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TERMPOL Review Process Report on the Trans Mountain Expansion Project

Trans Mountain Pipeline Expansion Project TERMPOL Review Process Report
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FORWARD

This report was prepared and approved by the following government authorities:

Transport Canada

Environment Canada

Fisheries and Oceans Canada (including Canadian Hydrographic Service)

Canadian Coast Guard

Pacific Pilotage Authority Canada

Port Metro Vancouver

Approved for Publication:



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GLOSSARY

Aids to Navigation – Devices or systems, external to a vessel, which help mariners determine their position and course, warn of dangers or obstructions, or advise on the location of the best or preferred route.

Automated Identification System (AIS) – AIS automatically provide information, including the vessel's identity, type, position, course, speed, navigational status and other safety-related information, to equipped shore stations, other vessels and aircraft. It is required on vessels of 300 tonnes gross tonnage or more (other than fishing vessels) on an international voyage and domestic vessels of 500 tonnes gross tonnage or more (other than fishing vessels).

Ballast – Bringing ballast water on board a vessel increases the draught and changes the trim to regulate the stability or maintain stress loads within acceptable limits.

Ballast Water Control and Management Regulations – Under the *Canada Shipping Act, 2001*, regulate management of ballast water on all ships arriving from beyond the Canadian exclusive economic zone and entering waters under Canadian jurisdiction.

Bitumen – A black hydrocarbon mixture which occurs naturally or can be manufactured by distilling crude oil.

Canada Shipping Act, 2001 (CSA, 2001) – The CSA, 2001 is the principal law that governs safety in marine transportation including the protection of the marine environment. It:

- Seeks to balance shipping safety and marine environment protection while encouraging maritime commerce.
- Applies to all vessels operating in Canadian waters and Canadian vessels worldwide and in some cases, to foreign vessels up to the Exclusive Economic Zone.

Canadian Exclusive Economic Zone (EEZ) – The Canadian exclusive economic zone (EEZ) is an area of the sea beyond and adjacent to the territorial sea of Canada, extending out to 200 nautical miles from the nearest point of the baselines. Within the EEZ, Canada has sovereign and jurisdictional rights for the purpose of exploring and exploiting, conserving and managing the natural resources of the waters, the seabed and its subsoil, and rights of economic exploitation of the zone.

Classification Societies - Organizations such as Lloyd's Register, the American Bureau of Shipping, Det Norske Veritas, etc., with the expertise and capabilities to inspect, verify and certify that vessels are built, maintained and operated according to established and recognized rules, regulations and standards to ensure vessel safety.

Collision Regulations – Under the CSA, 2001, rules vessels must follow to prevent collisions while in Canadian waters, which are based on the *Convention on the International Regulations for Preventing Collisions at Sea*.

Convention on the International Regulations for Preventing Collisions at Sea (COLREG) –The COLREGs include 38 rules divided into five sections:

- Part A - General
- Part B - Steering and Sailing
- Part C - Lights and Shapes
- Part D - Sound and Light signals
- Part E - Exemptions

The COLREGs also include four Annexes containing technical requirements for:

- Lights and shapes and their positioning
- Sound signalling appliances
- Additional signals for fishing vessels when operating in close proximity
- International distress signals

Crude oil – The name given to unprocessed, naturally occurring petroleum product, after exploitation, considered a pollutant under the CSA, 2001.

Diluted Bitumen – Bitumen diluted with either condensate or synthetic crude oil.

Double Hull – A vessel whose bottom and sides have two complete layers of watertight hull surface.

Electronic Chart Display and Information System – A computer-based navigation information system that complies with International Maritime Organization regulations. It displays information from electronic navigational charts or digital nautical charts and integrates position information from the Global Positioning System and other navigational sensors, such as radar and automatic identification systems. It may also display additional navigation-related information, such as sailing directions and fathometer readings.

Escort Tug – A vessel able to provide assistance and accompany another vessel. The scope and range of assistance capabilities are determined by those establishing and using the service. Some escort tugs can be tethered to the vessel to provide a different level of service.

Fisheries Act – An Act to protect the productivity of recreational, commercial, and Aboriginal fisheries.

Flag State – Country of registry of a vessel, often a seagoing one. A flag state sets the safety standards and pollution prevention requirements that apply to the vessels flying its flag.

International Convention for the Control and Management of Ships' Ballast Water and Sediments – Adopted in 2004, this Convention aims to prevent the spread of harmful aquatic organisms from one region to another, by:

- Establishing standards and procedures for managing and controlling ships' ballast water and sediments.
- Requiring all ships in international traffic to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan.
- Requiring all ships to carry a ballast water record book and an international ballast water management certificate.

International Convention for the Prevention of Pollution from Ships (MARPOL) – The main international convention aimed at preventing pollution of the marine environment by ships from operational or accidental causes.

International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) – Adopted in 1990, OPRC aims to provide a global framework for international co-operation in combating major incidents or threats of marine pollution. Parties to this Convention must establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries.

International Convention on Standards of Training, Certification and Watchkeeping for Seafarers – This Convention sets minimum standards relating to training, certification and watchkeeping for seafarers that countries must meet or exceed.

International Maritime Organization (IMO) – Established in 1948 at an international conference in Geneva, the *IMO Convention* entered into force in 1958 and the new organization met for the first time the following year. The IMO's main task has been to develop and maintain a comprehensive regulatory framework for shipping. Its scope today includes safety, environmental concerns, legal matters, technical co-operation, maritime security and the efficiency of shipping.

Marine Communications and Traffic Services (MCTS) – The MCTS program provides safety radio-communication services, vessel traffic information and a commercial marine telephone call service on a 24/7 basis. MCTS falls under the responsibility of the Minister of Fisheries and Oceans under the CSA, 2001.

Marine Liability Act (MLA) – In force since August 2001, the MLA is the principal law dealing with shipowner and vessel operator liability towards passengers, cargo, pollution and property damage. Its intent is to set limits of liability and establish uniformity by balancing the interests of shipowners and other parties. The MLA gives many IMO international conventions the force of law.

National Oil Spill Response and Preparedness Regime – Established in 1995 as a partnership between government and industry, Transport Canada as the lead federal regulator, sets the guidelines and regulatory structure for the preparedness and response to marine oil spills.

Pacific Pilotage Regulations – Rules for the operation, maintenance and administration of pilotage services including compulsory pilotage and the qualifications for holding licences and pilotage certificates within the Pacific Pilotage Authority Region.

Paris Memorandum of Understanding (MOU) – Aims to eliminate the operation of sub-standard ships through a harmonized system of port State control to ensure that ships meet international safety, security and environmental standards, and that crew members have adequate living and working conditions. The organization consists of 27 participating maritime Administrations, including Canada, and covers the waters of the European coastal States and the North Atlantic basin from North America to Europe.

Pilotage – The rules requiring vessels operating within specified waters to take on board a marine pilot with local knowledge of the waterway to help guide the vessel safely to its destination.

Pilotage Act – Enacted in 1972 and amended in 1998, this law establishes the following four Pilotage Authorities that operate, maintain and administer a safe and efficient pilotage service within their respective regions:

1. The Atlantic Pilotage Authority
2. The Laurentian Pilotage Authority
3. The Great Lakes Pilotage Authority
4. The Pacific Pilotage Authority

Among other things, the Act allows Pilotage Authorities to establish, with the approval of the Governor in Council, compulsory pilotage areas in which ships must bring pilots on board.

Port State Control – The inspection of foreign vessels in national ports to verify they meet major international conventions related to condition and equipment as well as crew and operations. In Canada, inspections determine compliance with conventions Canada has implemented.

Regional Advisory Councils (RACs) – Appointed by the Minister of Transport under the CSA, 2001, section 172; RACs provide advice on the preparedness and response regime set out in the CSA, 2001, Part 8. RAC members provide a cross-representation of the communities and interests potentially affected by an oil spill.

Response Organizations and Oil Handling Facilities Regulations – Under the CSA, 2001, rules related to the procedures, equipment and resources of response organizations and oil handling facilities during an oil pollution incident.

Science Table – A panel that replaces the Regional Environmental Emergencies Team (REET) model. It brings together scientific and technical specialists from federal, provincial/territorial and local governments, First Nations, environmental non-government organizations, industry and academic institutions to address environmental concerns, protection and clean-up priorities and strategies.

Ship Inspection Report Program – Launched in 1993 by the Oil Companies International Marine Forum to address concerns about sub-standard shipping, it serves as a unique tanker risk assessment tool of value to charterers, vessel operators, terminal operators and government bodies concerned with vessel safety. The program operates a very large database of up-to-date information about tankers and barges.

SOLAS (International Convention for the Safety of Life at Sea) – An international maritime safety treaty, with a marine security component. It includes the *International Convention for the Safety of Life at*

Sea, 1974, and the Protocol of 1988 relating to the Convention, as amended from time to time. It is generally seen as the most important international treaty on merchant ship safety. The first version was adopted in 1914, in response to the Titanic disaster. *SOLAS, 1974*, requires flag states to ensure that their ships meet minimum construction, equipment and operational standards. Canada is a signatory to SOLAS.

Synthetic Crude Oil – A mixture of hydrocarbons, similar to crude oil, derived by upgrading bitumen from oil sands.

Tanker Acceptance Process – A Trans Mountain process that vets tankers before clearing them to berth at the Westridge Marine Terminal to ensure tanker operations do not endanger personnel, the public, or the environment.

TERMPOL – “Technical Review Process of Marine Terminal Systems and Transshipment Sites.” It dates from the late 1970s when an interdepartmental committee reviewing marine pollution issues identified the need for a precise and reliable way to measure the navigational risks associated with placing and operating marine terminals for large oil tankers. The process was further revised in 2001 and is the one Transport Canada uses today. 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.

TERMPOL Review Committee (TRC) – 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 Canada; the Canadian Hydrographic Service; Pacific Pilotage Authority Canada; British Columbia Coast Pilots; and Port Metro Vancouver.

Tokyo Memorandum of Understanding (MOU) – Aims to establish an effective port State control regime in the Asia-Pacific region through co-operation of its members and harmonization of their activities to eliminate substandard shipping so as to promote maritime safety, to protect the marine environment and to safeguard working and living conditions on board ships. The organization consists of 18 member Authorities in the Asia-Pacific region.

Trans Mountain Expansion Project – Trans Mountain Pipeline ULC (Trans Mountain) is proposing to expand its existing pipeline system between Alberta and British Columbia (BC) and its marine terminal in BC by twinning its pipeline system and adding new tanker loading facilities at its marine terminal. The expansion will allow for up to 630,000 barrels of oil per day to be transported via pipeline to the marine terminal, and increase marine export traffic from 60 tankers per year to an estimated 408 tankers per year (34 tankers per month) depending on market demand. Trans Mountain expects future outbound cargo shipments to continue to be crude oil, including synthetic crude or diluted bitumen.

Vessel Traffic Services (VTS) – A means of exchanging information between vessels and a shore-based centre. Canada’s Vessel Traffic Services system is operated by certified Marine Communications and Traffic Services officers who monitor vessel movements using VHF (very high frequency) radio and direction-finding equipment, tracking computers and, in areas of high traffic density, surveillance radar.

The Canadian Coast Guard, Pacific Region, operates three Vessel Traffic Services zones: Vancouver, Tofino and Prince Rupert.

Vessel Pollution and Dangerous Chemicals Regulations – Under the CSA, 2001, rules that implement standards to reduce air pollution and greenhouse gas emissions from vessels.

Vessel Traffic Services Zones Regulations – Under the CSA, 2001, rules that outline the requirements for Canadian and foreign vessels to report information before entering, while operating within, and upon leaving Canadian waters.

Vetting – Extensive inspection programs oil exporters follow to prevent unsafe tankers from entering into service.

VHF Radiotelephone Practices and Procedures Regulations – Under the CSA, 2001, rules that set out the practices and procedures persons on board ships must follow when using bridge-to-bridge VHF radiotelephones to ensure safe navigation.

*Note full text of Canadian Acts and Regulations can be found at <http://www.laws-lois.justice.gc.ca>.

ACRONYMS

AIS - Automatic Identification Systems

CHS – Canadian Hydrographic Service

COLREG – Convention on the International Regulations for Preventing Collisions at Sea

CSA – Canada Shipping Act

CVTS – Cooperative Vessel Traffic System

DGPS – Differential Global Positioning System

DNV – Det Norske Veritas

DWT – Deadweight Tonnes

EEZ – Exclusive Economic Zone

FMO – Federal Monitoring Officer

FOSET – Fishermen’s Oil Spill Emergency Team

GPS – Global Positioning System

HAZID – Hazard Identification

IMO – International Marine Organization

ISGOTT – International Safety Guide for Oil Tankers and Terminals

LNG – Liquefied Natural Gas

MARCS – Marine Accident Risk Calculation System

MARPOL – International Convention for the Prevention of Pollution from Ships

MCTS – Marine Communications and Traffic Services

MLA – Marine Liability Act

MRA - Movement Restriction Area

NEB – National Energy Board

OCIMF – Oil Companies International Marine Forum

ODAS – Ocean Data Acquisition System

OHF – Oil Handling Facility

OPRC – Oil Pollution Preparedness, Response and Cooperation

OSC – On-Scene Commander

PIANC – Permanent International Association for Navigation Congress

PMV – Port Metro Vancouver

RAC – Regional Advisory Council

SIRE – Ship Inspection Report Programme

SOLAS – International Convention for the Safety of Life at Sea

SOPF – Ship-Source Oil Pollution Fund

STCW – Standards for Training, Certification and Watchkeeping

TERMPOL – Technical Review Process of Marine Terminal Systems and Transshipment Sites

TRC – TERMPOL Review Committee

UKC – Underkeel Clearance

VHF – Very High Frequency

VTSS – Vessel Traffic Services

WAAS – Wide Area Augmentation System

WCMRC – Western Canada Marine Response Corporation

EXECUTIVE SUMMARY

Trans Mountain operates an existing pipeline system that transports a range of petroleum products from Edmonton, Alberta to Burnaby, BC. It then ships them to various domestic and international destinations via its Westridge Marine Terminal, located in Burrard Inlet within Port Metro Vancouver jurisdiction.

Trans Mountain is proposing to expand its operations by twinning the existing pipeline system and adding new tanker loading facilities at its marine terminal. The expansion will allow it to transport up to 630,000 barrels of oil per day via pipeline to the marine terminal, and increase marine export capacity from 60 tankers to 408 tankers per year, depending on market demand. Under the expansion proposal, the tanker route and maximum tanker size calling at the terminal will remain unchanged.

Trans Mountain has requested to have the marine transportation components of its proposed Trans Mountain Expansion Project (Project) assessed under the voluntary Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL). A TERMPOL Review Committee (TRC), whose members include experts from federal departments and authorities with responsibilities related to safe marine transportation, reviews submissions. The purpose of the TERMPOL Review Process is to:

- Objectively appraise operational vessel safety, route safety and cargo transfer operations associated with a proposed marine terminal system or transshipment site.
- Focus on improving, where possible, those elements of a proposal which could, in certain circumstances, pose a risk to the integrity of a vessel's hull while navigating and/or the cargo transfer operations alongside the terminal.

On December 16, 2013 Trans Mountain submitted its studies and surveys relating to its proposed Project to the TRC for review. The submission contains vessel, route, and terminal operation information. It also identifies:

- Increases to risk of a cargo spill due to the Project, based on risk assessments completed by the classification society Det Norske Veritas on Trans Mountain's behalf.
- A number of measures that may reduce these risks, for TRC consideration.

Oil tankers, and their operations, must comply with the safety and environmental protection requirements of international conventions and, while in Canadian waters, with Canada's marine safety regulatory regime. Canadian and international requirements address such areas as safe vessel design and construction, including requirements for double-hulled tankers; safe manning, crew qualifications and training; working conditions; safety management systems, radio communications equipment and equipment for safe navigation including Electronic Chart Display and Information Systems and automatic identification systems (AIS); voyage planning; vessel reporting; and rules to prevent collisions.

Canada has several measures in place to help ensure large vessels entering Canadian waters comply with international and Canadian requirements and do not pose an undue risk to safety or the environment.

While there will always be some risk in any project, after reviewing Trans Mountain's studies and taking into account Trans Mountain's commitments, the TRC:

- 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. Trans Mountain commitments and enhancements to the existing marine safety regime will provide for a higher level of safety for tanker operations appropriate to the increase in traffic.
- Identified several findings and recommendations in response to the submission, and has proposed actions for Trans Mountain that will provide for a high level of safety for tanker operations.

