1.0 INTRODUCTION

The Vancouver Fraser Port Authority, doing business as Port Metro Vancouver (PMV or the proponent), proposes to build a new three-berth container terminal at Roberts Bank in Delta, British Columbia (B.C.). The proposed Roberts Bank Terminal 2 Project (referenced throughout this document as RBT2 or the Project) is an important component of PMV's plan to meet growing demand for container capacity in support of Canada's import and export markets. By providing for an additional 2.4 million **twenty-foot equivalent units** of container capacity per year, the Project will help to ensure that container capacity on the west coast of Canada is sufficient to meet projected demand to 2030.

The Project will involve the development of additional land area at the seaward end of the existing Roberts Bank causeway, adjacent to the existing Deltaport Terminal and Westshore Terminals, widening of the existing causeway, and expansion of the existing tug basin.

1.1 PURPOSE OF THE ENVIRONMENTAL IMPACT STATEMENT

On September 12, 2013, PMV submitted a Project Description to the Canadian Environmental Assessment Agency (CEA Agency) and the B.C. Environmental Assessment Office (EAO). On November 7, 2013, the CEA Agency determined that the Project would require approval pursuant to the *Canadian Environmental Assessment Act*, *2012 (CEAA 2012)*. On January 7, 2014, the CEA Agency issued *Guidelines for the Preparation of an Environmental Impact Statement Pursuant to the Canadian Environmental Assessment Act, 2012 for the Roberts Bank Terminal 2 Project* (*EIS Guidelines*), specifying the nature, scope and extent of information to be included in the Project's Environmental Impact Statement (EIS). Also on that date, the federal Minister of the Environment and Minister responsible for the CEA Agency referred the Project for an environmental assessment (EA) by an independent review panel.

On November 5, 2014, the EAO determined that the Project required an EA pursuant to the B.C. *Environmental Assessment Act* and on December 19, 2014, the B.C. Minister of the Environment set out the process to be followed, indicating that the EAO would principally rely on the federal assessment.

This EIS has been prepared in accordance with the *EIS Guidelines*, and is also intended to meet provincial requirements.

The purpose of this EIS is to provide comprehensive information on potential Project-related changes to the environment, sufficient to permit a thorough evaluation of the environmental effects of the Project by the independent review panel.

As set out in the *EIS Guidelines*, part 1, section 3, the scope of the Project for the purposes of the EA includes the Project components, associated and ancillary works, transportation within the areas for which the proponent has jurisdiction, and other characteristics as necessary to assist in understanding the Project's environmental effects. The EIS also includes detailed descriptions of the construction, operation, maintenance, foreseeable modifications, and, where relevant, decommissioning of sites and facilities associated with the Project.

1.1.1 Guiding Principles

In preparing the EIS, PMV has adhered to the four guiding principles set out in the *EIS Guidelines*, part 1, section 2, including:

- Use of EA as a planning tool;
- Provision of opportunities for meaningful public participation;
- Engagement with Aboriginal people and groups that may be affected by the Project or that have asserted or established Aboriginal and treaty rights and related interests in the Project area; and
- Application of a precautionary approach.

Engagement with Aboriginal groups has included provision of timely access to relevant information to enable Project understanding and facilitate the determination of potential Project-related effects on Aborginal communities, activities and other interests, and integration of traditional Aboriginal knowledge into the EA.

Port Metro Vancouver has taken a careful and precautionary approach to the Project's EA and is committed to designing, constructing, and operating the Project in a manner that gives priority to the avoidance and mitigation of adverse effects, as reflected throughout the EIS.

1.2 ROBERTS BANK TERMINAL 2 PROJECT

The Project will be located at Roberts Bank in Delta, B.C., approximately 35 kilometres (km) south of Vancouver (**Figure 1-1**). Existing facilities at Roberts Bank include Westshore Terminals, a 54-hectare (ha) coal handling facility operated by Westshore Terminals Ltd., and Deltaport Terminal, an 85-ha container handling facility operated by GCT Canada Limited Partnership. The Roberts Bank causeway links these terminals and associated facilities to the road and rail infrastructure that supports the movement of goods within, across, and beyond the Metro Vancouver region.

The new marine terminal will be located immediately west of the existing Roberts Bank terminals, approximately 5.5 km from the east or landward end of the causeway. As shown in **Figure 1-2**, the terminal, with the berth face oriented perpendicular to the causeway, will extend approximately 600 metres (m) further offshore than the seaward edge of Westshore Terminals. The geographic coordinates for the new terminal are approximately 49° 01′ 6.84″ N and 123° 11′ 3.33″ W.

In addition to construction of the new terminal, the north side of the existing causeway will be widened from its east-end connection with the mainland to the entrance to the new terminal (**Figure 1-2**). The existing tug basin, connected to the north side of Deltaport Terminal, will be expanded to meet the Project's need for additional tug operations and associated moorage (**Figure 1-2**).

A detailed description of these Project components (i.e., marine terminal, widened causeway, expanded tug basin), as well as the Project schedule and activities to be undertaken during the Project's construction (including decommissioning of temporary construction-related facilities) and operation phases, is provided in **Section 4.0 Project Description**.

1.3 PROPONENT DESCRIPTION

This section provides an overview of PMV, including the organisation's corporate and management structures, relevant corporate policies, and approach to environment, health, and safety. The entity that will be developing, managing, and operating the Project has not yet been determined, as detailed in **Section 2.0 Project Overview**.

1.3.1 Port Metro Vancouver Contact Information

The President and Chief Executive Officer (CEO) of PMV is **Robin Silvester:**

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Project Website:	www.portmetrovancouver.com/RBT2

The name, professional credentials, and affiliation of the lead author for each EIS section is provided in the preface to each EIS Volume (under the heading Professional Credentials).

1.3.2 Port Metro Vancouver Overview

Port Metro Vancouver's mission is to lead the growth of Canada's Pacific Gateway in a manner that enhances the well-being of all Canadians and inspires national pride. The vision of PMV is for the port to be recognised as a world-class gateway by efficiently and sustainably connecting Canada with the global economy, inspiring support from its customers and from communities locally and across the nation. Port Metro Vancouver is the most diversified port in North America, operating across five business sectors: automobiles, breakbulk, bulk, container, and cruise.

Port Metro Vancouver is a non-shareholder, financially self-sufficient corporation. As manager of Canada's largest port, PMV helps Canadian businesses deliver their goods and products, such as grain, coal, potash, and lumber to markets around the world, and provides an entry point for construction and manufacturing inputs and many consumer goods, including fruits and vegetables, electronics, furniture, and automobiles. The port generates an estimated 98,800 jobs, $6.1 billion in wages, and $9.7 billion in direct gross domestic product across Canada. Each year the port handles $184 billion of cargo (based on 2013 cargo volumes), which represents one-fifth of Canada's total trade. In addition, PMV supports Canadian trade by facilitating port-related infrastructure necessary to connect Canada's markets to trading economies around the world, particularly those in the Asia-Pacific region.

1.3.2.1 Port 2050

In 2011, PMV completed a strategic long-term visioning process called Port 2050. This process engaged representative parties in a frank, collaborative discussion about the future of the port and the Asia-Pacific Gateway. More than 100 participants, including key stakeholders such as terminal operators and tenants, railways, industry organisations, government agencies, municipalities, community liaison groups, and Aboriginal groups, engaged with PMV board members, executives, and employees in the process. As an outcome of this process, PMV revised its mission and vision, and developed a shared outlook for PMV's future direction, one in which growth across cargo sectors will continue to provide positive economic benefits to the region and to Canada[1]. As a corporate citizen undertaking a variety of sustainability initiatives and programs, PMV is a recognised industry[2] leader in corporate social responsibility.

1.3.2.2 Mandate and Jurisdiction

Port Metro Vancouver is a port authority created pursuant to the *Canada Marine Act*. The purpose of the *Canada Marine Act* includes but is not limited to the following:

- Promote the success of Canadian ports to contribute to the competitiveness, growth, and prosperity of the Canadian economy;

[1] For more information, refer to Port 2050 Summary Report at: http://www.portmetrovancouver.com/en/about/corporate/Port2050.aspx.

[2] In 2014, PMV received recognition for strong sustainability performance by placing fourth in Corporate Knights' first Future 40 Responsible Corporate Leaders in Canada ranking, and PMV's EcoAction program was recognised by Canada's Clean50 for Sustainability Achievement.

- Ensure that marine transportation services satisfy the needs of users at a reasonable cost;
- Provide for a high level of safety and environmental protection; and
- Manage marine infrastructure in a commercial manner, taking into account input from users and the community.

Port authorities are accountable to the federal Minister of Transport.

In the *Canada Marine Act* the federal government has delegated certain port-related aspects of its constitutional authority with respect to navigation and shipping and the management of federal lands to port authorities. The *Canada Marine Act* gives port authorities the authority to take, permit, or prevent certain activities within a port, which is defined as "the navigable waters under the jurisdiction of a port authority and the real property and immovables that the port authority manages, holds or occupies as set out in the letters patent". The letters patent issued for PMV describe the geographic boundaries of the navigation jurisdiction of PMV, the federal real property which it manages, and the lands other than federal real property, namely lands that PMV holds in its own name. For core activities related to shipping and navigation, PMV acts as agent to the federal Crown.

Port Metro Vancouver's territorial jurisdiction therefore includes the federal lands and lands other than federal real property that it manages, together with the navigable waters over which it has navigation jurisdiction (**PMV jurisdiction**). The federal real property managed by PMV and its navigation jurisdiction are shown in **Figure 1-3***.* Lands within the management of PMV border 16 Metro Vancouver municipalities (Coquitlam, Delta, Maple Ridge, New Westminster, Pitt Meadows, Port Coquitlam, Surrey, Richmond, Vancouver, Burnaby, District of North Vancouver, City of North Vancouver, Port Moody, West Vancouver, Belcarra, and the Township of Langley), as well as one treaty First Nation, the Tsawwassen First Nation. Port Metro Vancouver is located within the asserted traditional territories of multiple other Aboriginal groups. Port-related facilities within PMV jurisdiction include three railways and 28 major terminals, four of which are container terminals.

The existing Roberts Bank marine terminal is located on federal lands managed by PMV, and is serviced by road and rail on the causeway located on lands owned by the Province of B.C. and the British Columbia Railway Company (BCR). Road and rail traffic enters PMV jurisdiction at the western (seaward) end of the causeway. The railway lines located on the Roberts Bank causeway and extending for approximately 24 miles, referred to as the Port Subdivision, are owned by BCR and managed by BCR Properties Ltd. British Columbia

Railway Company is operated and regulated by the BC Minister of Transportation and Infrastructure. The Port Subdivision is used by Canadian National Railway, Canadian Pacific Railway, and Burlington Northern Santa Fe Railway, which are all federally regulated railway companies.

Vessels enter PMV territorial jurisdiction as they enter PMV navigation jurisdiction. The *Canada Marine Act* gives port authorities the authority to establish practices and procedures to be followed by ships to ensure efficient navigation or environmental protection within a port. In accordance with this statutory authority PMV has issued a Port Information Guide for marine operations within its jurisdiction and maintains a 24-hour operations centre.

Under the *Canada Marine Act*, PMV is entitled to restrict access to the lands it manages and to regulate the activities on those lands. The *Port Authorities Operations Regulations* also state that PMV shall not provide access to the port by a truck for the purpose of transporting a container unless a written authorisation from PMV and a licence under the B.C. *Container Trucking Act* have been issued. Authorisations issued by PMV contain requirements for accessing port lands, including compliance with a truck reservations system and truck identification, and are deemed licences under the *Container Trucking Act*. As of February 1, 2015, the truck licensing system is administered by the British Columbia Trucking Commissioner. Port Metro Vancouver will continue to issue authorisations.

Regulatory authority in relation to marine shipping outside of PMV navigation jurisdiction rests with Transport Canada and the Canadian Coast Guard (under the control and supervision of Fisheries and Oceans Canada), together with the Marine Communications and Traffic Services centres in Victoria and Vancouver (operated by the Canadian Coast Guard) and the Pacific Pilotage Authority. Relevant legislation includes the *Canada Shipping Act, 2001* and the *Pilotage Act*.

Regulatory authority with respect to federal railway companies rests with Transport Canada, pursuant to the *Canada Transportation Act* and the federal *Railway Safety Act*. Provincial railway companies are regulated by the B.C. Minister of Transportation and Infrastructure, pursuant to the B.C. *Railway Act* and the *Railway Safety Act*.

More information pertaining to territorial jurisdiction and land ownership in the immediate vicinity of the Project is provided in **Section 3.3.3 Geographical Setting, Land Ownership – Federal and Provincial Lands**.

1.3.3 Governance and Corporate Structure

Port Metro Vancouver's governance structure will provide the mechanism for ensuring Project implementation is consistent with PMV's corporate policies and Project-specific commitments.

Port Metro Vancouver is governed by a diverse, independent Board of Directors representing government and industry, including one federal appointee, seven federal appointees recommended by port users, one local municipal appointee, one B.C. provincial appointee, and one appointee for the prairie provinces of Alberta, Saskatchewan, and Manitoba. As outlined in the *Canada Marine Act*, a user is defined as a person (including a partnership, an association, a corporate body, or an individual) who makes commercial use of or provides services at the port. The Board typically meets approximately six times per year, and has established a committee to oversee the development of major capital projects. The Major Capital Projects Committee receives bi-monthly reports from the Project team and reports regularly to the Board on the progress of RBT2 and other major capital projects.

Operational decisions are delegated to the President and CEO. The Executive Leadership Team (ELT) consists of the President and CEO, the Chief Financial Officer (CFO), and five Vice Presidents (**Figure 1-4**).

Figure 1-4 Port Metro Vancouver Executive Leadership Team

PRESIDENT AND CHIEF EXECUTIVE OFFICER					
CHIEF FINANCIAL OFFICER	**VICE PRESIDENT** Corporate Social Responsibility	**VICE PRESIDENT** Human Resources	**VICE PRESIDENT** Infrastructure	**VICE PRESIDENT** Planning & Operations	**VICE PRESIDENT** Real Estate

The Project is led by the Vice President, Infrastructure, who provides regular Project updates to the ELT and is responsible for ensuring that the Project advances in a manner consistent with PMV's strategic priorities and corporate policies.

1.3.3.1 Insurance and Liability Management

The Board of Directors, whose duties include identifying the appropriate level of risk that the organisation can accept in the conduct of its business activities, is ultimately accountable for all risks incurred by PMV. Authority for risk management is delegated to the President and CEO and the Chief Financial Officer.

During Project construction, PMV will ensure that an insurance program is in place that will include but may not be limited to the following coverage:

- Course of Construction Insurance – for any property damage to the Project that may occur during construction;
- Professional Liability – to address any claims that may arise due to professional errors and omissions; and
- General Liability or Wrap-up Insurance – for liability to third parties, including damage arising from sudden and accidental pollution.

During Project operation, PMV will ensure that an insurance program is in place that includes general liability coverage, including damage arising from sudden and accidental pollution.

In addition, where applicable, PMV will require its concessionaires, contractors, and terminal operators to provide additional insurance or liability coverage at a level adequate to address reasonably foreseeable risk.

1.3.3.2 Environmental Policy

Port Metro Vancouver is committed to the safe, efficient, and environmentally responsible movement of goods and passengers through the port, and is mindful of potential port-related effects on the quality of air, land, water, and fish and wildlife habitat in its jurisdiction. Port Metro Vancouver's Environmental Policy outlines its commitment to sustainability, avoidance and reduction of environmental impacts, minimisation of environmental risk of port operations, and promotion of continual environmental improvement.

Port Metro Vancouver plays a regional, national, and global leadership role in improving the sustainability of port-related operations and services. Port Metro Vancouver is the first North American port to employ a dedicated team of specialists to address issues concerning the environment, and it shares this vital responsibility with Transport Canada, Environment Canada, Fisheries and Oceans Canada, and Metro Vancouver, with the support of other local organisations. The Environment Team at PMV implements programs and initiatives that contribute to PMV's goal to sustainably connect Canada with the global economy[3].

Port Metro Vancouver has created a suite of industry-leading programs to promote a healthy ecosystem, minimise environmental impacts from port operations and grow a sustainable gateway. Some of these programs relevant to the Project are outlined in **Table 1-1**.

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3 For more information refer to PMV's 2013 Sustainability Report at http://portmetrovancouver.com/en/about/corporate/accountability.aspx

Table 1-1 Port Metro Vancouver Environmental Initiatives Relevant to the Project

Port Metro Vancouver Initiative	Description
Air Action Program	The Air Action Program focuses on reducing air emissions from ocean-going vessels, cargo handling equipment, rail, and truck sectors and includes a variety of initiatives.
	Shore Power: In 2009, PMV became the first port in Canada, and the third in the world, to install shore power facilities for cruise ships. This system enables cruise ships to shut off their diesel-powered engines and connect to the land-based hydroelectric grid while docked at Canada Place, improving air quality and reducing noise. By 2020, it is anticipated the majority of container vessels calling on terminals within PMV's jurisdiction will be shore power-enabled. Port Metro Vancouver is working with BC Hydro and container terminals to expand shore power infrastructure and enable container vessels to plug-in while docked.
	Northwest Ports Clean Air Strategy: Port Metro Vancouver is working with the ports of Seattle and Tacoma and government agencies, such as Environment Canada, to reduce port-related air emissions in the Georgia Basin/Puget Sound airshed through the Northwest Ports Clean Air Strategy. This strategy establishes air quality and greenhouse gas emissions reduction goals through to 2020.
	EcoAction Program: The EcoAction Program promotes emission reductions by offering discounted harbour dues rates to ocean-going vessels that have implemented emission reduction measures and other environmental practices. A variety of fuel quality, technology, and environmental management practices are eligible to receive discounted harbour dues rates.
	Landside Emissions Inventory: By developing an inventory of emissions from cargo-handling equipment, trucks, rail and other tenant activities, PMV works with customers and tenants to identify opportunities to conserve energy, reduce emissions, and promote clean energy technologies.
	Truck Licensing Program: In 2008, PMV introduced increasingly stringent environmental requirements as part of the truck licensing system (TLS) program. These requirements include emission reduction measures and age restrictions on trucks, in addition to mandatory opacity and idling limits. A new TLS policy came into effect on February 1, 2015. This policy included a rolling 10 year old truck model age requirement for approval in TLS. The introduction of a phased approach will see all trucks approved in TLS at a maximum of 10 years old as of January 2022.
Energy Action Program	Port Metro Vancouver's Energy Action Program focuses on promoting energy conservation and the use of reliable, clean energy across port operations. Port Metro Vancouver seeks opportunities for energy conservation and implementation of alternative or renewable energy to support operations and reduce air emissions. Studies are conducted to investigate energy efficiency, electrification, hybridization, integrated resource management, and other practices or technologies at key terminals. By improving understanding of these opportunities, PMV is better positioned to work with partners and develop a more sustainable gateway.

Port Metro Vancouver Initiative	Description
Habitat Enhancement Program	The Habitat Enhancement Program is a PMV initiative focused on creating and enhancing fish and wildlife habitat. This program is a proactive measure intended to provide a balance between a healthy environment and future development projects that may be required for port operations. PMV has been proactively building habitat since 1991. Examples of functioning habitat enhancement projects include salt marshes, intertidal marshes, and eelgrass beds. Port Metro Vancouver engages with all levels of government, regulators, Aboriginal groups, and adjacent communities, as appropriate, during project definition, design, and construction. Through an established Agreement, PMV works closely with Fisheries and Oceans Canada (DFO) to identify and implement enhancement projects. Under this Agreement, and at the discretion of DFO, PMV is able to apply credits from its habitat bank to offset potential residual effects from future development, after other mitigation measures have been implemented.
Noise Monitoring	Port Metro Vancouver has implemented a long-term noise monitoring program and installed noise monitoring terminals (noise monitors) to obtain and record existing noise levels and track trends over time. In the interest of transparency, data from noise monitors are available in real-time online. While there are some limitations with the technology, PMV is hopeful that the data gathered will assist in determining how much noise is attributed to port operations compared with other community noise sources, and documenting the location, volume, timing, and type of noises near the monitors. Port Metro Vancouver is committed to working with all of its terminals, tenants, railways, and suppliers, and encouraging them to make operational improvements that reduce noise and minimize impacts on neighbours. Locations for the noise monitors were chosen on the recommendation of noise experts and based on feedback received from the community. There are two noise monitors located in Delta and the location for a third unit is currently being determined. The Delta monitors are not streaming live as of March 1, 2015, but will come online in the near future.
Enhancing Cetacean Habitat and Observation Program	The Enhancing Cetacean Habitat and Observation (ECHO) Program was established by PMV, in collaboration with government agencies, First Nations, marine industry users, non-government organisations, and scientific experts, to better understand and manage the potential impacts to cetaceans (whales, porpoises, and dolphins) from noise created by commercial vessel activities throughout the southern coast of B.C. ECHO will look at the following factors, which have been identified by DFO in Recovery Strategies and/or Action Plans as key threats to at-risk whale species in the region: • Acoustic disturbance; • Physical disturbance; • Environmental contaminants; and • Reduced prey availability. Under the umbrella of the ECHO Program, a series of individual initiatives are being considered to better understand potential threats associated with noise created by commercial vessel-related activities. The outcomes of these projects will inform the possible development of mitigation and management measures to reduce potential impacts of shipping to cetaceans.

More information about these programs can be found at portmetrovancouver.com.

As outlined in **Section 2.3.5 Project Overview, Market and Concession Phase**, PMV will be retaining an infrastructure developer to build the Project and a terminal operator to equip and operate the Project. As part of the contractual agreements with the infrastructure developer and terminal operator, PMV will ensure that its contractors, consultants, and terminal operators comply with its environmental and health and safety requirements. In addition, construction on lands managed by PMV typically requires a PMV project permit. For RBT2, permit conditions will include compliance with PMV's environmental standards, as well as all terms and conditions of the Project approval under *CEAA 2012*, the B.C. *Environmental Assessment Act*, and Project-specific permits, approvals, and authorisations issued by other regulatory authorities.

Information on PMV's environmental management system and the environmental management program to be implemented during the construction and operation of RBT2 is provided in **Section 33.0 Environmental Management Program**.

1.4 USE OF INFORMATION

During Project planning, preliminary design, and preparation of the EIS, PMV gathered and integrated information from a wide range of sources, including the following:

- Academic experts;
- Federal authorities with specialist or expert scientific information, advice, and knowledge relating to projects of this nature;
- Other levels of government with expert and specialist knowledge;
- Aboriginal groups;
- Communities;
- Existing information relevant to the Project, including Aboriginal traditional knowledge; and
- Professional practitioners (e.g., registered professional biologists, air quality specialists, geomorphologists)

Port Metro Vancouver has not intentionally included any information in the EIS that is sensitive or confidential, in accordance with the requirements outlined in the *EIS Guidelines*, part 1, section 4.4.4.

1.5 ORGANISATION OF THE ENVIRONMENTAL IMPACT STATEMENT

The EIS is organised into a preface and five volumes. The preface includes the following:

- Title page;
- Cover letter;
- Stand-alone executive summary (translated into both official languages);
- Table of concordance that provides cross-references between the information requirements set out in the *EIS Guidelines* and the EIS sections in which the information is presented;
- Summary of acronyms and abbreviations applicable to the EIS; and
- Summary of definitions applicable to the EIS.

Each volume contains a table of contents (including lists of figures, tables, and appendices) and authorship (i.e., names and professional credentials of primary authors and contributors to EIS sections), followed by the volume's text, its figures, and appendices. The contents of each EIS volume are briefly described below.

Volume 1: Introduction and Project Information

This volume provides information on the following:

- **Section 1.0 Introduction** introduces the Project and PMV as the proponent;
- **Section 2.0 Project Overview** describes the Project context, purpose, and objectives;
- **Section 3.0 Geographical Setting** provides an overview of the Project's geographical setting, including land ownership, and the inter-relationships between the biophysical environment, people, and communities in the vicinity of the Project;
- **Section 4.0 Project Description** describes Project components and activities, and the anticipated schedule for the Project's construction and operation phases;
- **Section 5.0 Alternative Means of Carrying out the Project** assesses the technical and economic feasible alternative means of constructing and operating the Project;
- **Section 6.0 Environmental Assessment and Permitting Process** describes the mandate, interests, regulatory role, and nature of involvement for each level of government and other key participants in the Project's EA process; and
- **Section 7.0 Engagement and Consultation** summarises the activities undertaken to date and future planned activities with respect to Aboriginal, public, local government, and regulatory engagement and consultation.

