertake a regional marine bird baseline monitoring program.	ECCC noted that it and other organizations administer a variety of monitoring and research programs related to marine bird sensitivities in the south coast region including surveys. ECCC said that its current monitoring activities focus on tracking populations (e.g., generating population estimates, identifying bird use of important habitats or generating population trend estimates for migratory bird species and some SARA-listed Migratory Birds). ECCC said it was engaged in migratory bird inventory work and the results of past regional migratory bird inventories are available in ECCC technical reports. ECCC stated that it currently allocates approximately $200,000 annually to marine bird research and monitoring programs in the Project area.	The Board heard that there is uncertainty as to effects of marine traffic on marine birds at the population level and uncertainty as to what mitigation measures may indeed be technically and economically feasible. Given this uncertainty, the Board is of the view that a marine bird monitoring and protection program, if implemented, would allow a better understanding of impacts of vessel use within the Salish Sea on marine bird populations, including species at risk, and would inform implementation of mitigation measures through adaptive management, if warranted by the monitoring results. The Board is of the view that the Government of Canada is best placed to develop and implement a marine bird monitoring and protection program, with support of industry including Trans Mountain. The Board is of the view that this program, and any associated mitigation that follows from monitoring results, should ultimately extend to all marine shipping vessels in Salish Sea. The Board therefore sets out Recommendation 3 to the Governor in Council regarding the implementation of a marine bird monitoring and protection program for the Salish Sea.	14.7.4
Socio-economic effects of Project-related marine shipping					
Effects of operational marine shipping on marine commercial and recreational use	Heiltsuk First Nation Lyackson First Nation Makah Tribal Council Pacheedaht First Nation Tsartlip First Nation Musqueam Indian Band Swinomish, Tulalip, Suquamish, and Lummi Indian Nations (US Tribes)	Trans Mountain said the information provided by Indigenous groups about commercial fishing and small vessel safety did not identify any potential effects that were not previously assessed in the OH-001-2014 hearing and the conclusions of these assessments of potential effects have not changed with the additional information provided. Trans Mountain provided an assessment of Project-related marine shipping wakes with focus on the potential for negative effects of wakes on other vessel traffic, including commercial traffic and private recreational vessels, in four locations along the shipping route (Burrard Inlet, Strait of	The Pacific Pilotage Authority said that the resultant wake of an inbound Project-related tanker will be no more than that of any other slow moving bulk carrier transiting the area, and will be a lot less than a fast moving large container ship or a Cape size laden bulk carrier. It also said that the outbound tanker in the loaded condition will be restricted in its speed due to the requirement for a tug either in the vicinity (Georgia Strait and Juan de Fuca) or tethered (Haro Strait and Boundary Passage), and the maximum speed while tethered is 10 knots which will significantly reduce any wash and wake effect and minimize any impact on private recreational vessels. The Federal authorities said that the Oceans Protection Plan outlines several initiatives being undertaken to	The Board notes Trans Mountain's commitments to provide regular updated information on Project-related marine vessel traffic to Indigenous communities, and to initiate a public outreach program prior to the Project operations phase to communicate information on Project-related timing and scheduling with Transport Canada, the Canadian Coast Guard, the Chamber of Shipping for British Columbia, commercial and tourism associations, and potentially affected Indigenous groups. The Board also notes Trans Mountain's commitment to raise awareness amongst Project-related tankers about conditions near Swiftsure Bank in its Port Information and Terminal Operations Manual. The Board acknowledges the safety concerns that were shared	14.8.1 14.8.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
		Georgia, Haro Strait and Juan de Fuca Strait). The study concluded that Project-related vessel waves are substantially smaller in height and substantially less in frequency of occurrence compared to existing and future commercial vessels (particularly ferries) operating along the same vessel routes and, therefore, Project-related wakes are insignificant compared to other vessel wakes already present. The study also concluded that vessel wakes from Project-related traffic are small or insignificant compared to naturally occurring wind waves that occur frequently in local waters and are considered routine by most experienced boaters. Trans Mountain said that raising user awareness and knowledge amongst small vessel operators is of great importance to ensure safety of all waterway users, regardless of Project-related shipping. Trans Mountain noted that multi-party solutions with active collaboration between industry and government are required to ensure continued maintenance and advancement of the marine safety regime, and it supports the approach proposed under the OPP, whether or not the Project proceeds. Trans Mountain committed to provide financial assistance to smaller vessels registered in WCMRC's Vessel of Opportunity program to be fitted with Automatic Identification Systems and radar reflectors, which will aid in locating vessel assets during standard operations, as well as while undertaking response activities, and will enhance safety.	improve marine navigational safety and enhance sharing of marine traffic information with local communities in near real time. The Federal authorities submitted that amendments are being proposed to the *Navigation Safety Regulations* to extend the requirement for Automatic Identification System to smaller passenger vessels to enhance navigation safety in terms of search and rescue efforts and collision avoidance. The VFPA said that measures to avoid, reduce, and/or offset the impacts of Project-related marine shipping vessels on non-Project-related vessels, including private recreational vessels, included the establishment of Traffic Control Zones in both the First Narrows (TCZ-1) and Second Narrows (TCZ-2) facilitating the safe navigation and efficient movement of vessels in this area of the port. The VFPA said that in addition to the relevant information published in the Port Information Guide, the VFPA publishes the safe boating guides for various parts of the ports jurisdiction, including the Burrard Inlet. The VFPA said that to support the safe and efficient movement of all vessel traffic within the Port of Vancouver, the VFPA issues annual media releases highlighting safe boating initiatives.	by Indigenous communities. Therefore, the Board has included Recommendation 12 which would require the Governor in Council, in conjunction with the Pacific Pilotage Authority and Transport Canada, to continue engagement and awareness activities targeting coastal Indigenous communities, recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. This should include incorporating the resources and information that Trans Mountain has already provided or will provide to the Pacific Pilotage Authority, such as applicable information on Project-related vessel timing and scheduling. The Board also sees value in the work the Federal Authorities are doing to enhance sharing of marine traffic information with local communities and promote safer navigation. The Board proposes Recommendation 13 that encourages GIC to accelerate the development and implementation of these programs. The Board also notes Trans Mountain's commitment to support the multi-party initiatives that are being led by Transport Canada, the Canadian Coast Guard, DFO, the VFPA, all of which are working to better understand and manage the potential impacts of marine shipping activity throughout the south coast of BC. The Board finds that there will be disruptions to Indigenous marine vessels and harvesters, and that this may disrupt activities or access to sites. The Board is of the view that these disruptions will be temporary, only occurring during the period of time when Project-related tanker vessels are in transit. While there is concern about interactions between Project-related marine vessels and traditional fishing vessels, the Board is of the view that disruptions that may result from interference or collisions with Project-related vessels are considered to be unlikely due to adherence to regulatory standards and navigational and safety measures by marine vessels. The Board is also of the view that any disruptions to Indigenous marine vessel users that would result from Project- related marine vessel traffic would be temporary, that the frequency of Project related marine vessels would be one return transit per day, and that all other marine vessels, including Indigenous marine vessel users, would be able to continue their movements very shortly after the transit of the tanker. In the unlikely event of a collision or damage to or loss of fishing gear, a comprehensive scheme of compensation would be available.	