Key measures the TRC supports, which will reduce risk and enhance awareness include:

- extended use of tethered and untethered tug escort;
- extension of the pilot disembarkation zone;
- safety calls by laden tankers when in transit;
- guidance on communication between masters and watchkeeping personnel to support strong communication between tankers and their escort tugs;
- clear guidance to industry on enhancements to the marine safety regime that will impact their operations; and
- an engagement and awareness strategy to promote safe navigation and interaction between Project tankers and recreational boaters, fishing vessel operators, and operators of small vessels.

A complete list of the TRC's findings and recommendations is included in Appendix 1.

1. INTRODUCTION

1.1 Project Background and Description

Trans Mountain Pipeline ULC (Trans Mountain) is proposing to expand its existing pipeline system between Alberta and BC and its marine terminal in BC.

The existing pipeline system transports a range of petroleum products from Edmonton, Alberta to Burnaby, BC, which are then shipped to the United States and offshore markets via Trans Mountain's Westridge Marine Terminal, in Burrard Inlet, within Port Metro Vancouver jurisdiction. In its Project, Trans Mountain is proposing to expand its operations by twinning the existing pipeline system and adding new tanker loading facilities at its marine terminal. The expansion will allow it to transport up to 630,000 barrels of oil per day via pipeline to the marine terminal, and increase marine export traffic from 60 tankers to an estimated 408 tankers per year (34 tankers per month) depending on market demand.

Trans Mountain expects future outbound cargo shipments to continue to be crude oil, including synthetic crude or diluted bitumen. Tankers transiting to and from the terminal will continue to use the existing shipping lanes.

The maximum size of tankers calling at the terminal will continue to be Aframax class (80,000 Deadweight Tonnes (DWT) to 120,000 DWT), although the smaller Panamax class tankers (60,000 DWT to 80,000 DWT) could also be nominated. Tankers calling at the Westridge Marine Terminal will not be owned or operated by Trans Mountain but will be chartered by other parties. However, the tankers will operate in waters under Canadian jurisdiction and will have to comply with Canada's regulatory regime for the safe operation of vessels. In Canadian waters, and internationally, the requirements and responsibilities for safe vessel operation, and the monitoring and enforcement of those requirements, are well established through Canadian legislation, which implements international conventions. In addition, tankers will have to comply with Trans Mountain's own tanker acceptance process and terminal procedures.

1.2 TERMPOL Process and Review Report

TERMPOL stands for Technical Review Process of Marine Terminal Systems and Transshipment Sites and is set out in Transport Canada's Technical Publication TP 743, *TERMPOL Review Process 2001*¹ found at the following link: <http://www.tc.gc.ca/eng/marinesafety/tp-tp743-menu-655.htm>.

TERMPOL is a voluntary review process, in which proponents involved in building and operating a marine terminal system for bulk handling of oil, chemicals and liquefied gases can participate. It focuses on the marine transportation components of a project (i.e., when a tanker enters Canadian waters, navigates through channels, approaches berthing at a marine terminal, and loads and unloads oil or gas)

¹ The Technical Publication is being revised to reflect program and regulatory changes, and to clarify the scope and intent of TERMPOL. The revised guide should be available in late 2014.

with the intent to improve, where possible, those elements of a proposal which could, in certain circumstances, threaten the integrity of a vessel's hull while navigating and/or during cargo transfer operations alongside the terminal.

Through the TERMPOL Review Process, a proponent works with a TERMPOL Review Committee (TRC) chaired by Transport Canada. Committee members represent Federal departments and authorities with expertise or responsibilities relevant to the project. The Committee reviews and provides a report on the proponent's TERMPOL submission. The report contains technical feedback, the perspectives of the Committee, and may propose improvements to enhance the marine safety of a project and to address any site-specific circumstances.

The success of the TERMPOL Review Process depends largely upon the proponent's adherence to the procedures described in the *TERMPOL Review Process 2001* guidelines (TP 743), and the quality of the data and analysis it submits to the TRC. The proponent is responsible for ensuring that the surveys and studies meet the highest industry and international standards.

While TERMPOL report findings and recommendations are not binding, the proponent may choose to adopt one or more of them. Recommendations cannot reduce the regulatory requirements of the *Canada Shipping Act, 2001* (CSA, 2001) and all other applicable legislation. It is also understood that the proponent or any vessel servicing a project, if approved, will have to comply with any and all applicable legislation and regulations as amended from time to time. Transport Canada and other agencies may use a TRC's work and report to help identify the need for regulatory improvements or special measures.

A TERMPOL report should not be interpreted as a statement of government policy, or as the government endorsing the project being reviewed. The TERMPOL Review Process is not a regulatory instrument. No approvals or permits are issued as a result of the TERMPOL Review Process.

This TERMPOL report examines the marine transportation and terminal procedures proposed by Trans Mountain. The review process takes into consideration:

- Studies, surveys and technical data provided by Trans Mountain in support of the *TERMPOL Review Process 2001* guidelines (TP 743)²;
- Current and anticipated national and international regulatory frameworks to ensure safe vessel operations; and
- Current marine transportation regimes/activities along the proposed shipping route.

1.3 Scope of TERMPOL

The *TERMPOL Review Process 2001* guidelines (TP 743) set out a maximum possible scope of assessment for vessel safety and the risks associated with vessel manoeuvres and operations. From the

² Trans Mountain's TERMPOL Submission can be found in Volume 8C of its Facilities Application at the following link: <http://application.transmountain.com/facilities-application>.

guidelines, a proponent, in consultation with the TRC, will select a scope that is most appropriate for the project, taking into consideration existing shipping activities and unique circumstances.

The TRC and proponent will also agree upon an appropriate geographical scope. This review focuses on vessel safety and vessel operation safety in Canadian waters along the proposed shipping routes to and from the Westridge marine terminal up to Buoy Juliet located at the mouth of the Juan de Fuca Strait. It examines Project tanker characteristics, the proposed route, navigability, other waterway users, and the marine terminal operations associated with Project tankers. It does not address the twinning of the pipeline or upland facilities.

The report also examines the marine transportation operations within the context of the existing marine regulatory regime, programs and services, and considers new measures that may be in effect once a project commences operations. The appraisal gives federal government departments, agencies and the proponent an opportunity to address new or changing issues, concerns, or priorities related to the Project's marine transportation components.

As set out in the *TERMPOL Review Process 2001* guidelines, Trans Mountain submitted the following studies, surveys, and technical data for TRC review and analysis:

- Origin, Destination and Marine Traffic Volume Survey
- Fishery Resources Survey
- Route Analysis, Approach Characteristics and Navigability Survey
- Special Underkeel Clearance Survey
- Transit Time and Delay Survey
- Casualty Data and Survey
- Tanker Specifications
- Site Plans and Technical Data
- Cargo Transfer and Transshipment Systems
- Channel, Manoeuvring and Anchorage Elements
- Berth Procedures and Provisions
- General Risk Analysis and Intended Methods of Reducing Risks
- Port Information Book
- Terminal Operations Manual
- Contingency Planning
- Oil Handling Facilities Requirements

Trans Mountain chose to combine:

- Studies 3.5 (Route Analysis, Approach Characteristics and Navigability Survey) and 3.12 (Channel, Manoeuvring and Anchorage Elements) due to the overlap in information to be provided and to reduce duplication.
- Studies 3.16 (Port Information Book) and 3.17 (Terminal Operations Manual), as Trans Mountain will provide this required information in its Port and Terminal Operations Manual, which it will

finalize closer to completion of terminal construction and before the expanded terminal becomes operational.

The results of the TRC's review are in the 'Analysis' section of this report. They are divided into the following sections: vessel information, route information, terminal operations, and oil spill prevention and response.

The TERMPOL Review Process does not replace the safety, security, and environmental requirements of any Acts and/or Regulations that are in effect and modified from time to time, nor is it a process to approve or reject the Project. Trans Mountain must obtain any such approvals from the appropriate regulatory authorities by following their own specific processes.

As such, parallel to the TERMPOL review process, the Project is undergoing a *National Energy Board Act* review process for a Certificate of Public Convenience and Necessity, which also fulfills the requirements of the *Canadian Environmental Assessment Act, 2012*. Several agencies, including Transport Canada and other members of the TRC, are registered as Intervenors in the Panel Review process and are providing expert advice to the Review Panel on matters within their mandates. Based on information provided by Trans Mountain, Intervenors, and its own analysis, the Review Panel will produce a report and recommendations on whether the Project is likely to have significant environmental effects and is in the public interest.

Trans Mountain has submitted all of the information it provided for the TERMPOL Review Process, as well as some additional marine transportation background material and a significant amount of other Project-related material to the National Energy Board (NEB) as part of its review process. The marine transportation-related material forms Volumes 8A, 8B and 8C of the Project application material held on file at the NEB web site. The TERMPOL submission is included as Volume 8C. The material is also available on Trans Mountain's website.

2. METHODOLOGY

This TERMPOL report follows *TERMPOL Review Process 2001* (TP 743) guidelines.

Trans Mountain formally requested a TERMPOL review in a letter to Transport Canada in October 2012. When Transport Canada accepted the request, Trans Mountain and the TRC met to establish an appropriate scope for the surveys and studies to be completed. Accordingly, Trans Mountain prepared its submission and provided its completed TERMPOL surveys, studies, technical data, analysis and other information related to the marine transportation components of the Project to Transport Canada and the TRC on December 16, 2013.³

Transport Canada then invited the TRC to review Trans Mountain's TERMPOL submission. TRC members included:

- Transport Canada
- Fisheries and Oceans Canada, including:
 - Canadian Coast Guard
 - Canadian Hydrographic Service
- Environment Canada
- Pacific Pilotage Authority
- Port Metro Vancouver

Together, these departments and authorities are responsible for delivering the Government of Canada's comprehensive regulatory framework to help ensure Canada's marine transportation is safe, secure and environmentally responsible. Transport Canada has a lead role in regulating shipping. Fisheries and Oceans Canada (including the Canadian Coast Guard and the Canadian Hydrographic Service), Environment Canada, and Pacific Pilotage Authority Canada are responsible for providing critical programs and services for safety and environmentally responsible marine transportation. Port Metro Vancouver is responsible for promoting safe and efficient navigation within waters under its jurisdiction.

The British Columbia Coast Pilots Ltd. (BC Coast Pilots) provided comments, as needed.

TRC participants from the various departments and agencies reviewed and analysed Trans Mountain's proposal and studies from the perspective of their respective mandates, regulatory authorities, responsibilities, and expertise. Following a thorough review, the TERMPOL report was completed and approved by the five relevant authorities. Overall, this report represents the appropriate authorities' analysis of the marine transportation elements of the tankers and tanker operations that could be associated with the Project.

The analysis and commentary in this report are based on the information, documentation, and technologies available at the time it was written. Some aspects of this analysis may need to be re-

³ See Appendix 2: List of Documents Submitted for TERMPOL.

evaluated by the appropriate authorities if there is a substantial delay in the start of operations or changes made to the proposed Project.

This report applies specifically to the proposed Project and the associated marine transportation to and from the proposed expanded Westridge Marine Terminal.

This report contains a number of recommendations and findings. Recommendations propose suggested actions to Trans Mountain, and findings highlight observations about the Project or actions that may be undertaken by appropriate authorities.

This report should be read in conjunction with the *TERMPOL Review Process 2001* guideline (TP 743) and the information Trans Mountain submitted in support of its participation in this TERMPOL review of the proposed Project.

3. ANALYSIS

This section reviews the measures Trans Mountain has proposed to mitigate risks associated with the Project and to further enhance marine safety. Some measures will be undertaken by Trans Mountain while others are recommended for the TRC's consideration and involve enhancements to the current marine safety regime.

This section also contains:

- An overview of Trans Mountain's risk assessment results, which take into account the study described in the TERMPOL Review Process as the "General Risk Analysis and Intended Methods of Reducing Risks", below.
- An analysis of four areas in greater detail: vessel information, route information, terminal operations, and oil spill prevention and response.

Project tankers and their operation will have to fully comply with all applicable Canadian and international laws and regulations. Examples include:

- The CSA, 2001, which is the principal law that governs safety in marine transportation and protects the marine environment from vessel-source pollution in Canada. It implements several international conventions in whole or in part, and seeks to balance vessel safety and marine environment protection with the need for maritime commerce.
- The *Pacific Pilotage Regulations* under the *Pilotage Act*, which establish mandatory pilotage areas along Canada's West Coast.

This analysis is based on the assumption that, if the Project should proceed, Trans Mountain will implement all commitments, protocols, strategies, rules, and its own requirements as described in its submission. The "safety enhancements," it proposed and committed to, as well as its proposals to regulators, were important considerations in the TRC's assessment of the Project's safety elements.

Recommendation 1: Trans Mountain should notify the appropriate authority if it wishes to alter any Project commitments, operational parameters, or characteristics, so the authority can review impacts to safety as a result of the changes.

Finding 1: The TRC recognizes implementation timelines for recommendations outlined in this report will have to be considered between Trans Mountain and appropriate authorities.

Risk Assessment Results

Trans Mountain commissioned the consultant Det Norske Veritas (DNV), a marine classification society recognized for its expertise in marine risk assessment, to conduct a marine transport Quantitative Risk Analysis to determine the impact of the Project on oil cargo spill risk, and identify mitigation measures if required.

DNV conducted the analysis using proprietary modelling software to determine risk, based on the frequency and consequence of a spill. Their analysis determined:

- frequency through the Marine Accident Risk Calculation System (MARCS) model⁴; and
- consequence, the volume of cargo that may be released, through Monte Carlo simulations.⁵

The proposed route was divided into seven segments, covering the area from Westridge Marine Terminal to Buoy Juliet. Further information on the route segments can be found in Appendix 4.

Accounting for risk mitigation measures currently in place, DNV assessed incident frequencies for five types of incidents: collision, powered grounding, drift grounding, structural failure, and fire and explosion. DNV then used its MARCS model to estimate oil cargo spill accident frequency for each segment of the proposed route due to one of the five events. DNV's results indicated that implementing the proposed Project will:

- Increase oil cargo spill accident frequency for a spill of any size from a Project tanker during transit from one in every 309 years to one in every 46 years.
- Project tankers contributions to potential spill accidents will increase from 20% to 63%.
- The likelihood of a credible worst case scenario during transit (calculated by DNV to be 16,500 m³ or 15,500 tonnes) will increase from one in every 3,093 years to one in every 456 years.
- The two most likely causes of spills are grounding and collision.

DNV also assessed unmitigated risks of small and large scale spills at the Westridge Marine Terminal due to cargo transfer associated with the Project. DNV's findings indicated that implementing the Project will increase the risk of a small scale spill from one in every 234 years to one in every 34 years and the risk of a large scale spill, including the credible worst case scenario of 103m³, from one in every 1,655 years to one in every 234 years.

In addition to the Quantitative Risk Analysis, DNV:

- held two Hazard Identification workshops with local marine stakeholders to help identify navigational hazards that could contribute to the likelihood of an incident; and
- conducted a sailing route review, sailing the portion of the route from Westridge terminal to the Victoria Pilot Boarding Station (segments one to five) to identify hazards and navigational complexities.

The following sections discuss Trans Mountain's proposed mitigation measures to reduce the increases in risk due to the Project, and the TRC's consideration of them.

⁴ The MARCS model is DNV's proprietary software used to calculate incident frequency by combining data on shipping traffic with data describing the marine environment and with the operational aspects of shipping operations.

⁵ The Monte Carlo simulations determine the probability distribution functions of an oil spill from an Aframax class tanker based on 50,000 random computer generated damages.

3.1 Vessel Information

Under the proposed Project, Aframax class (80,000 DWT to 120,000 DWT) and/or Panamax class tankers (60,000 DWT to 80,000 DWT) will call at the Westridge Marine Terminal. Trans Mountain indicates that the global tanker fleet will, on average, be nine years of age or less.

The stern of a typical Aframax or Panamax class tanker is designed to hold the navigational bridge, crew accommodations, engine room, auxiliary generators, propulsion, steering, and cargo pumps. The middle section of the tanker contains cargo and segregated ballast tanks, and the bow contains additional storage space for spares and consumables. Further descriptions of the physical characteristics and safety features of tankers proposed for use under the Project can be found in Section 3.9 of Trans Mountain's TERMPOL submission. Design information is also provided in Appendix 3 of this report.