Volume 2: Effects Assessment Methods and Physical Setting

This volume begins with **Section 8.0 Effects Assessment Methods**, which describes the methods used in the EA, including the approach and key steps followed in selecting valued components (VCs), identifying mitigation measures, and conducting the assessment of potential Project-related changes and effects, and cumulative effects. **Section 9.0 Physical Setting** provides an overview description of climate, coastal conditions, and geotechnical considerations (i.e., seismic hazards and geotechnical stability) in the vicinity of the Project (**Section 9.1**). The remaining sections describe conditions and anticipated changes in the physical components of the environment, including **Section 9.2 Air Quality**, **Section 9.3 Noise and Vibration**, **Section 9.4 Light**, **Section 9.5 Coastal Geomorphology**, **Section 9.6 Surficial Geology and Marine Sediment**, **Section 9.7 Marine Water Quality**, and **Section 9.8 Underwater Noise**.

Volume 3: Biophysical Effects Assessments

This volume begins with an overview description of the Project's marine and terrestrial setting in **Section 10.0 Biophysical Setting**; and continues with an effects assessment of each of the Project's biophysical VCs including: **Section 11.0 Marine Vegetation**, **Section 12.0 Marine Invertebrates**, **Section 13.0 Marine Fish**, **Section 14.0 Marine Mammals**, **Section 15.0 Coastal Birds**, and **Section 16.0 Ongoing Productivity of Commercial, Recreational, and Aboriginal Fisheries**. Each of these sections describe the assessment approach, existing conditions, assessment of potential effects and cumulative effects, mitigation measures, and monitoring and follow-up programs, as applicable. **Section 17.0 Mitigation for Marine Biophysical Valued Components** provides the approach to mitigating and offsetting effects for biophysical VCs.

Volume 4: Socio-economic Effects Assessments

This volume presents an overview description of the Project's **Economic and Social Setting** (**Section 18.0**), including demographic conditions, and continues with an effects assessment of each of the Project's economic and social VCs, including **Section 19.0 Labour Market**, **Section 20.0 Economic Development**, **Section 21.0 Marine Commercial Use**, **Section 22.0 Local Government Finances**, **Section 23.0 Services and Infrastructure**, **Section 24.0 Outdoor Recreation**, **Section 25.0 Visual Resources**, and **Section 26.0 Land and Water Use**. The volume also contains **Section 27.0 Human Health** and **Section 28.0 Archaeological and Heritage Resources**. Each of these sections describes the assessment approach, existing conditions, assessment of potential effects and cumulative effects, mitigation measures, and monitoring and follow-up programs, as applicable.

Volume 5: Environmental Management, Aboriginal Rights and Interests, Conclusions, and Summaries

This volume includes much of the summary information required in the *EIS Guidelines*, including **Section 29.0 Summary of Changes to the Environment and Effects of Changes to the Environment**, **Section 34.0 Benefits to Canadians**, and **Section 35.0 Effects Assessment Summaries**.

In addition, this volume presents assessments on **Potential Accidents or Malfunctions** (**Section 30.0**) and **Effects of the Environment on the Project** (**Section 31.0**). **Section 32.0 Potential or Established Aboriginal and Treaty Rights and Related Interests, Including Current Use of Lands and Resources for Traditional Purposes** describes, from PMV's perspective and based on information exchanged with and provided by the Aboriginal groups listed in the *EIS Guidelines* (see also **Section 3.3.2 Geographical Setting, Aboriginal Groups**), and presents the Project's potential effects on the current use of lands and resources for traditional purposes by Aboriginal people and the ability of Aboriginal peoples to exercise their asserted or established Aboriginal and Treaty rights and related interests.

Section 33.0 Environmental Management Program sets out PMV's overarching approach to environmental management, presents outlines of the component plans to be included in the Project's construction and operation **Environmental Management Plans**, and identifies Project-specific monitoring and follow-up programs.

2.0 PROJECT OVERVIEW

This section describes the need for the proposed Roberts Bank Terminal 2 Project (RBT2 or the Project), including the purpose, objectives, and context of the Project, and summarises Project planning, development, and implementation phases. It also briefly describes Project-related opportunities and benefits.

2.1 PROJECT PURPOSE AND OBJECTIVES

Port Metro Vancouver (PMV) proposes to build RBT2 to meet increasing forecasted demand for containerised trade on the west coast of Canada and to continue to maximise the potential economic and competitive benefits of the port. Development of the Project is consistent with Port Metro Vancouver's mandate under the *Canada Marine Act* as outlined in **Section 1.3.2.2 Mandate and Jurisdiction**.

2.1.1 Rationale

Forecasts developed by Ocean Shipping Consultants (OSC), independent experts in global economics and logistics, show that in the near term, existing container capacity on Canada's west coast and specifically, in B.C.'s Lower Mainland, will become constrained. While there are currently improvements to existing infrastructure underway to help alleviate constraints, the west coast will require additional capacity by the early to mid-2020s.

The Project will provide an additional 2.4 million twenty-foot equivalent unit (TEU) of container capacity per year. In doing so, it will drive economic growth and increase employment, benefitting the region, the province, and the country while supporting the ongoing promotion and protection of Canada's trade objectives.

Port Metro Vancouver has long been the hub of one of North America's most important economic corridors, generating tens of thousands of jobs and adding almost $10 billion to the gross domestic product (GDP) annually. It is because of the foresight shown in decades past that PMV has grown to meet global demand for Canadian goods and that Canadians have been able to rely on the diverse, rich trading economy that it supports. The Project furthers that proactive approach to meeting demand. Through comprehensive container demand forecasts, PMV understands the market potential and is acting now to meet the opportunity with greater capacity and faster, more efficient terminal operations.

2.1.2 Objectives

Port Metro Vancouver has five main objectives with respect to the Project:

1. **Meet demand for containerised trade growth on behalf of Canada and Canadians.** Additional container capacity will be required on Canada's west coast by the mid-2020s.
2. **Ensure sustainable development objectives continue to play a key role in the design and operation of the Project – considering environmental, social, and economic factors.** Port Metro Vancouver is committed to maintaining a healthy environment and minimising the environmental impact of port operations.
3. **Provide economic benefits, including job creation, to the region, B.C., and Canada.** The Project will create employment during construction and operation and will facilitate trade.
4. **Improve the efficiency of moving goods at Roberts Bank, including marine traffic and on-terminal operations.** The Project will ensure the continued efficiency of ship-to-shore container movements at Roberts Bank.
5. **Align with federal and provincial strategies to continue to strengthen Canada's Asia-Pacific Gateway.** The Project aligns with Canada's Global Markets Action Plan, the New Building Canada Plan, and the Asia-Pacific Gateway and Corridor Initiative. The Project further supports provincial strategies such as The Pacific Gateway Transportation Strategy 2012-2020, the B.C. Jobs Plan and, most recently, B.C. on the Move: A 10-Year Transportation Plan.

2.2 PROJECT CONTEXT

This section describes containerised trade through the port, and summarises current and forecasted containerised trade on Canada's west coast, as well as past and current PMV initiatives to meet predicted demand.

2.2.1 About Containers

Historically, goods being transported by ship were packed individually in non-standardised formats such as pallets, boxes, and sacks, while bulk commodities were poured into ship holds. In the 1950s, shippers began to use uniform-sized boxes to store goods during transport, which greatly simplified the loading and unloading process. By 1964, universal ISO container dimensions had been adopted, allowing greatly improved time and cost efficiencies through the use of standardised equipment.

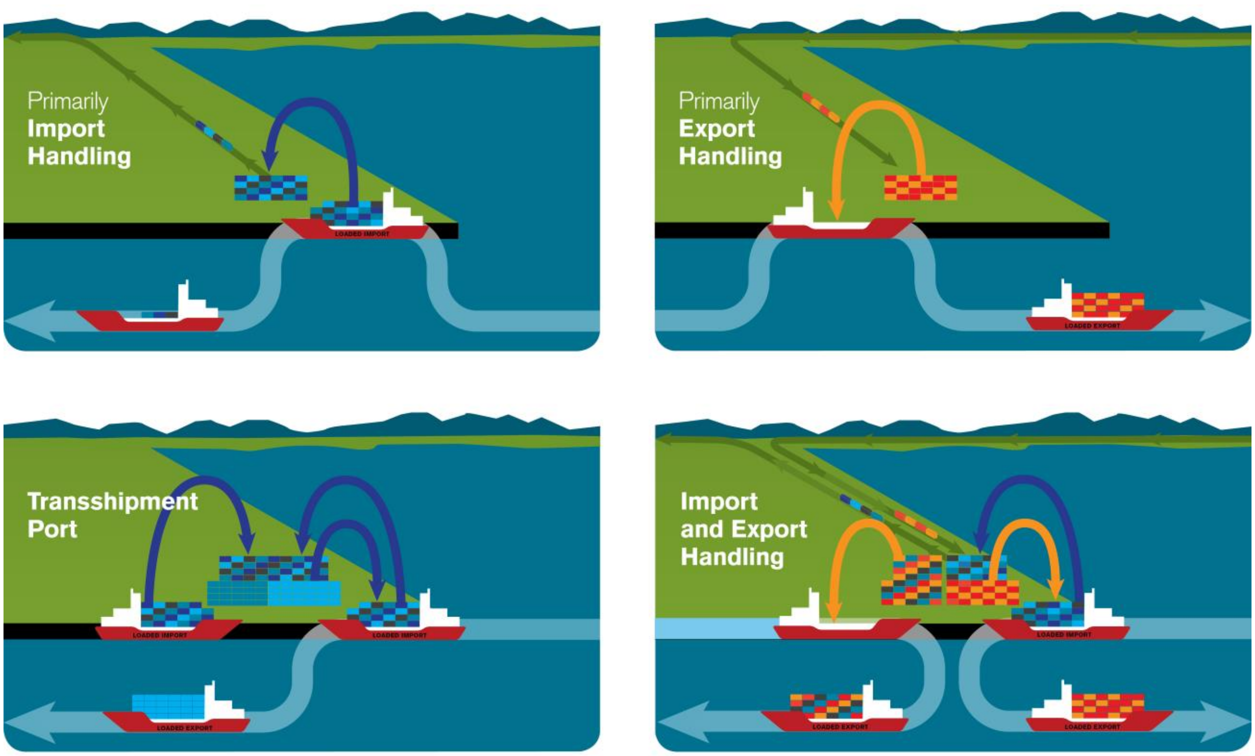
Modern shipping containers are constructed of steel, which allows for repeated use and the safe transport of a diverse range of goods. Their standardised design means that they can be easily and quickly transferred between ship, train, or truck.

The capacity of a container terminal and a ship is measured in twenty-foot (ft.) equivalent units (TEUs). A 20-ft. container is referred to as 1 TEU and a 40-ft. container as 2 TEUs.

Container ports in the world generally fall into one of four categories as illustrated in **Figure 2-1**:

- Primarily import handling (e.g., ports of Los Angeles or Long Beach);
- Primarily export handling (e.g., Shanghai);
- Transshipment port (e.g., Singapore); and
- Import and export handling (e.g., PMV).

Figure 2-1 Types of Container Ports



2.2.2 Containerised Trade through Port Metro Vancouver

Port Metro Vancouver is Canada's largest port and the fourth largest tonnage port in North America. Port Metro Vancouver container terminals serve as a Canadian gateway for imported goods that are destined for markets across the country. The majority of the goods arriving at Vancouver terminals are destined for Eastern Canada, with approximately 10% remaining in B.C. and approximately 20% bound for the U.S.A.

In terms of volume, PMV is the fifth largest container port in North America. Other Canadian ports with significant container volume include the Port of Montreal, the Port of Prince Rupert, and the Port of Halifax. Due to their location and intermodal connectivity, Canada's west coast ports are at a particular advantage to service trade with Asian markets. Container terminals require sufficient water depth for deep-sea vessel access, as well as road and rail connections to allow for efficient movement of containers to and from local, regional, national, and international markets.

In 2014, 3.5 million TEUs transited through Canada's west coast ports (PMV and Port of Prince Rupert), with terminals within PMV's jurisdiction accommodating the majority of the volume, at 2.9 million TEUs.

Container trade benefits both Canadian consumers and producers, as evidenced by the almost equal volume of loaded import and export containers that travel through the port.

- **Import containers** often contain electronics, food items, household goods, clothing, shoes, health and medical products, sporting equipment, construction materials, and manufacturing inputs such as car parts and
- **Export containers** often contain lumber, pulp, plywood, specialty grain, and local agricultural products including blueberries, tomatoes, and mushrooms.

There are advantages to having imports and exports moving through the port. For example:

- It is less vulnerable to a decrease in one type of traffic than a port that handles primarily one or the other;
- It is much more attractive to shipping lines as a port of call, since they can earn revenue delivering imports and carrying exports away; and
- The multi-directional flow of goods and the integrated web of supply chain participants result in a dynamic and competitive environment that delivers overall reliability, lower costs, and less time in transit.

2.2.3 The Container Supply Chain in Metro Vancouver

The container supply chain in Metro Vancouver is made up of a highly integrated web of suppliers, shippers, intermediaries, and service providers.

2.2.3.1 The Container Supply Chain

Each supply chain participant makes independent decisions that reflect the dynamic and constantly shifting business environment in which all participants operate.

- **Cargo Owners:** Cargo owners are the importers (e.g., retailers, wholesalers) and exporters (e.g., pulp and lumber producers, crop and agri-food producers), whose primary concerns are transport time, cost, service levels, and reliability.
- **Shipping Lines:** Container ships have enabled the efficient cross-ocean movement of an increasing volume of goods. Shipping lines operate the physical container ships, and provide transportation from one marine terminal to another, usually on a fixed weekly schedule. Shipping lines own their own shipping containers, and form alliances with other shipping lines to transport other companies' containers on their vessels. For this reason, several different brands of containers may be seen on a particular ship.
- **Marine Terminals:** Terminal operators load and unload container ships that call on that terminal, provide temporary storage for import and export containers, and act as an interface between the trucks and trains that transport containers to and from the marine terminal.
- **Railways:** Rail companies provide the most efficient land-based mode of container transportation over long distances, such as Vancouver to Montreal. Most container trains are between 8,000 ft. (approximately 2,440 m) and 12,000 ft. (approximately 3,660 m) in length, and can accommodate double-stacked containers up to 53 ft. (approximately 16 m) in length.
- **Trucking Companies:** Truck operators provide the most efficient form of container transportation over short distances (usually less than 500 km), and are used to move containers between various points within the Lower Mainland, including to off-dock facilities.
- **Off-Dock Facilities:** Off-dock facilities in Metro Vancouver offer a range of value-added services that enhance the efficiency of the supply chain. These facilities usually offer some combination of transloading (unpacking marine containers and repacking goods into other marine containers or larger domestic containers), stuffing (loading empty containers for export), warehousing, and storing empty containers.

2.2.3.2 Import Transloading

While approximately two-thirds of import containers are loaded directly onto trains and leave the container terminal within three days, the remaining one-third leave the terminal by truck, and are transported to a transload facility or warehouse in the Lower Mainland where goods are unloaded, sorted, and reloaded for further transportation. Since the distance between the marine terminals and the transload facilities is usually less than 50 km, trucks are the most efficient form of transportation to and from these facilities.

There are three primary reasons that import containers are transloaded at facilities in the Metro Vancouver region:

1. **The goods are destined for consumption in the Metro Vancouver area**. As Vancouver is the largest market in western Canada, a portion of cargo from certain containers needs to be unloaded and warehoused for distribution in the Lower Mainland and surrounding areas;
2. **The goods from different containers are combined and sent to multiple destinations**. In many cases, containers from a variety of origins in Asia will need to be mixed and matched in Vancouver and sent to multiple destinations both locally and across the country; and
3. **The goods must be loaded into larger containers for cost-efficient, long-distance rail transportation.** While 40-ft. marine containers are the most common type of containers used for marine transport, North American trains are equipped to carry 53-ft. containers. By unloading the goods from 40-ft. marine containers into 53-ft. domestic containers, cargo owners can achieve significantly lower rail transportation costs by transporting the same number of goods in fewer containers.

In practice, transloading of most import containers will often involve local delivery of a portion of a container's contents, as well as reloading it in such a way that maximises both transportation and cost efficiencies.

Approximately 80% of containers that leave the terminal by truck will end up being transported out of Metro Vancouver on trains, typically within three days of arriving at the terminal. With the majority of transload facilities co-located with local distribution warehouses in the Vancouver area for local consumption, and with westbound 53-ft. domestic containers from across the country emptied in the same region, the Lower Mainland is the logical hub for import transloading activities in the Asia-Pacific Gateway.

2.2.3.3 Export Transloading

The concept of transloading is not limited to import cargo. Most of the goods that are exported from Vancouver in containers are transported here by train in railcars that are specifically designed to optimally hold that particular commodity. Export commodities tend to be very heavy, and container trains cannot be efficiently loaded with full containers of heavy export commodities. Once the export railcars arrive in the Lower Mainland, they are unloaded at specialised export stuffing facilities and placed into marine containers. These containers are then trucked to the marine terminal for eventual loading onto a container ship destined for markets in Asia.

2.2.3.4 Empty Containers

The process of transloading creates a surplus of containers in some locations and a requirement for additional containers in others. The only solution to this imbalance is to truck the empty containers to the locations they are required.

Empty containers accumulate in the following locations:

- **Container terminals:** More than half of the containers on trains returning to the marine terminals from Eastern Canada are empty. These empty containers are then unloaded at the terminal where they are stacked until they are needed for loading exports and
- **Transload facilities:** Some transload facilities, particularly those primarily handling imports, will generate an excess number of empty containers from the process of unloading goods from marine containers and reloading them into larger domestic containers.

These empty containers will then be trucked to one of the following facilities:

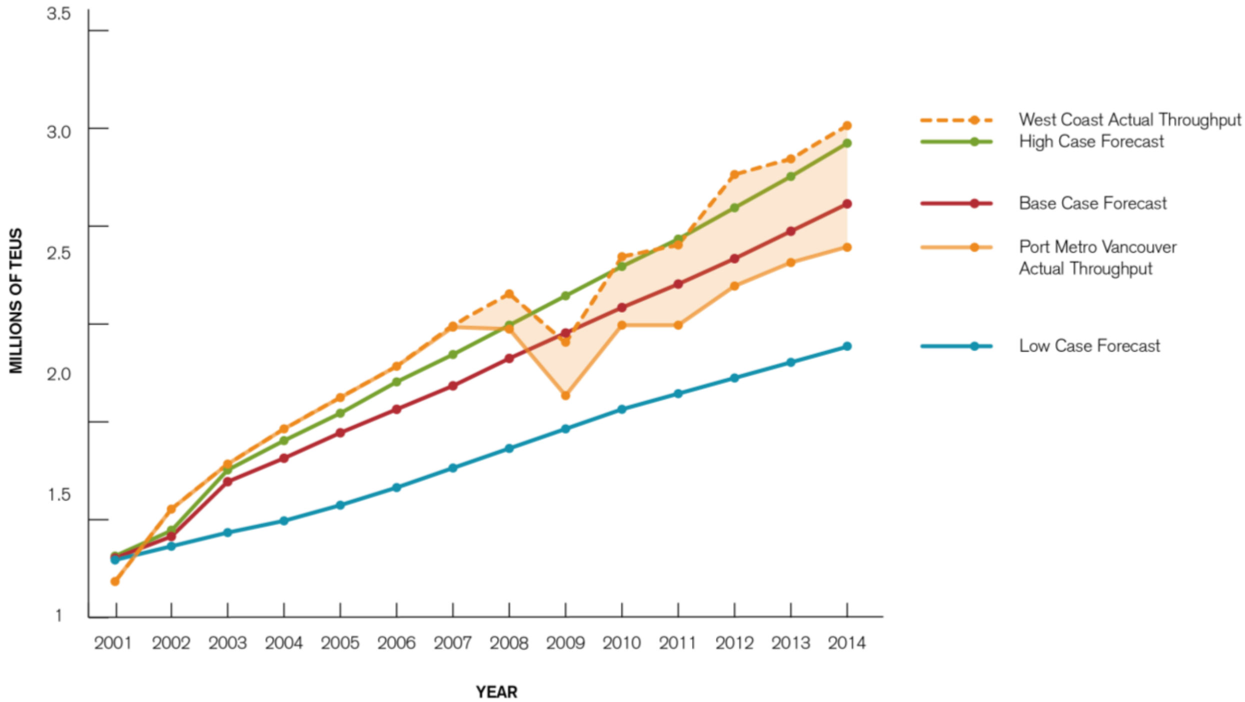
- **Export stuffing facilities:** Since the majority of export commodities arrive in the Lower Mainland on specialised railcars, a consistent supply of marine containers is required at export stuffing facilities, where exports are transferred into marine containers in preparation for ocean shipping and
- **Empty off-dock depots:** Empty containers are also stored at empty depots in the Lower Mainland.

The convergence of export commodities and empty containers in the Lower Mainland make the region the logical hub for export stuffing facilities.

2.2.4 Historic Canadian West Coast Container Traffic Forecasts

In 2001, Ocean Shipping Consultants, internationally recognised experts in global transportation economics and logistics, forecasted low case, base case, and high case container traffic scenarios for Canada’s west coast. **Figure 2-2** demonstrates the robustness and accuracy of the forecasts. Actual west coast container traffic remains closely aligned with, and has in many years exceeded, the high case forecast, with the exception of the decrease in container volumes that occurred in 2009 in association with the global financial crisis.

Figure 2-2 Canadian West Coast Container Traffic Forecast (2001) and Actual Throughput



Note: Based on source data presented in OSC 2013. The Fairview Container Terminal (Port of Prince Rupert) opened in 2007. From 2007 onwards, the dotted line showing West Coast Actual Throughput includes Port Metro Vancouver and Port of Prince Rupert.

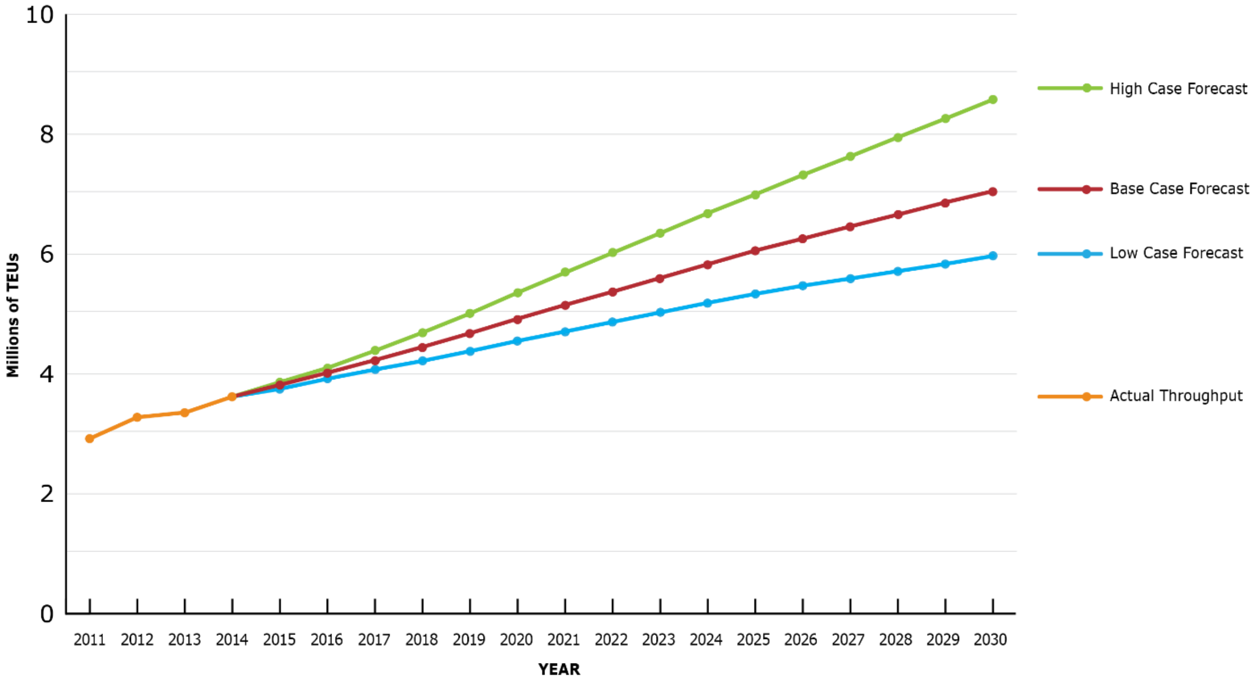
2.2.5 Current Canadian West Coast Container Traffic Forecasts

The most recent independent container traffic forecast was completed by OSC in 2014. Under the base case outlined in OSC 2014, container traffic on Canada's west coast (PMV and Prince Rupert) is forecasted to grow at an average of 4.5% per year as 2014 container volumes of 3.5 million TEUs increase to over 6.0 million TEUs by 2025 and 7 million TEUs by 2030 (see **Figure 2-3**).

Port Metro Vancouver remains a highly competitive option for import and export container volumes moving forward. By 2025, the port's terminals are projected to be handling almost 5 million TEUs per annum in total (under the base case), compared to the 2014 total of 2.9 million.