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Effects of operational marine shipping on heritage resources	Blood Tribe (Kainai First Nation) Tsartlip First Nation Tsawout First Nation	Trans Mountain said there are 81 previously recorded archaeological sites located in proximity to the marine vessel corridor. The combination of existing vessel traffic, Project-related vessel traffic and reasonably foreseeable vessel traffic will increase the frequency of wake waves interacting with the shoreline. Trans Mountain said that as wakes generated by vessels will be within natural wave size variation by the time they reach the shoreline, there is no discernible impact on shorelines associated with the shipping channel.	Parks Canada Agency noted that portions of the proposed shipping route are adjacent to the Gulf Islands National Park Reserve.	The Board is not convinced that effects from the Project-related vessels would translate into impacts on heritage resources. The Board is of the view that Project-related vessel wake will be localized to the shipping lanes and within natural wave size variation by the time they reach the shoreline.	14.8.2
Effects of operational marine shipping on traditional marine resource uses, cultural practices and activities	Adams Lake Indian Band Blood Tribe (Kainai First Nation) Ditidaht First Nation Driftpile Cree Nation Heiltsuk First Nation Kwantlen First Nation Little Shuswap Lake Indian Band Louis Bull Tribe Lyackson First Nation Makah Tribal Council Malahat First Nation First Nations of the Maa-Nulth Treaty Society Musqueam Indian Band Pacheedaht First Nation Seabird Indian Band Shxw'ōwhámel First Nation Snuneymuxw First Nation Squamish Nation Stk'emlupsemc te Secwepmc of the Secwepmc Nation Stó:lō Collective Stó:lō Tribal Council Stz'uminus First Nation Tsartlip First Nation Tsawwassen First Nation Tsawout First Nation	Trans Mountain said that the types of impacts presented by Indigenous communities in their written and oral traditional evidence are consistent with those assessed in the original Application, and no new information was presented that changes any of the results from that assessment. Trans Mountain said that it has reviewed the new information provided by Indigenous communities as part of the MH-052-2018 hearing in the context of its original ESA and has determined that the significance conclusions of the ESA with regard to TMRU remain unchanged for both Project-related effects and the contribution to cumulative effects.	Multi-party initiatives are being led by Transport Canada, the Canadian Coast Guard, DFO, the VFPA, all of which are working to better understand and manage the potential impacts of marine shipping activity throughout the south coast of BC.	The Board acknowledges the safety concerns that were shared by Indigenous communities. Therefore, the Board has included Recommendation 12 which would require the Governor in Council, in conjunction with the Pacific Pilotage Authority and Transport Canada, to continue engagement and awareness activities targeting coastal Indigenous communities, recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. This should include incorporating the resources and information that Trans Mountain has already provided or will provide to the Pacific Pilotage Authority, such as applicable information on Project-related vessel timing and scheduling. The Board also notes Trans Mountain's commitment to support the multi-party initiatives that are being led by Transport Canada, the Canadian Coast Guard, DFO, the VFPA, all of which are working to better understand and manage the potential impacts of marine shipping activity throughout the south coast of BC. The Board is of the view that not only will the Federal Authorities learn from Indigenous communities, the communities themselves will have the opportunity to become more aware of the entirety of marine traffic activity as well as the government's proposed measures in the TMRU areas that are of importance to them.	14.8.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Tsleil-Waututh Nation T'Sou-ke First Nation Tsuut'ina Nation Swinomish, Tulalip, Suquamish, and Lummi Indian Nations (US Tribes) Whitefish Lake First Nation #459 White Lake (Goodfish) Lake First Nation #128 Lyackson First Nation				
Impacts on Indigenous traditional use due to operational effects of marine shipping on SRKW	Driftpile Cree Nation Ermineskin Cree Nation Lyackson First Nation Makah Tribal Council Malahat First Nation Snuneymuxw First Nation Stó:lō Collective Stz'uminus First Nation Tsartlip First Nation Tsawout First Nation Tsawwassen First Nation Swinomish, Tulalip, Suquamish, and Lummi Indian Nations (US Tribes)	Trans Mountain said that it is of the view that multi-party initiatives are an essential approach to managing cumulative effects on the SRKW population, its critical habitat, and associated effects on traditional Indigenous use of the population. In its evidence, it provided an outline on those initiatives that were already underway, as described elsewhere in this Report, including: • The Oceans Protection Plan • The Action Plan for the Northern and Southern Resident Killer Whale • Pacific Salmon Foundation – Salish Sea Marine Survival Project • ECHO Program • Green Marine • Chair in Cetacean Research at UBC Trans Mountain noted that all of the multi-party initiatives also act in support of the requirements of Condition 132 - Marine Mammal Protection Plan (MMPP). Trans Mountain noted that its Condition 132 compliance filing is required three months prior to commencing operations on the Project, however, it said that it had plans to commence a process to solicit and obtain feedback and comments from Indigenous communities on a draft version of the MMPP no later than 18 months prior to the commencement of Project operations.	Federal Authorities pointed to multi-party initiatives noted by Trans Mountain. They noted that a key principle across all OPP activities is building Indigenous partnerships. They said that funding for Indigenous engagement and participation in the OPP gives recipients the opportunity to take part in developing and improving Canada's marine transportation system and contribute their knowledge towards tailoring marine transportation systems to local conditions and the environment. The Federal Authorities also noted that during engagement on the OPP, as well as during Project-specific reviews and engagement activities, they heard from Indigenous communities that they want to be able to monitor real-time vessel traffic in a system that identifies areas of traditional use, as a potential means to mitigate impacts on this use. Further, Indigenous communities have indicated during this engagement that they may want sensitive areas, such as SRKW habitat, identified in the system. One of the potential sources of information to be displayed in the Enhanced Maritime Situational Awareness system is data relating to the current position of marine mammals, including the SRKW. The Federal Authorities noted that there are various potential sources of this data, which could be shared directly with British Columbia Coast Pilots and the commercial shipping industry to improve their situational awareness and minimize interference with the SRKW. Although the pilot project has not yet begun, the Federal Authorities said that they understand that Indigenous peoples want to be able to monitor real-time vessel traffic in an application that identifies areas of traditional use, as a potential means to mitigate impacts on this use. The Federal Authorities said that meaningful collaboration on potential adverse effects of Project-related marine traffic could be enabled through Proactive Vessel Management forums between Indigenous communities, industry, Non-Governmental Organizations, and federal and other authorities. For example, they noted that	The Board notes that within the MH-052-2018 hearing, Indigenous communities provided additional evidence regarding their familial connections with the SRKW, including the role the SRKW have in their origin stories and the cultural teachings that have been passed down from generation to generation as result of their spiritual connection with the SRKW. The Board finds that the increase in marine vessel traffic associated with the Project is likely to result in significant adverse effects on the SRKW. The Board finds that Project-related marine vessel traffic would further contribute to total cumulative effects which are determined to be significant, with or without the Project. Given these conclusions and recognizing the stated cultural importance of the killer whale to certain Indigenous groups, the Board finds that the increase in marine vessel traffic associated with the Project is likely to result in significant adverse effects on the traditional Indigenous use associated with the SRKW. The Board notes that Indigenous intervenors have indicated that they were not satisfied with the mitigation measures that have been proposed by Trans Mountain or are currently underway as part of the Federal Authorities programs to reduce disturbances on the SRKW in the Salish Sea. The Board notes that embedded in all of these initiatives is consultation with Indigenous communities, with an aim to understanding where traditional marine use activities take place, as well as the incorporation of Indigenous traditional knowledge, where appropriate. The Board is of the view these increased opportunities for Indigenous communities to provide input about their, traditional knowledge, TMRU activities and cultural practices, could, in time, lead to improvements in the mitigation measures. As a result, the Board has included Recommendation	14.8.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
			Indigenous communities could raise their concerns in a Proactive Vessel Management Forum around the impacts of vessel traffic patterns on the SRKW populations in their local waterways. Forum participants would then work to gather information and evidence necessary to assess these concerns and identify potential, cooperative (i.e., non-regulatory) measures to address them. The Federal Authorities also noted that a contracted study on how to incorporate traditional knowledge into a proactive vessel management approach has been received and analyzed. The Federal Authorities noted that one of the measures for the Species at Risk Action Plan for Northern and Southern Resident Killer Whale (Orcinus orca) in Canada (2017) is to incorporate Indigenous Traditional Knowledge on the behaviour and distribution of SRKW and their prey into measures for the recovery of the species. DFO said that Indigenous communities are being engaged through governance bodies such as the SRKW Indigenous and Multi-stakeholder Advisory Group, and the DFO-led SRKW prey availability working group.	1 which would require GIC to develop and implement a regional cumulative effects management plan implemented in consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders.	
Human Health effects from Project-related marine shipping	BC Métis Federation Driftpile Cree Nation Louis Bull Tribe Shxw'ōwhámel First Nation Squamish Nation Stz'uminus First Nation Tsuut'ina Nation Tsleil-Waututh Nation Whitefish Lake First Nation #459	During the MH-052-2018 hearing, Trans Mountain submitted a 2017 report prepared for the VFPA titled "Environmental Air Assessment." Annual emission estimates for all of the contaminants of interest including GHGs and NO_x were provided in Tables 37 to 40 for the VFPA Study Area, which extends to the western port jurisdictional boundary at the mouth of the Burrard Inlet. This report indicated that, based on dispersion modelling results with a number of conservative assumptions, which were intended to over-estimate effects, the Project would comply with all applicable ambient air quality objectives in place at that time, including those for nitrogen dioxide (NO_2). Trans Mountain said that it intends to manage arriving vessels to minimize the use of anchorages by holding tankers at the Westridge Marine Terminal dock whenever a berth is available, even if cargo transfer is not planned immediately. Trans Mountain also said that if assigned berth is not immediately available, there is inclement weather, or for any other reason the berth or vessel is not ready, the vessel may anchor at one of the four designated anchorages that have been established within the jurisdiction of the VFPA.	Health Canada said that it is not aware of any information that would alter the views expressed in the department's 2015 Letter of Comment concerning mitigation and monitoring for the potential health effects of Project-related marine shipping. The VFPA Port Information Guide from May 2018 includes guidelines concerning noise and light for all vessels anchoring within the Port of Vancouver. For example, all vessels, while at anchor, should minimize noise levels and light usage in consideration of local residents. VFPA also created a Noise Monitoring Program to help better understand the source and intensity of port-related noise in order to better respond to community concerns. Health Canada said that it does not appear that the sound from three ships docked and idling at the same time was evaluated, which is the worst-case scenario for noise generation from docked vessels. Health Canada also said there is no apparent formal complaint resolution plan identified. In the event of public complaints related to project-related noise as it affects residents adjacent to anchorages, Health Canada recommended that a formal, transparent and readily accessible complaint-response process be in place as a means of identifying and mitigating Project-related noise complaints.	In response to Health Canada's recommendation and NS NOPE's submissions during the MH-052-2018 hearing for a formal complaint resolution process to address concerns about noise and light from tankers docked at the VFPA managed anchorages, the Board is of the view this mitigation measure is not within Trans Mountain's control. The VFPA remains the steward of the Port of Vancouver. The VFPA has guidelines concerning noise and light for all vessels anchoring within the Port of Vancouver; however, it is not clear from the evidence on the record whether the VFPA has a formal complaint resolution process. Therefore, the Board would include Recommendation 16 encouraging GIC, in conjunction with VFPA, to develop a formal complaint resolution program that gathers community feedback, brings together diverse community stakeholders to facilitate discussions about port-related impacts, and resolves complaints about vessels anchored at the VFPA-managed anchorages. Considering that Trans Mountain will be required to adhere to all federal and international emission requirements to reduce emissions from the Project-related marine shipping, the Board finds that the residual effects from Project-related marine shipping is not likely to cause significant adverse effects on human health, including the health of Indigenous people.	14.8.4