Trans Mountain will not own or charter the tankers calling at Westridge. Either the oil purchasers or the oil producers will hire or charter Project tankers.

All tankers calling at the terminal will be required to comply with Canadian, international, and Trans Mountain safety and environmental protection requirements, as discussed in further detail below.

Recommendation 2: Trans Mountain should notify the appropriate authority if there will be changes to the types of tankers calling at the Westridge Marine Terminal.

Canadian Requirements Including International Conventions

Oil tankers, and their operations, must comply with the safety and environmental protection requirements of international conventions and, while in Canadian waters, with Canada's marine safety regulatory regime. Canadian and international requirements address such areas as safe vessel design and construction, including requirements for double-hulled tankers; safe manning, crew qualifications and training; working conditions; safety management systems, radio communications equipment and equipment for safe navigation including Electronic Chart Display and Information Systems and automatic identification systems (AIS); voyage planning; vessel reporting; and rules to prevent collisions.

Canada has several measures in place to help ensure large vessels entering Canadian waters comply with international and Canadian requirements and do not pose an undue risk to safety or the environment. For example:

- Canada's Port State Control program verifies foreign vessel compliance with Canadian requirements and applicable international conventions. Before a foreign vessel may enter Canadian waters, Port State Control officers make use of international databases to review a vessel's safety and inspection record.
- It is Transport Canada's policy that every foreign oil tanker calling at a Canadian port is inspected on its first visit to Canada and at least once a year thereafter.
- Tankers must be double hulled to operate in Canadian waters.
- Tankers more than 12 years of age are targeted for a more detailed or expanded inspection. An expanded inspection includes, among other things:

- confirmation of watertight/weather tight condition;
- structural condition (exterior as well as inside ballast tanks);
- emergency systems;
- propulsion machinery; and
- pollution prevention measures.

Tankers that do not meet safety standards are detained until their deficiencies are rectified.

Through the Flag State Control program, Transport Canada inspectors also conduct inspections of Canadian flagged vessels.

Vessels trading internationally, including tankers, are inspected regularly and certified by their administration⁶ in accordance with the relevant international conventions. SOLAS is the main international convention on the safety of vessels. Each vessel's administration, or the organization the administration authorizes, must carry out inspections and surveys according to the convention, and issue the appropriate certificate. The convention sets out what is covered by each survey and certificate. The initial and renewal surveys include a complete inspection to confirm that inspected items comply with the regulatory requirements, are in satisfactory condition, and are fit for the vessel's intended service.

In addition, classification societies (such as Lloyd's Register, the American Bureau of Shipping, Det Norske Veritas, etc.), are organizations with the expertise and capabilities to inspect, verify and certify that vessels are built, maintained and operated in accordance with established and recognized rules, regulations and standards to ensure vessel safety.

Finding 2: If the Project is approved, compliance inspections and monitoring of tanker traffic by federal authorities with jurisdiction in marine safety, such as Transport Canada and the Canadian Coast Guard, will increase.

Proponent Criteria

Trans Mountain has an existing tanker acceptance process that will apply to all tankers calling at its terminal as part of the proposed Project. The purpose of the process is to ensure tanker operations do not endanger personnel, the public, and/or the environment.

The two-stage process involves vetting a tanker before and every time it is scheduled to arrive at the terminal for cargo transfer. The process includes tanker pre-screening for scheduling purposes and physical inspection by the Trans Mountain Loading Master to ensure compliance with Trans Mountain, Canadian, and international requirements.

As part of the tanker acceptance process, Trans Mountain has stated it will only accept tankers that are flagged to a State on the Tokyo Memorandum of Understanding White List and that meet flag criteria for

⁶ "Administration" means the government of the state whose flag the vessel is entitled to fly.

low risk vessels as listed by the Paris Memorandum of Understanding. In addition, Trans Mountain will only accept tankers that participate in the Ship Inspection Report Programme (SIRE).⁷

Finding 3: Trans Mountain's commitment to vet oil tankers through its tanker acceptance process is a good practice that can help achieve safety objectives.

Finding 4: Tanker vetting and the Ship Inspection Report Programme (SIRE) process are generally accepted tools terminals and oil companies use to verify compliance and enhance safety.

Trans Mountain also notes the requirement for overfilling detection at the tanker. All oil carrying vessels (tankers and barges) must conduct their cargo loading operations at Westridge Marine Terminal in a 'closed' configuration that uses a Class approved vapour collection and control system onboard. Such systems must also be fitted with overfill sensors and alarms to meet approval standards.

Ballast Water Requirements

The proposed Project will involve tankers up to Aframax size arriving at Burrard Inlet. They will be, in all likelihood, arriving ballasted with sea water. These tankers must comply with Canada's *Ballast Water Control and Management Regulations*, including the *International Convention for the Control and Management of Ships' Ballast Water and Sediments*.

Vessel Security Requirements

Vessel security requirements are administered through national and international regulatory frameworks beyond the scope of the TERMPOL Review Process. All vessels must comply with national legislation and international frameworks for vessel and terminal security.

Automatic Identification System

Vessels of 300 tonnes gross tonnage or more engaged on an international voyage, and domestic vessels of 500 tonnes gross tonnage or more (other than fishing vessels), must be fitted with an Automatic Identification System (AIS).⁸ AIS automatically provides information, including the vessel's identity, type, position, course, speed, navigational status and other safety-related information, to AIS-equipped shore stations, other vessels, and aircraft. AIS improves a vessel's situational awareness and greatly enhances the traffic-monitoring capabilities of the Canadian Coast Guard's AIS-equipped Marine Communications and Traffic Services centres, which are discussed in further detail in Section 3.2.1.

Project tankers will be fitted with AIS. To help tankers identify other vessels and to enhance situation awareness, Trans Mountain proposes AIS regulations be revised to require all powered vessels longer than 12 meters to be fitted with AIS. Trans Mountain also suggests the TRC consider promoting voluntary use of AIS on smaller vessels through education and information sharing.

⁷ TERMPOL Review Process Study 3.9, page 18 and 21

⁸ *Navigation Safety Regulations*, SOR/2005-134, s. 65, <http://laws-lois.justice.gc.ca/eng/regulations/sor-2005-134/page-11.html#h-41>.

Vessels of a size that could cause cargo release (a spill incident) by Project tankers as a result of collision are already required to be fitted with AIS, which will make them visible to Project tankers to help reduce risk of an incident. As such, the TRC does not support Trans Mountain's proposal to require all vessels longer than 12 metres to be fitted with AIS as an effective measure for reducing risk of spills.

However, the TRC does acknowledge that improvements to AIS carriage requirements may help smaller vessels identify and avoid collision with other marine waterway users. A measure being considered under the Government of Canada's World Class Tanker Safety System initiative is a proposal to amend regulations to extend AIS carriage requirements to a greater number of vessels, which will enhance vessel monitoring by Canadian authorities and by other ships navigating nearby.

Finding 5: As part of the Government of Canada's actions to modernize Canada's navigation system, the TRC supports a review of existing AIS carriage requirements by Transport Canada, in collaboration with the Canadian Coast Guard, to determine whether they should apply to a greater number of vessels.

For its part, Trans Mountain will help expedite the rollout of AIS on smaller vessels by financially supporting the fitting of commercial fishing vessels with AIS if they enrol in Western Canada Marine Response Corporation's (WCMRC) Fishermen's Oil Spill Emergency Team (FOSET) program. To qualify for assistance, vessels must be smaller than Transport Canada's current AIS threshold and be capable of having AIS. Trans Mountain has chosen to provide funding through the FOSET program because it is an existing program known to fishing vessel operators. Trans Mountain has also indicated it will be useful to know the location of FOSET assets during standard operations as well as while undertaking response activities.

Finding 6: The TRC supports Trans Mountain's commitment to financially assist smaller vessels registered in WCMRC's FOSET program to be fitted with AIS, which will aid in locating FOSET assets during standard operations as well as while undertaking response activities.

Per the *Collision Regulations*, if vessels are less than 20 metres long or constructed of non-metallic material, they should be fitted with radar reflectors.⁹ Trans Mountain will financially assist small vessels enrolled in the FOSET program to be fitted with radar reflectors, making it easier for vessel and shore based radar to detect their location.

Finding 7: The TRC supports Trans Mountain's commitment to financially assist smaller vessels that are registered in WCMRC's FOSET program to be fitted with radar reflectors to enhance safety.

Finding 8: Based on information provided by Trans Mountain on the size and type of Project tankers, and considering the existing regulatory framework, the TRC has not identified a need for additional regulatory instruments.

⁹ *Collision Regulations*, C.R.C., c. 1416, rule 40. http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._1416/page-4.html.

3.2 Route Information

The shipping route to and from Trans Mountain's terminal to the open sea is well established and used by deep sea tankers as well as other vessel types such as cargo vessels, cruise ships, and ferries.

Liquid bulk carriers of the size proposed under the Project currently use the existing route to transport crude oil.

There are already a number of safeguards and requirements in place along the route that contribute to marine safety. The section below discusses existing safeguards and the enhancements Trans Mountain proposed.

3.2.1 Overall Route

A description of the route can be found in section 3.5/3.12 of Trans Mountain's TERMPOL submission. A route overview is also provided in Appendix 4.

The route is divided into seven segments that cover the area from the Westridge Marine Terminal through the Port of Vancouver, English Bay, Strait of Georgia, Boundary Pass, Haro Strait, Race Rocks, and Juan de Fuca Strait. The physical characteristics of each segment as well as current marine safety requirements are detailed. Of note, portions of the route cross into US waters.

Trans Mountain is proposing to add a requirement to its tanker acceptance criteria that Project tankers planning to leave Canada via the Juan de Fuca Strait must agree that, upon exiting the Juan de Fuca Strait, they will steer a course no more northerly than due West (270°), until the tankers are outside the Canadian Exclusive Economic Zone (EEZ), 200 nautical miles from Canada's coast. The routing requirement will ensure Project tankers will use the shortest route to exit the EEZ.

Finding 9: Trans Mountain's commitment to require via its tanker acceptance process that Project tankers steer a course no more northerly than due West (270°) upon exiting the Juan de Fuca Strait will enhance safety and protection of the marine environment by providing the shortest route out of the Canadian EEZ.

Canadian Hydrographic Service Charts

Trans Mountain examined Canadian Hydrographic Service Charts to identify any issues related to water depth along the route and found depths to exceed requirements, with a few known exceptions.¹⁰

The Canadian Hydrographic Service (CHS) is in the process of updating navigation charts for the Burrard Inlet based on recently obtained multi-beam survey data, which will provide a greater level of detail regarding water depths in the area. Since the Burrard Inlet is included in a portion of the route and

¹⁰ TERMPOL Review Process Study 3.6, page 1. Exceptions: First and Second Narrows, Westridge Terminal.

contains areas of known limited water depths, it is prudent Trans Mountain review any updates to CHS charts.

Pilotage

Pilotage involves using licensed pilots that board vessels in specific areas to navigate through difficult waterways to avoid local hazards. Pilots provide extensive expertise and knowledge of a local waterway for vessels travelling to and from Canadian ports.

The four Pilotage Authorities in Canada responsible for setting requirements for, and providing marine pilotage services in, all geographic areas of the country are the Atlantic Pilotage Authority, the Great Lakes Pilotage Authority, the Laurentian Pilotage Authority, and the Pacific Pilotage Authority. They regulate the requirements for compulsory pilotage within which certain classes of vessels, including oil tankers, must take a marine pilot with local knowledge on board before entering a harbour or busy waterway.

The *Pacific Pilotage Regulations* under the *Pilotage Act* govern pilotage activities in Canada's western waters. The Pacific Pilotage Authority is a federal Crown corporation whose mandate is to administer marine pilotage service in Canadian waters off the BC coast.

As per the *Pacific Pilotage Regulations*, every ship over 350 gross tons that is not a pleasure craft and every pleasure craft over 500 gross tons must use pilotage services except for ferries and certain government vessels. Therefore, all Project tankers will be subject to compulsory pilotage between the Westridge Marine Terminal and the Victoria Pilot Boarding Station, which represents a majority of the route in Canadian waters. In addition:

- Outbound laden tankers require two pilots to be on the bridge when transiting between three miles north of East Point and the Victoria Pilot Station.
- Inbound light tankers require one pilot onboard from the Victoria Pilot Boarding Station to English Bay, where the pilot is then relieved by another pilot who guides the tanker from English Bay to the terminal.

Proposed enhancements to pilotage requirements are discussed in Section 3.2.4.

Stemming from suggestions received during the hazard identification process, Trans Mountain suggests the BC Coast Pilots and Tug Masters should continue to train and improve pilotage and tug escort techniques and skills by using locally available Full Mission Ship Simulators. Such ongoing training and practice should include:

- advanced use of the Portable Pilot Unit
- docking/undocking manoeuvres
- familiarity with Second Narrows
- emergency scenarios that may occur in restricted waters

Pilots safely operate and guide vessels at a high rate of success. The Pacific Pilotage Authority places a priority on continuous improvement of pilotage techniques, spending between \$500,000 and \$1,000,000

annually on training. As the authority responsible for administering marine pilotage in BC, the Pacific Pilotage Authority will endeavour to train together with Tug Masters at local facilities and as much as possible. International training and simulation institutions may be used when necessary.

Tug Escort Program

Escort tugs provide an additional level of safety. They can be tethered or untethered and in an emergency, they can provide assistance in steering and stopping tanker vessels to reduce the probability of collision, grounding, or other incidents that may occur.

While there are no requirements to use escort tugs under the CSA, 2001, pilotage authorities and port authorities have requirements for tugs in place within certain geographic areas.

The Pacific Pilotage Authority requires the use of tethered and untethered escort tugs for certain inbound and outbound laden tankers between East Point and Race Rocks because:

- vessels of varying sizes and capacity use the waterway
- the waterway is relatively narrow
- there are several turns and required course adjustments
- there are converging traffic separation schemes
- vessels are travelling at varying speeds to pick up and drop off pilots at the Victoria Pilot Boarding station

Port Metro Vancouver also requires tug escort for inbound and outbound tankers travelling from Vancouver Harbour through the Second Narrows Movement Restriction Area. Requirements are outlined in its Port Information Guide, which includes a tug matrix indicating the number of tug escorts required to assist tankers.

Section 3.2.4 discusses proposed enhancements to the tug escort regime.

Canadian Coast Guard's Marine Communications and Traffic Services

Vessel Traffic Services zones have been established along Canada's east and west coasts as far as the limit of its territorial sea. Shipping in the zones is monitored by the Canadian Coast Guard Marine Communications and Traffic Services (MCTS). Under the CSA, 2001, vessels of 500 tonnes gross tonnage or more must report information about the vessel and its intended route, including pollutant cargoes and defects, to an MCTS officer 24 hours before entering Canadian waters. Vessels are not allowed to enter unless they receive clearance from an MCTS officer. A vessel believed to be in violation of Canadian regulations, including international conventions, can be directed not to enter Canadian waters or, if already in Canadian waters, directed to leave.

Once in Canadian waters, all large vessels, including oil tankers, are subject to vessel reporting requirements and must make regular reports at specified calling-in points.¹¹ Vessels of 300 tonnes gross tonnage or more engaged on an international voyage and domestic vessels of 500 tonnes gross tonnage or more (other than fishing vessels) must be fitted with an AIS as, discussed in Section 3.1.

The preferred shipping routes to and from the Westridge Terminal are within the Vessel Traffic Services zones. Project tankers will be required to communicate with Vessel Traffic Services operators in three MCTS centres along the route – Vancouver, Victoria, and Tofino. The Canadian Coast Guard is in the process of consolidating MCTS centres and modernizing its equipment. These changes may be in effect by the time the Project commences operations, if it is approved.

Further, the main shipping routes in and out of Vancouver cross the international boundary between Canada and the United States in a number of locations. Both the Canadian and US Coast Guards provide a joint Cooperative Vessel Traffic Service for these areas to provide a uniform approach and international efficiency in managing vessel traffic in contingent waterways. Portions of Trans Mountain's proposed route along the Juan de Fuca Strait cross into US waters, so Project tankers will also be required to communicate with the Puget Sound Vessel Traffic Services, operated by the US Coast Guard.