Continued growth of Asian imports, together with more locally sourced exports, are anticipated to continue, with the port able to serve more distant import intermodal markets in both Canada and the U.S.A.

Figure 2-3 Canadian West Coast Container Traffic Forecast (2014)



Source: Ocean Shipping Consultants, 2014

The annual independent forecasts, which have been completed on an annual basis (WorleyParsons and Seaport Group 2011a, b, OSC 2012, 2013, 2014), considered many key factors that interact to influence container traffic demand, including GDP growth, widening of the Panama Canal, planned container terminal expansion at the Port of Prince Rupert, and other key container demand considerations, as identified in the following subsections.

2.2.5.1 Macro-Economic Trends in North America

Container trade volumes (and port demand) are directly related to overall volumes of traded goods, especially in the manufacturing sector. This is particularly true for cargoes imported into North America. For PMV, the important containerised export sector is driven by the pace of demand for primary goods in developing Asian markets.

An imbalance of loaded inbound and outbound containers between North America and Asia means shippers are continually searching for more cargoes on return legs to Asia. As a result, there has been an increasing use of containers in sectors not historically regarded as suitable for containerisation, such as grain, forest products, iron and steel scrap, and waste papers. This is an important consideration for PMV export demand.

2.2.5.2 North American Container Port Demand

Between 1990 and 2007, total North American container demand increased by 216% to reach just under 50 million TEUs, growing at 6.8% per annum. The global financial crisis saw the total fall to 40.2 million TEUs for 2009, but a strong recovery saw the total rise to 49.9 million TEUs by the end of 2013.

The distribution of west coast volumes between the Pacific northwest region (Prince Rupert, Vancouver, Seattle, Tacoma, and Portland) and ports in California has remained largely consistent, although the Californian ports were more severely affected by the downturn.

In 2013, Pacific northwest ports handled 7.56 million TEUs, of which PMV's share accounted for 37.5%, a rise from 31.5% in 2011. Prince Rupert's share is currently 7.1%, although it did decline slightly in 2013 as its total traffic fell. Since 2000, PMV has seen growth in container throughput of 7.1% per year.

2.2.5.3 Competitive Developments at Other Ports

Ocean Shipping Consultants (2014) considered the competitive landscape of Pacific coast container ports, as well as the impact of any infrastructure improvements that are planned or underway. The report provides an overview of current and planned capabilities, as well as a forward-looking, competitive outlook of Pacific northwest terminals, including those in Seattle, Tacoma, Portland, PMV, and Prince Rupert. This same assessment is performed for Pacific southwest ports, including Long Beach, Los Angeles, and Oakland. Cumulatively, there are ongoing investments in capacity to meet the overall continued growth in North American trade with Asia. The OSC report concludes that PMV's planned improvements are likely to result in an increased market share in the Pacific northwest over the next decade.

2.2.5.4 Trends in Container Shipping

Trends within the container shipping industry, and their implications for the proposed Project, include the following:

- **Ship Size –** The most significant development has been the ongoing growth in the size of container ships. The average size of ships on the trans-Pacific route in 2013 was 6,000 TEUs, up from 5,350 TEUs in 2010. This trend is expected to continue for the foreseeable future as larger ships enter service and older, smaller ships are retired. In addition, this trend has implications on the required vessel draft and crane size needed to service these ships. Both of these factors favour terminals such as RBT2, which would be capable of handling the simultaneous loading and unloading two post-Panamax ships (12,000 TEUs) and one ultra-large container ship (18,000 TEUs).

- **Shipping Alliances –** The proliferation of alliances among various shipping lines has helped ensure a more efficient deployment of container vessels. As a result, terminals must be able to handle higher-intensity operations in order to maintain cargo schedules, as well as provide efficient road and rail links to a variety of inland destinations. The increasing adoption of shipping alliances will benefit PMV, which already sees calls from all of the major shipping lines, as well as offering the necessary vessel draft, terminal efficiencies, and intermodal links to meet the requirements of the alliance services.
- **Alternative Routes –** While most container trade between Asia and North America travels the most direct route across the Pacific Ocean, the Suez Canal provides an alternative route for goods destined for the east coast of the U.S. Once it is opened in 2015, the enlarged Panama Canal will offer another alternative all-water route to the east coast of North America for ships up to 13,000 TEUs. While both of these canals may provide advantages on certain shipping routes, the combination of lower overall costs and faster transit times offered via PMV for containers travelling between Asia and most Canadian and mid-west American destinations is anticipated to minimise any redirection in future container traffic volumes.
- **Intermodal Developments –** Intermodal links are critical to the efficient transportation of containers between the terminals on the Pacific coast and their inland destinations, which can be as far away as the Canadian east coast and American Midwest. This is especially true within PMV, as almost 90% of all import containers leave the region by rail directly or after transloading.

  Each of the container terminals within PMV's jurisdiction feature on-dock rail facilities, as well as access to nearby off-dock facilities where containers can be transloaded before being transferred to rail. Port Metro Vancouver's position at the terminus of the Canadian Pacific and Canadian National mainlines, as well as continued investments by both of the rail lines, has allowed for increased throughput of containers destined for central Canada and the American Midwest. Ultimately, efficient rail service is understood to be a competitive advantage which will ensure that PMV retains west coast import market share moving forward.

2.2.5.5 Competitive Position of Port Metro Vancouver Compared To Other North American Ports

Ocean Shipping Consultants (2014) concludes that PMV is considered to have a higher competitive position than its immediate competitors – Prince Rupert, Seattle, and Tacoma – based on a review of the following criteria:

- Physical capability of the terminals;
- Planned development of capacity;
- Productivity of the terminals;
- Cost of transiting the terminals;

- Delivered costs to eastern Canada and the U.S. Midwest;
- Intermodal capacity;
- Import-export balances;
- Suitability as a regional hub location; and
- Existing customer base.

2.2.6 The Container Capacity Improvement Program: Meeting Increasing Demand for Containerised Trade

To meet the forecasted growth in container traffic shown in **Figure 2-3**, PMV established the Container Capacity Improvement Program (CCIP), to consider options for increasing container capacity on the west coast of Canada.

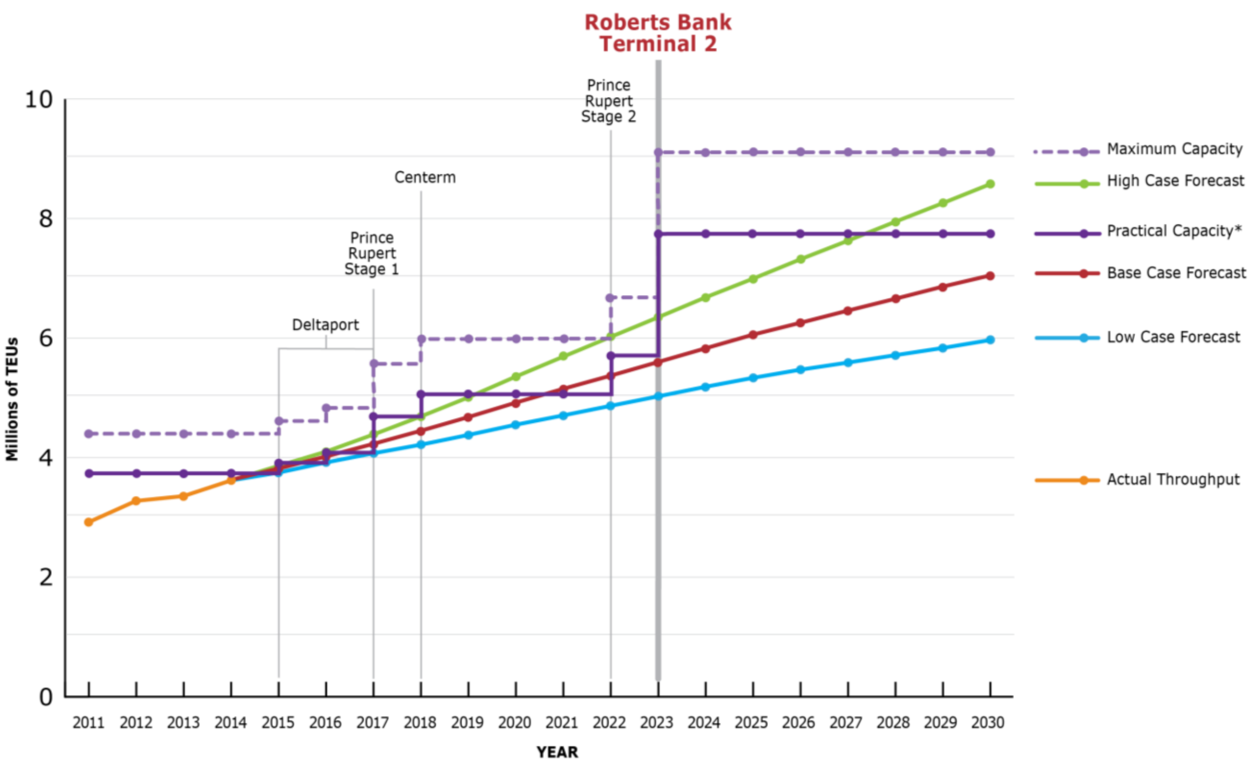
Port Metro Vancouver examined the following alternatives in planning for the Project:

- **Increasing capacity and efficiency at existing container terminals within PMV's jurisdiction:** Port Metro Vancouver's objective through CCIP is to maximise the use of existing terminals before building any new facilities. Incremental capacity and efficiency increases are underway or in planning at the existing Deltaport and Centerm terminals. These projects will help meet short-term container demand to the early 2020s, but would not meet forecasted long-term requirements. Additional capacity at the Vanterm terminal in Vancouver's inner harbour may be available after 2030, but would require the conversion of adjacent facilities. Some container ships, such as the largest ships visiting Deltaport and Centerm, cannot be accommodated in the Fraser River channel due to draught requirements and the length of ships (inability to turn around in the river). As a result, Fraser Surrey Docks is not expected to be a major source of container capacity to meet demand beyond 2018.
- **Converting existing terminals or properties within PMV's jurisdiction to handle containers:** Conversion of the Lynnterm Terminal in North Vancouver is not feasible as the lessee has other plans for the site in support of equally important Canadian trade objectives. Development of the Fraser Richmond properties is not technically or financially feasible due to constraints preventing large container ships from turning around in the Fraser River. In addition, road and rail constraints in both areas limit the ability of these alternatives to handle large volumes of container traffic.
- **Building a new terminal within PMV's jurisdiction:** Roberts Bank is an established trade corridor that is well positioned to accommodate future growth in containerised trade, as it provides connections to an existing road and rail network and deep water capable of handling large container ships.
- **Utilising other west coast alternatives:** PMV also examined other west coast alternatives that are outside of its jurisdiction. Planned expansions at the Fairview Container Terminal in Prince Rupert are needed, in addition to the Project, to meet container demand on the west coast of Canada.

More detail regarding the alternatives reviewed by PMV can be found in **Section 5.0 Alternative Means of Carrying Out the Project**.

The stepped lines in **Figure 2-4** show the projects described above that would accommodate demand for increased container throughput to the early 2020s. Practical capacity is defined as 85% of maximum capacity. When terminals operate above practical capacity for extended periods of time, inefficiencies which often occur elsewhere in the transportation chain cannot be accommodated. Considering the base case for forecast demand, the west coast of Canada will be operating near or above practical capacity at several points until improvements to existing terminals are completed.

Figure 2-4 Canadian West Coast Container Traffic Forecast (2014) and Planned Capacity Increases to 2030



Source: Ocean Shipping Consultants, 2014
*Practical capacity is calculated as 85% of maximum capacity, above which terminals begin to lose efficiency.

Need for the Roberts Bank Terminal 2 Project

As shown above, even with recent, current, and proposed improvements to infrastructure at container terminals within PMV jurisdiction, and the planned expansion at the Fairview Container Terminal[1] in Prince Rupert, demand forecasts indicate Canada's west coast will need additional container capacity by the early to mid-2020s. Port Metro Vancouver's analysis concludes that the Project is the only viable alternative to provide this capacity (see **Section 5.0 Alternative Means of Carrying Out the Project**).

Since large infrastructure projects require a long lead time due to regulatory, permitting, procurement, construction, and commissioning processes, PMV has chosen to advance RBT2 now so that it can meet anticipated growth and demand in container capacity in the mid-2020s. The Project could be operational in the mid-2020s, subject to regulatory approvals and based on the current Project schedule (see **Section 4.0 Project Description**).

2.2.7 Roberts Bank as a Terminal Location

As an established trade gateway, the Roberts Bank location is well positioned to accommodate future growth in trade activity. The location has several competitive advantages, including the following:

- Deep water capable of handling large container ships;
- Proximity to major transportation corridors for both truck and rail movements;
- Proximity to the Strait of Juan de Fuca and Pacific Ocean shipping routes; and
- Direct access to numerous off-dock facilities.

Expanded trade through Roberts Bank terminals will also benefit from significant federal and provincial infrastructure investments to improve transportation for communities, commuters, and commercial traffic, including the $1.2 billion South Fraser Perimeter Road Project, completed in 2013, and the $300 million Roberts Bank Rail Corridor Program, completed in 2014.

[1] The Prince Rupert Port Authority is planning to expand its container capacity in two stages. The first stage would increase capacity by 0.5 million TEUs, bringing the port's total capacity to approximately 1.3 million TEUs between 2017 and 2020. The second stage of expansion, in the early 2020s, would add approximately 0.7 million TEUs, bringing the total capacity to approximately 2.0 million TEUs.

The Gateway Transportation Collaboration Forum (GTCF) is an initiative established in 2014 to identify and prioritise development of transportation and related infrastructure necessary for supporting continued gateway growth and providing overall net benefits to host communities. It brings together Transport Canada, the B.C. Ministry of Transportation and Infrastructure, TransLink, the Greater Vancouver Gateway Council, and PMV to collaboratively pursue solutions and funding opportunities under the New Building Canada Plan. The GTCF builds on the success of past initiatives, including the Roberts Bank Rail Corridor Program, South Fraser Perimeter Road, North Shore and South Shore Trade Area projects, Ashcroft Terminal's Expansion Project, and the Regional Transportation Management Centre.

Consisting of four trade areas, including the Roberts Bank Trade Area, the GTCF will leverage existing reports and conduct new studies, as necessary, to guide evaluation and identification of regional projects that relate to additional truck and train traffic from increasing demand for trade through the Gateway. The GTCF will work in consultation with municipal and regional government, Aboriginal groups, industry, and other stakeholders, to consider how best to meet long-term trade demand while minimising impacts to local communities and the environment. Much of this work will focus on addressing the increased truck and train traffic within the Lower Mainland that is anticipated as demand for trade through the gateway grows.

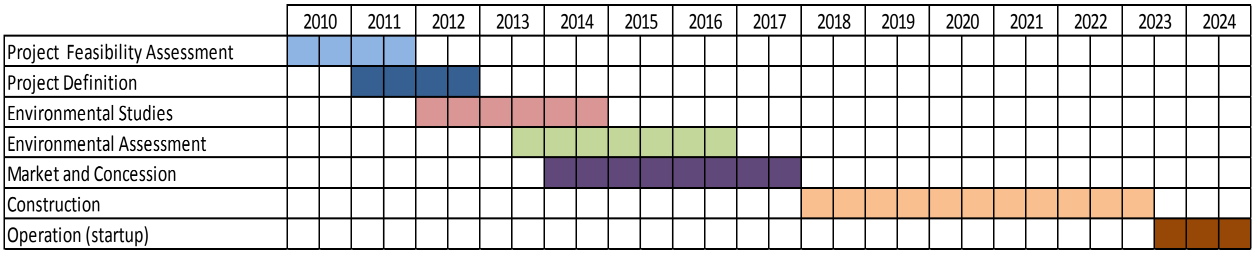
2.3 PROJECT PLANNING, DEVELOPMENT, AND IMPLEMENTATION

The Project has been contemplated twice before, from 2002 to 2004, and from 2008 to 2010. The current Project design, including the terminal location and orientation, has accounted for lessons learned from previous technical work and feedback from regulators. For more information, see **Section 5.0 Alternative Means of Carrying Out the Project**.

Current RBT2 planning, development, and implementation are discussed below with reference to the following activity phases, which are shown in **Figure 2-5**:

- Project Feasibility Assessment;
- Project Definition;
- Environmental Studies;
- Environmental Assessment (EA);
- Market and Concession;
- Construction; and
- Operation.

Figure 2-5 Project Planning, Development, and Implementation Schedule



2.3.1 Project Feasibility Assessment Phase

Preliminary planning for a new three-berth container terminal at Roberts Bank was undertaken in the early 2000s[2]. The economic, social, and environmental aspects of RBT2's feasibility were more thoroughly assessed between 2010 and 2011 as part of the Project Feasibility Assessment Phase. During this phase, the assessment focused on determining the need for and feasibility of the Project. Port Metro Vancouver reviewed past plans, existing studies, and available reports, and engaged in discussions with regulators and marine consultants about the feasibility of a new terminal development at Roberts Bank. The conclusion of the assessment was to proceed to the next stage of planning and development.

2.3.2 Project Definition Phase

During the Project Definition Phase, which took place between 2011 and 2012, PMV retained engineering firms to develop a conceptual engineering design and complete a cost estimate for the Project. Throughout 2013 and 2014, PMV continued to monitor and track economic forecasts, and compared actual container volumes to earlier forecasts to verify growth predictions in the container industry. Forecasts were shared annually with the public through PMV's RBT2 website[3]. A PMV-led engagement program, consisting of several rounds of consultation with the public, local governments, and Aboriginal groups, was initiated in 2011.

Significant consultation with the public – including communities, local and regional government, stakeholders, community groups, and residents – has taken place since 2011 and is continuing through the EA process. Since 2011, PMV has led or participated in more than 100 consultation meetings, presentations, local government meetings, community events, and open houses.

[2] In 2002, RBT2 was proposed together with the Deltaport Third Berth Project (DP3). Based on regulator input, PMV chose not to advance RBT2 in order to provide more time to complete environmental and engineering studies to explore the best location and design for a new terminal; DP3 proceeded through the regulatory process as a separate project.

[3] Container volume forecasts are available at http://www.robertsbankterminal2.com/about-the-project/.

In addition to these PMV-led consultation activities, there have been multiple opportunities to participate and provide comments in the EA process for the proposed Project, which is being led by the Canadian Environmental Assessment Agency (CEA Agency).

Refer to **Section 7.0 Engagement and Consultation** for a summary of engagement and consultation activities undertaken and outcomes.

2.3.3 Environmental Studies Phase

Between 2012 and 2014, PMV undertook environmental studies to build upon the extensive physical, biophysical, and socio-economic data already collected for previous Roberts Bank terminal developments. In response to requests during Project Definition consultation, PMV made available, via the RBT2 website, the terms of reference for field studies. Port Metro Vancouver also developed an online monthly field notification program to inform local governments, Aboriginal groups, and the public about the specific environmental studies being undertaken.

During this phase, a Technical Advisory Group process was undertaken to proactively engage with local and international scientific and technical experts to enhance the relevance, quality, and rigour of studies that would inform the environmental assessment. Refer to **Section 7.4 Technical Advisory Group Process (2012 to 2013)** for additional information.

During the course of the Environmental Studies phase, PMV continued with Project planning.

2.3.4 Environmental Assessment Phase

Port Metro Vancouver submitted a Project Description to the CEA Agency and the B.C. Environmental Assessment Office in September 2013. In January 2014, the federal Minister of the Environment referred the Project for assessment by an independent review panel. It is anticipated that the EA will take between two to three years to complete (2014 to 2017).

The federal EA process for the Project is thorough and independent, and includes public comment periods to obtain feedback on key EA process-related documents, as well as public hearings under an independent review panel. The process provides opportunities for timely and meaningful participation by the public, Aboriginal groups, all levels of government, and other stakeholders.

While not part of the federal EA process, PMV established a Working Group process to bring together representatives of federal and provincial agencies, regional and local government, and Aboriginal groups to discuss issues relevant to the development of this environmental impact statement (EIS). Input received through the Working Group process has been considered in the development of the EIS. The Working Group process is summarised in **Section 7.1 Regulatory Engagement and Consultation.**

The Project is also subject to a provincial EA process under the B.C. *Environmental Assessment Act*. A description of the Project's EA process is presented in **Section 6.0 Environmental Assessment and Permitting Process**. During this phase, PMV will continue to consult with regulatory authorities, Aboriginal groups, local governments, and the public. The EA phase will be complete upon issuance of approvals to proceed from the federal and provincial governments.

2.3.5 Market and Concession Phase

Port Metro Vancouver began the process of selecting a **Terminal Operator Concessionaire** in 2013. The terminal operator would be in place for a period of up to 40 years and would be responsible for terminal facilities, equipment, and ongoing container-handling operations. An **Infrastructure Developer** would be identified through a separate competitive process after the terminal operator has been selected, and would be responsible for designing, building, financing, and maintaining the terminal land and related infrastructure, including the berth structure. This procurement approach, consistent with large infrastructure projects across Canada, would provide Port Metro Vancouver with integrated, long-term contracts and financial accountability during Project development and operation.

As shown in **Figure 2-5**, this phase will continue until shortly before the Project construction phase commences, anticipated in approximately 2018, following receipt of Project approvals.

2.3.6 Construction and Operation Phases

Project construction, anticipated to commence upon Project approval and the acquisition of necessary permits, will proceed over a period of approximately five and a half years. Subject to approvals, the Project's operation phase is expected to commence in the mid-2020s. Details of these phases are provided in **Section 4.0 Project Description**.

2.4 Project Opportunities and Benefits

This section summarises the potential economic, social, and community benefits that can be realised from Project development.

2.4.1 Economic Benefits

Container-handling activities within PMV jurisdiction currently generate more than 10,900 person-years of direct employment. The handling and distribution of containerised cargo supports over 21,700 person-years of total employment across B.C. The direct GDP associated with the container traffic logistics system contributes close to $1.4 billion to the Canadian economy. The annual economic output of container traffic through PMV generates $3.6 billion (InterVISTAS 2011). Port Metro Vancouver's overall continued successful operations contribute to the creation of over 98,800 jobs, representing 93,200 person-years of employment across Canada (InterVISTAS 2011).

The Project will accommodate the demand for trade, thereby expanding economic growth and increasing employment opportunities during the Project's construction and operation phases, to the benefit of both B.C. and Canada. In addition, the economic and social benefits to Canada from the Project will include direct, indirect, and induced employment.

During a five-and-a-half-year construction period, the Project would generate significant employment benefits for British Columbia. Project construction would generate an estimated total of 12,719 person-years of direct, indirect, and induced employment of B.C. workers.

Employment During Construction (person-years)			
	Metro Vancouver	**British Columbia (Outside of Metro Vancouver)**	**Total**
Direct	4,150	0	4,150
Indirect	3,942	2,322	6,264
Induced	1,632	673	2,305
Total	**9,724**	**2,995**	**12,719**

The construction period would generate approximately $1 billion in wages, $1.3 billion in provincial gross domestic product (GDP) and $3.65 billion in total economic output.

Economic Output Development Benefits During Construction ($ millions)			
	Metro Vancouver	**British Columbia (Outside of Metro Vancouver)**	**Total**
Labour Income			
Direct	494	0	494
Indirect	247	127	374
Induced	83	46	129
Total	**824**	**173**	**997**
Gross Domestic Product			
Direct	496	0	496
Indirect	418	198	616
Induced	149	76	225
Total	**1,063**	**274**	**1,337**
Economic Output			
Direct	1,945	0	1,945
Indirect	837	507	1,344
Induced	238	123	361
Total	**3,020**	**630**	**3,650**

Government revenues from taxes paid by construction employers, suppliers, and Project-associated workers would be approximately $300 million.

Government Revenue During Construction ($ millions)	
Federal Government	127.4
B.C. Government	154.3
Local Government	19.6
Total	**301.3**

Benefits During Operation

During the operation phase, on-terminal activities would generate an annual total of 1,553 person-years of direct, indirect, and induced employment.

Employment During Operation[4] (person-years per year)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Direct	835	93	928
Indirect	109	5	114
Induced	468	43	511
Total	**1,412**	**141**	**1,553**

On-terminal activities during operation would account for approximately $186 million in wages, $212 million in provincial GDP and about $291 million in total economic output each year.[5]

Economic Output Development Benefits During Operation ($ millions per year)			
	Metro Vancouver	British Columbia (Outside of Metro Vancouver)	Total
Labour Income			
Direct	138.1	15.3	153.4
Indirect	5.6	0.4	6.0
Induced	25.8	0.4	26.2
Total	**169.5**	**16.1**	**185.6**
Gross Domestic Product			
Direct	139.8	15.5	155.3
Indirect	9.2	1.5	10.7
Induced	44.8	0.9	45.7
Total	**193.8**	**17.9**	**211.7**
Economic Output			
Direct	184.1	0	184.1
Indirect	31.2	2.2	33.4
Induced	71.3	2.0	73.3
Total	**286.6**	**4.2**	**290.8**

4 On-terminal and off-terminal (outside of the Project scope) activities associated with increased demand for approximately 2 million TEUs per year of containerised trade would support approximately 12,400 direct, indirect, and induced person-years of employment and $813 million in wages annually. Off-terminal activities include services provided by truck drivers, harbour pilots, tugboat operators, the Canada Border Services Agency, railways, transload, and distribution facility operations, and container storage yards, and would generate an estimated 6,700 person-years of direct, 3,100 person-years of indirect and 1,050 person-years of induced employment annually, an estimated total of 10,850 person-years.