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Effects of accidents and malfunctions (oil spills)					
Environmental effects					
Adequacy of ecological risk assessment	Snuneymuxw First Nation Squamish Nation Stz'uminus First Nation Tsleil-Waututh Nation	Trans Mountain said that the information contained in Dr. Short's 2018 report is generally the same as that presented in the OH-001-2014 proceeding, that the report erroneously interpreted the intent and conclusions of Trans Mountain's evidence regarding the fate and behaviour of diluted bitumen, and the opinions presented lack substantiation through provision of specific numbers or reference to relevant expert studies. Trans Mountain said that as such Dr. Short's 2018 report does not change, or cast doubt on, the findings or conclusions in the NEB Report. Trans Mountain said that the Royal Society of Canada (2015) Expert Panel Report on "The Behaviour and Environmental Impacts of Crude Oil Released into Aqueous Environments", commented that the risk assessments conducted for Trans Mountain Expansion Project are impressive documents in their scope and detail, and are among the best of their kind.		The Board finds Trans Mountain's approach reasonable and in Board's view the locations modeled by Trans Mountain provide representative effects.	14.9.1
Effects of accidents and malfunctions (oil spills) on marine fish and fish habitat	Adams Lake Indian Band BC Métis Federation Cheam First Nation Chawathil First Nation Coldwater Indian Band Driftpile Cree Nation Ermineskin Cree Nation Kwantlen First Nation Little Shuswap Lake Indian Band Musqueam Indian Band Nooaitch Indian Band Seabird Island Band Squamish Nation Stk'emlupsemc te Secwepmc of the Secwepmc Nation Tsartlip First Nation Tsuut'ina Nation Whitefish (Goodfish) Lake First Nation #128	Trans Mountain evaluated potential environmental effects of worst-case and smaller oil spills resulting from marine transportation and these results can be applied to evaluate potential spill-related effects on salmonid fish including Chinook Salmon and Steelhead Trout. Trans Mountain said that the potential effects of marine oil spills on salmonid species, including Coho Salmon and Steelhead Trout, were evaluated and tested during the OH-001-2014 proceeding. It said that there has been no change in Trans Mountain's assessment of potential effects to Pacific salmon species resulting from hypothetical spills along the marine transportation route.	DFO said that in the case of significant spills, it provides advice and input about environmental sensitivities in the spill area and the prioritization of protection measures through the Incident Command System (ICS). It said that the Environmental Unit under the ICS is where technical experts from all response partners combine to provide advice on environmental protection objectives and priorities, strategies and tactic implementation. Species of conservation concern (e.g., *Species at Risk Act*-listed species) are considered an "elevated priority" when the Environmental Unit determines the protection objective and its subsequent protection strategies and tactical implementation. DFO said that a holistic approach for the protection and treatment of marine mammals, invertebrates, fish and turtles for an oil/chemical spill will draw on all relevant information including physical, chemical, biological, and geographic information.	The Board is of the view that the environmental effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time, the effectiveness of containment and clean-up, the valued components that are impacted, and the weather and time of year of the spill. In the Board's view, there is a spectrum of potential spill outcomes ranging from small quickly contained spills that do not result in significant effects to credible worst-case spills that would result in significant effects. In between these two extremes are other spills that could also result in significant effects depending upon the circumstances. The Board finds the probability of a worst-case event is very low.	14.9.4

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Effects of accidents and malfunctions (oil spills) on marine mammals	Shxw'ōwhámel First Nation Snuneymuxw First Nation Squamish Nation Stz'uminus First Nation		DFO said that a marine mammal oil spill response plan is in development. It focuses on preventing exposure of marine mammals, including resident killer whales, to spills. This includes strategies for monitoring and tracking SRKW; prevention of exposure to oil spills by prioritizing cleanup and booming efforts for key areas; and prevention of exposure using acoustic deterrents to keep resident killer whales away from spill affected areas. There are a number of actions completed or underway to support the strategies described above, including: a real time SRKW tracking network in SRKW critical habitat is in development to assist with locating and determining the direction of travel of SRKWs using hydrophones and cetacean sighting. It said that the current Fisheries and Oceans Canada (DFO) approach is to develop a single marine mammal spill response plan that covers all marine mammal species, including Species at Risk Act-listed species. It focuses on preventing exposure of marine mammals, including resident killer whales, to spills. This includes strategies for monitoring and tracking SRKW; prevention of exposure to oil spills by prioritizing cleanup and booming efforts for key areas; and prevention of exposure using acoustic deterrents to keep resident killer whales away from spill affected areas. DFO said that in the case of significant spills, it provides advice and input about environmental sensitivities in the spill area and the prioritization of protection measures through the Incident Command System (ICS). It said that the Environmental Unit under the ICS is where technical experts from all response partners combine to provide advice on environmental protection objectives and priorities, strategies and tactic implementation. Species of conservation concern (e.g., Species at Risk Act-listed species) are considered an "elevated priority" when the Environmental Unit determines the protection objective and its subsequent protection strategies and tactical implementation. DFO said that a holistic approach for the protection and treatment of marine mammals, invertebrates, fish and turtles for an oil/chemical spill will draw on all relevant information including physical, chemical, biological, and geographic information.	The Board is of the view that the environmental effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time, the effectiveness of containment and clean-up, the valued components that are impacted, and the weather and time of year of the spill. In the Board's view, there is a spectrum of potential spill outcomes ranging from small quickly contained spills that do not result in significant effects to credible worst-case spills that would result in significant effects. In between these two extremes are other spills that could also be result in significant effects depending upon the circumstances. The Board finds the probability of a worst-case event is very low.	14.9.4
Effects of accidents and malfunctions (oil spills) on marine birds	Malahat First Nation Snuneymuxw First Nation Squamish First Nation Stz'uminus First Nation Tsawout First Nation Tsawwassen First Nation	Trans Mountain said that ECCC would be best placed to collect migratory bird and species at risk data, conduct assessment strategies, identify response strategies, and determine the type and extent of monitoring in relation to informing Wildlife Emergency Response Plans] for marine transportation. Through participation in regional planning and preparedness efforts, Trans Mountain understands that other federal	ECCC said it has been resourced (initially under World Class Tanker Safety Phase II, and currently under Oceans Protection Plan Regional Response Planning sub-initiative) to collect marine bird environmental sensitivities data in marine waters of southern BC, including but not limited to the Salish Sea.	The Board is of the view that the environmental effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time, the effectiveness of containment and clean-up, the valued components that are impacted, and the weather and time of year of the spill.	14.9.4