In addition, Project tankers will transit through the Turn Point Special Operating Area (located where Boundary Pass and Haro Strait meet) which has rules for the movement of Vessel Traffic Services participant vessels, including restrictions for one way traffic that will apply to Project tankers.¹²

Aids to Navigation

Shipping routes are marked by aids to navigation according to the Canadian Coast Guard's recognized levels of service for safe navigation to provide for safe and expeditious movement of marine traffic.

As part of the hazard identification process undertaken during its risk analysis, Trans Mountain held discussions with stakeholders to identify potential enhancements to the aids to navigation system for the route Project tankers would use. In consultation with the BC Coast Pilots, Trans Mountain identified four additional visual aids to navigation for specific portions of the shipping routes.¹³ Trans Mountain noted the suggested improvements do not stem from the Project and are not essential requirements, but items that could benefit all users.¹⁴

The proposed enhancements fall within the Canadian Coast Guard's Aids to Navigation Program and include:

- Establishing a navigational sector light on Berry Point (segment one)
- Introducing an additional Aid to Navigation to better mark the extent of Beaumont Shoal (segment five)

¹¹ *Vessel Traffic Services Zones Regulations*, SOR/89-98, s. 6. <http://laws-lois.justice.gc.ca/eng/regulations/SOR-89-98/page-2.html#h-6>.

¹² Information on the Special Operating Area can be found at: <http://www.ccg-gcc.gc.ca/RAMN2012/Pacific/Part3>.

¹³ TERMPOL Review Process Study 3.5/3.12, page 23

¹⁴ *Ibid*, page 22

- Installing an Aid to Navigation on Admiralty Point, Belcarra (segment one)
- Installing Range Lights located strategically close to the shore in West Vancouver to provide an additional guide to outbound vessels (segment two)

In response, the Canadian Coast Guard notes its Aids to Navigation Program provides aids to navigation where the volume of traffic and the degree of risk justify them. It will conduct a thorough review using the national standards to determine the aids to navigation requirements for safe and efficient navigation in the area in consultation with mariners, Trans Mountain, and other authorities as required. The review will:

- Follow the Canadian Coast Guard's national design methodology and provision directives before the new terminal is built if the Project proceeds.
- Identify the responsible authority to implement and maintain new aids to navigation.

A key consideration is that the Canadian Coast Guard does not provide aids to navigation that will solely benefit a single or a small number of users, for example aids to navigation specific to berthing tankers at Trans Mountain's facility.

Established aids to navigation currently provide services to vessels along the identified tanker route. The systems of aids along the route meet Canadian Coast Guard levels of service and national standards for provision and are designed for the existing volume and nature of marine traffic.

Recommendation 3: Trans Mountain should provide information when requested by the Canadian Coast Guard, to facilitate the Canadian Coast Guard's evaluation of the proposed additional navigation aids.

Trans Mountain also suggests improvements to aids to navigation that provide information to mariners such as radar and tide and current gauges.

A few of the suggested enhancements fall within Port Metro Vancouver jurisdiction. Trans Mountain suggests Port Metro Vancouver provide a reliable real time Tide & Current Gauge at the Second Narrows and First Narrows, with data transmittable to the pilots' Portable Pilot Unit and/or other electronic devices. This type of aid to navigation is already in place at Second Narrows. Options for the First Narrows are being explored by the Canadian Hydrographic Service and Port Metro Vancouver.

Lastly, Trans Mountain notes that signals of the existing GPS/DGPS system may be affected by interference, especially in urban areas. The status of the system is monitored by, amongst others, the pilots through their Portable Pilot Units. In such circumstances, all vessels under guidance of a pilot are able to either continue passage or bring the vessel to a safe anchorage.

The BC Coast Pilots currently use satellite positioning receivers that use GPS and WAAS systems. The BC Coast Pilots are moving towards using receivers that use multiple global positioning satellite systems for navigation, which will enhance safe navigation of all large commercial vessels including tankers by pilots.

Finding 10: The TRC supports the BC Coast Pilots' plan to use receivers that use multiple navigation systems, which will enhance safe navigation of tankers by pilots.

Fishing Activities

As Trans Mountain notes, commercial, recreational, and traditional fishing activities take place throughout the coastal waters of BC and along the proposed route.

Direct interactions between Project-related tankers and other marine users, including fishing vessels, are reasonably expected to occur within the shipping lanes and the area immediately beyond the shipping lanes. A suite of safety measures are in place along the proposed route that guide interactions between vessels to avoid collisions and contribute to marine safety. A comprehensive vessel routing system aimed at reducing the risk of casualties exists and includes traffic separation schemes and precautionary areas. Traffic separation schemes serve to separate opposing streams of traffic by establishing traffic lanes to:

- reduce incidences of head-on collisions;
- reduce dangers of collisions between crossing traffic and shipping in established lanes; and
- simplify patterns of traffic flow in converging areas.

Collision Regulations Rule 10 (i) and (j) require vessels under 20 metres, sailing vessels, and fishing vessels not to impede power-driven vessels following a traffic lane. Additional rules are also outlined in Port Metro Vancouver's Port Information Guide¹⁵ and the *Fisheries Act*, Section 24, which includes rules related to vessels' use of fishing nets and prohibits using nets in a manner or place that obstruct the navigation of boats and vessels.

Other Activities in the Area

Although military exercise areas exist along the route, they are well marked and mariners are informed of any activities via the Canadian Coast Guard's Notice to Mariners.¹⁶

There is a moratorium on offshore exploration in the EEZ along the west coast so Project tankers are not expected to encounter any offshore exploration activities.

The Vancouver water aerodrome landing zone also does not pose a concern as it is south of the main vessel traffic routes.

3.2.2 Navigability and Vessel Operations

Fast-time simulations were not carried out for the entirety of the route, as Aframax class tankers currently use the proposed route, demonstrating that tanker manoeuvrability issues are not a concern. No concerns were identified during fast-time simulations carried out in the areas surrounding the terminal. Trans Mountain will conduct real-time simulations around the terminal, in consultation with Port Metro

¹⁵ A copy of the PMV Port Information Guide can be found at: <http://www.portmetrovancover.com/docs/default-source/port-users-marine-operations/port-information-guide-version-8-2.pdf?sfvrsn=0>.

¹⁶ TERMPOL Review Process Study 3.2, page 10

Vancouver, the Pacific Pilotage Authority, and BC Coast Pilots, to confirm various berthing requirements such as minimum safe speeds, navigability of tankers, and operational requirements for tugs.¹⁷

Recommendation 4: Trans Mountain should carry out real time simulations for the areas surrounding the terminal in full consultation with Port Metro Vancouver, the Pacific Pilotage Authority, and BC Coast Pilots; after completion of the detailed design.

Port Metro Vancouver Practices and Procedures

Project tankers will transit through areas under the Port Metro Vancouver jurisdiction, and be required to abide by the Port's Practices and Procedures set out in its Port Information Guide.¹⁸

Project tankers will transit through the Second Narrows, which forms a natural bottleneck of water in the Burrard Inlet. As such, the Second Narrows has been designated a Movement Restriction Area (MRA) by Port Metro Vancouver and is administered by the Canadian Coast Guard from its Marine Communications and Traffic Services Centre in Vancouver through a Memorandum of Understanding between the Canadian Coast Guard and Port Metro Vancouver. The MRA has additional process and procedural requirements in place which Trans Mountain will be required to comply with to ensure safe navigation and efficient operation of its tankers.¹⁹

MRA procedures dictate restrictions on operational periods, speed, and draft based on channel depth and width that will impact Project tankers. Trans Mountain is aware of the existing restrictions and discussed them at length in its TERMPOL submission, and has indicated Project tankers will comply.

Trans Mountain will conduct real time simulations when the detailed terminal design is complete, to confirm the navigability of tankers from the Second Narrows MRA and/or anchorage locations in Indian Arm to Westridge Terminal.

Project tankers will also be required to follow procedures related to transit through First Narrows, including restrictions on passing or overtaking vessels and complying with requests for clear narrows when necessary.

Channel Width Requirements

The TERMPOL guidelines indicate that one-way channel width should be at least four times the design vessel's breadth and two-way channel width should be at least seven times the design vessel's breadth. Trans Mountain indicates Project tankers will be Aframax class tankers that have a beam of 44 meters,

¹⁷ TERMPOL 3.5/3.12, page 36

¹⁸ Appendix 5 provides a map of PMV's navigational jurisdiction.

¹⁹ Port Metro Vancouver. *Second Narrows Movement Restriction Area Procedures* (2010)

<http://www.portmetrovancover.com/docs/default-source/port-users-marine-operations/second-narrows-mra-procedures.pdf?sfvrsn=0>.

resulting in a two-way channel width requirement of approximately 308 meters, although Trans Mountain uses an estimate of 350 meters in its calculations.²⁰

The two-way channel width guideline is met along the entirety of the route, except through the Second Narrows, which is a Port Metro Vancouver designated MRA and where vessels are directed by Canadian Coast Guard MCTS Vancouver. To be able to transit through the Second Narrows, Aframax class tankers are limited to, among other restrictions, daylight transit in slack water conditions, one-way transit, clear narrows, two pilots, special trim requirements, and additional tug assist.

In addition, Canadian Coast Guard, Permanent International Association for Navigation Congress (PIANC), and Port Metro Vancouver guidelines indicate a minimum channel width of 2.85 times the beam of a vessel is required for vessels in transit. Under the guidelines, Aframax class tankers need a one-way channel width of 125.4 meters, a requirement met for all portions of the route.

To improve movement of two-way traffic near the Westridge Marine Terminal Trans Mountain requests:

- Redesign of the “shipping channel” in the eastern section of Port Metro Vancouver between Second Narrows and Port Moody.
- Port Metro Vancouver consider adjusting the location of Indian Arm anchorages specifically Mike, Kilo, Lima, and November, and create a two-way navigation channel in the vicinity of the Westridge Marine Terminal to improve navigational clearances between the terminal, anchored vessels, and passing vessels.

Port Metro Vancouver reviewed the request by Trans Mountain, independently and within the TRC. Based on the proposed design of the berth arrangement at the Westridge Terminal and on work completed by Port Metro Vancouver so far in the form of a draft channel design east of Second Narrows, Port Metro Vancouver agreed in principle that vessel traffic could be safely managed around the terminal. However, because the berths proposed under the Project extend further out than the existing berth at Westridge Marine Terminal, they could impact the way in which vessels manoeuvre past the terminal, to and from other terminals east of Second Narrows and to and from the anchorages east of Second Narrows.

As a result, Port Metro Vancouver requested that an independent complete a Passing Vessel Analysis on behalf of Trans Mountain. Port Metro Vancouver requested the analysis take into account the proposed berth layout and determine the safety parameters for all manoeuvring situations that may result east of Second Narrows.²¹

Trans Mountain provided the results of the Passing Vessel Analysis to Port Metro Vancouver.²² The results indicate that:

- The minimum distance between inbound traffic within the proposed channel and a moored vessel at Berth 3 of the proposed expanded terminal is approximately 190 meters.

²⁰ TERMPOL Review Process Study 3.5/3.12, page 27

²¹ On September 5, 2014, Trans Mountain provided a revised proposed berth layout to the TRC. The revised layout does not impact the results of the Passing Vessel Analysis.

²² Moffatt & Nichol. *Passing Ship Analysis* (2014).

- The proposed channel will require adjusting some existing designated anchorages in the area.

Finding 11: Port Metro Vancouver intends to use the results of the Passing Vessel Analysis provided by Trans Mountain to inform redesign of the channel in the eastern section of the Burrard Inlet between Second Narrows and Port Moody, and the location of the anchorages east of Second Narrows.

Recommendation 5: Should changes to current channel design near Westridge Marine Terminal occur due to the results of the Passing Vessel Analysis provided to Port Metro Vancouver by Trans Mountain, Trans Mountain should run trial transits to observe the real effects of passing traffic on moorings and tankers at the terminal post construction. They may do this in conjunction with Port Metro Vancouver, the Pacific Pilotage Authority, and Transport Canada as an observer. Trans Mountain should incorporate any observations made during the trials into the terminal's mooring and transit plans.

Channel Depth Requirements

The TERMPOL guidelines indicate a vessel's underkeel clearance (UKC) should be 15% of its maximum permissible draught, or meet requirements established and published by the appropriate government authority for a specific waterway.

A fully loaded Aframax class tanker has a maximum loaded draught of 15.5 metres. However, Port Metro Vancouver's (PMV) Movement Restriction Area (MRA) draught rules dictate a vessel can only have a maximum loaded draught of 13.0 meters, so Aframax tankers are partially loaded to ensure they are in compliance with Port Metro Vancouver MRA draught rules. Changes to the draught rules by 2018 may allow for vessels to have a maximum loaded draught of 13.5 meters, but Project tankers will still have to be partially loaded to meet the updated requirements.

Taking into account dynamic vessel motions, vessel squat, sag and hog, and Port Metro Vancouver MRA trim requirements, the dynamic draught for a Project tanker is calculated at 14.0 metres and must have a minimum water depth of 16.1 metres to meet the 15% UKC guideline.

The depth requirement is met along all portions of the route, with the exceptions of the First Narrows, Second Narrows, and the area around the Westridge Terminal.²³

As noted previously, all three areas fall within PMV jurisdiction. PMV MRA requirements dictate a large vessel must have a UKC of 10% (based on static draught), which requires a water depth of 14.9 metres. PMV considers the lower level of UKC reasonable because the area is well charted and PMV's MRA restrictions require low speeds and tidal assist in the First and Second Narrows to ensure appropriate level of water depth and clearance by large vessels. Pilotage and tug requirements provide further safeguards. Trans Mountain has also committed to ensuring its berth layout will accommodate at least 10% UKC for its tankers, in compliance with PMV MRA rules.²⁴

²³ TERMPOL Review Process Study 3.6, page 10

²⁴ Ibid, page 11

Finding 12: Underkeel clearance requirements are met along the entirety of the route.

Vertical Clearance Restrictions

As part of the proposed route, Project tankers will navigate through Vancouver Harbour, portions of which have limited vertical clearances. Specifically, the limiting vertical clearance for transit of the Second Narrows is 44 metres (Ironworkers Bridge), 46 metre at the CN Bridge once it is raised, and 61 metres at the Lions Gate Bridge in the First Narrows. Project tankers should be aware of the identified vertical clearance restrictions and ensure they will not pose an issue.

Safe Operating Speeds and Transit Windows

In line with current practice, Trans Mountain estimates safe operating speeds for tankers will vary from six knots to 14.5 knots, depending on the location and restrictions in place by authorities. The route is approximately 160 nautical miles in total. Transit from the terminal to the 12 mile nautical limit will take approximately 14 to 15 hours.²⁵

In its submission, Trans Mountain analysed the influence of Port Metro Vancouver Movement Restriction Area (MRA) transit window restrictions, weather, and other factors effecting vessel loading on vessel movements, berth availability, and potential delays for its tankers. Results indicated projected transit times and delays will be within industry norms and that Project tankers will not impede access for other vessels to transit windows or anchorages.²⁶ However, Project tankers will impact movement of vessels within the MRA.

Recommendation 6: Trans Mountain should discuss with Port Metro Vancouver and the Canadian Coast Guard the effects of the Project on available transit windows and the movement of vessels within the MRA.

Anchorage

In line with TERMPOL guidelines, Trans Mountain identified viable anchorage and emergency anchorage possibilities. Trans Mountain notes emergency anchorages are available and can be used, with the exception of the anchorage near Port Renfrew, which is too rocky for Project tankers to use safely.²⁷ Of note, the anchorages east of Second Narrows, which are currently used by tankers to meet MRA requirements or await a berth at the terminal, may be adjusted based on the results of the Passing Vessel Analysis requested by Port Metro Vancouver. Canadian Coast Guard Marine Communications and Traffic Services officers currently provide anchorage assistance and anchor monitoring services as outlined in the Memorandum of Understanding between the Canadian Coast Guard and Port Metro Vancouver. This practice is currently under review.

²⁵ TERMPOL Review Process Study 3.7, page 3

²⁶ Ibid, page 11

²⁷ TERMPOL Review Process Study 3.5/3.12, page 35

Weather and Sea Conditions

An oil tanker crew considers a number of factors 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
- 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.