5 On-terminal and off-terminal activities would generate an estimated annual average of $1.22 billion in GDP and $2.36 billion in total economic output. Off-terminal activities associated with increased demand for approximately 2 million TEUs per year of containerised trade would generate an estimated annual average of $1.01 billion in GDP and $2.07 billion in total economic output.

Annual average tax payments to the three levels of government by the terminal operator, infrastructure developer, suppliers, and Project-associated workers would be approximately $42 million.

Government Revenue During Operation ($ millions per year)	
Federal Government	22.4
B.C. Government	12.8
Local Government	6.9
Total	**42.1**

Detailed information on potential Project-related effects on economic development, local government finances, and benefits to Canadians is presented in **Section 20.0 Economic Development**, **Section 22.0 Local Government Finances**, and **Section 34.0 Benefits to Canadians.**

2.4.2 Social and Community Benefits

In the spirit of its long-standing commitment to supporting communities, PMV began a process to determine the potential for community legacy benefits related to the Project. Since 2011, PMV has consulted and had discussions with local governments (Delta, Surrey, Richmond, City of Langley, Township of Langley, and Tsawwassen First Nation) and the public regarding community legacy benefits that would be provided as part of the Project. The objectives of community legacy benefits are to bring lasting economic and social benefits to communities and the region. Ensuring a local and regional approach to the types of projects and initiatives is critical to their success. Feedback from local governments and the public has indicated community benefits may include the development of transportation infrastructure and recreational facilities such as walking trails and bike paths, a pedestrian overpass to connect a trail, and environmental initiatives.

Community legacy benefits will continue to be the subject of discussions between PMV, local governments (including Tsawwassen First Nation), Aboriginal groups, and the public throughout the development of the Project.

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3.0 GEOGRAPHICAL SETTING

This section provides an overview of the geographical setting of the Roberts Bank Terminal 2 Project (RBT2 or Project), including natural and human elements in the vicinity of Roberts Bank. Existing projects and activities in the vicinity of the Project, as well as a number of expected projects being carried out during EIS preparation, are identified, with cross-references provided to the EIS sections in which their contributions to existing and expected conditions, respectively, are described.

3.1 ROBERTS BANK OVERVIEW

Roberts Bank is a shallow offshore estuarine area located on the outer edge of the Fraser River delta, south of the Fraser River South Arm, approximately 35 km south of downtown Vancouver, B.C. (refer to **Figure 1-1 Project Location**). The centre of the Project's marine terminal will be located approximately 5.5 km offshore at Universal Transverse Mercator (UTM) coordinates 486508E, 5429515N (Zone 10N NAD 83) (latitude and longitude of N 49° 1′ 6.15″ , W –123° 11′ 4.31", respectively) (**Figure 4-2 Project Universal Transverse Mercator (UTM) Coordinates**).

Roberts Bank supports a diverse ecosystem of biologically productive intertidal and subtidal sandflats and mudflats, eelgrass meadows, estuarine marsh, and salt marsh, bordered by fertile agricultural lands and the deep waters of the Strait of Georgia (also referred to as the Salish Sea). The biophysical attributes of Roberts Banks are described in **Section 10.0 Biophysical Setting** and in each of the marine biophysical valued component (VC) effects assessment sections (**Sections 11.0** to **16.0**).

The ecological and cultural importance of the Fraser River delta is recognised locally, nationally, and internationally, including Roberts Bank, Sturgeon Bank, and Boundary Bay, and its role in supporting globally significant populations of migratory and overwintering birds, as well as marine mammals and other wildlife, estuarine and marine vegetation, invertebrates, and fish.

Roberts Bank is also an established trade gateway and an integral component of the Asia-Pacific Gateway, providing an important transportation corridor for sea-going ships enroute to the South Arm of the Fraser River and the Roberts Bank terminals. In addition, it supports commercial, recreational, and Aboriginal fishing, marine-based recreational activities, and B.C. Ferries operations.

3.2 Natural Elements

The physical marine environment at Roberts Bank is influenced by tides, wind, and waves (see **Section 9.1 Climate, Coastal Conditions, and Geotechnical Considerations**). As tidal flow in the Strait of Georgia encounters the shallower portions of the Fraser River delta, flow direction changes and becomes perpendicular to the depth contours of the Roberts Bank tidal flats.

The Fraser River is the primary source of freshwater and fine sediments to Roberts Bank. The outlet channel of Canoe Passage, the southernmost channel on the Fraser River's South (Main) Arm, discharges directly to Roberts Bank. Both water and sediment inputs peak during spring freshet (i.e., late May to early July) due to snowmelt in B.C.'s interior. The spatial extent of the Fraser River plume is influenced by both river flow and tidal stage. The plume is diverted toward the north during rising (flood) tides and drawn toward the south during falling (ebb) tides.

The construction of the B.C. Ferries Tsawwassen Terminal causeway in the 1950s, followed by the Roberts Bank causeway in the late 1960s, created an area in the intertidal zone referred to as the inter-causeway area, which currently supports a large eelgrass meadow. The two causeways deflect freshwater flows from the Fraser River and interrupt the migration of sand-sized sediment over this portion of Roberts Bank. Further information on the physical attributes of Roberts Bank, including the inter-causeway area, is provided in **Section 9.5 Coastal Geomorphology**, **Section 9.6 Surficial Geology and Marine Sediment**, and **Section 9.7 Marine Water Quality**.

Over time, awareness of the global ecological significance of the Fraser River estuary for fish and wildlife has increased. In 1977, the Province of B.C. issued an Order in Council directing that development could not proceed in the Roberts Bank area until an environmental assessment (EA) had been reviewed and approved by the Minister of Environment. The environmental values and sensitivity of the area, including Sturgeon Bank, Roberts Bank, Boundary Bay, Fraser River, and upland areas have been formally recognised by regional, provincial, federal, and international conservation-related designations. The location and approximate boundaries of these designated areas are identified in **Figure 3-1**. A brief description of each designated area is provided below, beginning with the following designations that include Roberts Bank in the vicinity of the Project:

- Roberts Bank Wildlife Management Area (WMA) (8,770 ha) – Designated by B.C. Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) in September 2011, and located at the **delta front** of the Fraser River estuary, encompassing intertidal, nearshore subtidal, and salt marsh environments (MFLNRO 2014a);

- Fraser River Estuary Western Hemisphere Shorebird Reserve (31,648 ha) – Designated by the Western Hemisphere Shorebird Reserve Network (WHSRN) in April 2005, and located at the mouth of the Fraser River, consisting of provincial and federal lands on Sturgeon Bank, South Arm Marshes, Roberts Bank, and Boundary Bay (WHSRN 2009);
- Boundary Bay – Roberts Bank – Sturgeon Bank (Fraser River Estuary) Important Bird Area (IBA) (75,396 ha) – Designated by IBA Canada in 2001, and consists of a complex of inter-connected marine, estuarine, freshwater, and agricultural habitats (IBA Canada 2012); and
- Critical Habitat for Southern Resident Killer Whales (*Orcinus orca*), established under the *Species at Risk Act (SARA)* (see **Section 14.0 Marine Mammals**).

Additional designations denoting special conservation status in adjoining areas that are ecologically linked to Roberts Bank include the following:

- Alaksen National Wildlife Area (NWA) (299 ha) – Established in 1972, and protected and managed according to the *Wildlife Area Regulations* under the *Canada Wildlife Act*, the Alaksen NWA consists of four former deltaic islands in the Fraser River delta that were historically joined by causeways and dykes (Environment Canada 2013);
- A section of the Alaksen NWA overlaps with the George C. Reifel Migratory Bird Sanctuary (300 ha) – A former farm designated under the Schedule in the *Migratory Bird Sanctuary Regulations* of the *Migratory Birds Convention Act*, *1994*, it is located on Westham Island near Ladner Village in Delta, B.C. (B.C. Waterfowl Society 2014);
- Fraser River delta – Ramsar Site No. 243, Wetland of International Importance (20,682 ha) – The Alaksen Ramsar Site was originally designated by the Ramsar Convention on Wetlands in May 1982. In 2012, the Ramsar Site was renamed and expanded to encompass six components including Burns Bog, Sturgeon Bank, South Arm Marshes, Boundary Bay, Serpentine, and the Alaksen Ramsar Site);
- South Arm Marshes WMA (937 ha) – Designated for management of critical habitat for waterfowl, shorebirds, raptors, songbirds, and small mammals by the B.C. government in May 1991 (MFLNRO 2014b);
- Boundary Bay WMA (11,470 ha) – Designated for conservation purposes by the B.C. government in June 1995 (MFLNRO 2014c);
- Sturgeon Bank WMA (5,152 ha) – Designated for conservation purposes by the B.C. government in October 1998 ((MFLNRO 2014d);
- Metro Vancouver's Boundary Bay Regional Park (174 ha) – Principally located in the Corporation of Delta on Boundary Bay, with the eastern-most portion of the Boundary Bay Dyke within the City of Surrey, and Deas Island Regional Park (120 ha), located in Delta, 2.5 km northeast of the George Massey Tunnel; and
- Burns Bog Ecological Conservancy Area (2,042 ha) – Established in March 2004 by a legally binding conservation covenant involving the federal and provincial governments, Metro Vancouver, and the Corporation of Delta (Metro Vancouver 2007). Located in northeast Delta.

3.3 HUMAN ELEMENTS

Aboriginal peoples have inhabited the Fraser River estuary, including the lands surrounding Roberts Bank, for millennia, relying on the intertidal and marine environments for sustenance and well-being. Descendants of the cultural group known as Coast Salish, as well as a division known as the Straits Salish, have inhabited, utilised, and shaped the cultural history of the Roberts Bank area. Aboriginal peoples historically moved throughout their traditional territories on a seasonal round of fishing, hunting, trapping, and gathering resources from the land and sea to maintain their communities.

European settlers began clearing, dyking, ditching, and cultivating lands along the lower Fraser River, including those adjacent to the Project area, in the 1860s. The flat, fertile land made the area ideal for agriculture. Hunting, shellfish harvesting, and fishing were also productive endeavours in the adjacent marine environment for early settlers. In more recent times, Roberts Bank has become the focus of productive commercial, recreational, and Aboriginal fisheries for species such as Dungeness crab and Pacific salmon.

The opening of the George Massey Tunnel (formerly known as the Deas Island Tunnel) in 1959 led to rapid population growth and increased commercial and residential development in the communities south of the Fraser River, including the Corporation of Delta. Within a decade, Roberts Bank and its vicinity had emerged as a key marine transportation corridor for the movement of goods and people. Two major infrastructure projects – the B.C. Ferries terminal and causeway (1958 to 1960) and the Roberts Bank Coal Port Facility and causeway (1968 to 1970) – were the foundations on which successive transportation infrastructure expansions were made. Additional information regarding current land use in the vicinity of Roberts Bank and the relationship of the Project facilities and components with any federal lands is presented in **Section 26.0 Land and Water Use**.

Today, the Roberts Bank terminals and B.C. Ferries terminal are connected to transportation infrastructure that supports the movement of goods and people within, across, and beyond the region and across the country. Within the Corporation of Delta, Highway 17 (formerly referred to as the South Fraser Perimeter Road (SFPR)), Highway 99, and the Roberts Bank Rail Corridor (RBRC) are key transportation routes. Agricultural land use continues adjacent to these transportation corridors.

3.3.1 Local and Aboriginal Communities

Communities located in proximity to the Project include Tsawwassen First Nation and, within the Corporation of Delta, Ladner, Tsawwassen, and North Delta. Other municipalities in the vicinity of the Project include the City of Richmond, City of Surrey, City of White Rock, Township of Langley, and City of Langley (**Figure 1-1**). Communities located in Washington State in proximity to the Project include Point Roberts, Birch Bay, and Blaine.

Each of these communities is briefly described below. Further information, where relevant, is presented in the assessments contained in **Volume 4: Socio-economic Effects Assessments** and in **Volume 5: Section 32.0 Potential or Established Aboriginal and Treaty Rights and Related Interests**.

3.3.1.1 Tsawwassen First Nation

The closest permanent residences to the Project are located in the Tsawwassen First Nation community, situated immediately north of the Roberts Bank inter-causeway area. In 2009, the *Tsawwassen First Nation Final Agreement* (a Tsawwassen First Nation-ratified treaty and land claims agreement) came into force, which provided for fee simple ownership of approximately 7 km^2 of land (Tsawwassen First Nation Lands and Other Tsawwassen First Nation Lands) (**Figure 3-2**). Further information regarding the *Tsawwassen First Nation Final Agreement* is provided in **Section 6.3 Environmental Assessment and Permitting Process, Tsawwassen First Nation**. Approximately 190 Tsawwassen First Nation members currently reside on the Tsawwassen First Nation lands. Tsawwassen First Nation has jurisdiction to enact laws, including those related to land management, over Tsawwassen First Nation Lands. Tsawwassen First Nation has no governance authority over Other Tsawwassen First Nation Lands that represent approximately 10% of the total fee simple lands.

Approximately 460 non-members with residential and agricultural leasehold properties live on Tsawwassen First Nation Lands. These lands currently provide market housing in three developments located south of Highway 17, including the following (AECOM 2009):

- Tsatsu Shores, a four-storey condominium complex on Tsawwassen Beach, beneath English Bluff, with approximately 200 residents in 81 units;
- Stahaken, a single-family dwelling neighbourhood with approximately 200 residents on 73 lots; and
- Tsawwassen Beach Lots, a single-family dwelling neighbourhood with approximately 60 residents on 25 lots.

The *Tsawwassen First Nation Land Use Plan* (AECOM 2009) includes information on the development of additional housing and industrial units on Tsawwassen First Nations Lands over the next 15 years, which will increase the population of this community.

Businesses located on Tsawwassen First Nation Lands include Splashdown Park, Parkcanada RV Park, F440 Kart Racing Track, Tsatsu Gas, and a Park N' Go lot.

3.3.1.2 Municipalities and Communities

The Project is located in the Corporation of Delta within the Regional District of Metro Vancouver. Communities and main population centres within the Corporation of Delta include Ladner, Tsawwassen, and North Delta (**Figure 1-1**). The Boundary Bay Airport, owned by the Corporation of Delta, is located northeast of the Project near the north shore of Boundary Bay and is accessible from Highway 17 and Highway 99.

The City of Richmond is situated on islands between the North, Middle, and South (Main) Arms of the Fraser River, with the Strait of Georgia to the west (**Figure 1-1**). The Vancouver International Airport (YVR) is located on Sea Island in the municipality's northwest sector.

The City of Surrey, the second largest city in B.C. by population, includes the town centres of Fleetwood, Whalley-City Centre, Guildford, Newton, Cloverdale, and South Surrey. The City of White Rock is south of Surrey, with the City of Langley and the Township of Langley further east (**Figure 1-1**).

Table 3-1 describes the approximate area of jurisdiction, and the approximate distance from each community to the Project. Demographic information regarding Metro Vancouver and Delta, including Tsawwassen First Nation, is presented in **Section 18.4.6 Social and Economic Setting, Population, Existing Conditions**.

Table 3-1 British Columbia Communities Located in Proximity to the Project

Community Name		Approximate Area (ha)	Distance (km) and Direction from Project
Tsawwassen First Nation	Tsawwassen First Nation Lands	700	Adjacent to Project area
Corporation of Delta[1]	Ladner	36,400	11 NE
	Tsawwassen		6.2 E
	North Delta		18 NE
Other Nearby Municipalities[2]	City of Richmond	12,900	16 N
	City of Surrey	31,600	27 NE
	City of White Rock	513	26 E
	City of Langley	1,000	39 E
	Township of Langley	31,600	40 E

Note:

1 Distances to residential areas within the Corporation of Delta are a direct-line measurement from the centre of the RBT2 terminal to the closest residentially zoned (RS1) property.

2 Distances to cities outside of the Corporation of Delta are a direct-line measurement from the centre of the RBT2 terminal to each community city hall.

Point Roberts (approximately 13 km^2), situated on the southern-most tip of the Tsawwassen Peninsula, is a **census-designated place** (CDP). Point Roberts and the City of Blaine (approximately 22 km^2) are both located immediately south of the Canada – U.S.A. border in Whatcom County, Washington State. The community of Birch Bay (approximately 55 km^2), also a CDP in Whatcom County, is located within 7 km of the border.

3.3.2 Aboriginal Groups

The *EIS Guidelines*, part 2, section 9.2, identify the following Aboriginal groups as having potential or established Aboriginal and Treaty rights and related interests that may be affected by the Project:

- Tsawwassen First Nation;
- Musqueam First Nation;
- Semiahmoo First Nation;
- Tsleil-Waututh Nation;
- Cowichan Tribes;
- Halalt First Nation;
- Penelakut Tribe;
- Stz'uminus First Nation;

- Lake Cowichan First Nation;
- Lyackson First Nation; and
- Métis Nation British Columbia.

The *EIS Guidelines* also identify the following additional Aboriginal groups that are less likely to be affected by the Project and its related effects:

- Stó:lō Tribal Council (Seabird Island First Nation, Scowlitz First Nation, Soowahlie Band, Kwaw'Kwaw'Apilt First Nation, Kwantlen First Nation, Shxw'ow'hamel First Nation, Chawathil First Nation, and Cheam Indian Band); and
- Stó:lō Nation (Aitchelitz First Nation, Leq'a:mel First Nation, Matsqui First Nation, Popkum First Nation, Skawahlook First Nation, Skowkale First Nation, Shxwha:y Village, Squiala First Nation, Sumas First Nation, Tzeachten First Nation, Yakweakwioose Band.

In addition, the CEA Agency has directed PMV to include the Hwlitsum First Nation when identifying traditional uses currently practiced.

As previously described, the Project is located in close proximity to the Tsawwassen First Nation Lands (**Figure 3-2**). The Project is also located within or proximal to the asserted traditional territories and reserve lands of the other Aboriginal groups listed above. The approximate boundaries of traditional territories and selected reserve lands for these Aboriginal groups are shown in **Figures 3-3** to **3-5**.

Port Metro Vancouver's past and present engagement with each of the identified Aboriginal groups is described in **Section 7.2 Aboriginal Groups Engagement and Consultation**.

Detailed summaries of the identified Aboriginal groups are presented in **Section 32.0 Potential or Established Aboriginal and Treaty Rights and Related Interests**, along with the Project's potential effects on the ability of Aboriginal peoples to exercise their potential or established Aboriginal and treaty rights and related interests.

3.3.3 Land Ownership – Federal and Provincial Lands

Current ownership and legal descriptions of the lands and water lots on Roberts Bank, including those required for the Project, are identified in **Figure 3-6** and **Figure 3-7**. A regional overview of federal lands in the Lower Mainland and Southern Gulf Islands is provided in **Figure 3-8**.

Approximately 122 ha of the Project will be constructed on federal lands managed by PMV. Approximately 48 ha of the Project will be constructed on provincial Crown lands. Port Metro Vancouver is currently negotiating with the Province of B.C. to acquire tenure to these lands. Depending on the outcome of these negotiations, the lands will either remain as provincial Crown lands or become federal lands. Finalisation of a tenure agreement is not anticipated prior to completion of the formal EA process.

A portion of the lands owned by the B.C. Railway Company (BCR) will be required to accommodate widening of the causeway. Port Metro Vancouver will negotiate acceptable tenure arrangements with BCR for these lands.

3.4 Projects And Activities Contributing to Existing Conditions and Expected Conditions

An understanding of existing physical, biophysical, and socio-community conditions, including the contribution of projects and activities that have been carried out or are being carried out within the Project assessment areas[1], provides the basis upon which Project-related effects and cumulative effects can be identified and assessed[2]. Information related to existing conditions is supported by a publicly available document entitled *History of Development at Roberts Bank – An Overview* (Hemmera 2004), which presents a history of development at Roberts Bank to 2004[3].

The following section identifies the projects and activities that, for the purposes of the EIS, are considered to have contributed to existing conditions (i.e., they have been carried out or were being carried out on or before April 2014). For the assessment of those intermediate components (ICs) or VCs for which the characterisation of existing conditions required field studies or modelling, however, an earlier time horizon may have been used to allow for the incorporation of actual observed, measured, or model-predicted data. For example, in the case of air quality, existing conditions were characterised for 2010 to allow for the use of Environment Canada air quality monitoring station and meteorological data.

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1 Note that the areas of assessment where direct and indirect Project-related effects are anticipated to occur vary between components being assessed; hence, there are multiple assessment areas used within this EIS.

2 Note that an explanation of EA methodology, including the selection of ICs and VCs, and the characterisation of temporal setting, is provided in **Section 8.1 Environmental Assessment Methods**.

3 Available online at http://portmetrovancouver.com/docs/default-source/projects-deltaport-third-berth-project/EA_App_AppendixA_Dec-04.pdf?sfvrsn=0

3.4.1 Projects Contributing to Existing Conditions

Projects that have been or were being carried out in the assessment area as of April 2014 during EIS preparation, and that have contributed to existing conditions are identified in **Table 3-2** and **Figure 3-9**. A brief description of each of the projects named in **Table 3-2** is provided in **Appendix 3-A Descriptions of Projects and Activities Contributing to Existing Conditions and Expected Conditions**.

Table 3-2 Projects Contributing to Existing Conditions

Existing Project	Location Relative to Project
B.C. Ferries Tsawwassen Terminal	Roberts Bank
Westshore Terminals	Roberts Bank
Deltaport Terminal and Deltaport Third Berth Project	Roberts Bank
Deltaport Terminal Road and Rail Improvement Project	Deltaport Way and Roberts Bank Causeway, South Delta
Roberts Bank Rail Corridor Program	• 41B Street Rail Overpass at Deltaport Way • 80th Street Rail Overpass, South Delta • 232nd Street Overpass, Langley
Highway 17 (formerly South Fraser Perimeter Road)	Delta to Surrey
BP Cherry Point Refinery	Blaine, Washington

In addition to those descriptions provided in **Appendix 3-A**, studies taken into account, where relevant, include the following reports:

- *Roberts Bank Port Expansion Report of the Environmental Assessment Panel* (FEARO 1979);
- *Deltaport Third Berth Project Environmental Assessment Report* (2006) (PMV 2016); and
- The *Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River, the Final Report – October 2012* (Cohen 2012)

3.4.2 Activities Contributing to Existing Conditions

Table 3-3 identifies activities that have been or were being carried out in the assessment area as of April 2014, during preparation of the EIS. A brief description of each of the activities named in **Table 3-3** is provided in **Appendix 3-A**.

Table 3-3 Activities Contributing to Existing Conditions

Existing Activity	Location Relative to Project
Aboriginal fishing and shellfish harvest	Fraser River estuary, including Roberts Bank
Aboriginal hunting	Fraser River estuary, including Roberts Bank
Aboriginal plant gathering	Fraser River estuary, including Roberts Bank
Aboriginal cultural use	Fraser River estuary, including Roberts Bank
Boundary Bay Airport	South Delta
Commercial fishing	Fraser River estuary, including Roberts Bank
Land-based transportation	Lower Mainland
Marine vessel traffic	PMV jurisdiction, including Roberts Bank
Outdoor recreation and tourism	Fraser River estuary, including Roberts Bank

3.4.3 Projects Contributing to Expected Conditions

Since pre-Project conditions within the assessment area could be altered prior to commencement of RBT2, anticipated in 2018, each assessment also considered an expected conditions case. **Table 3-4** and **Figure 3-10** identify those projects that had not been carried out by April 2014 but were underway and will have been carried out prior to Project commencement, and therefore will contribute to expected conditions. Brief descriptions of each of the projects named in **Table 3-4** are provided in **Appendix 3-A**.

The nature and level of existing activities is not anticipated to change. As such, only projects are considered to have contributed to the expected conditions case.