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Tsleil-Waututh Nation	government agencies, provincial government agencies, Indigenous and local communities, vessel operators, Western Canada Marine Response Corporation, and other stakeholders would also have a role in one or more aspects related to informing a WERP. Trans Mountain said that it would consider opportunities to implement or support or participate in the collection of information that could be used in a WERP.		The Board notes the concern raised by Dr. Short said that small to medium sized oil spills on the order of 100 to 1,000 m3 from the Project can cause substantial mortalities to seabirds, and estimated effects for small to medium spills in Canada and in Alaska. In the Board's view, there is a spectrum of potential spill outcomes ranging from small quickly contained spills that do not result in significant effects to credible worst-case that would result in significant effects. In between these two extremes are other spills that could also be result in significant effects depending upon the circumstances. The Board finds the probability of a worst-case event is very low.	
Effects of accidents and malfunctions (oil spills) on sand verbena moth	Tsawout First Nation	Sand-verbena Moth and Yellow Sand-verbena are terrestrial species that occupy habitats above the high tide limit. There are no identified direct interactions between Sand-verbena Moth (and its host plant) and Project-related marine transportation (routine operations or accidents and malfunctions). Therefore, no adverse effects are anticipated, and no specific mitigation measures are proposed or required.		The Board accepts Trans Mountain's response to this concern.	14.9.4
Socio-economic effects					
Effects of accidents and malfunctions (oil spills) on heritage resources	Tsleil-Waututh Nation	Trans Mountain did not provide updated views on effects of accidents and malfunctions on heritage resources. In the OH-001-2014 hearing, Trans Mountain said that heritage resources could be affected by a spill in a number of ways. Oil and cleanup activities can directly damage artifacts and sites or disturb their context, which may result in permanent loss of information.	The Canadian Coast Guard said that it is the on-water federal lead agency for marine pollution response. It provides oversight of every marine incident and is responsible for ensuring the cleanup of ship-source and mystery-source spills of oil and other pollutants into Canadian waters. Should the polluter be unable, unwilling, or unknown, the Canadian Coast Guard would assume command of the situation and ensure an appropriate response to the incident.	The Board acknowledges the high degree of concern Indigenous groups have regarding potential spills or contamination of the ocean, and how it would impact archaeological sites located on the shoreline. The Board is of the view that the effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time to contain and recover the spill, the effectiveness of containment and clean-up, and the weather and time of year of the spill. A credible worst-case spill would have adverse effects. The Board is of the view that the effects of a credible worst-case spill on heritage resources could be adverse and significant. However, the Board is of the view that the probability of such an event is very low. The Board encourages Indigenous groups to participate in the spill response planning process with regulatory authorities such as the Canadian Coast Guard and Transport Canada, and the certified response organization WCMRC. The Board also encourages Indigenous groups to share information regarding potential archaeological and cultural heritage sites with the B.C. Ministry of Forests, Lands & Natural Resource Operations.	14.10.2 14.11.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Effects of accidents and malfunctions (oil spills) on traditional marine use	Adams Lake Indian Band Blood Tribe (Kainai First Nation) Ditidaht First Nation Coldwater Indian Band Driftpile Cree Nation Heiltsuk First Nation Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee Little Shuswap Lake Indian Band Lyackson First Nation Neskonlith Indian Band Nooaitch Indian Band First Nations of the Maa-nulth Treaty Society Makah Tribal Council Malahat First Nation Musqueam Indian Band Shxw'ōwhámel First Nation Snuneymuxw First Nation Squamish Nation Stk'emlupsemc te Secwepmc of the Secwepmc Nation Stz'uminus First Nation Stó:lō Collective Stó:lō Tribal Council Tsartlip First Nation Tsawout First Nation Tsawwassen First Nation T'Sou-ke First Nation Tsuut'ina Nation Tsleil-Waututh Nation Swinomish, Tulalip, Suquamish, and Lummi Indian Nations (US Tribes)	Trans Mountain acknowledged the concerns raised by Indigenous communities related to the potential for a marine spill and the adequacy of spill response procedures and mechanisms and the ultimate effect of any oil spill on Indigenous culture and way of life. Trans Mountain submitted that the original assessment conclusions have not changed as a result of the additional evidence provided by Indigenous communities in the MH-052-2018 hearing. Trans Mountain also acknowledged the concerns raised by non-coastal Indigenous communities regarding the impacts of a marine spill adversely affecting the salmon resources returning from the ocean to inland areas. Trans Mountain said it understands the integral cultural and economic importance of the Thomson and Fraser River fisheries to inland Indigenous communities in BC. Trans Mountain noted that Geographic Response Strategies (GRS) are being developed by WCMRC as part of implementing the Enhanced Response Regime (ERR). It further noted that WCMRC continues to develop partnerships with Indigenous and/or coastal communities as part of their overall community engagement process and in order to develop new and improve existing GRS, including the collection of Traditional Marine Resource Use/Traditional Ecological Knowledge information from Indigenous communities to incorporate into its GRS. Trans Mountain stated that upon request of WCMRC it is ready to assist or facilitate conversations between WCMRC and Indigenous communities.	The Canadian Coast Guard said that it is the on-water federal lead agency for marine pollution response. It provides oversight of every marine incident and is responsible for ensuring the cleanup of ship-source and mystery-source spills of oil and other pollutants into Canadian waters. Should the polluter be unable, unwilling, or unknown, the Canadian Coast Guard would assume command of the situation and ensure an appropriate response to the incident.	The Board is of the view that the effects of a credible worst-case spill on the current use of lands, waters and resources for traditional purposes by Indigenous people would likely be adverse and significant. The Board finds that although impacts from a credible worst-case spill would probably be adverse and significant, natural recovery of the impacted areas and species would likely return most biological conditions to a state generally similar to pre-spill conditions. Certain values and uses could be lost or diminished in the interim. The Board notes Trans Mountain's commitment to use available spill response technologies to mitigate spill impacts to ecosystems and assist in species recovery. The Board is of the view that implementation of an appropriate spill response, and measures such as compensation and harvest restrictions or closures would lessen the effects experienced until resource-dependent species recover. The Board finds the probability of a worst-case event is very low.	14.10.5 14.11.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Human Health effects from accidents and malfunctions (oil spills)	Chawathil First Nation Cheam First Nation Kwantlen First Nation Seabird Island Band Squamish Nation Stó:lō Collective Stó:lō Tribal Council Tsartlip First Nation Tsleil-Waututh Nation	Trans Mountain said that effects of an oil spill from Project-related marine shipping was thoroughly canvassed in the OH-001-2014 hearing. Overall, none of the information filed by Intervenors in the MH-052-2018 hearing is new or updated information that is materially different from the information the Board considered in the OH-001-2014 hearing. As a result, Trans Mountain said that the Board's findings in OH-001-2014 hearing remain valid and no changes to the Conditions are warranted. Trans Mountain said an evaluation of the combined effects of crude oil and dispersants in the Ecological Risk Assessment of Marine Transportation Spills Technical Report is not warranted., given that the use of dispersants is not a pre-approved response technique in the marine RSA,	The Canadian Coast Guard said that it undertakes emergency response planning for marine spills within its mandate, which includes potential spills from Project-related marine shipping. The approach and principles described in the Canadian Coast Guard's response plans are consistent with those described in Health Canada's "Guidance for the Environmental Public Health Management of Crude Oil Incidents – A Guide Intended for Public Health and Emergency Management Practitioners." Both Health Canada and the Canadian Coast Guard prioritize the health and safety of first responders and the public during the spill response. The Canadian Coast Guard submitted version 2.0 of the Greater Vancouver Integrated Response Plan (GVIRP) for Marine Pollution Incidents. At a local level, the GVIRP integrates public health management during both preparedness and response. There are many organizations that were instrumental and agree in principal to support the implementation and ongoing maintenance of the Plan, including First Nation Health Authority and Vancouver Coastal Health Authority. The GVIRP includes information about the role of health authorities during response to marine pollution incidents that occur, or may occur, in the Greater Vancouver Area. CCG said that no dispersants are currently approved for use in response to ship-source oil spills in Canada.	The Board is of the view that, in the event of a spill in the marine environment during shipping, including a large spill, there would be adverse effects on human health. These effects would vary over time and space depending on the location and extent of the spill, and there would likely be exceedances of certain short-term exposure limits for some chemicals of potential concern, including both carcinogenic and non-carcinogenic chemicals, but these would be expected to diminish in the hours following a spill. The Board notes some of the concerns from the OH-001-2014 hearing about the inclusion of local and Indigenous health authorities in marine pollution incidents. The Board is encouraged to see, in the evidence submitted in the MH-052-2018 hearing, that the First Nation Health Authority and Vancouver Coastal Health Authority were instrumental and agree in principal to support the GVIRP. The Board also notes concerns raised by municipalities in the MH-052-2018 hearing about the inclusion of more detailed information in the GVIRP around air quality monitoring. The Board is not including a recommendation to GIC on this topic because the GVIRP is the product of a cooperative effort and the Board is not well positioned to prescribe detailed requirements. In response to the suggestion for Trans Mountain to expand its Marine Public Outreach Program to include risks to public health in the event of a marine spill, the Board is of the view that the federal government has the authority to address such matters. Therefore, the Board would include Recommendation 12 encouraging GIC, in conjunction with the Pacific Pilotage Authority and Transport Canada, to continue engagement and awareness activities targeting Indigenous coastal communities, recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. The focus of these engagement and awareness activities should be determined by the regulatory authorities who have the appropriate jurisdiction and expertise. Based on the evidence before it, the Board finds that a large spill in Burrard Inlet is not a likely event. The Board is therefore of the view that the potential effects on human health that are predicted to result from such spill scenarios are also not likely to occur.	14.10.6

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Spill prevention, risk analysis, emergency preparedness and response					
Adequacy of spill prevention measures	Makah Tribal Council Heiltsuk First Nation	Current data from the International Tanker Owners Pollution Federation filed by Trans Mountain indicated that there is a continued downward trend in large oil spills (>700 tonnes) and medium sized spills (7 – 700 tonnes) from tankers on a world-wide basis despite a world-wide increase in seaborne oil trade. Trans Mountain said that since the issuance of the OH-001-2014 Report, it has continued to engage and work with the BC Coast Pilots Ltd., Pacific Pilotage Authority, Transport Canada, Canadian Coast Guard and the Vancouver Fraser Port Authority to complete its commitments under the TERMPOL Review Committee's Findings and Recommendations.	The Canadian Coast Guard provided an update on improvements and initiatives related to Marine Communications and Traffic Services (MCTS) and the safe navigation of vessels. The role of the MCTS program is to provide communications services to mariners in Canadian waters on a 24/7 basis. This includes responding to vessels in distress, providing safety services to mariners, communicating with vessels, regulating traffic in vessel traffic zones and identifying and tracking vessels operating in Canadian waters through data sensors such as radar and Automatic Identification System. The Canadian Coast Guard said that modernization and consolidation of MCTS centres across the country and a preliminary assessment of the existing aids to navigation system along the route identified in the Trans Mountain's TERMPOL submission was completed. The Canadian Coast Guard said it is continuing to explore and test e-Navigation concepts and technologies in order to provide current and contextualized marine navigational information to improve marine safety when operating in Canadian waters. From 2024 to 2026, the Canadian Coast Guard will replace its RADAR systems as part of its lifecycle management of these assets. Transport Canada said that pre-identification of potential places of refuge is key in a time-sensitive situation. Pre-planning allows for the deliberate compilation and consideration of information prior to an incident such as information on logistics, environmental sensitivities, human use, navigation, potential use conflicts and local knowledge. It said that it is reviewing and updating the 2007 Places of Refuge Contingency Plan and associated regional plans, with engagement from key partners. The intent is for the work to be completed by 2022. The Vancouver Fraser Port Authority said that it has developed and formalized Traffic Control Zones, formerly known as Movement Restricted Areas, for the purpose of promoting safe and efficient navigation and environmental protection in the waters of the port. The Vancouver Fraser Port Authority also noted that it had proposed to Transport Canada Marine Safety and Security in 2018 that the Vancouver & Approaches Traffic Separation Scheme be amended, with a target date for implementation of 2019. Transport Canada continues to support Trans Mountain's commitment for enhanced tug escort for Project-related tankers being made mandatory through the certificate terms and conditions through the Board's permitting process.	To bolster regulatory oversight and make enhanced tug escort mandatory for Project-related tankers in the Salish Sea, the Board recommends that the Governor in Council develop a regulatory framework for making such tug escort mandatory for Project-related tankers (Recommendation 8). GIC should also consider mandatory enhanced tug escort for other vessels as appropriate. The Board is of the view that the evidence filed by those bodies that regulate marine shipping and by Trans Mountain indicate that there is an acceptable level of safety in place regarding marine shipping associated with the Project.	14.11.1. 14.11.2