Trans Mountain indicates 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.²⁸

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 MRA, where vessels are not permitted to continue transit if weather prevents them from staying on course. Since its inception, the Pacific Pilotage Authority has not had to abort a transit due to poor weather, and ensures its pilots exercise the practices of good seamanship in adverse weather conditions.

***Finding 13:** Because weather conditions along the route have never caused a pilot to abort a transit, it is the view of the TRC that weather related restrictions beyond existing requirements are not necessary at this time.*

Trans Mountain suggests introducing an Ocean Data Acquisition System (ODAS) or 'Smart' buoy for monitoring weather and environmental conditions in the southern Strait of Georgia, similar to the one at Halibut Bank, able to transmit information to pilots' Portable Pilot Unit on a real time basis. The suggestion falls under the jurisdiction of Environment Canada, which has determined that environmental and sea state conditions are adequately monitored in southern Strait of Georgia for marine weather forecasting purposes. As a result, the Meteorological Service of Canada has no plans to install additional marine weather forecasting stations/buoys in the southern Strait of Georgia. Wind observations are available from the nearby Sand Heads Light station, the Tsawwassen Ferry terminal, Saturna Island, the Vancouver International Airport, and Kelp Reefs. Sea state observations are available from Environment Canada's buoy at Halibut Bank, which can be used to forecast sea state in conjunction with numerical wave height prediction systems for a location southeast 50 km to the US/Canada boundary.

²⁸ TERMPOL Review Process Study 3.5/3.12, pages 18 and 19

***Finding 14:** It is the TRC's view that an additional ODAS buoy is not required in the southern Strait of Georgia to monitor weather and environmental conditions, as the area is already adequately monitored.*

3.2.3 Marine Traffic Considerations and Additional Traffic Controls

Fishing vessels, tugs, cargo ships, ferries, and recreational vessels all use the waters near the proposed shipping route. Trans Mountain had marine traffic studies done for the Project, which identified and counted the vessel traffic in the area. The studies considered current vessel traffic information from the Marine Exchange of Puget Sound, and forecast future vessel traffic based upon the area's trends and plans as provided by Seaport Consultants. Expansion plans considered in calculations included the Deltaport expansion, Roberts Bank Terminal 2, expansion of terminals at Vancouver Harbour, and the Pacific Gateway Terminal at Cherry Point.

Study results indicate the proposed Project will increase sailed nautical miles for tankers by an average of 70% and for all vessels by an average of 3.2%.²⁹ Project oil tankers will, on average, add up to two vessel transits per day to the existing vessel traffic in the area. The increase in large vessel transits per day is unlikely to pose a significant safety issue, especially when also considering:

- the characteristics of the shipping route;
- current vessel traffic;
- the national, including international, regulatory frameworks governing safe navigation and collision avoidance;
- the comprehensive traffic routing measures, with traffic separation schemes;
- Vessel Traffic Services; and
- mandatory pilotage, including additional requirements for oil tankers in the area.

To assist with traffic control in particular areas, Trans Mountain requests the TRC consider:

- applying similar rules and restrictions associated with meeting traffic at Turn Point to East Point and Discovery Island as well; and
- additional scheduling at Boundary Pass, East Point and Race Rocks for all transiting vessels as well as consideration of a priority system for loaded tankers.

The BC Coast Pilots and Pacific Pilotage Authority have reviewed traffic levels around East Point and Discovery Island, and determined they have robust mitigation measures in place to manage piloted traffic effectively. Additionally, the areas of greatest concern along the route already have supplemental measures in place.

***Finding 15:** At this time, it is the TRC's view that additional traffic control measures around the East Point area proposed by Trans Mountain are not necessary.*

Trans Mountain also suggests adopting an effective method of monitoring and controlling small craft in the vicinity of the First and Second Narrows, 'TA' buoy west of Roberts Bank, East Point, and/or the

²⁹ TERMPOL Review Process Study 3.2, pages 56-57

mouth of the Capilano River when larger traffic is scheduled to transit, using for example, the Port Metro Vancouver (PMV) Harbour Master's or Vancouver Police Department's launch.

As indicated in PMV's Port Information Guide, the Harbour Master's launch is available to clear traffic and provide escort services through First and Second Narrows during operational periods for certain traffic. The PMV does not provide escort services outside operational hours and may not provide them if a pressing operational matter or emergency situation takes precedence.

Trans Mountain has indicated it supports cost recovery, such as fees for service, for PMV to extend its escort services. Extending escort service would help the master/pilot of a Project tanker avoid the need to take evasive action to avoid smaller vessels, by deterring such vessels from approaching or coming too close to a Project tanker in congested areas.

Recommendation 7: Trans Mountain should discuss with Port Metro Vancouver the possibility of extended traffic clearance and escort services by the Port Metro Vancouver Harbour Master's launch within Port Metro Vancouver boundaries.

Lastly, Trans Mountain proposes formalization of the existing practice of using tethered tugs and passing at reduced speed for large commercial vessels passing the Westridge terminal. PMV requested an independent party complete a Passing Vessel Analysis on behalf of Trans Mountain to determine the necessity and feasibility of the request. The analysis was done and results were provided to PMV.

Finding 16: Port Metro Vancouver intends to use the results of the Passing Vessel Analysis provided by Trans Mountain to determine the need for any further requirements in the Burrard Inlet between Second Narrows and Port Moody to ensure safe navigation.

3.2.4 Proposed Risk Mitigation Measures

If the proposed Project proceeds, the risk of incidents and spills will increase due to the greater number of tankers that will transit the waterway. To address the increase and return risk levels to a near pre-Project state, Trans Mountain proposes two main mitigation measures: enhanced tug escort and a laden tanker moving exclusion zone.

Per Det Norske Veritas' (DNV) risk analysis, drift grounding is one of the most likely causes of an incident that could lead to an oil spill. An escort tug can serve as a mitigation measure. DNV applied the risk mitigation measure to its MARCS model and found that requiring tug escort for outbound laden tankers for the duration of the sailing route reduces risk of a spill from drift grounding. As such, Trans Mountain proposes untethered tug escort for outbound laden tankers through portions of the route that do not have such requirements in place be considered, and has assessed the availability of suitable tugs for such a purpose.³⁰

Further to DNV risk assessment results, Trans Mountain had supplementary simulation studies conducted to assess the effectiveness of the proposed enhanced untethered tug escort in assisting with prevention of

³⁰ Robert Allan. *An Evaluation of Local Escort and Rescue Tug Capabilities in Juan de Fuca Strait* (2013).

a tanker casualty, such as a grounding or collision, with another vessel in the Strait of Georgia and Juan de Fuca Strait.³¹

Study results indicate that, for any failure, the presence of an untethered tug escort within one nautical mile of the tanker ensures the pilot has an effective means of regaining navigational control within ten minutes of experiencing a major steering or propulsion failure. Tug presence will also add certainty to the level of support and assistance available to the tanker. Further, extending the pilot disembarkation area and tethered tug escort for Trans Mountain tankers west of the Race Rocks area will help guide tankers beyond the shoals of Race Rocks and effectively eliminate the response time for tug assist and associated risk of grounding in the event of a tanker mechanical failure. Based on the simulation results, the studies recommend:

- Extending the Second Narrows tethered tug escort for laden tankers to two miles southwest of Point Atkinson.
- Implemented single untethered tug escort from two nautical miles southwest of Point Atkinson to three nautical miles north of Rosenfeld Buoy (entrance to Boundary Pass), with a recommended maximum tanker speed of 11 knots, and maximum distance of one nautical mile between the tanker and tug.
- Extending single untethered tug escort for laden tankers from two nautical miles west of Constance Bank to a position abreast of Sombrio Point, with a recommended maximum tanker speed of 11 knots and distance of one nautical mile between the tanker and tug.
- Requiring tugs responsible for the duties described to be ‘escort capable’ and able to produce a dynamic line load of 70 tonnes at a speed of ten knots.
- Giving consideration to assigning untethered escort to a position within one nautical mile ahead of the tanker as a means to aid situational awareness and help prevent close quarter situations from developing with other nearby vessels.
- Extending the location of the pilot disembarkation zone and termination of tethered tug escort west of Race Rocks if possible.

To mitigate the risk of oil spills due to collision, Trans Mountain proposes introducing a laden tanker moving exclusion zone around its Project tankers to reduce the probability of collision with other large vessels. The moving exclusion zone would require other vessels to provide outbound laden Project tankers with a wide berth for the entire route to the entrance of Juan de Fuca Strait. Ship personnel and authorities ashore would apply and manage the zone via verbal warnings transmitted by Marine Communications and Traffic Services via VHF radio.

DNV’s analysis identifies collision as one of the most likely causes of an incident that could lead to an oil spill, and assesses the effectiveness of a laden tanker moving exclusion zone as a mitigation measure. DNV estimates the laden tanker moving exclusion zone will reduce collision frequency.

³¹ LANTEC Marine Incorporated. *Summary Report of Manoeuvring Assessment Strait of Georgia Proposed Tug Escort* (2014).

LANTEC Marine Incorporated. *Summary Report of Maneuvering Assessment Juan de Fuca Strait Proposed Tug Escort* (2014).

On October 8, 2013, Trans Mountain wrote to the Canadian Coast Guard and the United States Coast Guard, the managers of the Joint Cooperative Vessel Traffic System (CVTS), to request that a laden tanker moving exclusion zone be introduced around all laden tankers in the region as part of continuous improvement of waterways management practices. In its response, the CVTS deferred a decision on the matter until after the TRC reviewed and responded to the request.

The TRC has dedicated a significant portion of its review of Trans Mountain's submission to assessing the proposal for a laden tanker moving exclusion zone. In the absence of clear data on the effectiveness of the proposed moving exclusion zone in reducing collisions over existing measures, the TRC has had difficulty clearly identifying its benefits to marine safety. As noted in Section 3.2.1, the increase in large vessel transits per day is unlikely to pose a significant safety issue, especially considering the:

- characteristics of the shipping route;
- current vessel traffic;
- national, including international, regulatory frameworks governing safe navigation and collision avoidance;
- comprehensive traffic routing measures, with traffic separation schemes;
- Vessel Traffic Services; and
- mandatory pilotage, including additional requirements for oil tankers in the area.

In addition, the TRC has identified a number of considerations related to the proposed laden tanker moving exclusion zone including unprecedented length of application, complexity of implementation and effect on the transit of other vessels, and enforcement.

Moving exclusion zones are not common, not recognized by the International Maritime Organization or SOLAS, and have no standards or harmonized practices governing them. Some examples of moving exclusion zone type measures are local prohibitions and navigation restrictions, which have been implemented as part of special port operating rules to help manage local traffic situations. Such examples allow particular vessels to safely navigate certain areas due to particular hazards of a local channel or confined area, where the vessels cannot safely transit or manoeuvre without the moving exclusion zones. Some moving exclusion zones exist to address marine security concerns. For example, some foreign ports have exclusion zones for loaded Liquefied Natural Gas (LNG) vessels within port authority boundaries and, predominantly, for marine security purposes.

In Canada, exclusion zones exist in very limited local areas within a port authority's jurisdiction and where traffic can be closely monitored and controlled. For example:

- The Saint John Port Authority has established an exclusion zone and harbour restrictions for crude oil tankers and LNG vessels within harbour limits.
- Port Metro Vancouver, as mentioned previously, has established a Movement Restriction Area (MRA) to regulate vessel movements within Vancouver Harbour.

Trans Mountain, however, is proposing a moving exclusion zone for laden oil tanker transits over the entirety of the 160 nautical mile route, which could impact other vessels using the traffic system.

Consideration must also be given to how a laden tanker moving exclusion zone would fit into the existing marine safety regime. A suite of safety measures are already in place that contribute to marine safety and deter collisions along the proposed route.

Specifically, the *Collision Regulations* set out:

- rules vessels must follow to prevent collisions while in Canadian waters and are familiar to both national and international mariners, as they follow the *Convention on the International Regulations for Preventing Collisions at Sea*. Rules include actions to take in head-on situations, crossing situations, and overtaking situations; and
- responsibilities between vessels and rules for traffic separation schemes.

All mariners are required to respect these “rules of the road”. The laden tanker moving exclusion zone could conflict with or cause confusion regarding the *Collision Regulations*.

There are also requirements for mandatory pilotage for large vessels, Vessel Traffic Services, traffic separation schemes, and the following segment specific measures:

Segment 1 & 2 Terminal to English Bay

As discussed in Section 3.2.2, the Second Narrows has an MRA in place to restrict movement of vessels, which is administered by Canadian Coast Guard officers in the Vancouver Marine Communications and Traffic Services Centre. In addition to MRA requirements, Port Metro Vancouver requires tug escort for inbound and outbound tankers travelling from Vancouver Harbour through the MRA. Requirements are outlined in the Port Metro Vancouver’s Port Information Guide, which includes a tug matrix indicating the number of tugs required to assist tankers. In addition, the Port Metro Vancouver Harbour Launch provides assistance in clearing small traffic during operational hours.

Segment 5 Boundary Pass/Haro Strait to Pilot Station

As discussed in Section 3.2.2, the Pacific Pilotage Authority requires use of tethered and untethered escort tugs for certain inbound and outbound laden tankers between Boundary Pass and Race Rocks, as outlined in its Notice to Industry. The requirements are in place because:

- vessels of varying sizes and capacity use the waterway;
- the waterway is relatively narrow;
- there are several turns and required course adjustments;
- there are converging traffic separation schemes, and
- vessels are travelling at varying speeds to pick up and drop off pilots at the Victoria Pilot Boarding station.

Also:

- The Pacific Pilotage Authority has implemented double pilotage and other operational requirements for large laden tankers transiting through the area.
- Turn Point is designated as a Special Operating Area for Vessel Traffic Services participant vessels, with rules in place regarding movement of vessels, including restrictions to one way traffic for certain sized vessels.

It is the TRC's position that implementing the laden tanker moving exclusion zone concept for the entire length of the passage (approximately 160 nautical miles) would present many challenges, and limited benefits, to navigation safety. It would also be physically and logistically difficult to apply effectively. Additionally, a mandatory laden tanker moving exclusion zone would have to be enforceable to be effective. Therefore, after significant analysis, the TRC cannot support the moving exclusion zone proposal.

However, the TRC does support implementation of the measures outlined below to enhance safety.

A) Trans Mountain's proposed new measures

The TRC supports extending tethered tug escort to Point Grey and tug escort through Strait of Georgia to Boundary Pass. The Pacific Pilotage Authority has indicated it will develop a Notice to Industry outlining the revised requirements for tug escort in the area.

Finding 17: The TRC supports proposed enhancements to tug escort for outbound laden Project tankers in the Strait of Georgia.

Recommendation 8: Trans Mountain should develop a tug matrix identifying appropriate tug specifications for untethered tug escort of Project tankers for the Strait of Georgia in consultation with the Pacific Pilotage Authority, BC Coast Pilots, and Transport Canada.

The TRC also supports extending the pilot disembarkation zone and tethered escort to an area in the vicinity of Race Rocks, weather permitting. It is recognized pilot transfer does not occur in the vicinity of the precautionary area south of Race Rocks.

Should the pilot disembarkation zone for Project tankers be extended, the Pacific Pilotage Authority has indicated helicopter transportation of pilots may be considered for operational purposes. Transport Canada's *Guidelines Respecting Helicopter Facilities on Ships* (TP 4414) should be referenced.

Finding 18: The TRC supports extending the pilot disembarkation zone and tethered tug escort requirements for Project tankers to an area in the vicinity of Race Rocks, weather permitting and subject to the requirements identified in a Pacific Pilotage Authority 'Notice to Industry'.

Further, the TRC supports tug escort from Race Rocks to the entrance of Juan de Fuca Strait (Buoy Juliet).

Recommendation 9: Trans Mountain should implement extended untethered escort for outbound laden Project tankers through the Juan de Fuca Strait.

Recommendation 10: Should Trans Mountain revise its tanker acceptance process to require untethered tug escort of Project tankers through the Juan de Fuca Strait, it should develop a tug matrix identifying appropriate tug specifications in consultation with the Pacific Pilotage Authority and Transport Canada.

Trans Mountain has indicated that it will require, via its tanker acceptance process, that tankers nominated to load at Westridge terminal have an arrangement for an enhanced tug escort along the entirety of the outbound route to the entrance of the Juan de Fuca Strait.