Table 3-4 Projects Contributing to Expected Conditions

Expected Project	Location Relative to Project
Westshore Terminals – Terminal Infrastructure Reinvestment Project	Roberts Bank
Deltaport Terminal Road and Rail Improvement Project	Deltaport Way and Roberts Bank Causeway, South Delta
Roberts Bank Rail Corridor Program	• Combo Project (196th Street Overpass, 192nd Street Overpass, and 54th Avenue East-West Connector Projects), Surrey and City of Langley • Panorama Ridge Whistle Cessation Project, South Delta • 152nd Street Rail Overpass Project, South Surrey • Mufford/64th Avenue at Highway 10, Langley
Tsawwassen Mills and Power Centre and Tsawwassen Commons	South Delta
Tsawwassen Gateway Logistics Centre/Container Examination Facility	South Delta
Tsawwassen First Nations Sewage Treatment Plant	South Delta
Tsawwassen Springs Development	South Delta
Tsawwassen Shores Development	South Delta
Neptune Terminals Coal Handling Capacity Expansion	North Vancouver
Pacific Coast Terminals Expansion and Improvement Project	Port Moody
Richardson International Grain Storage Capacity Project	North Vancouver

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4.0 PROJECT DESCRIPTION

The Roberts Bank Terminal 2 Project will consist of a new three-berth marine container terminal, widening of the existing causeway, and expansion of the existing tug basin to facilitate an additional 2.4 million twenty-foot equivalent units (TEUs) per year of container capacity to facilities at Roberts Bank. Existing facilities and infrastructure at Roberts Bank are described in **Section 3.4 Projects and Activities Contributing to Existing Conditions and Expected Conditions**.

This section describes the Project components as designed in the Preliminary Engineering phase and as assessed in this EIS. Final designs and construction methodology will be produced and determined by the chosen **Terminal Operator Concessionaire** and **Infrastructure Developer** upon Project approval, and as such may vary slightly from those described in this section. Any design or construction changes will be required to meet any commitments made by PMV, or conditions stipulated during the environmental assessment (EA) and regulatory review process.

This section of the EIS specifically describes the following anticipated and assessed Project features:

- The location and orientation of Project components (**Section 4.1**);
- The purpose of and design requirements for Project components (**Section 4.2**);
- The schedule for construction, operation, and decommissioning phases (**Section 4.3**);
- Construction activities, including decommissioning of temporary construction-related facilities (**Section 4.4.1**); and
- Operation activities, including maintenance (**Section 4.4.2**).

4.1 PROJECT COMPONENT LOCATION, ORIENTATION, AND AREAS

Project components and sub-components will consist of the following:

- Marine terminal (**Figure 4-1** and **Figure 4-4**):
  - **Berth pocket** (referred to in the *EIS Guidelines* as **harbour basin and berth areas**) (**Figure 4-4**);
  - **Marine approach areas** (area partially referred to in the *EIS Guidelines* as **approach channel**) (**Figure 4-4**);
  - Three-berth wharf structure and **mooring dolphin** (**Figure 4-4**);
  - Container storage yard (CY) (**Figure 4-4**);

- Rail intermodal yards (IYs) (**Figure 4-4**); and
- Infrastructure, ancillary systems, and support facilities (**Figure 4-4**).

- Widened causeway (**Figure 4-1** and **Figure 4-6**):
    - Rail additions and improvements (**Figure 4-6**);
    - Road additions and improvements (**Figure 4-6**); and
    - Utility additions (**Figure 4-6**).
- Expanded tug basin (**Figure 4-1** and **Figure 4-8**).

The location and orientation of the marine terminal, widened causeway, and expanded tug basin are shown in **Figure 4-1** and described in **Sections 4.1.1** to **4.1.3**, respectively. The Universal Transverse Mercator (UTM) coordinates of the Project components, and the Roberts Bank bathymetry are provided in **Figure 4-2** and **Figure 4-3**, respectively. The required land and water lot area ownership and the legal description of Project land are described in more detail in **Section 3.0 Geographical Setting** and associated **Figures 3-6 Land and Water Lot Ownership at Roberts Bank** and **Figure 3-7 Legal Description of Land Ownership at Roberts Bank**.

The area for each component, and sub-component if applicable, is summarised in **Table 4-1**. The total Project area, including land and land covered by water to be occupied by Project components is 186 hectares (ha).

Table 4-1 Project Component and Sub-component Areas

Project Component	Sub-component Area (ha)	Component Area (ha)
Marine Terminal		**133.5**
• Terminal including slope, toe of slope, and three-berth wharf	116.1	
• Berth pocket and marine approach areas	17.4	
Widened Causeway		**49.4**
• Causeway including slope and toe of slope	42.4	
• Overpass and road tie-ins on existing causeway	6.0	
• Rail tie-ins and emergency access road tie-in on mainland	1.0	
Expanded Tug Basin		**3.1**
Total Project Area		**186.0**

Note: Useable land area for the terminal is approximately 108 ha, and for the widened causeway is approximately 36 ha, due to the differences between the crest and the toe of slope elevations.

4.1.1 Marine Terminal

The new marine terminal will be located immediately west of the existing Roberts Bank terminals, approximately 5.5 km from the east end of the causeway (**Figure 4-1**). The terminal will be oriented perpendicular to the causeway and will extend approximately 600 m further offshore than the seaward edge of Westshore Terminals. The marine terminal will be rectangular in shape, approximately 1,700 m long and 700 m wide, to support terminal sub-components such as the moorage of three container ships on the south side, container storage in the centre, and the rail intermodal yards on the north side of the terminal. Dimensions and areas for each of the sub-components on the marine terminal are provided in **Section 4.2.1**.

4.1.2 Widened Causeway

The causeway links road and rail networks to the Roberts Bank terminals. Although the existing causeway is oriented in a northeast to southwest direction, for the purposes of Project orientation, it is described as having an east (mainland) end, a west (terminal) end, a north shore, and a south shore (**Figure 4-1**). This orientation is consistent with regional railway protocol for train movements described as either westbound or eastbound.

The causeway will be widened on the north side along its full length (approximately 5.5 km), from its east end connection with the mainland, to the RBT2 terminal. Causeway widening will require a new land area of approximately 42.4 ha, including slope and toe of slope at the seabed, for additional rail, road, and utility requirements. At the east end of the causeway, rail infrastructure will extend eastward 450 m in a narrow strip (approximately 1 ha) on the existing British Columbia Railway (BCR) right-of-way for tie-in purposes to the existing mainline rail network via the Roberts Bank Rail Corridor (RBRC).

4.1.3 Expanded Tug Basin

The existing tug basin is located on the north side of Deltaport Terminal (**Figure 4-1**). It is currently used by a single tug operation contractor and will be expanded for future use by two tug operators. Tugs assist in the arrival and departure of ships calling at the two existing Roberts Bank terminals, and will be used in the same capacity at the new marine terminal.

Tug basin expansion of approximately 3.1 ha, including new crest protection, will increase the tug basin footprint from 1.4 ha to 4.5 ha.

4.2 PROJECT COMPONENT DETAILS

Details provided within this section are from the Basis of Design document (**Appendix 4-A**), preliminary engineering drawings (**Appendices 4-B** and **4-C**), and current RBT2 operation concepts. Technical feasibility has been confirmed by preliminary designs. The Project operation concepts accommodate transfer of containers between ships and the terminal, and between the terminal and the road and rail networks at design capacity.

The following subsections describe the use of, and preliminary design information for, Project components to facilitate an additional 2.4 million TEUs of container capacity annually at Roberts Bank.

4.2.1 Marine Terminal

The marine terminal is designed to facilitate the berthing and unberthing of container ships, while minimising the need for dredging and reclamation, and disturbance to the marine environment. The marine terminal layout is illustrated in **Figure 4-4**. The wharf face, situated approximately 6.2 km offshore and parallel to the mainland shoreline, will be located in the deepest practicable water depth at the −10 m **chart datum** (CD) contour line (i.e., approximately 10 m below lower low water level (LLWL)). This location will allow for dredging to −30 m CD depth and native soil densification to −47 m CD depth as shown in **Figure 4-5**, based on the technology and equipment available at the time of preliminary design, and address soil liquefaction concerns as described in **Section 9.1.3 Geotechnical Considerations**.

Terminal dimensions are as follows:

- 1,500 m average length and 700 m width;
- 1,346 m berth length (includes the wharf and mooring dolphin);
- 1,300 m wharf length; and
- 8.75 m to 6.5 m in height above LLWL sloped from the south side to the north side.

The terminal’s total useable area will be approximately 108 ha. To accommodate this space requirement, the marine footprint of the terminal with the three-berth wharf on the south side, including the rip-rap protected marine slopes and seabed toes on its west, north, and east sides, will be approximately 116.1 ha (see **Figure 4-24**). The terminal layout has changed slightly since submission of the Project Description to the CEA Agency in

September 2013 through the introduction of a rounded northwest corner design. This design modification was made to address a scour concern on the west side of the terminal as discussed in **Section 5.4.1 Marine Terminal (including Berth Pocket and Marine Approach Areas)**.

The dredged berth pocket and marine approach areas, located in front of, and adjacent to the three-berth wharf, will have a marine footprint of approximately 17.4 ha.

The combined total marine footprint of the terminal and dredged berth pocket and marine approach areas will be approximately 133.5 ha (**Figure 4-24**).

The marine terminal design has incorporated the following seismic design criteria:

- A475 criteria for the wharf structure with the preliminary design incorporating sufficient leeway to meet or exceed this rating to ensure that the most conservative environmental effects are assessed in other sections of this EIS. Detail design and further geotechnical testing will determine the exact amount of soil densification required, if any, to meet the A475 or higher criteria, and it is anticipated it will be much less than the depth shown in the preliminary design **Figure 4-5**;
- A475 criteria for perimeter dykes; and
- A2475 criteria for the terminal buildings, as per current National Building Code of Canada (NBCC) requirements.

Each of the seismic event ground-shaking levels mentioned in various sections of this EIS (A2475, A475, A100) describe the return period for that level of earthquake shaking (i.e., how often it is expected to occur). For example, the A2475 event refers to a major earthquake that produces ground motions associated with a 2,475-year return period. This is a relatively rare and large earthquake expected to occur on average only once in 2,475 years, and therefore, has a very low probability of occurring in any given year (probability is 0.000404, which can more easily be understood as 2% chance in 50 years). In contrast, the A100 event, which is a relatively small earthquake, can be expected to occur once every 100 years, and thus has a much higher probability of occurring in any given year (40% chance in 50 years). The A475 event falls in between these two in terms of severity and frequency.

The wharf structure and terminal were not explicitly designed to withstand a tsunami event triggered by an earthquake or landslide, as stated in the Basis of Design (**Appendix 4-A**) and described in more detail in **Section 31.2.3 Effects of the Environment on the Project – Submarine Landslides**.

4.2.1.1 Berth Pocket and Marine Approach Areas

The berth pocket is the dredged area adjacent to the terminal wharf structure where the container ships will be berthed and moored to the wharf. The berth pocket and the associated marine approach areas will be approximately 1,700 m long and 100 m wide (see **Figure 4-24**). The seabed will be dredged to a depth of approximately –30 m CD (i.e., 20 m below the existing seabed) along a strip at the proposed berth face (**Figure 4-5**). Native soils below the dredged cut will be densified and backfilled to a level of –21.6 m CD (i.e., approximately 11.6 m below the current seabed). Dredging, densification, and backfilling activities will be conducted to provide adequate depth for the safe navigation of container ships while accessing the three-berth wharf; for foundation stability reasons; and for stabilisation of the seabed to avoid scouring due to propeller wash. The berth pocket depth will be 21.7 m below LLWL (i.e., elevation –21.6 m CD) to meet the under-keel clearance requirements of current and future container ships with loaded draughts of up to 19 m, to allow for **out of trim**, and accommodate wave-induced vessel motions in a 50-year storm event. Refer to **Appendix 4-B Engineering Drawing 60287593-GE-107** that explains the 0.1 m elevation difference between LLWL and CD as published by the Canadian Hydrographic Service for Tsawwassen area normal water levels referenced to CD. From this point forward in this EIS section, CD elevations will be used instead of LLWL.

The elevation in the marine approach areas will be the same –21.6 m CD to accommodate a fully laden design vessel with under-keel clearance to accommodate **squat effects**, out of trim, and wave-induced vessel motion in a five-year storm event.

Marine navigation markers will be installed just outside the marine approach areas to assure safe arrival and departure of the container ships calling at the terminal.

4.2.1.2 Three-berth Wharf Structure

The purpose of the wharf structure is to allow safe berthing and mooring of vessels that have entered the berth pocket; support **ship-to-shore gantry cranes**; and provide connections for vessel **shore power**, potable water, and other amenities. Key features of the wharf structure are as follows:

- The wharf face will have appropriately sized **marine fenders** to accept the design berthing impact of the design vessels at any tide and vessel load condition.
- The **mooring bollards**, and a mooring dolphin at the east end of the wharf, will be spaced to facilitate moorage of three ships simultaneously without crossing mooring lines.

- The ship-to-shore gantry cranes will be electrically powered and mounted on rails set parallel to the wharf face. They will be used to move containers between moored ships and the terminal, and vice versa.
- Shore power connections will enable the ships to be plugged into electrical power sources at the wharf so that their diesel engines and associated electrical generators can be turned off, thus reducing air and noise emissions.
- Radiation portal monitors (RPMs) will be used to scan all incoming containers unloaded from vessels, for radiation sources.
- **Mobile horizontal-transfer equipment** will be used to move containers between the three-berth wharf structure and the container storage yard, or the intermodal yards.

The wharf length (1,300 m) is based on an analysis of the world shipping fleet and anticipated future trends in container shipping. The 1,346 m berth length (includes wharf and mooring dolphin), berth pocket, and marine approach areas are designed to accommodate the simultaneous moorage of three ships, with only one ship berthing or unberthing at a time. As shown in **Table 4-2**, the Project design provides for the maximum simultaneous moorage of:

- One Maersk Triple-E-class vessel with a capacity of 18,000 TEUs and a draught of 14.5 m; and
- Two Panamax 2014-class vessels with capacities of 12,000 TEUs and draughts of 15.2 m.

Refer to **Appendix 4-B Engineering Drawing 60287593-MA-527** for possible three-ship berthing arrangements.

Table 4-2 Project Design Ship Parameters

Ship Parameters	Panamax 2014 (Launched in 2006)	Maersk Triple-E Class (Launched in 2013)
Length Overall	366 m	400 m
Deadweight	140,000 tonnes	165,000 tonnes
Draught	15.2 m	14.5 m
Beam	49 m	59 m
Capacity	12,000 TEUs	18,000 TEUs

The depth of the berth pocket and the marine approach areas considers the vessel parameters described in **Table 4-2**, and future trends in container ship dimensions. To accommodate the anticipated increase in ship dimensions, and possible 19 m draught (Seaport 2012), the berth pocket depth was set at elevation −21.6 m CD as shown in **Figure 4-5**, to allow for the required under-keel clearance.

The wharf will be constructed using prefabricated concrete **caissons** tied together at the wharf face with a concrete **cope wall**. A cross-section of the caisson wharf structure is shown in **Figure 4-5**. Wharf end returns will utilise a combination of prefabricated concrete caissons and steel sheet pile walls to retain backfill soils. The elevation of the **wharf apron** (i.e., area between the wharf face and the CY) is set at 8.75 m CD, approximately 0.75 m higher than the cope wall at the existing Deltaport Terminal. The elevation is designed to be high enough to minimise wave overtopping during storm events, and to accommodate projected future sea level rise (1 m) in the twenty-first century (Ausenco-Sandwell 2011) (see **Section 31.2.6 Effects of the Environment on the Project, Climate Change**), while accounting for long-term settlement (0.5 m). The cope wall will support the ship berthing fenders and mooring bollards, and contains within its structure the utility corridors or conduits, for shore power, potable water, and other amenities.

4.2.1.3 Container Storage Yard

A large area in the centre of the terminal will become the CY (**Figure 4-4**). The purpose of the CY is to store containers until their continuing mode of transportation becomes available, whether by truck, train, or ship. Containers move between other terminal areas from the CY using mobile horizontal-transfer equipment, which may include **shuttle carriers**, **automatic guided vehicles (AGVs)**, and tractor trailers (frequently referred to as **bombcarts** in the container handling industry). The equipment layout included in the preliminary design is based on shuttle carriers for the mobile horizontal-transfer equipment. This layout configuration has proven to be efficient in container terminals globally, and provides flexibility for installation of manual, to fully automated equipment. Refer to the PMV Project website http://www.robertsbankterminal2.com/about-the-project/roberts-bank-terminal-2-project/ for a video link showing examples of the proposed equipment in virtual operation.

The preliminary design consists of electrically powered **automated stacking cranes** (ASCs) (referred to in the *EIS Guidelines* as **electric stacking cranes**) on rails, or a similar type of equipment, for transferring and storing containers within the CY. The CY contains 33 blocks (runs) of container storage from east to west, with each block supported by two ASCs and the capacity to position containers in 39 rows from south to north, and with each row having a capacity of 10 containers wide by 5 containers high. Refer to **Appendix 4-B Engineering Drawing 60287593-GE-103** for a detailed layout view of the CY, and **Appendix 4-B Engineering Drawing 60287593-CI-240** for a cross-section view of a typical CY block.

In addition, the preliminary CY design also provides for 11 blocks containing three rows each for refrigerated containers, commonly referred to as **reefers**. This preliminary design includes access platforms required for reefer connection to electrical supply, and for monitoring of power status and the temperature within the units.

The truck loading and unloading transfer area will be located on the north end of the east blocks of the CY. This area will serve 20 blocks, each with six truck slots, for a total of 120 truck slots to enable container transfer between the CY and the trucks. **Appendix 4-B Engineering Drawing 60287593-GE-103** provides a layout view of the truck transfer area.

4.2.1.4 Rail Intermodal Yards

The Project is designed to include two IYs (**Figure 4-4**) with a total rail capacity of approximately 49,410 ft.[1] (15,060 m), as shown in **Appendix 4-B Engineering Drawing 60287593-GE-103 Item 25**, consisting of the following:

- Six tracks in the south IY, each nominally 4,150 ft. (1,265 m) long; and
- Six tracks in the north IY, each nominally 4,085 ft. (1,245 m) long.

Each IY will be served by four electrically powered **rail-mounted gantry cranes** (RMGs), or a similar type of equipment, as required to transfer containers between railcars and mobile horizontal-transfer equipment. Mobile horizontal-transfer equipment, previously defined in **Section 4.2.1.2**, will be used to move containers between the IYs and CY, and between the IYs and the wharf.

[1] For railway track and train lengths, the common practice by railways and users is to express the length in feet rather than metres. This practice is followed in the EIS.

4.2.1.5 Infrastructure, Ancillary Systems, and Support Facilities

Truck Gate Facility

A multi-lane truck gate facility, located at the northeast end of the terminal (**Figure 4-4**), will be used to control truck entry and exit for the terminal. It will be equipped with control gates, truck scales, and various security and inspection features, including cameras and scanning equipment. The preliminary design has 10 entry lanes with 8 scales and 6 exit lanes. One entry and one exit lane will be capable of handling oversized containers. A preliminary layout of the gate and service area is shown in **Appendix 4-B Engineering Drawing 60287593-GE-104**.

Systems to Maintain Site Security

Site security systems will be located throughout the terminal to ensure that port operations meet expected municipal, national, and international requirements. Security equipment will include perimeter fencing, closed-circuit television (CCTV) cameras, and vehicle and cargo inspection system (VACIS) facilities. Refer to Area 33 in **Appendix 4-B Engineering Drawing 60287593-GE-104**.

Civil Utility Systems – Terminal Water Management

Potable Water

Potable water will be supplied from the Corporation of Delta's water system and distributed throughout the site for drinking water and domestic supply to terminal buildings and moored ships. Refer to **Appendix 4-B Engineering Drawings 60287593-CI-270** to **274** for pipeline size and routing details.

Fire Protection Water

Fire water supply lines and hydrants will be located throughout the site and are part of the potable water system. Refer to **Appendix 4-B Engineering Drawings 60287593-CI-270** to **274** for hydrant location details.

Industrial Water

A container terminal does not require water for process purposes, and thus does not have any dedicated **industrial water** system. The terminal does, however, have a reefer wash station, and equipment washing facilities in the maintenance and repair building. The water used for these areas will come from the potable water supply, and the drainage water for these areas will be handled in the stormwater system as further described below.

Wastewater

Sanitary discharge will be collected from serviced buildings and piped to a wastewater treatment plant on the east side of the terminal. The treatment plant will be similar to the plant at the existing Roberts Bank terminals, designed to current standards, and capable of treating a volume of 60 cubic metres (m^3) of effluent per day. This daily treatment capacity was based on a semi-automated terminal operation having on average 500 people on site per 24-hour day multiplied by 120 litres (L) per capita per day.

The treated effluent will be discharged via ocean outfall at the mooring dolphin, with the top of the outfall pipe at elevation –10.0 m CD as per regulatory guidelines. Treated outfall specifications to meet the Ministry of Environment effluent standards are shown in **Appendix 4-B Engineering Drawing 60287593-GE-108**.

Stormwater

Stormwater will be collected by a stormwater system that includes oil interceptors to trap surface oil and grit that reaches the drainage collection system. The system has five outfalls located at the wharf face with the top of the outfall pipes being at elevation –5.0 m CD as per regulatory guidelines. Each outfall will be fitted with shutoff valves to prevent discharge if required in the event of an on terminal spill.

Independent oil containment systems will be provided at the fuelling facilities, electrical transformer yards, reefer wash station, and the equipment washing station. Collected drainage water from these areas will be passed through coalescing plate oil-water separators sized for a minimum hydraulic flow rate of a 10-year return, 1-hour storm event. These oil water separators will be equipped with gravity oil stop valves.

The stormwater system layout is shown in **Appendix 4-B Engineering Drawing 60287593-CI-260**.

Support Facilities

Terminal Buildings

Support facilities will be located mostly on the east side of the marine terminal, including an administration building, maintenance and repair facilities, parking structure, and Canada Border Services Agency (CBSA) building, as well as a longshoremen’s break room at the west end. Buildings that house facility infrastructure and equipment (such as electrical substations) will be simple, low-rise, flat-roofed buildings. The preliminary engineering allows for a LEED Gold design for the administration building only. To accommodate the staffing required for terminal operation and maintenance, a parking structure for approximately 344 vehicles will be located near the administration building, as shown in **Appendix 4-B Engineering Drawing 60287593-AR-370**.

Terminal Equipment Fuelling Facility

The fuelling facility for terminal equipment will be located near the maintenance and repair building at the southeast corner of the terminal. The fuelling facility will include two systems: one system will be used to service manually operated terminal equipment for both gasoline and diesel fuel; a second system will service any automated yard equipment. All fuelling stations will be adjacent to the storage tanks.

Fuelling facility infrastructure will include above-ground, monitored, double-walled tanks for diesel (150,000 L) and gasoline (19,000 L) storage. The facility and tanks will comply with storage tank regulations. Preliminary fuelling area layouts are shown in **Appendix 4-B Engineering Drawing 60287593-AR-325**.

There is no facility for bunkering (fuelling) container ships at Roberts Bank.

Hazardous Material Storage

Storage of hazardous material, such as lubricants, hydraulic oil, engine oil, cleaning solvents, batteries, and paints required for terminal operation and maintenance will be located at the maintenance and repair facility, and will be managed according to applicable regulations. Inventories of these items will depend on the degree of automation implemented by the Terminal Operator Concessionaire, the operating equipment used, and the technology available at the time of EA approval (e.g., more battery-powered equipment results in more spare batteries and less engine oil).

Power and Lighting

Power Distribution

Electrical power at 69 kilovolts (kV) will be obtained from the existing BC Hydro transmission line on the Roberts Bank causeway. The line to the new terminal’s main substation will transition to an underground cable at the existing Deltaport Terminal and Westshore Terminals distribution point. Power distribution at various voltages within the terminal area will occur via an underground distribution system from the terminal’s main substation to local substations throughout the terminal.

According to system studies conducted by BC Hydro, no new overhead transmission lines will be required to satisfy the 37 megavolt ampere (MVA) demand load for the Project. **Appendix 4-B Engineering Drawing 60287593-EL-860** presents preliminary design electrical load calculations for the Project.

Lighting

For safety considerations, lighting will be installed on the terminal to enable 24-hour operation. The amount of lighting required will be partly a function of the degree of automation adopted. For assessment purposes, a semi-automated terminal has been assumed. Detail design will consider lighting options and technology available at the time that will minimise offsite effects while meeting operational and security needs. Preliminary information regarding the proposed lighting locations and the associated lux levels is shown in **Appendix 4-B Engineering Drawing 60287593-EL-840**.

Some of the light poles will be equipped with fibre optics and power for cameras, Wi-Fi transmitters, and receivers and transmitters to interface with the terminal's operation control system.

4.2.2 Widened Causeway

The extent of widening along the causeway is determined by road and rail infrastructure requirements for the Project. To minimise the marine footprint, the width will vary from 0 m at the east end to 140 m at the **S-bend** of the causeway (see **Figure 4-6**). **Appendix 4-B Engineering Drawings 60287593-GE-121** to **122** present a more detailed view of the varying causeway widths.