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
Adequacy of marine shipping risk analysis	Makah Tribal Council Snuneymuxw First Nation Squamish Nation Stz'uminus First Nation Tsleil-Waututh Nation	Trans Mountain said that the results of its own application of the United States Bureau of Ocean Energy Management's Oil Spill Risk Assessment Model validates the refined results of the risk assessment conducted as part of the original proceeding on the likelihood of oil spill by a Project-related tanker. These results indicated a 16 percent likelihood of an oil spill over 50 years for Project-related tankers.		The Board accepts Trans Mountain's evidence that there are no proposed or widely accepted risk acceptance criteria for marine oil spills. The Board understands that the marine shipping risk assessment performed for the Project-related tankers and the marine shipping risk assessment undertaken for Transport Canada and the report of the Tanker Safety Expert Panel do not recommend stoppage of marine shipping in the area. Rather, such risk assessments are intended to inform mitigation to lessen the potential for an accident to occur, and for spill response planning. That is, the Board does not view the results of these risk assessments as absolute indicators of the actual probability of a spill occurring. The Board has recommended that the Governor in Council consider the need for a transboundary vessel traffic risk assessment in conjunction with relevant United States regulatory authorities (Recommendation 9).	14.11.2
Adequacy of emergency preparedness and response	Chawathil First Nation Cheam First Nation Cowichan Tribes Ditidaht First Nation Driftpile Cree Nation Ermineskin Cree Nation Heiltsuk First Nation Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee Kwantlen First Nation Lyackson First Nation Makah Tribal Council Malahat First Nation Pacheedaht First Nation Nooaitch Indian Band Seabird Island Band Snuneymuxw First Nation Stó:lō Tribal Council Stz'uminus First Nation Tsleil-Waututh Nation T'Sou-ke First Nation Tsuut'ina Nation	Trans Mountain said that it has made numerous enhancements to its Emergency Management Program since the date of the Board's OH-001-2014 Report. These enhancements strengthen marine oil spill prevention, emergency preparedness, and response measures. Trans Mountain concluded that with implementation of its proposed enhanced marine oil spill response regime, WCMRC's response capacity would be commensurate with the legislated worst-case discharge planning standards in the US. It said that the intent of the Canadian regime is to ensure that a level of preparedness exists such that a suitable response is in place and ready to be deployed in the event of any spill, regardless of size and condition. National and international mutual aid agreements are also part of a response organization's capability for spills that exceed their capacity. Trans Mountain said that use of chemical dispersants in response to any oil spill would only be considered on a case by-case basis, in consultation with federal regulators, local authorities and other experts, and where this use would result in net environmental benefit. It also said that the use of Spill Treating Agents in Canadian waters is prohibited under federal law except under certain conditions in relation to	The Canadian Coast Guard said that environmental response planning in the Lower Mainland and South Coast is ongoing as part of regular Coast Guard spill response preparedness activities. The Canadian Coast Guard Marine Spills Contingency Plan – National Chapter establishes the requirement for Geographically Specific Response Planning, and the Coast Guard is working directly with Indigenous communities and other partners on the Lower Mainland and South Coast to develop Geographically Specific Response Plans, like the Greater Vancouver Integrated Response Plan. Canadian Coast Guard said that it maintains a close working relationship with WCMRC. When an incident occurs, the Coast Guard advises WCMRC of the developing situation to initiate any required preparation for response. This enables the WCMRC to mobilize and deploy staff, vessels and equipment accordingly. The Coast Guard and WCMRC maintain regular communication as the incident evolves. The Canadian Coast Guard and other federal participants discussed a number of response planning initiatives under the Oceans Protection Plan and other improvements to federal prevention, preparedness and response capabilities since 2015. The Vancouver Fraser Port Authority said that it co-chairs the Marine Emergency Response Coordination Committee with Canadian Coast Guard. The Marine Emergency Response Coordination Committee provides a venue for interested organizations to dialogue on the coordination of	To promote continued improvement in the marine oil spill response regulatory framework, the Board included Recommendation 7 which would require that the Governor in Council review and update federal marine shipping oil spill response requirements. This recommendation has been crafted such that it would include consideration of the concerns noted by the above parties. To the extent that response planning approaches and methodologies noted by the Nuka report would further enhance marine oil spill response, the Board recommends that the Governor in Council consider such approaches and methodologies as part of any work undertaken in response to Recommendation 7.	14.11.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Whitefish (Goodfish) Lake First Nation #128 Whitefish Lake First Nation #459	offshore oil exploration and production. Trans Mountain said that it provided comments on requirements for oil spill response organizations to Transport Canada in 2018, as part of the government's consultation on the Oceans Protection Plan Trans Mountain had proposed that the planning standard for response times of response organizations in a local area should be commensurate to the level of risk contributed by industry in the local area. Trans Mountain submitted that this was Trans Mountain's approach in facilitating the largest-ever expansion of spill response personnel and equipment on the BC coast by WCMRC.	marine assets in the Metro Vancouver area during emergency or security response and recovery activities. Under the Marine Emergency Response Coordination Committee is the Environmental Response Sub-Committee which addresses emergency response planning in the Greater Vancouver area. The Environmental Response Sub-Committee also serves as the primary source of subject matter expertise relating to any changes to the Greater Vancouver Integrated Response Plan. The Vancouver Fraser Port Authority noted that it cooperates with the Canadian Coast Guard, Western Canada Marine Response Corporation, first responders, and other agencies in emergency response through training and exercises and by providing information through its operations centre and patrol boats. Canadian Coast Guard said that it maintains storage capacity in the region to store and transport oily waste and that additional Canadian Coast Guard capacity could be cascaded to the impacted area from other regions of Canada, if required. Additional storage capacity, such as tankers and barges, could also be contracted during a response operation to meet any anticipated volume of oily waste. It said that incident-specific waste management plans are developed at the time of an incident based on the specific products, volumes and locations, and are reviewed to ensure that they meet local, provincial and federal laws and regulations. Canadian Coast Guard also described methods for transferring highly viscous oils such as weathered diluted bitumen as part of oily waste management. Transport Canada noted that a response organization must demonstrate that it has sufficient storage capacity to maintain oil/oil water waste recovery operations 24 hours a day. In addition, through mutual aid agreements and arrangements with other response organizations and contractors, responders have access to cascading resources that expand capabilities beyond the Transport Canada-mandated spill threshold of 10,000 tonnes		
Inclusion of Indigenous People in marine oil spill response and planning	Chawathil First Nation Cheam First Nation Indigenous Caucus for the Trans Mountain Indigenous Advisory and Monitoring Committee Kwantlen First Nation Pacheedaht First Nation Seabird Island Nation	Trans Mountain noted that Geographic Response Strategies (GRS) are being developed by WCMRC as part of implementing the Enhanced Response Regime (ERR). It further noted that WCMRC continues to develop partnerships with Indigenous and/or coastal communities as part of their overall community engagement process and in order to develop new and improve existing GRS, including the collection of Traditional Marine Resource Use/Traditional Ecological Knowledge information from Indigenous	Through the Indigenous Community Response Training initiative under the OPP, the Canadian Coast Guard has provided training to Indigenous communities that is then applied in joint operational exercises that incorporate all on-water first response partners, such as the Coast Guard Auxiliary, Indigenous communities, Parks Canada, other federal, provincial and municipal partners and any other implicated organizations. Regional training workshops are available to all coastal Indigenous communities.	The evidence before the Board indicates that since its OH-001-2014 Report, there have been substantial investments made by the federal departments and agencies and WCMRC aimed at including Indigenous people in marine oil spill planning and response. The Board also heard concerns from First Nations regarding the actual implementation of such initiatives. The Board notes that the IAMC has been operational since 2017 and is already participating in emergency	14.10.5 14.11.3

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
	Stó:lō Tribal Council	communities to incorporate into its GRS. Trans Mountain stated that upon request of WCMRC it is ready to assist or facilitate conversations between WCMRC and Indigenous communities.	Canadian Coast Guard said that as a result of training and exercise programs and response planning initiatives, Indigenous groups are pre-established as Incident Commanders in Canadian Coast Guard contingency response plans. Consequently Indigenous governments may choose to participate and lead in environmental response operations activated by the Canadian Coast Guard within their traditional territories in British Columbia.	management and marine exercises. The Board sees value in the role of this existing committee and encourages its participation in ongoing spill planning and response efforts. To promote the continued participation of Indigenous people in marine oil spill planning and response, the Board has specifically included the need for such inclusion in Recommendation 7. Recommendation 11 addresses engagement with, and feedback from, the Indigenous Advisory and Monitoring Committee on the marine safety system and Project-related marine shipping activities that intersect with Canadian Coast Guard operational programs.	
Financial Responsibility, Liability, and Insurance					
Ship-source oil pollution fund	First Nations of the Maa-nulth Treaty Society Esquimalt Nation Scia' new First Nation Pauquachin First Nation Tsleil-Waututh Nation Squamish Nation Stz'uminus First Nation Snuneymuxw First Nation		In October 2018, the Government of Canada introduced legislation to modernize Canada's Ship-Source Oil Pollution Fund, which includes a number of changes from what was described in the OH-001-2014 Hearing to ensure that unlimited compensation would be available to all eligible claims from victims and responders of oil spills from ships. If the Ship-Source Oil Pollution Fund contained insufficient funds to fully pay for a spill, then the Minister of Finance could grant a loan to the Ship-Source Oil Pollution Fund to pay all eligible claims. The Ship-Source Oil Pollution Fund can be replenished through an annual levy on oil receivers and exporters, as well as providing the option to impose a temporary supplementary levy if the annual levy is insufficient. The Ship-Source Oil Pollution Fund would provide emergency funding to the Canadian Coast Guard to respond to a significant oil spill. The Canadian Coast Guard would use these funds to respond to the oil spill and compensate third parties for their response activities under its direction. A simplified and expedited process for claims under $35,000 would be established, allowing the Ship-Source Oil Pollution Fund to accept small claims without conducting a full investigation and assessment. Transport Canada described the types of losses and damages compensable under the *Marine Liability Act* to include measures to prevent or minimize damage; clean-up and containment costs; property damage; environmental damage limited to loss of profit, post-spill studies and costs of reasonable measures of reinstatement undertaken or to be undertaken; and economic losses. An economic loss occurs when oil pollution has caused a loss of earnings to persons whose property has not been polluted. Transport Canada listed a number of examples: individuals who derive income from fishing, from the production, breeding, holding or rearing	The Board notes that the *Marine Liability Act* allows individuals who fish or hunt for food or animal skins for their own consumption or use to claim for losses under the Ship-Source Oil Pollution Fund. [Marine Liability Act, Section 107 (2)(d), Link, Accessed 30 January 2019] The Board notes that Transport Canada held consultations with Indigenous groups regarding the recent changes to the Marine Liability Act, where concerns regarding the scope of the Ship-Source Oil Pollution Fund was discussed. The Board is of the view that the Ship-Source Oil Pollution Fund is a compensation fund where Indigenous communities who have sustained loss or damage, or incurred costs and expenses, in respect of oil pollution may file a claim.	14.12.1