B) Other new measures

To further mitigate risk of collision and to enhance situational awareness, the TRC is of the view that tankers under escort could make VHF safety calls as outlined in the *VHF Practices and Procedures Regulations* under the CSA, 2001. In addition, the TRC recognizes there are concerns related to interactions between small vessel traffic and tankers. Increased education about safe boating practices around large vessels, which have limited manoeuvrability and sight, and to reinforce existing regulations will be beneficial. Consequently, the TRC recommends that the Pacific Pilotage Authority, BC Coast Pilots, and Canadian Coast Guard Marine Communications and Traffic Services work together to outline the details for proposed safety calls.

Finding 19: Appropriate use of VHF safety calls can enhance situational awareness for other vessels of Project tanker movements.

In addition, the TRC recommends that Trans Mountain work with appropriate authorities to develop an engagement and awareness strategy about safe navigation and collision prevention for recreational boaters, fishing vessel operators, and operators of small vessels. The Pacific Pilotage Authority has indicated it is willing to lead the effort.

Recommendation 11: 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 has indicated it is willing to financially support such an initiative. The TRC encourages Trans Mountain to leverage partnerships with existing boating safety organizations to promote awareness. The Canadian Marine Pilotage Association has produced a video entitled ‘Stay Clear to Stay Afloat’, which may serve as an example of an effective engagement and awareness strategy.

Finding 20: The TRC supports Trans Mountain’s commitment to provide financial support for an enhanced education campaign for small vessel operators about safe boating practices.

Due to the increased use and role of tugs, strong communication between tug masters and tankers will be essential. The Standards for Training, Certification and Watchkeeping (STCW) Convention, in particular Regulation VIII/2, outline requirements for watchkeeping arrangements and principles for masters and all watchkeeper personnel. Compliance will ensure safe continuous watch or watches appropriate to the prevailing circumstances and conditions are maintained on vessels at all times. The BC Coast Pilots have been conducting simulator training with pilots, apprentice pilots, and tug masters for a number of years to ensure appropriate bridge management. Further to this, the TRC recommends the Pacific Pilotage Authority and BC Coast Pilots, in consultation with escort tug masters, develop guidance on communication between masters and watchkeeping personnel as reflected in the STCW Code Section A-VIII/2.

Finding 21: The Pacific Pilotage Authority and BC Coast Pilots have indicated they will, in consultation with escort tug masters, develop guidance on communication between masters and watchkeeping personnel as reflected in the STCW Code Section A-VIII/2.

Lastly, and in light of the above, the TRC recommends the Pacific Pilotage Authority update its applicable Notice to Industry to outline use of *Sécurité* safety calls while considering proper bridge resource management protocols.

*Finding 22: The Pacific Pilotage Authority has indicated it will update its applicable 'Notice to Industry' to outline use of *Sécurité* safety calls while considering proper bridge resource management protocols.*

The additional measures outlined above, in conjunction with the existing regime, will further enhance marine safety and support safe navigation and shared use of the waterway by small and large vessel traffic.

Trans Mountain should work with the appropriate authorities to determine which measures could be considered for phased implementation or trials.

3.3 Terminal Operations

Trans Mountain will undertake the mitigation measures discussed below to help reduce risk of a spill at the Westridge Marine Terminal. Many of the measures are already in place.

As per Trans Mountain's proposal, only oil tankers that meet its tanker acceptance criteria and requirements will be allowed to call at the Westridge Marine Terminal. Tankers will also be required to follow the International Safety Guide for Oil Tankers and Terminals (ISGOTT) Oil Companies International Marine Forum (OCIMF) guidelines.³² For example, before the tanker's arrival, the crew will have completed checks in accordance with International Safety Management Code requirements and the onboard safety management system.³³ In addition a Ship-Shore Safety Checklist, per ISGOTT recommendations, will be completed by tanker and terminal staff as part of a safety meeting before starting cargo transfer.³⁴ Completing the checklist is mandatory for all liquid bulk terminals within Port Metro Vancouver jurisdiction and is in its Port Information Guide.

Recommendation 12: Trans Mountain should include the ISGOTT safety checklist in its Terminal Operations Manual for reference. It should include a checklist with additional terminal specific safety items that tankers must be aware of within the Manual, as well.

A Loading Master familiar with the design and layout of the terminal will be present during tankers' arrival to confirm they meet acceptance criteria, and that safety and terminal best practices are being followed. The Loading Master has the authority to stop or abort cargo transfer operations if required.³⁵

Finding 23: Trans Mountain's existing practice of having a dedicated loading master present at Westridge Marine Terminal provides an added measure of safety to cargo transfer operations.

3.3.1 Marine Terminal

Trans Mountain has submitted plans and development studies outlining its commitment to design, build and operate the proposed marine terminal to meet the applicable standards, codes, and industry best practices such as those outlined in ISGOTT, by the IMO, and OCIMF. The full list of relevant codes and standards are listed in Trans Mountain's study.³⁶ The National Energy Board will review the construction and operation of the marine terminal. It was not examined as part of the TRC's review or this report.

The expanded Westridge Marine Terminal will accommodate three new berths. Expected as well are:

- on-site docking of at least one tug; and

³² TERMPOL Review Process Study 3.10, page 48

³³ TERMPOL Review Process Study 3.11, page 25

³⁴ Ibid, page 26

³⁵ Ibid, page 20

³⁶ TERMPOL Review Process Study 3.10, pages 38-39

- a utility berth for smaller vessels to accommodate spill response and service vessels used to deploy containment booms.³⁷

The existing berth will remain in operation until construction is complete, and be decommissioned after that point. Terminal operations will expand accordingly. Preliminary engineering to determine design and layout of the terminal has been completed, and detailed design and engineering will be completed if regulatory approvals are received. The detailed design phase will include site specific surveys to gather appropriate bathymetric data and a detailed geotechnical assessment.³⁸

Trans Mountain has carried out fast-time simulations to determine suitability of the terminal location and orientation, and will complete real-time simulations around the terminal during the detailed design phase to confirm various berthing requirements such as minimum safe speeds, navigability of tankers, and operational requirements for tugs.³⁹

In its submission, Trans Mountain notes private aids to navigation marker lights will comply with the International Association of Lighthouse Authorities standards and will be mounted on the outer east and west vertical face of the dolphin pile caps. Details related to the navigation lights, such as colour and intensity, will be confirmed with the Pacific Pilotage Authority, Transport Canada, and the Canadian Coast Guard.⁴⁰

Management and environmental concerns about the location and construction of the marine terminal are outside the authority and scope of the TERMPOL review, with the exception of two issues:

- As an oil handling facility, the terminal must meet oil spill planning, preparedness and response requirements. This report discusses oil spill preparedness and response in Section 3.4.
- The marine terminal must meet Canadian security requirements. Before operations may begin at the Westridge Marine Terminal, the terminal operator must comply with national, including international, regulatory frameworks for marine terminal security.

3.3.2 Berthing and Mooring Procedures

Before the master of a vessel, or a pilot, brings a vessel into a berth, they must be confident that the facility is suitable for the vessel. Trans Mountain submitted information describing:

- The berthing facility and its location; and indicated the facility has sufficient water depth and area for manoeuvrability for Project tankers.⁴¹
- Environmental and marine conditions that are appropriate for Project tankers, which will be confirmed during the detailed design phase.

Due to considerations outside the TERMPOL review process, Trans Mountain submitted a revised berth layout to the TRC on September 5, 2014.⁴² Changes to the layout include shifting the entire berth

³⁷ TERMPOL Review Process Study 3.10, page 18

³⁸ Ibid, section 4

³⁹ TERMPOL Review Process Study 3.5/3.12, page 36

⁴⁰ TERMPOL Review Process Study 3.10, page 16

⁴¹ TERMPOL Review Process Study 3.10, page 6

structure approximately 50 metres to the east southeast and shifting the location of the core dock to the east.

Finding 24: The TRC has reviewed the proposed revised berth layout and does not have any concerns.

Trans Mountain will include policies and procedures relating to terminal berthing in its Operation and Maintenance Manuals, which it will provide to terminal staff.⁴³

Trans Mountain notes tethered tugs and standby tugs will assist the tanker during berthing at the terminal. The practice is standard procedure and Trans Mountain will be responsible for ensuring availability of standby tugs for this purpose. Trans Mountain states on-site docking will be available for one assist tug at the terminal if required.⁴⁴

Recommendation 13: Trans Mountain should ensure availability of berthing and standby tugs at the terminal. The tugs should be of an adequate number and bollard pull to safely berth Project tankers.

Trans Mountain indicates tankers calling at Westridge may be moored from either side – port or starboard. Mooring dolphins will provide mooring points along the berth and be equipped with quick release mooring hooks, which will allow quick release of mooring lines during normal operations and, if required, in emergencies. The hooks can be operated manually or by electrical release via remote control from a central monitoring station.⁴⁵

Finding 25: The draft mooring procedures are adequate for the type of operation proposed.

Recommendation 14: Trans Mountain should confirm draft mooring procedures as part of real-time simulations to enhance safety.

3.3.3 Cargo Transfer Operations

While in Canadian waters, vessels transferring oil must comply with Canadian *Vessel Pollution and Dangerous Chemicals Regulations*.

Trans Mountain has stated operations procedures will be in place to assure that all systems work adequately before cargo transfer, and operational procedures for safe cargo transfer activities will be carried out both onboard the tanker and at the terminal.⁴⁶ During transfer operations, activity will be monitored by the terminal control room through a computer control system.⁴⁷ In addition, the following safety mechanisms will be in place:

⁴² LANTEC Marine Incorporated. *Summary Report of Manoeuvring Assessment Westridge Terminals Vancouver Expansion Supplementary Report – July 2014 Modifications* (2014).

⁴³ TERMPOL Review Process Study 3.10, page 48

⁴⁴ Ibid, page 18

⁴⁵ Ibid, page 12

⁴⁶ TERMPOL Review Process Study 3.11, section 5

⁴⁷ Ibid, page 22

- Loading platform at the berths drained to slop tanks and treated at shore
- Emergency Release Couplers at the loading arms
- Emergency shutdown (ESD) valves at flow pipelines by the manifold at the loading platform and at landfall, all ESD can be activated from the control room
- Fire prevention and protection both onboard the tanker and at the marine terminal
- Marine terminal personnel who are trained for this purpose
- Adjusted Emergency Response Plans for increased future activities

Finding 26: Trans Mountain's commitment to industry best practices related to cargo transfer activities will enhance safety and protection of the marine environment.

Tankers nominated to load at Westridge Marine Terminal that have not complied with the *Canadian Ballast Water Control and Management Regulations* will be required to retain their ballast water on board or return to the open ocean to exchange ballast water. Retaining ballast water on board or embarking on a return trip to the open ocean from the terminal could have operational implications for a vessel operator.

Trans Mountain has stated it will develop a Port Information and Terminal Operations Manual once the detailed design of the facility has been completed, and it will be available at least six before the start of terminal operations.⁴⁸

Recommendation 15: Trans Mountain should provide copies of its Port Information and Terminal Operations Manual to Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, and Port Metro Vancouver for information at least six months before the start of terminal operations.

Recommendation 16: Trans Mountain should ensure its Port Information and Terminal Operations Manual is available to oil shippers and their agents in time for them to understand and fully comply with its contents.

Finding 27: Based on the information provided regarding proposed marine terminal operations, and considering the existing regulatory framework, the TRC has not identified a need for additional regulatory instruments.

⁴⁸ TERMPOL Review Process Study 3.16/3.17, page 1

3.4 Oil Spill Preparedness and Response

Canada's National Marine Oil Spill Preparedness and Response Regime ensures that Canada is prepared for and can respond to oil spills from vessels and oil handling facilities. The Regime took effect in 1995 based on the 'polluter pay' principle and is a partnership between government and industry. It is governed under the CSA, 2001, Part 8 and its regulations and standards. Canada, as an active member of the IMO, has acceded to a number of international conventions that support the Regime, such as the International Convention for the Prevention of Pollution from Ships (MARPOL) and the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC).

Transport Canada is the lead federal regulatory agency responsible for the National Oil Spill Preparedness and Response Regime. The department's responsibilities include, among other things:

- providing regime management and oversight;
- developing regulations and standards relative to the CSA, 2001, Part 8;
- applying and enforcing regulations relating to the *Response Organization and Oil Handling Facilities Regulations*, Part 2;
- overseeing an appropriate level of preparedness; and
- monitoring marine activity levels.

The Regime is a partnership between government and industry, and industry, as the creator of the risk, bears the liability and responsibility to respond in the event of a marine incident in Canadian waters and, therefore, is charged with the operational elements of the Regime. Industry carries out its operational role through four industry-funded and Government-certified Response Organizations, which maintain a level of preparedness, according to Canadian regulations and standards, to respond to spills.⁴⁹ Prescribed vessels entering Canadian water must have an arrangement with the appropriate Response Organization for spill response, which on the west coast is the Western Canada Marine Response Corporation (WCMRC).

Under the Regime, as a Tier 4 Response Organization, WCMRC must have the capacity to respond to a 10,000 tonne spill within prescribed time standards and operating environments. In addition, the Regime is built upon the principle of cascading resources, which means that, in the event of a spill larger than 10,000 tonnes, the WCMRC response can be supplemented by the Canadian Coast Guard, by resources from other regions, or internationally through the *International Convention on Oil Pollution Preparedness, Response and Co-operation*.

Federal agencies provide assistance in the event of a spill, with a designated lead for every type of environmental emergency. The CSA, 2001, along with the *Oceans Act*, provide the Canadian Coast Guard with legislative authority as the lead federal response agency responsible for ensuring an appropriate response to all vessel-source and unknown source pollution incidents in waters under Canadian jurisdiction. The Canadian Coast Guard is transitioning to an internationally recognized Incident

⁴⁹ Tanker Safety Expert Panel. *A Review of Canada's Ship-source Oil Spill Preparedness and Response Regime – Setting the Course for the Future* (2013), page 3.

Command System, which allows it to respond more effectively to an incident and integrate its operations with key partners, including the US Coast Guard.

When the polluter is known and is willing and able to respond, the Canadian Coast Guard will advise the polluter of its responsibilities under the CSA, 2001, and assume the role of Federal Monitoring Officer (FMO) when it is satisfied with the polluter's intentions and plans. However, in cases where the polluter is unknown, unwilling or unable to respond, the Canadian Coast Guard will assume the overall management of the incident as On-Scene Commander (OSC). In all cases, Canadian Coast Guard Environmental Response will ensure an appropriate response.

Under the *Marine Liability Act*, the Canadian Coast Guard is able to recover the costs and expenses incurred as OSC or FMO from the owner of the vessel responsible for the pollution, the Canadian Ship-source Oil Pollution Fund, or the International Oil Pollution Compensation Fund, depending on the particulars of the situation.

Other departments assist the Canadian Coast Guard as required. For example, Environment Canada can convene the Environmental Emergencies Science Table to provide consolidated, consensus-based environmental advice for OSC consideration and to the Responsible Party for action. The Science Table, which builds upon and replaces the former Regional Environmental Emergencies Team model, brings together relevant experts in the field of environmental protection such as response agencies, all levels of government, Aboriginal representatives, local communities, industries, environmental non-government organizations, and academic institutions. Science Table Members develop consensus on protection and clean-up priorities.

The Canadian Coast Guard and Environment Canada also have roles concerning oil pollution planning and preparedness. For example, the Canadian Coast Guard regularly conducts or participates in Emergency Response exercises with partners and stakeholders to ensure rapid response to incidents or potential incidents.

Transport Canada works with stakeholders through a network of six Regional Advisory Councils to address areas of mutual concern and to advise the Minister of Transport on issues related to the Regime. Each Council has seven members, representing people, groups, and companies whose interests could be affected by spills.

3.4.1 Pollution Prevention and Response during Transit

Places of Refuge

As part of Canada's National Marine Oil Spill Preparedness and Response Regime, Transport Canada has put in place the National Places of Refuge Contingency Plan (TP 14707). The Plan establishes a national framework and approach which, with associated regional measures, aims to provide an effective and efficient response to requests from vessels in need of assistance seeking a place of refuge, including vessels at risk of discharging cargo. Transport Canada's Pacific Regional Places of Refuge Contingency

Plan complements the national plan by establishing a regional framework to respond to requests for assistance within the region.