Causeway widening in the west zone has been designed to withstand an A475 seismic design event. In the east zone of the widened causeway, no special ground improvement is anticipated in the preliminary design to meet the seismic requirement, due to the low height of the containment dyke in this zone.

4.2.2.1 Causeway Rail Additions and Improvements

Causeway rail additions associated with the Project will include the following (see **Figure 4-6**):

- Addition of two new lead rail tracks, approximately 5,000 ft. (1,524 m) each, to connect the 12 IY-lead tracks to the **T-yard** (see **Appendix 4-B Engineering Drawing 60287593-CI-912** for terminal tie-in location);

- Addition of nine approximately 6,000 ft. (1,830 m) support, switching, and lead rail tracks in the T-Yard where any two tracks can be used as the continuation of the Project's lead tracks;
- Addition of a new **DPU/Bad Order Setout Yard** consisting of two approximately 1,400 ft. long (427 m) tracks for setting off **distributed power unit** (DPU) locomotives, and four tracks for setting off **bad order** railcars, ranging between approximately 615 ft. and 1,400 ft. (187 m and 427 m); and
- Addition of two lead tracks, approximately 5,600 ft. (1,707 m) and 4,550 ft. (1,390 m) long to connect the T-yard to the two rail tie-in points at the existing rail network tracks.

Appendix 4-C Engineering Drawing 34-347-RL-1060 provides a not to scale schematic representation of the rail infrastructure required for the Project with more specific track lengths for individual tracks.

In addition, the existing coal tracks adjacent to Roberts Bank Way North to Westshore Terminals will be repositioned to accommodate the new RBT2 overpass and road access. Refer to **Appendix 4-C Engineering Drawings 34-347-RL-1052** to **1054** for the repositioning details of these four tracks identified as Ent31, Ent32, Ext31, and Ext32.

4.2.2.2 Causeway Road Additions and Improvements

The existing Roberts Bank Way North will remain two lanes wide from the Deltaport Terminal, Road and Rail Improvement Project (DTRRIP) overpass to the new RBT2 overpass to allow access to and from the Roberts Bank terminals. It will connect to a new three-lane access road that will lead to the new marine terminal. These proposed road improvements are illustrated in **Figure 4-7**.

The new RBT2 overpass will separate road traffic bound for the Project from traffic bound for Westshore Terminals, or Deltaport Terminal's Gate 2. The RBT2 overpass will be built on the north side of the existing causeway and extend onto the new widened causeway. It will span the North Yard tracks leading to Westshore Terminals and connect Roberts Bank Way North to the RBT2 access road.

The three-lane RBT2 access road will follow the rail alignment that connects to the IYs. This access road has been configured with two westbound lanes and one eastbound lane.

A gravel emergency access road will be located on the north side of the widened causeway to allow for uninterrupted access to the Roberts Bank terminals in the unlikely event that the main causeway road, Deltaport Way, is blocked (see **Figure 4-6**). Located within a 10-m-wide right-of-way, the 8-m-wide emergency access road will allow for two-way traffic on a gravel surface. This gravel road will tie in to the existing Deltaport Way at the east end of the causeway via emergency at-grade crossings over the rail tracks. This road will also be used for maintenance purposes with restricted access at the at-grade crossings.

Vehicle Access and Control System

To provide security and control access into the terminal, a **vehicle access and control system** (VACS) gate will be incorporated along the three-lane access road. Although the final location has yet to be determined, **Appendix 4-C Engineering Drawing 34-347-CI-1152** provides a representation of the preliminary VACS layout. The VACS will include two gates for westbound vehicles and one gate for eastbound vehicles. Vehicles denied access to the Project will be required to turn around. Details of the turn-around are shown in **Appendix 4-B Engineering Drawing 60287593-GE-104 Item 19**.

4.2.2.3 Causeway Utility Corridor

A 12-m-wide utility corridor will be located between the emergency access road and the new rail tracks to support the routing of utilities such as a new water main, local underground power distribution for rail-yard switch lighting, and other components.

4.2.3 Expanded Tug Basin

Tug basin expansion (see yellow perimeter shown in **Figure 4-8**) is required to meet the following functional requirements for the Project:

- Capacity to accommodate two tug operation contractors (one existing and one new), each with separate pivoted access gangways and pontoon floats for independent operation; and
- Provision for moorage for each tug operator of three 30 m, 80-tonne-bollard-pull berthing and escort tugs; two 18 m line handling tugs; and two 6 m small craft.

Appendix 4-B Engineering Drawings 60287593-MA-601 to **603** present preliminary designs of the expanded tug basin layout, cross-sections, and details.

Following submission of the Project Description to the CEA Agency in September 2013, the tug basin layout was modified to minimise disturbance to marine vegetation and improve drainage in the local area on an ebbing tide (see **Section 5.4.4 Alternative Means of Carrying out the Project – Tug Basin**).

The entire expanded tug basin area will be dredged to a depth of –6.5 m CD to allow for the required under-keel clearances for the anticipated new tugs. This is 0.5 m deeper than the existing tug basin.

The entrance channel width, at navigation depth, will be 78 m to allow for two-lane vessel navigation. A vessel turning radius of 45 m was used to set the turning area diameter within the navigation area between a moored tug and an opposite float and pontoon structure, or crest protection bank.

A free berthing length of 10 m, with full navigation depth, will be used to limit tug boat proximity to underwater hazards such as embankments. An end clearance length of 3 m is provided between ends of adjacent vessels.

The majority of the tug basin facility design incorporates floating pontoons and the Seaspan Mooring Barge 912, currently located in the existing tug basin behind the inshore berth at the Deltaport Terminal (see **Figure 4-8**). No allowance has been made for future sea level rise at this facility due to the floating structure design. Seismic loading is also not considered applicable to the piled and moored structures in the tug basin; however, the existing perimeter dyke of the Deltaport Terminal facility, which must be deepened to accommodate the tug basin expansion dredging, has been designed to withstand an A100 seismic design event as per the current dyke's rating. (See **Appendix 4-B Engineering Drawing 60287593-MA-602**).

Since high mast lighting at the adjacent Deltaport Terminal is considered sufficient to provide light for the pontoon floats and gangways in the tug basin, no additional lights are included in the design. Electrical services for tug shore power connections will be extended, or added from the existing tug basin services.

The existing tug basin facility has ample parking space to accommodate additional vehicles. No additional upgrade to the access road or parking area is required for the expanded tug basin.

Tugs will be fuelled at the existing Chevron fuelling station in Coal Harbour, Burrard Inlet, as per current practice (see **Figure 4-26**).

4.3 Project Schedule

This section describes the anticipated timelines for Project construction, operation, and decommissioning.

4.3.1 Construction Phase

The schedule for the Project construction phase to operation start-up of the three-berth terminal will depend on a variety of factors including the outcome of the EA review process, the timing of subsequent environmental approvals and permits, and market conditions. The anticipated preliminary key activities schedule shown in **Figure 4-9** assumes that Project approval will occur in 2017 and that construction will proceed over a five-and-a-half year period commencing in 2018. A more detailed preliminary construction schedule, and associated Basis of Schedule report, which was used for the Project assessment, are provided in **Appendix 4-E Preliminary Construction Schedule and Basis of Schedule Report**. As per the previous **Section 4.0** description, the construction methodology and equipment used will be determined by the chosen Terminal Operator Concessionaire and Infrastructure Developer upon Project approval, and as such may vary slightly from methodologies and equipment described in this section.

According to this construction plan, construction of components will occur from the water toward the shore, which will require key construction activities to be phased, as shown in **Figure 4-9**. Several constraints to work activities were considered during development of the preliminary construction schedule, including:

Fisheries Closures:

- Juvenile salmon closure – applies to work activities within the water column above –5.0 m CD (March 01 through to August 15 annually); and
- Crab closure – applies to work activities on and in the seabed below –5.0 m CD (October 15 through to March 30 annually).

Work Stoppages for Marine Mammal Sightings:

- If specific marine mammals as identified in **Section 14.0 Marine Mammals** are observed in close vicinity to the Project, marine-based work stoppages for marine mammal sightings will occur in accordance with the proposed Construction Environmental Management Plan as discussed in **Section 33.3.8 Marine Mammal Observation Plan**. Due to their uncertain nature and short duration, these as-required stoppages were not factored into the preliminary construction schedule.

Other Schedule-related Constraints:

- The Fraser River Maintenance Dredging Program[2] operates annually from June 15th to approximately February 28th, as determined by Fisheries and Oceans Canada (DFO). Sand from this source will therefore, be available only during that annual period; and
- The *Coasting Trade Act*, which includes the regulation of marine activities of a commercial nature by foreign ships in Canadian waters, could limit Project use of dredge vessels and equipment originating from offshore locations. Providing suitable dredging equipment is available within Canada, use of foreign-owned dredging equipment was not considered in the preliminary schedule or the assessment. Changes resulting from the proposed Canada-European Union Comprehensive Economic and Trade Agreement (CETA) may alter or potentially eliminate this constraint.

Construction-phase activities, organised by Project component (instead of chronologically due to schedule complexity), are described in **Section 4.4.1**.

4.3.2 Operation Phase

The terminal's container handling systems, including maintenance activities, will be fully operational within approximately six months following completion of construction. Terminal throughput will ramp up gradually after start-up, with design capacity throughput potentially being reached as early as 2025, but more likely by about 2030, depending on demand. The four main operation activities include container ship manoeuvring, marine terminal operation, railway switching and container hauling procedures, and container **drayage** by truck. Operation-phase activities are described in more detail in **Section 4.4.2**.

4.3.3 Decommissioning Phase

Port Metro Vancouver does not plan to decommission or abandon the Project. It is assumed that the land will remain in perpetuity and its future use will be subject to then-current permitting and regulatory requirements. As such, there are no activities associated with this phase. The decommissioning of temporary works and infrastructure required during the construction phase is described in **Section 4.4.1.19**.

2 The Fraser River navigation dredging has been carried out for over 100 years, with annual records being kept since 1946. Port Metro Vancouver has been funding and administering the annual Fraser River Maintenance Dredging Program since 1999, and this annual program is not part of the Project.

4.4 PROJECT ACTIVITIES

This section describes the activities to be undertaken during the Project's construction and operation phases.

4.4.1 Construction-phase Activities

4.4.1.1 General

The construction of RBT2 consists of a complex series of activities that need to be carried out concurrently or sequentially, and temporary works/infrastructure that need to be in place and subsequently removed in order to develop the marine terminal and the widened causeway in the optimal timeframe.

The temporary works and infrastructure necessary for Project construction consist of the following:

- Installation of barge ramps (**Section 4.4.1.4**);
- Utilisation of **Intermediate Transfer Pit** (ITP) (**Section 4.4.1.5**);
- Installation of pipelines from ITP to Project area (**Section 4.4.1.5**);
- Installation of pipelines from Project area to disposal at sea (DAS) sites (**Section 4.4.1.8**);
- Creation of causeway aggregate storage area (**Section 4.4.1.14**); and
- Creation of other on-Project laydown areas (**Section 4.4.1.14**).

A simplified sequence of key activities to construct the Project, which are expanded upon and described in more detail in the following subsections, is as follows:

- Deep soil densification of the ocean floor in areas below future terminal building foundations prior to any land development to comply with NBCC seismic design requirements;
- Establishment of a small **beachhead** island for temporary barge ramps to accommodate delivery of aggregate materials to be used in the land development process;
- Underwater storage of sand to be reclaimed for fill in the land development process;
- Development of **containment dykes** for both the terminal and the widening of the causeway in order to isolate the land development areas from the marine environment;
- Dredging the **dredge basin** and marine approach areas, and using the dredgeate as fill within the terminal containment dykes;

- Performing deep soil densification in the dredge basin;
- Reclaiming stored sand as fill for the terminal land mass construction and the causeway widening;
- Adding aggregate to the dredge basin areas to establish final levels, provide scour protection, and caisson toe protection in the berth pocket and caisson foundation areas;
- Installing caissons;
- Reclaiming and depositing sand to be used as preload for the filled terminal and causeway areas;
- Closing off of the east and west ends of the area between the caissons and the terminal south containment dyke using steel sheet piles;
- Filling in the area between the caissons and the containment dyke (apron area);
- Preloading the apron area;
- Densifying perimeter dykes and filled areas;
- Realigning Westshore Terminals' rail track leads;
- Constructing the RBT2 overpass;
- Installing all subgrade utility piping, cables, ducting, and services at the terminal and along the widened causeway;
- Installing all above-grade buildings, equipment, rail, roads, and infrastructure on the terminal, and the rail yards and emergency access road on the widened causeway;
- Paving terminal and causeway areas; and
- Decommissioning temporary construction facilities.

The expansion of the tug basin will occur independently of terminal construction and the causeway widening; therefore, it can be carried out during any year of the Project's construction period. A simplified description of the sequence of activities for the expansion of the existing tug basin, which is described in more detail in following subsections, is identified as follows:

- Dredging the entire tug basin area;
- Establishing a new crest protection perimeter; and
- Installing piles, float moorage, and access trestles and ramps.

The sequence of 11 figures (**Figure 4-10** to **Figure 4-20**) shows a representation of the construction progress in 6-month intervals. While these figures are only an approximation based on the preliminary design, and not the detail design and construction schedule to be created by the Infrastructure Developer, they provide a visual reference of how the Project could be developed over the five-and-a-half year construction period. The construction equipment anticipated within the Project area during this time is categorised in **Appendix 4-F Construction Equipment Peak Analysis**.

4.4.1.2 Land Development Material Balances

The development of land for the new marine terminal and widened causeway will involve the following:

- Reclaiming sand stored in the ITP (referred to as **Sediment Transfer Pit** in the *EIS Guidelines*) (see **Figure 4-21**);
- Using a variety of other fill materials transported to the Project site by tugs and barges from existing quarries; and
- Using the dredgeate from the dredge basin.

Specific volumes of material are described below with reference to particular activities. In some cases, due to the need to describe the material movements in and out of the ITP, the same fill materials and volumes are described with respect to multiple activities, and are not to be considered cumulative.

Table 4-3 describes the approximate (rounded values) volumes of aggregate required for land development at the marine terminal and along the widened causeway.

Table 4-3 Project Fill Volumes

Description	Volume (million m^3)	Source
Marine Terminal Area		
Containment dyke rock, gravel, and **rip-rap**	1.4	Existing quarries
Sand and miscellaneous fill	11.7	(see **Table 4-4** for sources)
Caisson rock ballast	0.4	Existing quarries
Buttress **mattress rock**	0.3	Existing quarries
Caisson mattress rock and **levelling course**	1.0	Existing quarries
Scour protection rock	0.2	Existing quarries
Caisson rock berm and filter rock	0.7	Existing quarries
Soil densification **sacrificial rock**	0.2	Existing quarries
Subtotal	***15.9***	

Description	Volume (million m³)	Source
Widened Causeway		
Containment dyke rock, gravel, and rip-rap (not including salvaged material from existing causeway)	0.4	Existing quarries
Sand fill	0.7	(see **Table 4-4** for sources)
Subtotal	***1.1***	
Project Total	**17.0**	

Sand for land development constitutes the majority of the required fill volume. **Table 4-4** presents anticipated Project-related sand sources and the approximate volumes to be supplied from each source.

Table 4-4 Sources and Quantities of Sand and Miscellaneous Fill

Fill Source	Volume (million m³)
Consolidated volume of useable dredged material from terminal dredge basin (berth pocket, marine approach areas, and **caisson trench**) (see **Section 4.4.1.8**)	3.2
Fraser River sand from annual maintenance dredging	8.1
Existing quarry sand	1.1
Total Sand Supply	**12.4**

Terminal dredge basin dredging, **vibro-densification**[3], and tug basin dredging will produce quantities of sediments, as described in subsequent sections, which will require DAS. The source and quantities of material requiring DAS over the five-and-a-half year construction period are outlined in **Table 4-5**. The nature of sediment to be dredged, including physical and chemical characteristics, is provided in **Section 9.6 Surficial Geology and Marine Sediment**.

[3] The vibro-densification process is a technique for subsoil improvement that uses a depth vibrator densifying in situ material, and is not considered a material replacement technique.

Table 4-5 Source and Quantities of Material Requiring Disposal at Sea

Nature and Source of Material	Volume (million m^3)
Dredged suspended material from terminal dredge basin (see **Section 4.4.1.8**)	0.625
Silty **fallout** material from the underwater densification process in the dredge basin (see **Section 4.4.1.9**)	0.128
Silty sand dredged from the expanded tug basin (see **Section 4.4.1.18**)	0.164
Total Disposal at Sea Volume	**0.917**

4.4.1.3 Marine Terminal – Initial Native Soil Densification

Native soil densification at the foundation locations for the Project's maintenance, administration, parking structure, and CBSA buildings, plus the main electrical substation is scheduled during the first year of construction and will occur simultaneously with the Year 1 terminal containment dyke construction. This deep soil improvement, which is necessary in order to meet NBCC A2475 seismic requirements for occupied buildings, extends to –42 m CD and is only feasible if completed prior to general fill placement at the terminal (see **Section 9.1.3.2 Geotechnical Considerations**, **Seismic Activity**).

Due to the shallow water depth at the location of these foundations and the exposed wave climate, this initial soil densification will be performed by vibro-densification equipment located on one of the following options:

- Mounted on a jack-up platform;
- Loaded on a grounded barge, protected by nearby rock dykes; or
- Loaded on a floating barge that withdraws to deeper water during low tides.

The exact method to be used for the vibro-densification equipment location will be determined by the Infrastructure Developer.

4.4.1.4 Temporary Barge Ramp Installation

Upon initiation of terminal construction, a barge mooring location will be established by installing temporary piles near the site of the first containment dyke around the terminal footprint. Construction of this containment dyke is expected to require two temporary ramps for materials off-loading from barges.

Since these ramps will be very exposed to wind and wave conditions, each barge ramp will consist of the following:

- Two 900 mm diameter locator piles at the outboard (pivot) end of each ramp;
- Two 900 mm diameter bearing piles at the abutment end of each ramp; and
- Four 900 mm diameter mooring piles, 10 m to 50 m outboard of the pivot end, to provide stable moorage for the aggregate barges (one unloading at the ramp and one tied up ready to unload) at each ramp.

The location and structural details for each ramp will be confirmed based on further geotechnical testing during detail design.

A portion of the first containment dyke will be established as a beachhead by dumping rock from the barges to create a small island that will serve as the abutment end of the barge ramps.

4.4.1.5 Intermediate Transfer Pit – Storage of Fraser River Sand

Storage of Fraser River sand obtained from the annual maintenance dredging program (not part of the Project) will commence following Project approval and issuance of all necessary permits (see **Section 6.0 Environmental Assessment and Permitting Process**). Instead of disposing the surplus Fraser River dredgeate into the ocean at the Sand Heads, B.C. disposal site, the suitable sand will be transported to the ITP by the dredge performing the maintenance dredging, and deposited underwater for future reclamation and use as fill. The ITP is a temporary underwater sand storage site located in the inter-causeway area, just east of the existing Roberts Bank terminals. The ITP is actually an underwater storage pile, rather than a pit, with a footprint of approximately 33 ha and sufficient capacity for storage of approximately 2.4 million m^3 of sand. Currently inactive, the ITP was most recently used for temporary sand storage during development of the Deltaport Third Berth Project.

Annual maintenance dredging in the Fraser River is carried out during an eight-month period from mid-June to the end of February in accordance with the seasonal dredging window for the Fraser River. The actual start date for dredging can be delayed, depending on the scale of the **freshet**.

It is anticipated that during the first year of construction, 2.5 to 3.0 million m^3 of Fraser River sand will be available to the Project and deposited into the ITP during construction of containment dykes for terminal development and causeway widening. Since the storage capacity of the ITP is limited to approximately 2.4 million m^3, a portion of this sand will be used directly as fill within the terminal and causeway containment dykes.

Depending on the dredging equipment and technologies available at the time of construction, the ITP will be used for storage over four consecutive years in order to provide approximately 8.1 million m^3 of sand required for the land development of the marine terminal and widened causeway (**Table 4-4**). The anticipated volumes of sand to be stored from 2018 to 2021 in the ITP during the multi-year construction phase are shown in **Figure 4-22**.

Transfer of reclaimed sand from the ITP to the fill sites will occur via two separate dredges and two temporary pipelines, which for EA purposes have been assumed to be installed from the ITP to the bottom of the Deltaport Terminal turning basin, along the Deltaport Terminal berths (at a location not interfering with navigation), and across land in the corridor between Westshore Terminals and Deltaport Terminal, as shown conceptually in **Figure 4-21**. It is anticipated that minimal surplus suspended sediments will remain in the dredgeate after dredge dumping into the ITP, leaving relatively clean sand for reclamation. Therefore, no surplus suspended sediments requiring DAS from the sand pumping operation between the ITP and the land development areas are anticipated.

4.4.1.6 Intermediate Transfer Pit – Storage of Supplementary Sand Imported from Existing Quarries

To maintain the construction schedule by bridging schedule gaps when Fraser River dredging is not taking place, and when the ITP sand supply is expected to be depleted, a supply of approximately 1.1 million m^3 of sand from additional sources has been incorporated into the schedule. This material will be delivered by tugs and barges from established existing quarries, and will be deposited either into the ITP, or unloaded directly to the terminal area via the temporary barge ramps, as described in **Section 4.4.1.4**.

4.4.1.7 Marine Terminal – Creation of Containment Dykes and General Fill

After establishing the beachhead and installation of the temporary barge ramps, the construction of the containment dykes will proceed with rock deliveries off-loaded from the barges into trucks at the ramps, dumped at the fill location, and placed via bulldozers and other grading equipment.

Containment dykes will be installed to isolate the terminal land development and causeway widening activities from the surrounding marine environment. A representative cross-section of the first scheduled containment dyke on the east side of the terminal is shown in **Figure 4-23**. Each containment dyke will have slightly different cross-section and embankment slope protection requirements based on site-specific seabed depth and wave climate as shown in **Appendix 4-B Engineering Drawings 60287593-MA-212** to **217**.

The construction of containment dykes and subsequent infilling will be completed in consecutive stages over approximately four years. The containment dykes, consisting of **perimeter and internal dykes**, will be constructed using approximately 1.4 million m^3 (**Table 4-3**) of rock, gravel, and rip-rap, sourced from existing quarries, with the outer exposed slope protected from waves by rip-rap, and the inner slope faced with a filter layer of gravel to minimise any seepage of fines from the retained fills into the surrounding marine environment. The containment dykes will remain a permanent part of the filled and perimeter area.

4.4.1.8 Marine Terminal – Dredging at the Dredge Basin

The dredge area footprint for the dredge basin (i.e., berth pocket, marine approach areas, and caisson trench combined), as described below and shown in **Figure 4-24**, will be approximately 30.8 ha.

Fraser River Pile & Dredge Inc. (FRPD), which holds the contract for the annual Fraser River Maintenance Dredging program, owns and operates the only dredges on the B.C. coast capable of undertaking the work required for the Project. It has been established that no alternative Canadian-registered dredges are currently available that are capable of dredging to –30 m CD at the production rate required for the Project. Due to factors including dredging depth, fines management, and required production rate, excavation by clamshell dredge is not a viable option for this activity at the dredge basin.

The RBT2 construction schedule was initially developed based on the assumption that FRPD's *Titan* and *Columbia* dredges will be the main dredges utilised on the Project. Although FRPD recently purchased an additional trailing arm suction hopper dredge (*FRPD 309*), for the purposes of the Project schedule, it is assumed that this dredge is intended to replace the aging *Titan* for the non-Project-related annual Fraser River maintenance dredging program, and that its dredging rate and general capability will be similar to that of the *Titan*. The *FRPD 309* will have the ability to discharge sand directly into fill areas, which may help to reduce the overall schedule duration (due to less reliance on underwater stockpiling at the ITP). In the absence of production data for this new dredge, a conservative assumption of *Titan* production rates and operational capability has been maintained in the preliminary construction schedule contained in **Appendix 4-E**, and in the effects assessment of this EIS. Due to anticipated technological changes and CETA development, this will be revisited by the Infrastructure Developer during final design and construction scheduling.

Dredging at the dredge basin will be performed using cutter-suction dredge equipment (*Columbia* assumed) from March 31 through to October 14 as per the assumed schedule constraints identified in **Section 4.3.1**. The estimated 4.2 million m^3 of dredged material removed from this area will be used as the initial 2 m to 3 m depth of fill within the terminal containment dykes. This depth constraint was applied in the preliminary design in order to use this lower-quality dredged material and still maintain the seismic design criteria of a 6-m layer of high-quality sand as the top layer for soil densification purposes. With this constraint, it is expected that the majority (approximately 85% or 3.6 million m^3) of this dredged material will be used as a consolidated volume of approximately 3.2 million m^3 of useable terminal fill (approximately 3.6 million m^3 consolidated by 10% to obtain a useable volume of 3.2 million m^3) (see **Table 4-4**). The balance, consisting of unusable fine sediments remaining in suspension (approximately 15% or 0.625 million m^3), will require DAS via a submarine pipeline to approved DAS locations (see **Table 4-5**). The outfall of the pipeline at the DAS locations is anticipated to be located at the –45 m CD level (see **Figure 4-21** for candidate DAS locations). Disposal at sea activities will occur subject to Environment Canada's DAS permit requirements (refer to **Section 6.0 Environmental Assessment and Permitting Process**).