Concern	Indigenous Communities	Company response	Government Response	NEB response	Reconsideration Report Section
			of fish, or from the culture or harvesting of marine plants; owners of fishing vessels, derives income from the rental of fishing vessels to holders of commercial fishing licenses issued in Canada; individuals who derives income from the handling of fish on shore in Canada directly after they are landed from fishing vessels; any person who rents or charters boats in Canada for sport fishing; and workers in a fish plant in Canada. In the case of an incident, Transport Canada noted that any person, entity, or organization, including local governments, may make a claim for costs or damages resulting from a ship-source oil pollution spill either directly to the ship owner and their insurer, or with the Ship-Source Oil Pollution Fund.		
Non-monetary compensation in event of spill	Heiltsuk First Nation T'sou-ke First Nation Nooaitch Indian Band			The Board agrees that it is unclear if all losses are eligible to be claimed under the Ship-Source Oil Pollution Fund. The Ship-Source Oil Pollution Fund does not appear to compensate for losses to non-use values, for Indigenous and non-Indigenous communities. In the event of an oil spill from a ship, not just a Project-related tanker, these losses may occur. The Board notes that section 48.12 of NEB Act establishes that pipeline operators are liable for the loss of non-use values relating to a public resource affected by a release and that the Crown may institute proceedings to recover the loss of non-use values. Thus, the Board has included Recommendation 15, which encourages GIC to work with Transport Canada to determine how a federal marine oil spill compensation regime, existing or otherwise, can include compensation for non-use values, for Indigenous and non-Indigenous communities, including any non-coastal communities that may be impacted as a result of a marine oil spill.	14.12.1

Appendix 15: Summary of comments received on draft conditions and recommendations

On 10 January 2019, the Board issued draft amendments to conditions and recommendations to parties for comment in their written argument-in-chief. The Board received a number of comments, which it considered. Some conditions and recommendations were adjusted in response to comments received. The various chapters of this MH-052-2018 Report provide reasons for changes made or not made, as do the summaries in Parts A and B below. Note that these summaries are not a comprehensive list, anyone wishing to see all submissions should review the entire record of the hearing. Part C provides a comparison of the draft and final versions of the conditions and recommendations.

A. Comments on draft conditions

Subject	Board views / comments
Response time	Some comments said that Condition 133 did not adequately address response times. The condition was changed to address these comments.
Compliance timing	Some comments said that Condition 91 did not clearly set out the timing of compliance requirements. The condition was changed to address these comments.
Specificity	Some comments requested increased specificity in certain conditions, including requests to list specific groups and people to be consulted. The Board has generally left wording broad, which accommodates the intent of the requests, and does not limit the intended scope of the conditions. Therefore, the Board has not made these changes.
Indigenous consultation	Some Indigenous intervenors requested that conditions include additional consultation with them. Consultation with, and participation of, Indigenous communities is already a part of federal government measures (enshrined as one of the pillars of the Oceans Protection Plan). Consultation and inclusion of Indigenous knowledge is already a requirement of many of conditions. Therefore, the Board has not made these changes.
Condition filings for approval	Some comments requested that certain condition filings be subject to Board approval. Regardless of whether this is indicated in a condition, the Board will assess all condition filings to ensure that Trans Mountain is in compliance prior to Trans Mountain being able to commence work on the applicable Project phase or component. If the Board is of the view that Trans Mountain is not in compliance, the Board may ask for further information until compliance is achieved. Therefore, the Board has not made these changes.
Condition commitments made by Trans Mountain	Some comments requested that certain commitments made by Trans Mountain be included in conditions, or be made into conditions themselves. Condition 2 requires Trans Mountain to meet all commitments it has made. Its commitments need not be made into, or added to, conditions for this obligation to continue. Therefore, the Board has not made this change, although it has updated Condition 2 to include commitments made during the MH-052-2018 hearing.
Rules to apply to Project-related marine vessels	Some comments suggested that more rules (e.g., further speed reductions, lighting) be applied specifically to Project-related marine vessels. In these cases, the Board considered whether they more appropriately applied to a broader range of marine vessels. The Board addressed these comments in its recommendations to the GIC, rather than in the conditions related to specifically to the Project and Project-related marine vessels. Therefore, the Board has not made these changes in the conditions.
Condition 131 should remain a condition	In response to the Board's proposal to convert Condition 131 (Marine Public Outreach Program) into a recommendation, some intervenors were of the view that it should remain a condition. Given that the work involved falls within the reach of government (and not Trans Mountain), the Board has made the conversion.

B. Comments on draft recommendations

Subject	Board views / comments
Definition of "Salish Sea"	Some comments requested that "Salish Sea" be defined in the recommendations. The Board has made changes to address these comments.
Additional consultation	Some comments requested that recommendations include additional consultation with Indigenous peoples and other stakeholders. The Board has made changes to address these comments.
Clarity regarding mitigation and monitoring	Some comments requested that recommendations include clear wording to show that they involve mitigation that was feasible and effective, and would involve monitoring. The Board has made changes to address these comments.
Clarity regarding offsets	Some comments suggested there was a lack of clarity in the recommendations regarding offsets and the distinction between them. The Board has made significant adjustments to be more specific about the purpose of these recommendations, and to add specific consultation requirements. Specifically, changes were made to clarify that Recommendation 5 is the overall offset program, whereas Recommendation 6 notes some individual potential mitigation for further consideration within that program.
Cumulative impacts on Indigenous rights and title	Some Indigenous intervenors provided comments regarding the cumulative impacts on the exercise of Indigenous rights and title, and that these matters should be addressed through consultation. While such wording has not been explicitly added to the recommendations, the inclusion of wording regarding consultation with Indigenous peoples will allow for input with respect to impacts on rights and title.
Including the Fraser Watershed in a regional study	Some comments requested that the Fraser Watershed be included in a regional study (Recommendation 1). The recommended study is to look at cumulative impacts on the Salish Sea. The geographic boundaries of the relevant cumulative effects would be determined as part of the planning process.

C. Comparison of draft and final versions of the conditions and recommendations

#	Draft wording	Final wording
	Conditions	
91	**Plan for marine spill prevention and response commitments** Trans Mountain must file with the NEB, **at least 2 months prior to commencing construction**, a plan describing how it will ensure that it will meet the requirements of Condition 133 regarding marine spill prevention and response. The plan must be prepared in consultation with Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, Vancouver Fraser Port Authority, British Columbia Coast Pilots, Western Canada Marine Response Corporation, Fisheries and Oceans Canada and the Province of British Columbia, and must identify any issues or concerns raised and how Trans Mountain has addressed or responded to them. Trans Mountain must provide the plan to the above-mentioned parties at the same time as it is filed with the NEB.	**Plan for marine spill prevention and response commitments** Trans Mountain must file with the NEB, **within 6 months from the issuance date of the Certificate**, a plan describing how it will ensure that it will meet the requirements of Condition 133 regarding marine spill prevention and response. The plan must be prepared in consultation with Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, Vancouver Fraser Port Authority, British Columbia Coast Pilots, Western Canada Marine Response Corporation, Fisheries and Oceans Canada and the Province of British Columbia, and must identify any issues or concerns raised and how Trans Mountain has addressed or responded to them. Trans Mountain must provide the plan to the above-mentioned parties at the same time as it is filed with the NEB.
131	**Marine Public Outreach Program** The Board proposed converting this condition into a recommendation (see Recommendation 12).	**Marine Public Outreach Program** The Board has converted this condition into a recommendation (see Recommendation 12).
132	**Marine Mammal Protection Program** Trans Mountain must file with the NEB, **at least 3 months prior to commencing operations**, a Marine Mammal Protection Program that focuses on mitigating effects from the Project and	**Marine Mammal Protection Program** Trans Mountain must file with the NEB, **at least 3 months prior to commencing operations**, a Marine Mammal Protection Program that focuses on mitigating effects from the Project and associated cumulative effects, and