Risk-based Response Planning

To enhance the current Regime, Trans Mountain suggests that risk based planning standards for spill response be adopted for the Salish Sea. According to Trans Mountain:

- The planning standards should be based on probability and consequence, with particular consideration to credible worst case spill volumes, product(s) fate and behaviour, as well as the geographic setting and sensitivities.
- The Regime should be modified to provide a means to identify and sanction risk based response planning standards for areas requiring enhanced response.

Trans Mountain also notes that, whether through private response organizations such as WCMRC, or through public efforts, where new investment in response capacity is required, opportunities to maximize the benefit to Aboriginal and other communities affected by the possible risks with marine traffic should be sought. Examples include capacity building, capital investment, training, and provision of ongoing services.⁵⁰ Trans Mountain is willing to actively support efforts in this regard.

As an example and as part of its risk analysis, Trans Mountain examined current spill response capacity along the proposed route to determine if enhancements may be required based on the risk, volume, and behaviour of a spill due to the proposed Project. Using the credible worst case spill scenario from a Project tanker of 15,500 tonnes, computer modelling indicated oil could spread to and affect shorelines if no response took place.⁵¹ Based on the volume of oil that could spill as a result of the credible worst case scenario, and its ability to spread to shore, Trans Mountain asked WCMRC to identify enhancements that could address response capacity and time gaps. As a result, WCMRC proposes five new base locations that will bring response capacity to 20,000 tonnes and reduce response initiation times to within two hours for the Vancouver harbour and six hours for the rest of the proposed route. Response times will be within 36 hours for any location between the terminal and Buoy Juliet. Redundancy of equipment will result in actual response capacity of 30,000 tonnes.⁵²

As part of its Responsible Resource Development Initiative, and in recognition of the increased number of energy export projects being proposed across the country including the west coast, the Government of Canada is undertaking several measures to contribute to a world-class tanker safety system.⁵³ The focus is on three key pillars: prevention; preparedness and response; and liability and compensation. The measures build on recommendations from the Tanker Safety Expert Panel and other studies, and have been informed by engagement with provincial governments, Aboriginal groups, marine stakeholders and internal analysis by federal departments and agencies. The measures include:

⁵⁰ Western Canada Marine Response Corporation. *Review of Trans Mountain Expansion Project Future Oil Spill Response Approach Plan Recommendations on Bases and Equipment* (2013), page 2.

⁵¹ TERMPOL Review Process Study 3.15, page 91

⁵² TERMPOL Review Process Study 3.15, page 92

⁵³ Further information can be found at: <http://news.gc.ca/web/article-en.do?nid=847489>.

- Establishing new area response planning partnerships for regions that have current or projected high levels of tanker traffic, including the southern portion of BC. Oil spill prevention, preparedness and response in these areas will consider their geography, environmental sensitivities, and oil tanker traffic volumes.
- Supporting Aboriginal communities so they can participate in marine emergency preparedness and response planning around their communities.
- Modernizing Canada's marine navigation system. Canada is a member of the IMO, and will take a leadership role in implementing e-Navigation, which reduces the risk of an oil spill by providing accurate and real-time information and data on navigational hazards, weather and ocean conditions to vessel operators and marine authorities to minimize the potential of collisions and accidents.
- Amending legislation to provide the use of alternate response measures such as the use of chemical dispersants and burning spilled oil during emergencies, and to clarify the Canadian Coast Guard's authority to use and to authorize these measures when there is likely to be a net environmental benefit.
- Strengthening the polluter pay regime by introducing legislative and regulatory amendments that will enhance Canada's domestic Ship-Source Oil Pollution Fund (SOPF). These amendments will:
 - remove the fund's existing per-incident liability limit of \$161 million to make available the full amount of the SOPF for a single incident, currently around \$400 million;
 - ensure compensation is provided to eligible claimants and recover these costs from industry through a levy, in the unlikely event that all domestic and international pollution funds have been exhausted; and
 - compensate those who have lost earnings due to an oil spill even if their property has not been contaminated by a spill.

***Finding 28:** The TRC supports 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.*

***Finding 29:** As part of measures to achieve a world-class tanker safety system, appropriate authorities will work with WCMRC and other stakeholders to develop and implement response plans tailored to the southern portion of BC. The plans will help to ensure the appropriate spill cleanup equipment is in place and readily available.*

3.4.2 Pollution Prevention and Response at the Terminal

Under the CSA, 2001, Westridge Terminal 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,

Westridge Terminal already has such plans in place, which will be revised and updated if the Project moves forward.⁵⁴

Recommendation 17: Trans Mountain should submit its Oil Pollution Emergency Plan to Transport Canada for review at least six months before terminal operations begin.

Prescribed OHF's must have an arrangement with a response organization that maintains a prescribed level of preparedness to respond to a spill on the polluter's behalf. The response organization supplements the OHF's response capacity to a maximum of 10,000 tonnes. The response organization arrangement is for additional response capability to be invoked when the OHF exceeds its ability to handle an oil pollution incident. The CSA, 2001 and relevant regulations outline the procedures, equipment, and resources of response organizations and OHF's for use in an oil pollution incident. OHF's must also meet Oil Handling Facilities Standards (TP 12402). Transport Canada's regional Pollution Prevention Officers enforce the OHF regulations by:

- reviewing OHF plans for compliance;
- inspecting the facilities and response resources to ensure an adequate level of preparedness; and
- attending and evaluating their exercises.

Trans Mountain has an agreement in place with WCMRC for on-water response in case of an oil spill at the terminal and \$750 million of spill liability insurance. It intends to continue to maintain similar levels of spill liability insurance over the life of the Project.⁵⁵

Trans Mountain states that:

- The terminal will be equipped with various pollution prevention systems and equipment to prevent system leaks and allow for the containment, isolation, and recovery of any hydrocarbon that may be released, including leak detection at the pipeline.
- Each berth will have an oil containment boom sized to encircle an Aframax class tanker. Tanker loading will not start before the boom is deployed, and the boom will remain in place until the loading arms have been retracted and secured.⁵⁶ Trans Mountain expects the boom to have an oil containment capacity of 1500m³, which is of sufficient volume to address a worst case scenario spill of 103m³.⁵⁷

Since information on the type and effectiveness of the boom is not available, Trans Mountain should ensure detailed plans are developed and take into consideration:

- The type and footprint of the system to keep the boom in place and away from tanker sides so as to prevent accidental spills from being discharged outside of the boom;
- A type and size of boom that clearly demonstrates its appropriateness and effectiveness for that environment, taking into account the effects of passing deep sea vessels on the boom; and
- An area inside the boom appropriate for potential spill size.

⁵⁴ TERMPOL Review Process Study 3.19, page 2

⁵⁵ TERMPOL Review Process Study 3.18, page 2

⁵⁶ TERMPOL Review Process Study 3.11, section 4.5

⁵⁷ TERMPOL Review Process Study 3.15, p. 2

Trans Mountain proposes the area demarcated by the oil spill prevention booms surrounding the tankers loading at Westridge terminal be marked as exclusion zones. However, it is the view of the TRC that the booms will serve as a visual signal to other vessels to exercise caution around the area and an exclusion zone is not required.

Finding 30: The oil booms surrounding tankers loading at Westridge Marine Terminal will serve as physical barriers and as a visual sign for other vessels around the area to exercise caution.

Detailed information on Trans Mountain's pollution prevention systems and equipment will be in the Westridge Operator's Handbook and Emergency Response Plan. Trans Mountain has indicated it will provide updated copies of the documents to the TRC and regulating authorities at least six months before terminal operations begin.⁵⁸

Finding 31: The TRC identified no regulatory concerns with the proposed oil spill preparedness and response procedures at this time.

⁵⁸ TERMPOL Review Process Study 3.18, page 2

4. CONCLUSION

The focus of the TERMPOL Review Process is on marine safety and accident prevention to help ensure that Trans Mountain can carry out the marine transportation components of its Project within acceptable risk levels consistent with Canada's regulatory regime and safety standards, and industry best practices.

If this Project goes ahead, the TRC will expect Trans Mountain to fully implement its commitments detailed in the information it submitted for the TERMPOL Review Process. However, if at any time the Project's operational parameters or characteristics change, or Trans Mountain needs to adjust its commitments, relevant authorities may need to conduct further review and analysis.

The existing Canadian marine laws and regulations, including international frameworks, complemented by the enhanced safety measures Trans Mountain has in place or is committed to implementing and the recommendations contained within this report will provide for safer shipping in support of the proposed Project. Tankers and shipping operations, like any other vessel operations, will have to comply fully with national, including international, regulatory frameworks. Through Trans Mountain's oil tanker vetting and acceptance process, tanker operators will have to follow Trans Mountain's additional safety enhancements as committed to through the TERMPOL Review Process, which are designed to reduce the risks during operations. As the terminal operator, Trans Mountain has authority to vet and to grant or deny permission for tankers to berth, which is a significant tool to compel tankers to comply with Trans Mountain's tanker acceptance process and terminal regulations.

The proposed shipping routes are appropriate for the oil tankers that will use the proposed expanded terminal. The tankers will be of the same maximum size calling at the terminal today. The TERMPOL review confirmed that there are no charted obstructions within the established shipping lanes that would pose a safety hazard to partially loaded Aframax class oil tankers. As noted, the Canadian Hydrographic Service is currently updating charts for Burrard Inlet to ensure the most accurate information is available for safe navigation. Trans Mountain should make note of any updates.

The proposed route provides the required clearances for good vessel manoeuvrability and allowances for Aframax class tankers to safely navigate. Trans Mountain has proposed enhancements to two-way navigation east of the Second Narrows that Port Metro Vancouver will review; informed by the results of the Passing Vessel Analysis Trans Mountain has provided.

Suggested enhancements to aids to navigation along the route will be reviewed by the Canadian Coast Guard and Port Metro Vancouver within their jurisdictions.

The TRC does not consider the overall increase in marine traffic levels to be an issue; however, it does support additional measures to promote shared safe use of the Project's preferred shipping route. Many of the measures go beyond regulatory requirements, and include:

- extended use of tethered and untethered tug escort;
- extension of the pilot disembarkation zone;
- safety calls by laden tankers when in transit;

- guidance on communication between masters and watchkeeping personnel to support strong communication between tankers and their escort tugs;
- clear guidance to industry on enhancements to the marine safety regime that will impact their operations; and
- an engagement and awareness strategy to promote safe navigation and interaction between Project tankers and recreational boaters, fishing vessel operators, and operators of small vessels.

Safe operation of the Westridge Marine Terminal will be assured through compliance with regulations and Trans Mountain's terminal requirements.

Canada has a robust oil spill preparedness and response regime in place. To further enhance the existing regime, the Government of Canada is undertaking several measures that will contribute to a world-class tanker safety system, including a focus on area response planning specific to local risks and conditions.

While there will always be some risk in any project, after reviewing Trans Mountain's studies and taking into account its commitments, the TRC has identified no regulatory concerns for the tankers, tanker operations, the proposed routes, navigability, other waterway users and the marine terminal operations associated with Project tankers. The TRC has identified several findings and recommendations in response to Trans Mountain's submission and has proposed actions for Trans Mountain to undertake that, in conjunction with Trans Mountain commitments, will provide for a higher level of safety for tanker operations commensurate with the increase in traffic. A complete list of the findings and recommendations is included in Appendix 1.

APPENDICES

Appendix 1 List of Findings and Recommendations

Recommendations

Recommendation 1: Trans Mountain should notify the appropriate authority if it wishes to alter any Project commitments, operational parameters, or characteristics, so the authority can review impacts to safety as a result of the changes. *(3 Analysis)*

Recommendation 2: Trans Mountain should notify the appropriate authority if there will be changes to the types of tankers calling at the Westridge Marine Terminal. *(3.1 Vessel Information)*

Recommendation 3: Trans Mountain should provide information when requested by the Canadian Coast Guard, to facilitate the Canadian Coast Guard's evaluation of the proposed additional navigation aids. *(3.2.1 Overall Route – Aids to Navigation)*

Recommendation 4: Trans Mountain should carry out real time simulations for the areas surrounding the terminal in full consultation with Port Metro Vancouver, the Pacific Pilotage Authority, and BC Coast Pilots; after completion of the detailed design. *(3.2.2 Navigability and Vessel Operations)*

Recommendation 5: Should changes to current channel design near Westridge Marine Terminal occur due to the results of the Passing Vessel Analysis provided to Port Metro Vancouver by Trans Mountain, Trans Mountain should run trial transits to observe the real effects of passing traffic on moorings and tankers at the terminal post construction. They may do this in conjunction with Port Metro Vancouver, the Pacific Pilotage Authority, and Transport Canada as an observer. Trans Mountain should incorporate any observations made during the trials into the terminal's mooring and transit plans. *(3.2.2 Navigability and Vessel Operations – Channel Width Requirements)*

Recommendation 6: Trans Mountain should discuss with Port Metro Vancouver and the Canadian Coast Guard the effects of the Project on available transit windows and the movement of vessels within the MRA. *(3.2.2 Navigability and Vessel Operations – Safe Operating Speeds and Transit Windows)*

Recommendation 7: Trans Mountain should discuss with Port Metro Vancouver the possibility of extended traffic clearance and escort services by the Port Metro Vancouver Harbour Master's launch within Port Metro Vancouver boundaries. *(3.2.3 Marine Traffic Considerations and Additional Traffic Controls)*

Recommendation 8: Trans Mountain should develop a tug matrix identifying appropriate tug specifications for untethered tug escort of Project tankers for the Strait of Georgia in consultation with the Pacific Pilotage Authority, BC Coast Pilots, and Transport Canada. *(3.2.4 Proposed Risk Mitigation Measures)*

Recommendation 9: Trans Mountain should implement extended untethered escort for outbound laden Project tankers through the Juan de Fuca Strait. *(3.2.4 Proposed Risk Mitigation Measures)*

Recommendation 10: Should Trans Mountain revise its tanker acceptance process to require untethered tug escort of Project tankers through the Juan de Fuca Strait, it should develop a tug matrix identifying appropriate tug specifications in consultation with the Pacific Pilotage Authority and Transport Canada. *(3.2.4 Proposed Risk Mitigation Measures)*

Recommendation 11: 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. *(3.2.4 Proposed Risk Mitigation Measures)*

Recommendation 12: Trans Mountain should include the ISGOTT safety checklist in its Terminal Operations Manual for reference. It should include a checklist with additional terminal specific safety items that tankers must be aware of within the Manual, as well. *(3.3 Terminal Operations)*

Recommendation 13: Trans Mountain should ensure availability of berthing and standby tugs at the terminal. The tugs should be of an adequate number and bollard pull to safely berth Project tankers. *(3.3.2 Berthing and Mooring Procedures)*

Recommendation 14: Trans Mountain should confirm draft mooring procedures as part of real-time simulations to enhance safety. *(3.3.2 Berthing and Mooring Procedures)*

Recommendation 15: Trans Mountain should provide copies of its Port Information and Terminal Operations Manual to Transport Canada, the Canadian Coast Guard, the Pacific Pilotage Authority, and Port Metro Vancouver for information at least six months before the start of terminal operations. *(3.3.3 Cargo Transfer Operations)*

Recommendation 16: Trans Mountain should ensure its Port Information and Terminal Operations Manual is available to oil shippers and their agents in time for them to understand and fully comply with its contents. *(3.3.3 Cargo Transfer Operations)*

Recommendation 17: Trans Mountain should submit its Oil Pollution Emergency Plan to Transport Canada for review at least six months before terminal operations begin. *(3.4.2 Pollution Prevention and Response at the Terminal)*

Findings

Finding 1: The TRC recognizes implementation timelines for recommendations outlined in this report will have to be considered between Trans Mountain and appropriate authorities. *(3 Analysis)*

Finding 2: If the Project is approved, compliance inspections and monitoring of tanker traffic by federal authorities with jurisdiction in marine safety, such as Transport Canada and the Canadian Coast Guard, will increase. *(3.1 Vessel Information – Canadian Requirements Including International Conventions)*

Finding 3: Trans Mountain's commitment to vet oil tankers through its tanker acceptance process is a good practice that can help achieve safety objectives. *(3.1 Vessel Information – Proponent Criteria)*

Finding 4: Tanker vetting and the Ship Inspection Report Programme (SIRE) process are generally accepted tools terminals and oil companies use to verify compliance and enhance safety. *(3.1 Vessel Information – Proponent Criteria)*