Berth Pocket and Marine Approach Areas

The berth pocket and marine approach areas, which will cover an area of 17.4 ha (**Figure 4-24**), are required for arriving, berthing, and departing ships at the three-berth wharf, with sufficient under-keel clearance for the design vessels as described in **Section 4.2.1.2**. The berth pocket and marine approach areas will be dredged to a depth of –30 m CD (approximately 20 m below the existing seabed). This dredging will be carried out in two approximate 6.5-month periods, as shown in **Figure 4-9** due to the assumed schedule constraints identified in **Section 4.3.1**.

Caisson Trench

The caisson trench covers an area of 13.4 ha (**Figure 4-24**). The dredging below and behind the planned caisson wharf structure is required to remove **in situ** low permeability and loose, sandy silts with poor seismic performance characteristics. Dredging of this trench will occur in conjunction with dredging of the adjacent berth pocket during the same two 6.5-month periods as described for the berth pocket and marine approach areas above.

4.4.1.9 Marine Terminal – Native Soil Densification and Mattress Construction at Dredge Basin

Soil densification in the dredge basin using vibro-densification equipment will be performed in conjunction with the dredging activity. Additional construction activity details for the dredge basin as a whole, and for the berth pocket and caisson trench areas individually, are provided below.

Dredge Basin Activities

After dredging approximately 300 m of trench at –30 m CD (see **Figure 4-5** for cross-section), soil improvement work will begin with placement of sacrificial rock and slope support mattress rock. A temporary 1.5-m-thick layer of sacrificial rock, consisting of approximately 0.2 million m^3 of crushed rock to be obtained from existing quarries, will be placed at the bottom of the trench to act as a cap to filter the outflow of fines produced during the **vibro-replacement** process[4]. Densification of in situ soil below the base of the trench will be carried out by barge-mounted vibro-densification equipment to a level of –47 m CD. Some of the rock forming the temporary cap layer may be drawn down into the native soil as part of the vibro-replacement process. Depending on the amount of entrained fines within the sacrificial cap layer, and the technical requirements of the final design, it may be necessary to remove the remainder of the sacrificial cap layer by clamshell excavation (suitable for this activity) prior to placement of the crushed rock mattress layer. If so, then the salvaged rock will be used elsewhere in the Project as part of the general fill.

It is anticipated that the underwater vibro-replacement technique will generate a layer of silty soil (termed fallout) on the seabed surface on top of the sacrificial cap layer. The fallout will be collected using a cutter-suction dredge, pumped into the terminal basins, and disposed of at the DAS site (see **Table 4-5** for quantity).

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[4] The vibro-replacement process is a technique for subsoil improvement that utilises special depth vibrators and coarse material to replace finer material (e.g., clay and sand) with the coarser material. In contrast, vibro-densification also uses a depth vibrator, but it densifies in situ material and is not considered a material replacement technique.

Berth Pocket Activities

The dredged trench in the berth pocket area will be backfilled with a thick layer of mattress rock, and two layers of rip-rap scour protection rock, as shown in **Figure 4-5**, to a level of –21.6 m CD (approximately 11.6 m below the current seabed) to provide adequate depths for safe navigation of container ships accessing the three-berth wharf. This trench will provide the minimum required water level to –21.6 m CD, as previously described in **Section 4.2.1.1** to meet the performance requirements for the adjacent new caisson wharf foundation. Prior to installing the scour protection rock, the mattress rock in the berth pocket area will be vibro-densified in situ to form the berth pocket foundation. This mattress densification process is anticipated to involve the installation of a temporary overbuild layer of mattress rock to provide feedstock material for the **confining effect** during vibro-densification. It is anticipated that the mattress overbuild, being only a temporary requirement, will be removed and re-used in the Project as mattress rock foundation material further along the berth pocket. An alternative approach is to re-use the mattress overbuild as **berm** rock backfill behind the caisson wharf, a practice that has been used in previous construction of similar caisson wharves. The scour protection rock will be installed only after completion of mattress rock densification in any given area of the berth pocket.

Caisson Trench Activities

The dredged caisson trench will be backfilled with a thick layer of mattress rock to a level of –22.6 m CD (approximately 12.6 m below the current seabed), which is the estimated foundation level for the caissons. The mattress rock in the caisson trench area will then be vibro-densified in situ in a fashion similar to the process described for construction within the berth pocket. Similarly, it is anticipated that the temporary mattress overbuild will be removed and re-used in the Project as mattress rock foundation material further along the caisson trench, or as berm rock backfill behind the caisson wharf. The mattress rock layer will be rough-**screeded** to the desired grade after completion of the mattress rock densification in any given area of the caisson trench. In final preparation for wharf construction, a thin layer of crushed rock termed **levelling course** will be placed on top of the mattress rock foundation in the caisson trench area, and screeded to a tight tolerance to provide a level surface for placement of the caissons.

4.4.1.10 Marine Terminal – Land Development and Preloading

This section presents information pertaining to marine terminal land development and preloading construction activities.

Marine Terminal – Containment Dykes and Infilling

Creation of the land for the Project's marine terminal will require placement of approximately 15.9 million m^3 of fill as previously quantified in **Table 4-3** to construct the dykes and infill the area. To coincide with the availability of the dredge basin dredgeate fill material and Fraser River sand, the dyked perimeter will be divided into two areas by an internal dyke, creating an east basin and west basin (**Figure 4-21**). The fill material will generally consist of the following:

- Approximately 4.2 million m^3 of rock, gravel, and rip-rap required for the containment dykes, mattress rock, caisson ballast, scour protection, levelling course, berm rock, and berm filter as described in previous sections and below. This aggregate material will be sourced from existing quarries;
- Up to 3.2 million m^3 of useable material from the dredge basin dredging to be placed into the bottom of each of the east and west basins prior to sand fill (see **Section 4.4.1.8**); and
- Up to approximately 8.5 million m^3 of sand sourced from the annual Fraser River maintenance dredging, and supplemented as required with sand from existing quarries (see **Sections 4.4.1.3** and **Table 4-4**).

Marine Terminal – Preloading

Following terminal infilling within the containment dykes with dredge basin dredgeate and Fraser River sand, additional Fraser River sand will be placed on top as preload to provide consolidation and geotechnical stability. The preload is currently designed to be 6 m deep, with a settlement allowance of 1.5 m, and will involve an application period of four months. Three separate preload areas are defined for each basin, all overlapping temporally. As the east basin preload period ceases, the preload material will be moved to the west basin, with additional reclaimed Fraser River sand added as make-up as required due to settlement. Subsequently, west basin preload will be moved to the apron area as general fill and apron preload (see **Section 4.4.1.11**). East causeway preload will supplement the remainder of the apron preload requirements (see **Section 4.4.1.15**).

4.4.1.11 Marine Terminal – Three-berth Wharf Structure

Construction of the three-berth wharf will start at the east end and will progress westward sequentially after dredging (see **Section 4.4.1.8**), native soil densification, mattress rock filling, and rock densification (see **Section 4.4.1.9**) processes are completed.

Caissons – Acquisition and Placement

The wharf face structure will be constructed using 30 prefabricated concrete caissons, each of which will be divided into rows of internal cells. Each caisson will have the approximate dimensions of 41.7 m length, 18 m body width, and 27.1 m wall height. **Appendix 4-B Engineering Drawing 60287593-MA-509** includes a typical plan and section view of a proposed main caisson. One additional caisson will be required at each of the east and west ends of the main wharf structure. These two additional caissons are designed to be smaller with approximate dimensions of 24.5 m length, 14 m body width, and 20.8 m wall height. **Appendix 4-B Engineering Drawing 60287593-MA-510** includes a typical plan and section view of the proposed end caissons, and **Appendix 4-B Engineering Drawing 60287593-MA-511** shows how these end caissons will be located against the main caissons.

Since local **graving docks** are currently too small to prefabricate caissons of the required size, they will likely be fabricated outside the local region and transported to site by sea. The source of the caissons will depend on the Infrastructure Developer's access to an appropriate manufacturing facility.

The prefabricated caissons will be floated into position for final placement on the screeded levelling course within the caisson trench. After allowing the caissons to sink into final position using tidal influence and water as ballast, internal cells within the caissons will be filled with approximately 0.4 million m^3 of rock ballast, obtained from existing quarries, to provide mass to resist overturning and sliding forces.

Precast concrete cover slabs (likely cast offsite, possibly at the same location as caisson fabrication) will then be placed and grouted into position on top of the caisson walls to close off each cell. Precast concrete keyways (likely also cast offsite) will be lifted into the 1.0 m wide gaps between caissons. A cast-in-place concrete cope wall with approximate dimensions of 3.25 m tall by 3 m wide and an overall length of 1,300 m, and a narrower, but otherwise similar concrete crane wall will tie adjacent caissons together. The cope wall will provide support for the fender and mooring systems, and will also accommodate services such as shore power and a potable water supply for ships through an internal service tunnel and appropriate surface pits. **Appendix 4-B Engineering Drawing 60287593-MA-518** includes cross-sectional views of the cope wall, crane wall, and topside structure for the caissons.

To coincide with the phasing of the dredge basin dredging and soil densification, as per the schedule constraints identified in **Section 4.3.1**, caisson placement and wharf construction will be similarly phased over two dredge seasons. Closure dykes, including sheet pile walls, will be constructed from each of the two smaller east- and west-end caissons to connect the caisson wharf structure to the containment dyke on the terminal's south side. Two steel sheet piling walls of 10-m plan length at each end of the terminal will be required. **Appendix 4-B Engineering Drawings 60287593-MA-502** to **505** provide details of the sheet pile structures and closure dykes. The construction of the closure dykes is scheduled to occur during the juvenile salmon fisheries closure (i.e., March 1 to August 15). Work above elevation –5 m CD may require deferral, and will be determined through further discussion with DFO. For schedule development purposes, it was assumed that **silt curtain** containment would allow work to continue to final elevation.

Wharf Apron – Infilling, Densification, and Preloading

The apron area of the wharf structure behind the caissons will comprise a combination of another rock berm, berm filter, and sand fill, and will adjoin with the south terminal containment dyke and terminal filled area. This rock berm and general fill will be vibro-densified to achieve design performance objectives. **Appendix 4-B Engineering Drawings 60287593-MA-506** and **507** include cross-sectional views of the fill in the apron area. The preload requirements set out in **Section 4.4.1.10** are applicable to the zone of general fill between the terminal containment dyke and the northern edge of the apron. Material from the west basin preload and the east causeway preload will be used to complete the apron general fill and eastern apron preload. The western apron area will be preloaded using stockpiled terminal granular base, or reclaimed sand from the ITP.

Caissons – Placement of Toe Protection

Approximately 0.2 million m^3 of scour protection rock will be placed on the seabed in the berth pocket (at the toe of the caissons) as previously described in **Section 4.4.1.9** to prevent erosion due to scour from propeller wash. The scour protection design includes a toe scour protection slab constructed with **tremied concrete**, which will be chain-connected to the caisson base slab, and abutting the berth scour protection rock. **Appendix 4-B Engineering Drawing 60287593-MA-511** describes the caisson toe protection details.

Mooring Dolphin and Access Bridge

To limit the marine footprint required for the simultaneous moorage of the Project's design vessels, a mooring dolphin and associated access bridge are included in the preliminary design. The mooring dolphin and bridge will be located at the east end of the three-berth wharf and will consist of six 914-mm-diameter steel piles to be driven into the seabed to –80 m CD. Actual pile size dimensions will need to be confirmed during detail design. Further details on the mooring dolphin and associated access bridge, pile cap, and mooring bollard are shown in **Appendix 4-B Engineering Drawings 60287593-MA-529** to **530**.

4.4.1.12 Marine Terminal – Fill Densification

Following the installation of the containment dykes and fills for the Project terminal, ground improvement measures will be implemented to achieve the desired seismic performance levels. These measures include further densification under the maintenance, administration, parking structure, and CBSA buildings; main electrical substation; and perimeter containment dykes using the vibro-replacement process. These foundational improvements will be phased during the construction process, with densification occurring in three- to eight-month windows as required for a particular area.

Following the fill addition and preload removal activities, densification by dynamic compaction of the 6 m sand fill top layer will be carried out for the entire terminal and apron area.

4.4.1.13 Marine Terminal – Development of Infrastructure

As the land is developed and the preloading is completed, the installation and development of utilities, buildings, roads, rail, and terminal operating equipment foundations will proceed. Placement of the granular base and fine grading for terminal pavements and other structures will be undertaken after the dynamic compaction work has advanced sufficiently and all underground services have been installed. Granular materials will be delivered by barge and either unloaded at the temporary barge ramps using mechanical excavator equipment (e.g., front-end loader) into off-road trucks, or they will be off-loaded using a barge-mounted conveyor. The development of the infrastructure will continue for one to two years after completion of land development on a section-by-section basis.

Building materials such as steel, concrete, asphalt, rebar, piping, cable, etc. are expected to arrive via road transport. Temporary laydown areas will be located on either the widened causeway or the terminal's west basin.

Railway materials such as ties, rail, switches, ballast, etc. will most likely be delivered initially by barges and trucks, and subsequently by trains once the causeway rail infrastructure is operational to the terminal.

Utilities

The layouts for the civil utility services of water, sanitary, stormwater, fire water, and security are shown in preliminary engineering drawings in **Appendix 4-B Engineering Drawings 60287593-CI-250** to **254**. Associated with these layouts, more specific details are presented in **Appendix 4-B Engineering Drawings 60287593-CI-241** to **247**.

Roads and Paved Areas

The CY occupies the largest area on the terminal and requires the majority of the Project paving. Due to differences in the various operations in and adjacent to the CY, the nature of terminal paving will vary as follows:

- Mobile horizontal-transfer equipment travel areas: These areas will require heavy-duty paving. Asphalt is typically used, but any heavy-duty paving system will be considered.
- Container stacking areas: No vehicle travel will take place in these areas as all containers will be transported in and out by ASCs, which will be rail-mounted on concrete runways. Container storage areas will be 400- mm concrete and the areas between the runways can be paved with relatively light-duty asphalt or crushed rock.
- ASC buffer areas: These are the transfer zones between mobile horizontal-transfer equipment and ASCs, and between ASCs and trucks. Due to the repetitive nature of vehicle movements to and from exactly the same position, as well as the dynamic loading caused by stop-start vehicle motion, these areas are likely to be constructed using reinforced concrete for maximum durability.
- Truck traffic areas: These are the roadway areas of the entrance and exit gates and the associated truck routes to and from the ASC buffer areas. Due to the repetitive nature of vehicle movements to and from exactly the same gate positions, and the dynamic loading caused by stop-start vehicle motion, these areas are likely to be constructed using varying thicknesses of reinforced concrete for maximum durability.
- Non-container handling areas: These include employee parking and circulation space to and from the maintenance building. These areas can be paved with light-duty pavement, typically asphalt.

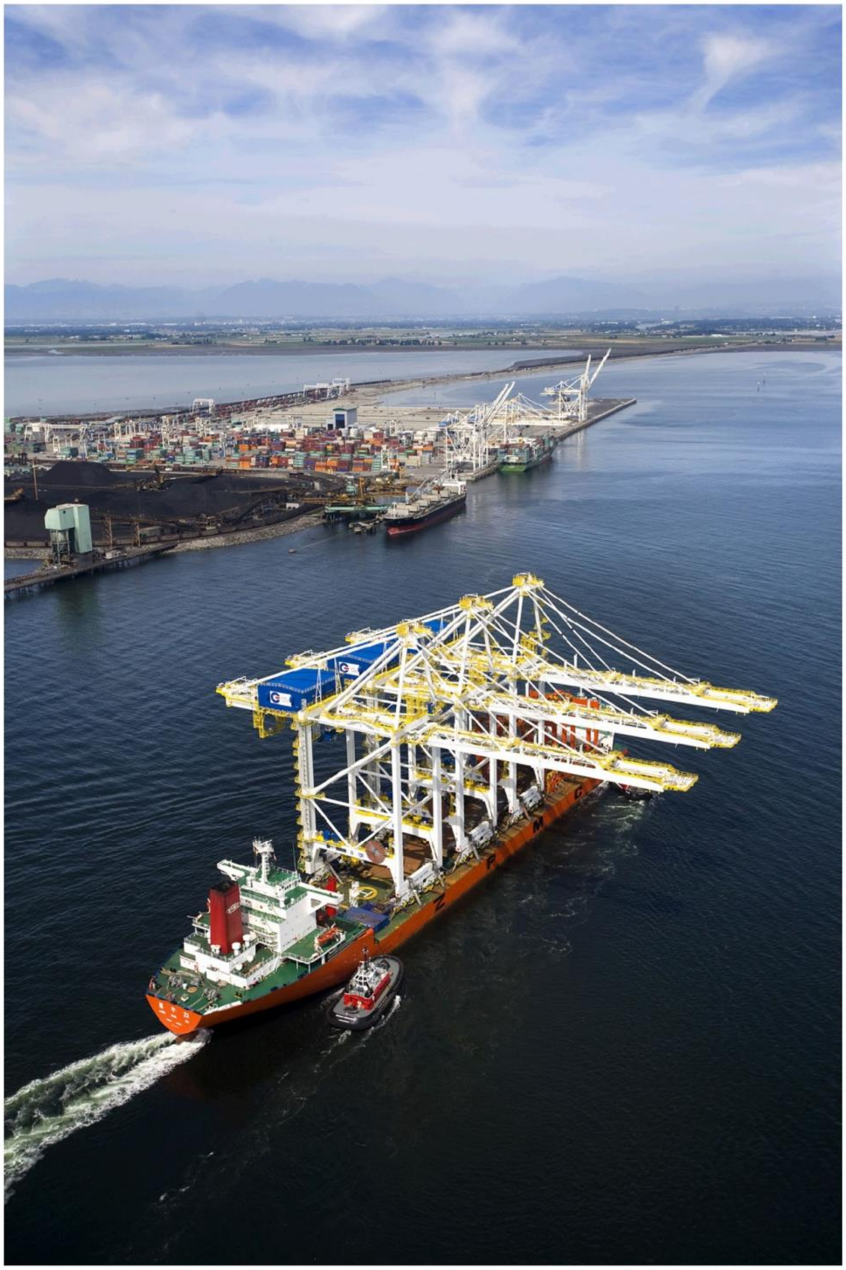
The majority of the IY area will be occupied by rail tracks and associated rail ballast; however, for operation and maintenance purposes, light-duty vehicles will need access to each IY track. The access roads within the IY will therefore, require light-traffic asphalt pavement.

Appendix 4-B Engineering Drawings 60287593-CI-230 to **235** provide terminal paving details.

Major Equipment

Major equipment to be delivered by the Terminal Operator Concessionaire, such as the ship-to-shore gantry cranes, the ASCs, and the RMGs, are expected to arrive pre-assembled via special ocean-going vessels. As an example, **Figure 4-25** shows a delivery of the ship-to-shore gantry cranes on such a vessel for the Deltaport Third Berth Project. Major operating equipment will be rolled off the vessel and onto the terminal apron via a track system and will be operational as soon as it is connected to terminal electrical and control systems, tested, and commissioned.

Figure 4-25 Assembled Ship to Shore Gantry Crane Delivery for the Deltaport Third Berth Project



PORT METRO vancouver	ROBERTS BANK TERMINAL 2	
	ASSEMBLED SHIP-TO-SHORE GANTRY CRANE DELIVERY	
	DATE: 12/17/2014	FIG No. 4-25

Terminal Buildings

The preliminary design layouts of the various terminal buildings and facilities that will be required are shown in **Appendix 4-B Engineering Drawings 60287593-AR-300** to **360** inclusive, and **370**.

Rail

The 12 IY tracks and associated leads will be constructed using track-laying equipment such as tie and rail placement equipment, ballast spreaders, ballast tampers, cranes, and rail grinders. **Appendix 4-B Engineering Drawings 60287593-CI-910** to **912** illustrate terminal rail layout details, and **Appendix 4-B Engineering Drawings 60287593-CI-920** and **921** provide typical cross-sections.

Electrical and Communications

All cabling, whether copper or fibre-optic, will be distributed through the site via underground ducts and conduits. **Appendix 4-B Engineering Drawings 60287593-EL-820** to **824** provide layout details for the distribution of the power, control, lighting, and communication cables.

As stated in **Section 4.2.1.3**, reefers will require electrical plug-in points and access platforms for connecting, disconnecting, and monitoring. **Appendix 4-B Engineering Drawing 60287593-EL-853** provides cross-sectional views of a constructed reefer platform.

4.4.1.14 Causeway Widening – Creation of Containment Dykes

Aggregate material for the causeway dykes (0.4 million m^3 as per **Table 4-3**) will be transported off barges moored at the temporary barge ramps, delivered by trucks driven along the crest of the new terminal containment dykes, then dumped, bulldozed, or graded into place. It is anticipated that similar to the east and west basin division for the terminal landfill, the causeway widening will be completed in two zones. The cut-off (internal) dyke will be placed approximately halfway down the causeway at a location to suit the available sand supply for causeway fill at that stage of the Project.

Rip-rap and shore protection from the north side of the existing causeway, that is suitable for reuse, will be reclaimed, stored at a temporary aggregate storage location at the S-bend of the causeway, and reused for the new dyke construction. **Appendix 4-B Engineering Drawings 60287593-MA-210** and **211** present plan views of the causeway dyke zones, and temporary storage area.

4.4.1.15 Causeway Widening – Land Development and Preloading

Widening of the causeway will proceed in two stages identified as zones:

1) West portion of causeway (first zone); and
2) East portion of causeway (second zone).

The 0.7 million m^3 (**Table 4-3**) of material required for widening of the area between the existing causeway and the new containment dykes will derive from two sources. Depending on actual preload results, excess preload sand from the terminal will be re-used in the first zone. This material will be supplemented with sand reclaimed from the ITP. The second zone will be filled using preload from the first zone. It will then be preloaded in a staged fashion using the remaining first zone preload. When the last preload is completed, the remaining preload sand will be used for terminal apron preload (see **Section 4.4.1.10**), other terminal infrastructure construction purposes, or sold to the local sand market. The preliminary design incorporates an aggregate balance with no surplus remaining.

4.4.1.16 Causeway Widening – Soil Densification of Containment Dykes

The native soil under the western causeway perimeter containment dyke will generally be densified using the vibro-replacement process. This densification activity will be phased during the construction process.

The preliminary design does not require densification of native soils for the eastern zone of the causeway dyke since the shorter dyke slope will likely not require vibro-densification to achieve seismic design performance levels. This will be confirmed during detail design.

4.4.1.17 Causeway Widening – Development of Road, Rail, and Utility Infrastructure

Once land development is complete, the development of road, rail, and utility infrastructure will proceed.

Road Infrastructure

Road infrastructure to be constructed on the causeway includes the RBT2 overpass, the access road between the RBT2 overpass and the terminal, and the emergency two-lane gravel road. **Figure 4-6**, **Figure 4-7**, and **Appendix 4-B Engineering Drawings 34-347-CI-1102** to **1106** provide the layouts of the roads and RBT2 overpass.

Building materials such as steel, concrete, asphalt, rebar, piping, cable, etc. are expected to arrive via road transport. Temporary laydown areas will be located on the widened causeway.

Construction equipment required for the roads and RBT2 overpass development will include typical earth-moving and consolidating equipment, cranes, cement mixers, concrete pumpers, and paving equipment. It is assumed that on-causeway batch plants will not be required, and that concrete and asphalt will be delivered via trucks.

Railway Infrastructure

Railway infrastructure to be constructed on the causeway includes two new rail yards and lead tracks between the existing RBRC rail network and the Project's IYs, as described in **Section 4.2.2.1** and shown in **Figure 4-6**. **Appendix 4-C Engineering Drawings 34-347-RL-1002** to **1009** include layouts and cross-sections of the new railway infrastructure.

Railway materials such as ties, rail, switches, ballast, etc. will most likely be delivered by trains for the causeway rail infrastructure development toward the terminal.

Construction equipment for the rail work will include track-laying machinery, including tie and rail-laying equipment, ballast spreaders, ballast tampers, cranes, and rail grinders.

Utilities

The preliminary layouts for provision of civil utility services of water and stormwater are shown in **Appendix 4-B Engineering Drawings 60287593-CI-255** to **256**.