#	Draft wording	Final wording
	associated cumulative effects, and on fulfilling Trans Mountain's commitments as a terminal operator with regard to Project-related marine shipping. The program must include: a) the goals and objectives of the program, including a discussion on how they align with the objectives of applicable Fisheries and Oceans marine mammal Recovery Strategies and Action Plans; b) a summary of the issues related to marine mammals from the Project and from Project-related marine vessels; c) a summary of the initiatives that Trans Mountain has supported or undertaken to-date, including the goals of each initiative and how they relate to the goals and objectives of the program; d) a discussion of the outcomes or progress updates of the initiatives identified in c), and how these outcomes have met or are contributing to the objectives of the program; [previous e) and f) deleted] e) any other initiatives that Trans Mountain intends to undertake or support in the future that are relevant to the program; and f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the program, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding, MH-052-2018 Reconsideration proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information.	on fulfilling Trans Mountain's commitments as a terminal operator with regard to Project-related marine shipping. The program must include: a) the goals and objectives of the program, including a discussion on how they align with the objectives of applicable Fisheries and Oceans marine mammal Recovery Strategies and Action Plans; b) a summary of the issues related to marine mammals from the Project and from Project-related marine vessels; c) a summary of the initiatives that Trans Mountain has supported or undertaken to-date, including the goals of each initiative and how they relate to the goals and objectives of the program; d) a discussion of the outcomes or progress updates of the initiatives identified in c), and how these outcomes have met or are contributing to the objectives of the program; e) any other initiatives that Trans Mountain intends to undertake or support in the future that are relevant to the program; and f) a description of how Trans Mountain has taken available and applicable Indigenous traditional land use and traditional ecological knowledge into consideration in developing the program, including demonstration that those Indigenous persons and groups that provided Indigenous traditional land use information and traditional ecological knowledge, as reported during the OH-001-2014 proceeding, MH-052-2018 Reconsideration proceeding and/or pursuant to Condition 97, had the opportunity to review and comment on the information.
133	**Confirmation of marine spill prevention and response commitments** Trans Mountain must file with the NEB, **at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project**, confirmation, signed by an officer of the company that: a) Trans Mountain has included in its Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide a requirement for tankers nominated to load at the Westridge Marine Terminal to have a suitable arrangement for the proposed enhanced tug escort between the Westridge Marine Terminal and Buoy J prior to departure. The tug escort should be suitable for foreseeable meteorological and ocean conditions and be based on tanker and cargo size. b) An enhanced marine oil spill response regime capable of delivering 20,000 tonnes of capacity within 36 hours of notification, with dedicated resources staged within the study area is in place.	**Confirmation of marine spill prevention and response commitments** Trans Mountain must file with the NEB, **at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project**, confirmation, signed by an officer of the company that: a) Trans Mountain has included in its Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide a requirement for tankers nominated to load at the Westridge Marine Terminal to have a suitable arrangement for the proposed enhanced tug escort between the Westridge Marine Terminal and Buoy J prior to departure. The tug escort should be suitable for foreseeable meteorological and ocean conditions and be based on tanker and cargo size; and b) an enhanced marine oil spill response regime is in place that is capable of: i) delivering 20,000 tonnes of capacity within 36 hours of notification, with dedicated resources staged within the study area; and, ii) initiating a response within 2 hours for spills in Vancouver Harbour, and within 6 hours for the remainder of the Salish Sea shipping route to the 12-nautical-mile territorial sea limit.
134	**Updated Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide** Trans Mountain must file with the NEB, **at least 3 months prior to loading the first tanker at the Westridge Marine Terminal with oil transported by the Project, and thereafter on or before 31 January of each of the first five years after commencing operations,** an updated Vessel Acceptance Standard and Westridge Marine Terminal Regulations and Operations Guide, and a summary of any revisions made to each.	same

#	Draft wording	Final wording
144	**Ongoing confirmation of marine spill prevention and response commitments** Trans Mountain must file with the NEB, **on or before 31 January of each year after commencing operations** confirmation, signed by an officer of the company, that it is continuing to meet the requirements of Condition 133 regarding Trans Mountain's marine spill prevention and response commitments. Trans Mountain must provide each filing to Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, Vancouver Fraser Port Authority, British Columbia Coast Pilots, Western Canada Marine Response Corporation, Fisheries and Oceans Canada and the Province of British Columbia at the same time as it is filed with the NEB. If a particular party mentioned above requests that it not be provided the annual filing, Trans Mountain may cease providing it to that party.	same
151	**Post-construction environmental monitoring reports** Trans Mountain must file with the NEB, **on or before 31 January following the first, third, and fifth complete growing seasons after completing final clean-up,** a post-construction environmental monitoring report for the Project that must include: a) a description of the valued components or issues that were assessed or monitored; b) measurable goals for each valued component or issue; c) monitoring methods for each valued component or issue, results of the monitoring, and a comparison to the defined measurable goals; d) corrective actions taken, their observed success, and their current status; e) identification on a map or diagram of the locations where corrective actions were taken; f) any further corrective actions planned and a schedule for monitoring and reporting; and g) a summary of its consultations with appropriate government authorities and any potentially affected Indigenous groups and affected landowners / tenants. In the post-construction environmental monitoring report filed after the fifth full growing season after completing clean-up, Trans Mountain must include: i) an assessment of the effectiveness of mitigative and corrective actions and how learnings have been or will be applied to Trans Mountain's Environmental Protection Program; ii) a detailed description of all valued components or issues for which the measurable goals have not been achieved during the duration of the post-construction monitoring program; and iii) an evaluation of the need for any further corrective actions, measurable goals, assessments, or monitoring of valued components or issues, including a schedule for those. All filed post-construction environmental monitoring reports must address issues related, but not limited, to: soils; weeds; watercourse crossings; riparian vegetation; wetlands; rare plants, lichens and ecological communities; municipal tree replacement; wildlife and wildlife habitat; fish and fish habitat; marine fish and fish habitat; marine mammals; marine birds; and species at risk.	same

#	Draft wording	Final wording
	Recommendations	
1	The Governor in Council should develop and implement a regional cumulative effects management plan that assesses the overall environmental state of, and cumulative effects on, the Salish Sea, and use that better understanding to help inform a long-term approach to managing those cumulative effects, as well as informing the consideration of future proposed projects. This plan should include, but not be limited to: a) consideration of the many impacts on the Salish Sea, including contamination from point and diffuse land-based sources, the multiple impacts on salmon and other fish stocks, and the impacts from all vessel traffic; b) incorporation of the work the federal authorities are already planning in the area, such as under the Coastal Environmental Baseline Program and the Cumulative Effects of Marine Shipping initiative (including its regional cumulative effects assessment); c) development of short-, medium-, and long-term targets for addressing cumulative effects, including consideration of the feasibility of reducing total underwater noise, strike/collision risk of vessels with marine species, and key contaminant levels over time; and d) any monitoring necessary to help determine the extent of cumulative effects, the success of measures to manage those effects, and progress towards meeting targets.	The Governor in Council should develop and implement a regional cumulative effects management plan. This plan should assess the overall environmental state of, and cumulative effects on, the Salish Sea (including the Strait of Juan de Fuca and out to the 12-nautical-mile territorial sea limit), and should include a long-term strategy for managing those cumulative effects. It should also be used to inform the consideration of future proposed projects. This plan should include, but not be limited to: a) consideration of the many impacts on the Salish Sea, including contamination from point and diffuse land-based sources, the multiple impacts on salmon and other fish stocks, and the impacts from all vessel traffic; b) incorporation of the work the federal authorities are already planning in the area, such as under the Coastal Environmental Baseline Program and the Cumulative Effects of Marine Shipping initiative (including its regional cumulative effects assessment); c) development of short-, medium-, and long-term targets for addressing cumulative effects, including consideration of the feasibility of reducing total underwater noise, strike/collision risk of vessels with marine species, and key contaminant levels over time, and feasible and effective measures for achieving those targets; and d) monitoring to help determine the extent of cumulative effects, the success of measures to manage those effects, and progress towards meeting targets. The Governor in Council should consider whether a regional study pursuant to sections 73 or 74 of the CEAA 2012 should be undertaken as part of the cumulative effects management plan, and include in its public reporting a rationale on whether this would be advantageous. The plan should be developed and implemented in consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, Vancouver Fraser Port Authority (VFPA), and other relevant stakeholders.
2	The Governor in Council should report publicly, on an annual basis, on the oversight, progress, and status of initiatives and measures to address cumulative effects on, and to support the health of, the Salish Sea, including but not limited to: a) progress on addressing Recommendation 1 above; b) the Ocean Protection Plan, the Whales Initiative, and any other relevant commitments made by federal authorities during the Board's MH-052-2018 Reconsideration hearing; c) relevant initiatives and measures being undertaken by others, such as the marine shipping measures of the Enhancing Cetacean Habitat and Observation Program (ECHO) Program; d) species status updates for Species at Risk Act-listed species, including any relevant measures proposed in recovery documents under the Species at Risk Act; e) progress on addressing Recommendations 3 through 13 below; and f) consultation activities related to these initiatives and measures, including with Indigenous peoples and other marine users. The reporting should include an explanation of how these various initiatives and measures work together, the identification of any notable gaps, and plans for how those gaps will be addressed.	The Governor in Council should report publicly, on an annual basis, on the oversight, progress, and status of initiatives and measures to address cumulative effects on, and to support the health of, the Salish Sea (including the Strait of Juan de Fuca and out to the 12-nautical-mile territorial sea limit), including but not limited to: a) progress on addressing Recommendation 1 above, including monitoring results and progress towards meeting targets; b) the Ocean Protection Plan, the Whales Initiative, and any other relevant commitments made by federal authorities during the Board's MH-052-2018 Reconsideration hearing; c) relevant initiatives and measures being undertaken by others, such as the marine shipping measures of the Enhancing Cetacean Habitat and Observation Program (ECHO) Program, for the duration such initiatives or measures are undertaken; d) species status updates for *Species at Risk Act*-listed species, including any relevant measures proposed in recovery documents under the *Species at Risk Act*; e) progress on addressing Recommendations 3 through 16 below, including results of monitoring to determine the effectiveness of measures and any adaptive management as part of a follow-up program; and f) consultation activities related to these initiatives and measures,