Finding 5: As part of the Government of Canada's actions to modernize Canada's navigation system, the TRC supports a review of existing AIS carriage requirements by Transport Canada, in collaboration with the Canadian Coast Guard, to determine whether they should apply to a greater number of vessels. *(3.1 Vessel Information – Automatic Identification System)*

Finding 6: The TRC supports Trans Mountain's commitment to financially assist smaller vessels registered in WCMRC's FOSET program to be fitted with AIS, which will aid in locating FOSET assets during standard operations as well as while undertaking response activities. *(3.1 Vessel Information – Automatic Identification System)*

Finding 7: The TRC supports Trans Mountain's commitment to financially assist smaller vessels that are registered in WCMRC's FOSET program to be fitted with radar reflectors to enhance safety. *(3.1 Vessel Information – Automatic Identification System)*

Finding 8: Based on information provided by Trans Mountain on the size and type of Project tankers, and considering the existing regulatory framework, the TRC has not identified a need for additional regulatory instruments. *(3.1 Vessel Information – Automatic Identification System)*

Finding 9: Trans Mountain's commitment to require via its tanker acceptance process that Project tankers steer a course no more northerly than due West (270°) upon exiting the Juan de Fuca Strait will enhance safety and protection of the marine environment by providing the shortest route out of the Canadian EEZ. *(3.2.1 – Overall Route)*

Finding 10: The TRC supports the BC Coast Pilots' plan to use receivers that use multiple navigation systems, which will enhance safe navigation of tankers by pilots. *(3.2.1 Overall Route – Aids to Navigation)*

Finding 11: Port Metro Vancouver intends to use the results of the Passing Vessel Analysis provided by Trans Mountain to inform redesign of the channel in the eastern section of the Burrard Inlet between Second Narrows and Port Moody, and the location of the anchorages east of Second Narrows. *(3.2.2 Navigability and Vessel Operations – Channel Width Requirements)*

Finding 12: Underkeel clearance requirements are met along the entirety of the route. (3.2.2 *Navigability and Vessel Operations – Channel Depth Requirements*)

Finding 13: Because weather conditions along the route have never caused a pilot to abort a transit, it is the view of the TRC that weather related restrictions beyond existing requirements are not necessary at this time. (3.2.2 *Navigability and Vessel Operations – Weather and Sea Conditions*)

Finding 14: It is the TRC's view that an additional ODAS buoy is not required in the southern Strait of Georgia to monitor weather and environmental conditions, as the area is already adequately monitored. (3.2.2 *Navigability and Vessel Operations – Weather and Sea Conditions*)

Finding 15: At this time, it is the TRC's view that additional traffic control measures around the East Point area proposed by Trans Mountain are not necessary. (3.2.3 *Marine Traffic Considerations and Additional Traffic Controls*)

Finding 16: Port Metro Vancouver intends to use the results of the Passing Vessel Analysis provided by Trans Mountain to determine the need for any further requirements in the Burrard Inlet between Second Narrows and Port Moody to ensure safe navigation. (3.2.3 *Marine Traffic Considerations and Additional Traffic Controls*)

Finding 17: The TRC supports proposed enhancements to tug escort for outbound laden Project tankers in the Strait of Georgia. (3.2.4 *Proposed Risk Mitigation Measures*)

Finding 18: The TRC supports extending the pilot disembarkation zone and tethered tug escort requirements for Project tankers to an area in the vicinity of Race Rocks, weather permitting and subject to the requirements identified in a Pacific Pilotage Authority 'Notice to Industry'. (3.2.4 *Proposed Risk Mitigation Measures*)

Finding 19: Appropriate use of VHF safety calls can enhance situational awareness for other vessels of Project tanker movements. (3.2.4 *Proposed Risk Mitigation Measures*)

Finding 20: The TRC supports Trans Mountain's commitment to provide financial support for an enhanced education campaign for small vessel operators about safe boating practices. (3.2.4 *Proposed Risk Mitigation Measures*)

Finding 21: The Pacific Pilotage Authority and BC Coast Pilots have indicated they will, in consultation with escort tug masters, develop guidance on communication between masters and watchkeeping personnel as reflected in the STCW Code Section A-VIII/2. (3.2.4 *Proposed Risk Mitigation Measures*)

Finding 22: The Pacific Pilotage Authority has indicated it will update its applicable 'Notice to Industry' to outline use of Sécurité safety calls while considering proper bridge resource management protocols. (3.2.4 *Proposed Risk Mitigation Measures*)

Finding 23: Trans Mountain's existing practice of having a dedicated loading master present at Westridge Marine Terminal provides an added measure of safety to cargo transfer operations. *(3.3 Terminal Operations)*

Finding 24: The TRC has reviewed the proposed revised berth layout and does not have any concerns. *(3.3.2 Berthing and Mooring Procedures)*

Finding 25: The draft mooring procedures are adequate for the type of operation proposed. *(3.3.2 Berthing and Mooring Procedures)*

Finding 26: Trans Mountain's commitment to industry best practices related to cargo transfer activities will enhance safety and protection of the marine environment. *(3.3.3 Cargo Transfer Operations)*

Finding 27: Based on the information provided regarding proposed marine terminal operations, and considering the existing regulatory framework, the TRC has not identified a need for additional regulatory instruments. *(3.3.3 Cargo Transfer Operations)*

Finding 28: The TRC supports 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. *(3.4.1 Pollution Prevention and Response during Transit)*

Finding 29: As part of measures to achieve a world-class tanker safety system, appropriate authorities will work with WCMRC and other stakeholders to develop and implement response plans tailored to the southern portion of BC. The plans will help to ensure the appropriate spill cleanup equipment is in place and readily available. *(3.4.1 Pollution Prevention and Response during Transit)*

Finding 30: The oil booms surrounding tankers loading at Westridge Marine Terminal will serve as physical barriers and as a visual sign for other vessels around the area to exercise caution. *(3.4.2 Pollution Prevention and Response at the Terminal)*

Finding 31: The TRC identified no regulatory concerns with the proposed oil spill preparedness and response procedures at this time. *(3.4.2 Pollution Prevention and Response at the Terminal)*

Appendix 2 List of Documents Submitted for TERMPOL

On December 16, 2013, the Trans Mountain Expansion Project submitted the following studies and surveys for consideration by the TERMPOL Review Committee in support of their explanation of the marine transportation elements of the Trans Mountain Expansion Project.

The TERMPOL Review Process submission includes five volumes. Volumes 1 to 2 contain the TERMPOL studies and surveys, and Volumes 3 to 5 contain the supporting reference material.

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Appendix 3 Design Vessels

Design Vessels		
Vessel Particular	Crude Oil	Crude Oil
Vessel Class	Aframax	Panamax
Average Length Overall (m)	244.3	227.3
Average Beam (m)	42.4	32.7
Average Draught (m)	14.7	13.9
Average Deadweight (t)	106921	72112
Hull Type	Double	Double

ATB & ITB OIL BARGES

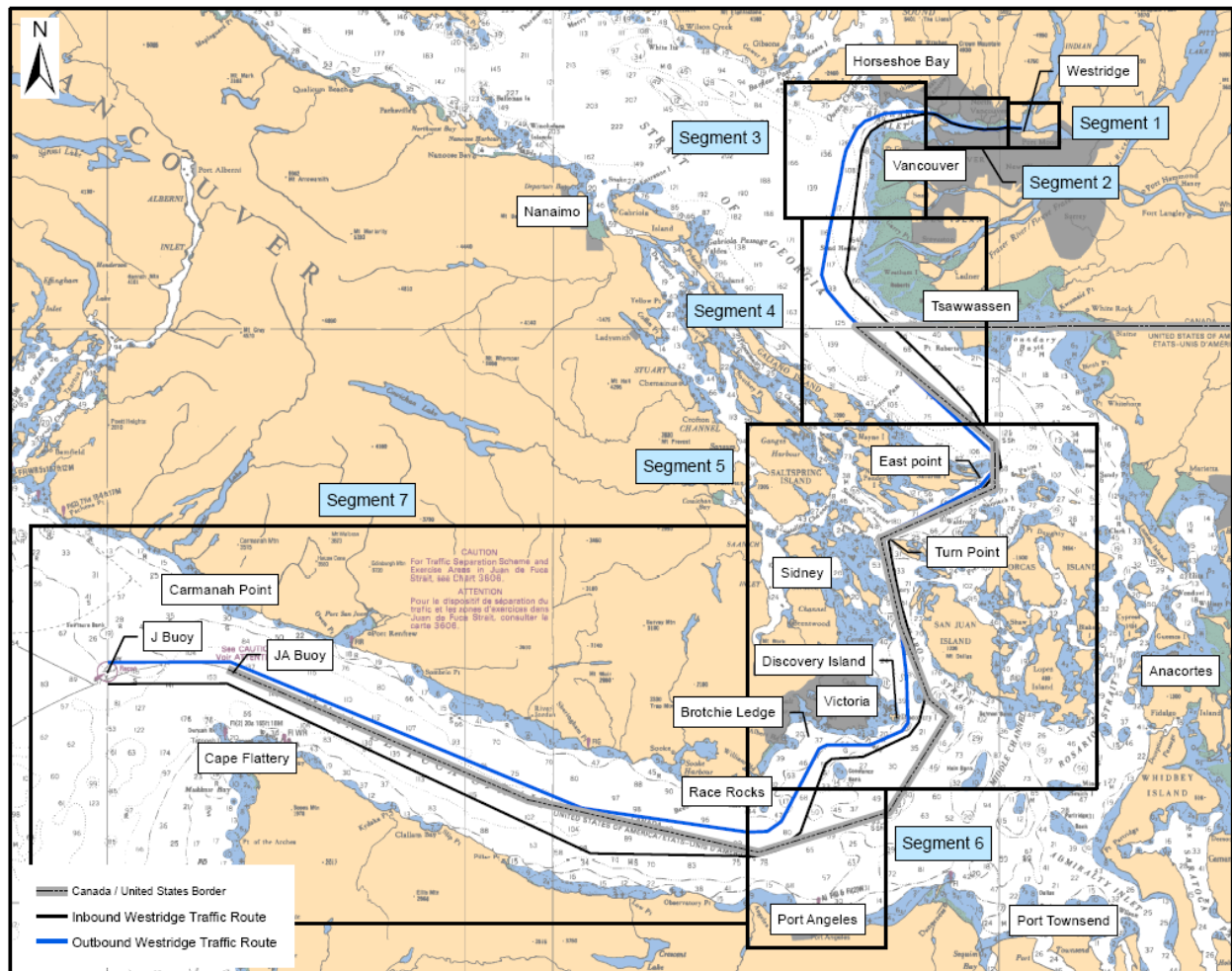
PRODUCT CARRIERS

PANAMAX TANKERS

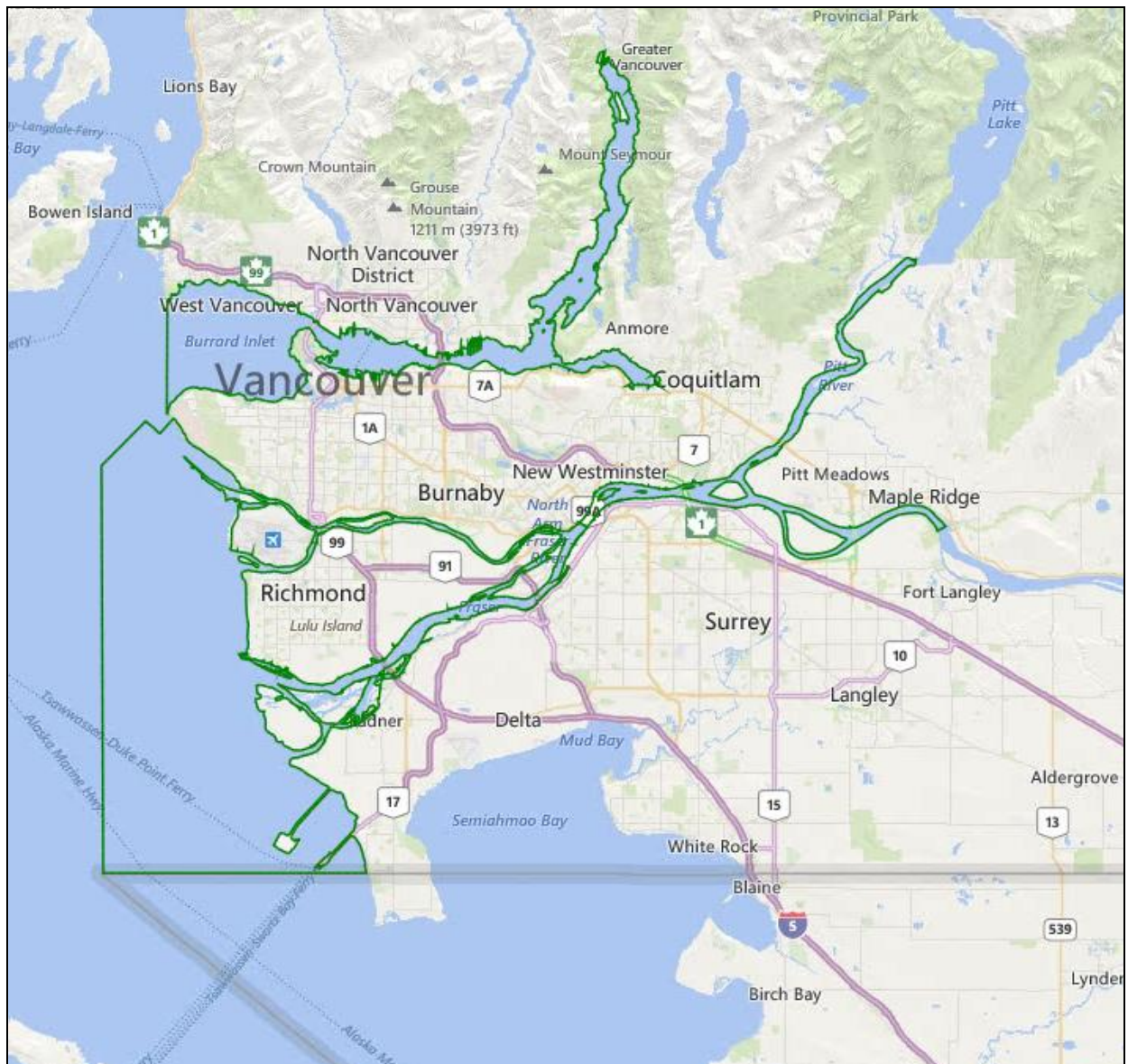
AFRAMAX TANKERS

Appendix 4 Proposed Shipping Routes

The proposed inbound and outbound routes are divided into seven segments and cover the area from the Westridge Marine Terminal through the Port of Vancouver, English Bay, Strait of Georgia, Boundary Pass, Haro Strait, Race Rocks, and Juan de Fuca Strait.



Appendix 5 Port Metro Vancouver Navigational Jurisdiction



Appendix 6 Bibliography

Canada Shipping Act, 2001 Statutes of Canada (2001, c. 26). Retrieved from the Department of Justice Canada website: <http://laws-lois.justice.gc.ca/eng/acts/C-10.15/>.

LANTEC Marine Incorporated. *Summary Report of Manoeuvring Assessment Juan de Fuca Strait Proposed Tug Escort* (2014).

LANTEC Marine Incorporated. *Summary Report of Manoeuvring Assessment Strait of Georgia Proposed Tug Escort* (2014).

LANTEC Marine Incorporated. *Summary Report of Manoeuvring Assessment Westridge Terminals Vancouver Expansion Supplementary Report – July 2014 Modifications* (2014).

Moffatt & Nichol. *Passing Ship Analysis* (2014).

Port Metro Vancouver. *Port Information Guide* (2014)
<http://www.portmetrovancover.com/docs/default-source/port-users-marine-operations/port-information-guide-version-8-2.pdf?sfvrsn=0>.

Port Metro Vancouver. *Second Narrows Movement Restriction Area Procedures* (2010)
<http://www.portmetrovancover.com/docs/default-source/port-users-marine-operations/second-narrows-mra-procedures.pdf?sfvrsn=0>.

Tanker Safety Expert Panel. *A Review of Canada's Ship-source Oil Spill Preparedness and Response Regime – Setting the Course for the Future* (2013).

Transport Canada. *Termopol Review Process 2001 (TP 743)* (2001).