#	Draft wording	Final wording
		including with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders. The public reporting should include an explanation of how these various initiatives and measures work together, the identification of any notable gaps, and plans for how those gaps will be addressed.
3	The Governor in Council should implement, with support from industry, a marine bird monitoring program to better understand impacts of all vessel use within the Salish Sea on marine bird species, including species at risk. This program would allow for the implementation of adaptive measures by the Government of Canada to avoid or reduce marine bird mortality and sensory disturbance.	The Governor in Council should develop and implement, with support from industry, a marine bird monitoring and protection program to better understand impacts of all vessel use within the Salish Sea on marine bird species, including species at risk, and, if adverse effects are found, implement mitigation from those impacts. This program should include adaptive management measures by the Government of Canada where warranted by monitoring results, to avoid or reduce marine bird mortality and sensory disturbance. This program should be developed and implemented in consultation with relevant marine shipping stakeholders and Indigenous peoples.
4	The Governor in Council should expedite the work in completing the feasibility study for establishing a Southern Strait of Georgia National Marine Conservation Area, publicly report on the outcomes of that study, and (if considered feasible) proceed to establish it.	The Governor in Council should expedite the work in completing the feasibility study for establishing a Southern Strait of Georgia National Marine Conservation Area Reserve, publicly report on the outcomes of that study, and (if considered feasible) proceed to establish it. Its potential establishment should include consideration of other initiatives under the Oceans Protection Plan, such as the Ports Modernization Review and the National Anchorage Strategy. This work should be done in consultation with potentially affected Indigenous and coastal communities and with relevant marine shipping stakeholders including Transport Canada, Canadian Coast Guard and the VFPA.
5	The Governor in Council should implement a suite of measures to offset both the increased underwater noise and the increased strike risk posed to Species at Risk Act-listed marine mammal and fish species (including Southern resident killer whale) due to Project-related marine shipping, at each relevant section of the marine shipping route (i.e., Strait of Georgia, Boundary Pass, Haro Strait, Juan de Fuca Strait, and out to the 12-nautical-mile territorial sea limit), and at the relevant times of year. Each offset measure should apply to all appropriate vessels for that measure (i.e., not limited to Project-related vessels). There should be periodic reporting that includes measured or estimated underwater noise and strike risk due to Project-related marine shipping, and the extent over time to which that additional noise and strike risk has been offset by measures that apply to all appropriate vessels.	The Governor in Council should develop an Offset Program to offset both the increased underwater noise and the increased strike risk posed to *Species at Risk Act*-listed marine mammal and fish species (including Southern resident killer whale) due to Project-related marine shipping, at each relevant section of the marine shipping route (i.e., Strait of Georgia, Boundary Pass, Haro Strait, Strait of Juan de Fuca, and out to the 12-nautical-mile territorial sea limit), and at the relevant times of year. Each offset measure should apply to all appropriate vessels for that measure (i.e., not limited to Project-related vessels), to be determined on a case-by-case basis according to the type of measure and the type(s) of vessels it is targeted at. The Offset Program should be developed and implemented in consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders. The Offset Program should include any further research and data collection that is necessary to successfully undertake it, including consideration of whether further information on the number of vessel strikes on marine mammals can be gathered. There should be periodic public reporting that provides, at the appropriate times, the information necessary to demonstrate a robust Offset Program. This should include measured or estimated underwater noise and strike risk due to Project-related marine shipping, and the extent over time to which that additional noise and strike risk has been offset in each section of the route, including the monitoring/modelling used to demonstrate that.
6	As part of Recommendation 5 to offset the underwater noise and strike risk added by Project-related marine shipping, the Governor in Council should further consider each of the following specific measures, each applicable to all appropriate vessels (i.e., not limited to Project-related vessels), and publicly report on the feasibility of each (including consideration of socio-economic effects): · slowdowns in each section of the marine shipping route (i.e., Strait of Georgia, Boundary Pass, Haro Strait, Juan de Fuca Strait, and out to the 12-nautical-mile territorial sea limit) and	As part of the Offset Program in Recommendation 5, the Governor in Council should further consider each of the following specific measures, each applicable to all appropriate vessels (i.e., not limited to Project-related vessels), and publicly report on the feasibility and likely effectiveness of each (including consideration of navigational safety, international coordination and socio-economic effects): a) Slowdowns in each section of the marine shipping route (i.e., Strait of Georgia, Boundary Pass, Haro Strait, Strait of Juan de Fuca, and out to the 12-nautical-mile territorial sea limit).

#	Draft wording	Final wording
	that apply to all appropriate vessels; · potential limits on the number of whale watching boats (and/or their time on water); · explicit noise reduction targets for regularly operating ferries in the area; · identification of specific whale congregation and migration areas (including for resident killer, Humpback, Grey, and Fin whales, as well as basking shark) and consideration of specific routing and speed restrictions in those areas; and · further incentives and requirements for quiet vessel design to address underwater noise over the long term.	b) Potential limits on the activities of whale watching boats (such as the number of boats and/or their time on water, and other potential ways to limit their impacts). c) Noise reduction efforts for regularly operating ferries in the area, and an accelerated schedule for implementation. d) Identification of specific foraging, congregation and migration areas of the *Species at Risk Act*-listed species (including Humpback, Grey, Fin and killer whales, as well as Basking shark and Leatherback sea turtle) and consideration of mitigations in those areas (including Swiftsure Bank). e) Further incentives and requirements for quiet vessel design and refits to address underwater noise over the long term, including maximal participation in relevant initiatives and committees of the International Maritime Organization. Consideration of the above measures should include consultation with Indigenous peoples, other marine users, the Province of British Columbia and local governments, VFPA, and other relevant stakeholders.
7	The Governor in Council should review and update federal marine shipping oil spill response requirements. This review should include consideration of the following: · updating response organization standards; · response planning methodologies; · public reporting by response organizations to promote transparency of information; · inclusion of Indigenous peoples and local communities in response planning; and · a requirement for additional response resources on all ocean-going vessels.	The Governor in Council should review and update federal marine shipping oil spill response requirements. This review should include consideration of the following: a) updating the 1995 Response Organization Standards; b) response planning methodologies; c) response planning for *Species at Risk Act*-listed species, including marine mammals; d) how completed and ongoing research related to oil fate and behaviour and response methods and technology will be considered in response planning, procedures, and equipment; e) salvage requirements; f) public reporting by response organizations to promote transparency of information; g) inclusion of Indigenous peoples and local communities in response planning; and h) a requirement for additional response resources on all ocean-going vessels.
8	The Governor in Council should develop a regulatory framework for making enhanced tug escort mandatory in the Salish Sea for appropriate ocean-going vessels, including Project-related tankers. The framework should include oversight and enforcement mechanisms.	The Governor in Council should develop a regulatory framework for making enhanced tug escort mandatory in the Salish Sea for Project-related tankers. The framework should include oversight and enforcement mechanisms. Mandatory enhanced tug escort should also be considered for other vessels as appropriate.
9	The Governor in Council should, in conjunction with relevant United States regulatory authorities, consider the need for a Canada/United States Transboundary Vessel Traffic Risk Assessment.	same
10	The Governor in Council should accelerate the development and implementation of greenhouse gas reduction measures related to marine shipping that would support the final International Maritime Organization Strategy in year 2023 for reducing greenhouse gas emissions. These measures could include, but not be limited to: a) facilitating the use of low-carbon alternate fuels (such as liquefied natural gas) for marine vessels by developing any necessary marine safety regulatory framework, training programs, and bunkering infrastructure requirements; and b) market-based measures, such as providing economic	The Governor in Council should actively support the development and implementation of greenhouse gas reduction measures related to marine shipping that would align with the final International Maritime Organization Strategy by year 2023 for reducing greenhouse gas emissions. These measures could include, but not be limited to: a) facilitating the use of low-carbon alternate fuels (such as liquefied natural gas) for marine vessels by developing any necessary marine safety regulatory framework, training programs, and bunkering infrastructure requirements;

#	Draft wording	Final wording
	incentives for industry investment in the development and use of energy efficient technologies, and offsetting any increases in ship emissions. In implementing the measures, the Governor in Council could also consider a mechanism to establish and monitor such reductions and to develop regulations under an appropriate legislation.	b) use of energy efficient technologies, such as engine and propulsion upgrades and hull modifications; and c) market-based measures, such as providing economic incentives for industry investment in the development and use of energy efficient technologies, and offsetting any increases in ship emissions. In implementing the measures, the Governor in Council could also consider a mechanism to establish and monitor such reductions and to develop regulations under an appropriate legislation.
11	The Governor in Council should, in conjunction with Transport Canada and the Canadian Coast Guard, facilitate opportunities, as appropriate, to engage and seek feedback from the Indigenous Advisory and Monitoring Committee on the marine safety system, including on the marine inspections and enforcement regime; in addition to identifying engagement opportunities for Project-related marine shipping activities that intersect with Canadian Coast Guard operational programs.	same
12	(in place of Condition 131 from the OH-001-2014 hearing): The Governor in Council should, in conjunction with the Pacific Pilotage Authority and Transport Canada, continue engagement and awareness activities targeting recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. This should include incorporating the resources and information that Trans Mountain has already provided or will provide to the Pacific Pilotage Authority, such as applicable information on Project-related vessel timing and scheduling.	The Governor in Council should, in conjunction with the Pacific Pilotage Authority and Transport Canada, continue engagement and awareness activities targeting coastal Indigenous communities, recreational boaters, fishing vessel operators, and operators of small vessels with respect to safety of navigation and prevention of collisions with larger vessels. This should include incorporating the resources and information that Trans Mountain has already provided or will provide to the Pacific Pilotage Authority, such as applicable information on Project-related vessel timing and scheduling.
13	The Governor in Council should accelerate the development and implementation of the Enhanced Maritime Situational Awareness initiative and the proposed extension of the Automatic Identification System to smaller passenger vessels.	The Governor in Council should, in order to enhance the safety of all sizes of marine vessels, accelerate the development and implementation of the Enhanced Maritime Situational Awareness initiative and the proposed extension of the Automatic Identification System to smaller passenger vessels.
14	new	In order to foster a more rapid development and employment of new oil recovery technologies, the Governor in Council should administratively combine its current initiatives and investigate the use of new paths for the delivery of government grants and contributions in order to provide financial incentives to promote innovation in such developments.
15	new	The Governor in Council, in conjunction with Transport Canada, should review the federal marine oil spill compensation regimes with regards to compensation for non-use values, for Indigenous and non-Indigenous communities, including any non-coastal communities that may be impacted as a result of a marine oil spill.
16	new	The Governor in Council, in conjunction with VFPA, should develop a formal complaint resolution program that gathers community feedback, brings together diverse community stakeholders to facilitate discussions about port-related impacts, and resolves complaints about marine vessels anchored at the VFPA-managed anchorages.