Lighting for 24-hour operation will be installed at all railway switch points and at the RBT2 overpass for traffic safety and direction signs. No other roadway lighting is anticipated. Refer to **Appendix 4-C Engineering Drawings 4124-13-01** to **06** for the widened causeway lighting details.

Major Equipment

There is no major operating equipment to be installed on the causeway, as all equipment using the causeway is mobile such as trains, trucks, and other vehicles.

4.4.1.18 Tug Basin – Expansion of Existing Tug Basin

To allow for a second tug operator to service the new terminal, the existing tug basin facility will require expansion and a revised layout, as outlined in **Section 4.2.3**.

The tug basin expansion will involve dredging of approximately 164,000 m^3 of in situ soil via clamshell excavation to a depth of –6.5 m CD to allow sufficient under-keel clearance in the entrance and basin for large berthing and escort tugs. The resulting dredgeate will require handling through one of the following two options:

- If dredgeate is of suitable quality, and dependent on the Project schedule, this material can be re-used as general fill for the terminal or the causeway widening, with surplus suspended sediments released to the DAS site; or
- If its quality is unsuitable, the dredgeate will be disposed to the DAS site via direct dumping barge. This is the scenario that has been assumed in the development of **Table 4-5** and this EA.

New piles will be required for float moorage, access ramps, and navigation purposes as per the following preliminary design information (pile sizes and lengths to be finalised during detail design):

- Twenty-one 450 mm diameter pipe piles for mooring the concrete floats;
- Four 450 mm diameter access trestle and ramp support piles; and
- Four 450 mm diameter navigation piles around the basin perimeter.

Crest protection rip-rap will be installed around the exposed perimeter of the expanded tug basin to protect the existing mudflats from scouring forces during tidal exchanges, thus mitigating the formation of **dendritic channels**. The crest protection has been designed to a low profile (with nominal 300-mm projection above the existing mudflat elevation, enough to allow for settlement or degradation over time). The **hydrodynamic** and geomorphic effects of the crest protection structure will be minimised by having it follow the local tidal flat elevation as closely as possible. The crest protection will be tied into the pre-existing crest protection at the north side of the tug basin (which dates back to the Roberts Bank Phase II Development in the 1980s) to provide continuity (**Figure 4-8**).

Tug basin expansion can occur during any year of the construction schedule, since the expansion activities are independent of other Project construction activities aside from possible re-use of the dredged material for Project infilling. Both the juvenile salmon and crab closures are expected to apply as tug basin works will occur in water depths both above and below –5.0 m CD. The work will therefore, be scheduled between August 15 (end of the juvenile salmon closure) and October 15 (start of the crab closure). Two-month duration for this activity is feasible for the scale of the work involved.

The Infrastructure Developer may find merit in expanding the tug basin early in the Project to provide a safe harbour for marine construction equipment in the event of inclement weather during construction.

4.4.1.19 Decommissioning of Temporary Construction Infrastructure

Barge Ramps

The temporary barge ramps, which will be used as the transfer site for import of aggregates and other materials for Project construction, will be removed completely before construction completion. The decommissioning will include extraction and offsite disposal of all driven piles, demolition of any onshore pivot ramp abutments, and removal of any navigation markers or tie-up buoys.

Intermediate Transfer Pit Pipelines

When the ITP has been depleted of all useable sand, the sand delivery pipelines that were installed at the onset of construction will be removed, and the surface pipeline corridor will be reinstated to its pre-existing condition.

Intermediate Transfer Pit

Since all useable sand is scheduled to be reclaimed from the ITP, no additional decommissioning work, aside from the above-mentioned pipeline removal work, is anticipated for the ITP.

Disposal at Sea Pipelines

Once all dredging activities have been completed, submarine pipelines connecting the terminal and the DAS location will be removed. The disposal area will be surveyed for the end-of-construction profile.

Temporary Causeway Aggregate Storage

The temporary aggregate storage area at the S-bend in the west end of the causeway (see **Section 4.4.1.14**) will be decommissioned once the terminal and causeway fill and preload activities are complete. Causeway infrastructure will be developed within this area.

Other Laydown Areas

Temporary laydown areas established in the widened causeway, or the terminal's west basin, (see **Section 4.4.1.14**) will be repurposed as construction progresses to allow for infrastructure development within these areas.

4.4.1.20 Compensation Plans and Associated Works

Section 17.3 Offsetting Potential Effects presents descriptions of fish habitat compensation plans and any associated mitigation or offsetting measures required pursuant to the federal *Fisheries Act*, as well as wetland compensation plans and associated works.

4.4.2 Operation-phase Activities

Project operation will involve the marine terminal, the widened causeway, and the expanded tug basin. This section describes the four main operation activities including container ship manoeuvres, marine terminal operation, railway procedures, and drayage by trucks. **Appendix 4-D Roberts Bank Traffic Data Matrix** provides the projected container and traffic volumes for these activities in various horizon years (including information sources and assumptions), and presents volume comparisons with the existing Roberts Bank terminals.

4.4.2.1 Container Ship Manoeuvres

Arrivals and Departures

All container ships destined for RBT2 will arrive from either ocean transit, or from the Puget Sound area, pick up a Coastal Marine Pilot at the Victoria pilot boarding station, and will travel toward the Project in the **international shipping lanes** leading to the greater Vancouver area. The terminal approach and departure areas were designed for **port-side-to** berthing of container ships, which has been reviewed by local pilots during the ship navigation study performed as part of the preliminary engineering, and accepted as the preferred routing (AECOM 2012b). With this routing, a container ship will move out of the shipping lanes near the international boundary between Canada and the U.S.A., proceed northwest of the terminal, and begin a slow U-turn back (southeast) toward the terminal. This is defined in the *EIS Guidelines* as the inbound approach channel, but due to the depth of the water in this area, it is not a dredged channel until it reaches the Project's west marine approach area.

Depending on wind and wave conditions, two or three large berthing and escort tugs, dispatched from the expanded tug basin, will engage the container ship after it has begun its slow turn. The tugs will manoeuvre the ship into its assigned berth along the wharf. Line boat tugs, also from the expanded tug basin, subject to other berthing and moorage line technology that might be deployed, may assist in moving the mooring lines from the container ship to the bollards on the wharf, or mooring dolphin if berthed at the easternmost berth. **Figure 4-26** identifies the approach and departure ship routes, the inbound approach tug-assist point, and the Victoria pilot boarding station.

After mooring is complete, the tugs will either return to the tug basin, or assist another ship from one of the other Roberts Bank terminals in berthing or unberthing. Once the container ship is securely moored, and any shore power, potable water, or other required utility connections are made, the terminal operations of unloading and loading the container ship will begin.

After all unloading and loading of containers has been completed, the ship will be prepared for departure. All utility connections will be disconnected, mooring lines released, and tugs brought in from the tug basin to assist with moving the ship away from the berth and toward the international shipping lanes. This activity is defined in the *EIS Guidelines* as occurring in the outbound approach channel, but due to the depth of the water in this area, it is not a dredged channel aside from the Project's east marine approach area. Once the container ship is safely clear from the terminal, the tugs will return to the tug basin, or will be deployed to assist another ship. The vessel will then depart, dropping the pilot off at Victoria, and continue on to ocean transit, or to the Puget Sound area.

Fuelling and Bunkering

Facilities to support bunkering of ships do not exist at Roberts Bank, nor does the Project include any facilities to support bunkering. Container ships usually bunker at one of their home ports.

As is the practice for the tugs servicing the existing Roberts Bank terminals, tugs are expected to continue to refuel at the existing Chevron marine fuelling station in Coal Harbour, Burrard Inlet, as shown in **Figure 4-26**.

Ballast and Bilge Water Management

Ships will ballast or de-ballast water as required near or at the terminal berth. To prevent the invasion of foreign species into local waters, international regulations, through the International Maritime Organization (IMO), are managed by Transport Canada. All commercial deep sea vessels are required to carry out a ballast water exchange prior to entering Canadian waters. This is done outside the exclusive economic zone of 200 nautical miles (nm) and in water deeper than 2,000 m. An official ballast water exchange report must be completed and filed to Marine Communications and Traffic Services (Coast Guard) at least 96 hours prior to entry into Canadian waters. In addition, an official entry must be made in the ship's logbook recording the time and position of the ballast water exchange. The requirement for vessels to complete this ballast flush well outside Canadian waters supports the objective of preventing any foreign organisms from entering into the local ecosystem. The U.S.A. has similar requirements, and vessels arriving from the Puget Sound area are required to forward the completed U.S. forms to Canadian authorities prior to entry into Canadian waters.

There is no dumping of noxious liquid substances, including bilge water, permitted within Canadian waters, including PMV jurisdiction, as regulated by the *Canada Shipping Act, 2001*, and the *Vessel Pollution and Dangerous Chemicals Regulations*.

Off-terminal Anchorage

There are no plans, or foreseen terminal operating requirements, for off-terminal anchoring of container ships waiting for a berth at the new marine terminal. Container ships operate on a scheduled service, usually between Asia and the west coast, and adjust their speeds as required to arrive at the terminal within their assigned arrival window; thus, anchorage is not a normal requirement. Exceptions to this could occur in the event of an extreme storm event in the Pacific, resulting in a refuge anchorage requirement for safety reasons, or to accommodate unexpected ship-specific maintenance, personnel, or operation issues that may arise. Container ship anchorages for Deltaport Terminal in 2012 and 2013 have been rare, with a frequency range of 3 to 4 per year out of an approximate annual total of 270 **ship calls** to Deltaport Terminal in each of those years. The same frequency can be assumed for RBT2, resulting in approximately one unforeseen container ship anchorage every 1.5 to 2 months for the two Roberts Bank container terminals. These vessels would use existing anchorages in English Bay, or in the Gulf Islands as determined by the pilot and the port authority having jurisdiction.

Ship Calls

Worldwide, and within the Vancouver region, container ship sizes are increasing. The Project has been designed to accommodate the Maersk Triple-E class ships. These are currently used on the Asia-Europe route and are not expected to be in regular service to the west coast of North America in the near future. With triple-E class introduction on the Asia-Europe route, it is anticipated that 12,000- to 15,000-TEU-capacity ships will begin calling on the west coast of North America. With this trend of steadily increasing ship sizes, the total number of future annual ship calls to RBT2 is anticipated to be less than the current number of annual ship calls to Deltaport Terminal.

It is estimated that the new marine terminal will receive 260 container ship calls (520 **ship movements**) per year by 2030, at which time the terminal throughput is expected to be at full capacity. A more detailed description of this shipping scenario is provided in **Figure 4-27** and **Appendix 4-D Roberts Bank Traffic Data Matrix**. Ship arrival and departure times will vary during day-to-day operations.

4.4.2.2 Marine Terminal Operation

Wharf Operation

On the terminal, electrically powered ship-to-shore gantry cranes will transfer containers between the ship and the wharf, and vice versa. A Project capacity target of 2.4 million vessel TEUs per year was established in the Basis of Design (**Appendix 4-A**) that was used to develop the terminal layout. This capacity target is equivalent to the terminal's sustainable design capacity if everything within and external to the Project functions properly. Due to seasonal fluctuations, import container traffic can cause the 2.4 million vessel TEUs per year terminal capacity target to be exceeded during certain peak days or weeks (e.g.; Christmas imports), and the terminal needs to be capable of handling these peak periods. Equipment sizing has been included in the preliminary design to allow for these peak periods capable of handling 3.0 million vessel TEUs per year and maintaining the average 2.4 million vessel TEUs design capacity.

Similarly, to account for inefficiencies, adverse weather conditions, road closures, equipment malfunctions or breakdowns, power failures, and other possible incidents that have the potential to reduce terminal throughput, a factor of 85% of design capacity is used by financial analysts when evaluating a Project. For RBT2, this results in a practical capacity of 2.04 million vessel TEUs per year.

Any of these three throughput values (2.04, 2.4, and 3.0 million vessel TEUs) may be referred to in this EIS, depending on which scenario is being described. For the purposes of the description of the Project's operation phase, 2.4 million vessel TEUs per year is used as the basis for average-period traffic information, and 3.0 million vessel TEUs per year is used as the basis for peak-period traffic information.

Figure 4-28 shows the expected container flow volumes at RBT2 when the terminal is operating at 2.4 million vessel TEUs per year. Volumes of laden and empty containers are expected to be 2.07 and 0.33 million vessel TEUs per year, respectively. Actual gate and rail volumes will surpass 2.4 million TEUs due to movements involving empty containers that enter and leave the terminal for off-dock facility handling, without being placed on a vessel.

Containers unloaded from a vessel will pass through RPMs at the apron area of the wharf before being taken to their next terminal destination by mobile horizontal-transfer equipment.

Container Yard Operation

Containers will be moved from the wharf to either the CY or one of the IYs via mobile horizontal-transfer equipment which, based on current technology for the purposes of this EA, were considered to be diesel-fuel-powered. If battery technology advances by the time of equipment acquisition, the equipment may also be battery-powered.

Containers will be moved and stacked in the CY into blocks and rows, as previously described in **Section 4.2.1.3**, for storage using electrically powered ASCs controlled by the **terminal operating system** (TOS) and the **computerised automation control system** (CACS). Containers are expected to be stored in the CY for four to five days on average (AECOM 2012a).

As previously described in **Sections 4.2.1.3** and **4.4.1.13**, the CY will also contain special access platforms and required electrical plug-ins for inspection and connection of reefers.

Inbound trucks are scheduled to arrive at the terminal gates within a designated time window via a terminal reservation system that is linked to the TOS. Laden trucks will deliver laden containers to the CY for export, or empty containers for return to their origin. Empty trucks will pick up imported containers that have arrived at the terminal by ship, or empty containers arriving by trains, to be delivered to local distribution warehouses for further handling, distribution, or **stuffing** for export.

Once trucks complete their terminal activities, they will proceed to the exit gate where they will be cleared for departure, with the correct container loaded, or empty in a single-ended move (i.e., arrive with a container and leave empty).

Approximately 35% of the Import containers leaving the terminal will be by truck drayage. In round numbers, on an average day, an estimated 3,700 **truck movements** (one-way trips) will occur at the terminal. This volume is expected to increase to 5,100 truck movements per day on a peak operating day. Using the same terminology as for ships, this can be expressed as inbound and outbound truck activity of 1,850 **truck calls** per day on an average day, or 2,550 truck calls per day on a peak day. Refer to **Figure 4-30** or **Appendix 4-D** for more specific numbers and details.

The number of truck movements per day for the Project's container throughput will depend on whether truck calls will involve a double-ended move (i.e., arrive with a container and leave with a container), or a single-ended move (i.e., arrive with a container and leave with an empty chassis, or vice versa). While a double-ended move reduces the number of daily truck movements, it is not always practical. In 2011 at Deltaport Terminal, approximately 37% of container movements by truck involved a double-ended move. In other words, for every 100 containers moved, 63 were single-ended, requiring 126 truck movements, and 37 were double-ended, requiring 37 movements, for a total of 163 truck movements. This resulted in a ratio of 1.63 truck moves per container. For the purposes of RBT2, this ratio is considered as a worst-case scenario and was used in the EA. The number of truck moves per container is expected to decrease due to the new efficiencies, procedures, and PMV initiatives (described in **Section 33.0 Environmental Management Program**) that are anticipated to be in place when RBT2 operation commences.

Intermodal Yard Operation

From the CY, the containers will move to the rail IYs via mobile horizontal-transfer equipment. Electric RMGs will be used to transfer containers to and from the mobile horizontal-transfer equipment, coming from either the wharf or the CY, to and from railcars situated on one of the 12 IY tracks.

Empty railcars within the IY will be double-stacked with containers, thus requiring a manual operation of **coning** (inserting and manipulating a twist-lock device that secures the stacked containers to each other) between the bottom and top containers loaded on each railcar.

On a fully laden incoming train, the reverse procedure takes place. The cones are manually unlocked (reverse twist-lock procedure), the top containers are removed, and the manual **de-coning** (cone removal) takes place prior to the bottom layer of containers being unloaded by the RMGs. Incoming railcars are also inspected within the IY for any problems that can either be repaired within the IY, or in the DPU/Bad Order Setout Yard if the repairs are more extensive.

When a **string** of approximately 3,000 ft. (915 m) of railcars has been loaded with containers, and the railcar inspections and air tests have been completed, the string will be switched out of the IY; coupled usually to another string from another IY track; and the combined larger string of railcars is then ready for movement to the T-Yard on the causeway.

Approximately 65% of the Import container traffic leaving the terminal will be by rail. Train lengths from and to RBT2 are expected to be between 8,000 ft. (approximately 2,440 m) and 12,000 ft. (approximately 3,660 m) and will be handled by Canadian National Railway (CN) or Canadian Pacific Railway (CP). For the 2.4 million TEU terminal capacity, and the 1.62 million TEUs container movements by rail shown in **Figure 4-28**, the RBT2 movement of containers through the IYs will equate to 39,000 railcar ft. per day on average (11,890 m), or 51,000 railcar ft. per day on a peak day (15,545 m), in each direction. This represents four trains per average day, or five trains per peak day, in each direction serving RBT2; therefore, 8 train movements per average day, or 10 train movements per peak day will be handled by the Project. Refer to **Figure 4-29** or **Appendix 4-D** for more details.

Support Facilities

Support facilities, to be located on the east side of the terminal, are described in **Section 4.2.1.5**. The administration building will contain the terminal's operation and security centres. Terminal operation will be controlled through the TOS, which will track all container movements, locations, departures, and arrivals through various container ID scanners located throughout the terminal and on the equipment. The CACS will be used to operate automated equipment and will receive feedback from manually operated equipment.

To accommodate the staffing needs for the Project, deliveries, service vehicles, and visitors, a rounded average of approximately 1,750 vehicle movements per day (not including the container trucks previously described) are expected at the terminal. Refer to **Figure 4-31** or **Appendix 4-D** for more specific numbers and details.

Operating Hours

The terminal is designed to operate 24 hours per day, 358 days a year at the berth, and 362 days a year at the CY and IY. Rail operations for the existing Roberts Bank terminals are carried out 24 hours per day, 364 days a year, with Christmas Day being the only shutdown for rail activities.

Historically, truck gates at the existing Deltaport Terminal were open weekdays between the hours of 8:00 a.m. and 4:30 p.m., with a half-hour lunchtime closure. Night gate or weekend gate openings were scheduled on an as-required basis to handle peak container volumes. In July 2014, regular weekday night gate operation was introduced by the terminal operator, providing 16 hours of access between 8:00 a.m. and 1:00 a.m. with two half-hour mealtime closures. The additional operating hours were introduced to reduce truck traffic and congestion during peak daytime hours, maximise the use of existing port infrastructure, and create more opportunities for growth by offering a wider range of access times at the terminals for container truckers.

By the time RBT2 is operational, it is assumed that night gate operation will be standard practice, and weekend gate openings will be common as local warehouses extend their hours to handle the increase in container volumes. For the purposes of the EIS, night gate operation was not considered in order to support a conservative traffic, noise, and air quality assessment. Refer to **Appendix 4-B Engineering Drawing 60287593-GE-106** for further details.

4.4.2.3 Widened Causeway Operation

This section describes the anticipated activities associated with Project operation on the widened causeway.

Railway Procedures

The railway design outside of the Project area, and the railway operation within and outside of the Project area, will be determined by the operating railways. For EA purposes, the descriptions presented in the following Railway Inbound and Outbound subsections outline a conceptual operating scenario that was used in the rail simulations for the preliminary design of the Project, and the EIS studies.

Inbound

Inbound (westbound) trains consisting of railcars carrying containers destined only for RBT2 (referred to as a RBT2 **pure train**) will proceed directly to the T-Yard. The operating railways, CN and CP, do not currently envision pure trains consisting of all Deltaport Terminal-bound railcars, or all RBT2-bound railcars. Instead, the railways foresee that arriving trains will consist of **blocks of railcars** destined for one terminal or the other. The railways will assemble these terminal-specific blocks of railcars into longer strings of railcars, possibly between 6,000 ft. (1,830 m) to 8,000 ft. (2,440 m) in length, at one of their yards. These railcar strings will then be moved into the associated terminal's yard (T-Yard for RBT2 or South Yard for Deltaport Terminal) using mainline, DPU, or yard switching locomotives.

When westbound rail traffic arrives in the T-yard, the railcars that make up the traffic, whether from a pure train or from the above-described block assembled strings, will generally be split up and set out into one or more of the T-Yard's nine 6,000 ft. (1,830 m) tracks. The mainline and DPU locomotives will be moved to the DPU/Bad Order Setout Yard pending a departing train. The railcar strings will then be ready to be moved by yard switching locomotives to the IY tracks on the terminal for unloading and reloading as previously described in **Section 4.4.2.2**.

Outbound

Outbound (eastbound) strings from the terminal's IYs will be moved into one or more of the T-Yards' 6,000 ft. (1,830 m) tracks by yard switching locomotives. These loaded railcar strings will be assembled into a CN or CP departing train at the T-yard, ranging in length from 8,000 to 12,000 ft. (approximately 2,440 to 3,660 m). The assembled train will be repositioned to the **mainline tracks** between the T-Yard and the DPU/Bad Order Setout Yard, where mainline locomotives and DPU locomotives (if required) will be added to the train according to CN or CP operating practice. Any identified bad order cars will be switched out into the DPU/Bad Order Setout Yard for carrying out of more extensive repairs, or for holding for a future transfer to a CN or CP repair facility. The resulting train, up to 12,000 ft. (3,660 m) long, will then be ready to depart the Project area via one of the two Project tie-in points to the existing rail network on the RBRC.

General

Rail simulations carried out during preliminary engineering design determined that under certain operating conditions involving inbound and outbound trains, and the movement of railcar strings in and out of the IYs, congestion could trap locomotives. To avoid the potential for congestion, a short locomotive bypass track between the northern IY lead track and the three northern T-Yard tracks, as well as a locomotive spur coming off the northern IY lead were added to the design. Both of these tracks are shown on the railway schematic in **Appendix 4-C Engineering Drawing 34-347-RL-1060**.

Drayage by Trucks

Inbound

After VACS gate clearance, trucks proceed to the terminal's entrance gates for assignment to one of the 120 truck slots at the CY. Inbound trucks may also be staged in existing designated staging lanes along the existing causeway roads, or along the new RBT2 access road's second inbound lane if terminal conditions require this staging.

Vehicles that do not clear VACS will need to turn around either at the DTRRIP overpass turnaround, or at the RBT2 turnaround, prior to the terminal entrance gates.

Outbound

After exit gate clearance, the trucks will proceed to their destination via the RBT2 access road, RBT2 overpass, existing Roberts Bank Way North, existing DTRRIP overpass, and existing Deltaport Way.

4.4.2.4 Expanded Tug Basin Operation

The purpose of the tug basin is to moor the tugs, line boats, and small craft that are required to service the arrival and departure of the container vessels and bulk carriers destined for the three Roberts Bank terminals. Tug operations for the Project were previously described with respect to container ship manoeuvres in **Section 4.4.2.1**.

4.4.2.5 Maintenance Activities

Maintenance Dredging

Maintenance dredging has not been required to date for the existing Roberts Bank terminals; consequently, it is expected that the Project will require limited or no maintenance dredging at the marine approach areas, berth pocket, and tug basin.

Terminal Maintenance

Terminal Perimeter

Inspections of perimeter dykes, the caisson toe, and the berth pocket will be performed on a regular basis to evaluate settlement and wave action effects. Some gradual deterioration of dyke slope protection is expected. The frequency of inspections will be determined after the initial inspection, but is expected to be annual initially, to ensure the integrity of the rip-rap and scour protection mattress, and allow for repair of any damage or settlement observed. Re-dressing of the slope and scour protection will be conducted as required.

Terminal Surfaces

A variety of terminal surfaces have been proposed based on the usage expected in each particular terminal area, and pavement will be selected to suit anticipated uses (see **Section 4.4.1.13**). Patching of potholes, cracks, or surface flaws will be performed on an as-required basis. Since pavement structures will be designed for a 20-year design life, major repaving work is not expected within the first 20 years of operation.

Terminal Equipment

All terminal operating equipment will be inspected and maintained at the terminal as per the equipment manufacturer's recommended maintenance schedule. Larger equipment such as the ship-to-shore gantry cranes, the ASCs, and the RMGs will be maintained in position, whereas the mobile equipment will be maintained in the maintenance facility at the east end of the terminal. Since the ASCs, and to a partial degree the ship-to-shore gantry cranes and RMGs, are located within the automated and semi-automated areas of the terminal, the Terminal Operator Concessionaire will need to develop a strict safety lockout procedure for this equipment to be maintained in situ by service personnel.

Major equipment is expected to have a 25- to 30-year operating life; therefore, no large equipment replacements are expected to occur within the first 25 years of terminal operation. Mobile equipment may require replacement more frequently, and this will be dependent on specific equipment usage.

Terminal Utilities

All terminal utilities such as water, stormwater, and sanitary sewage collection and treatment, communications, electrical and controls, and security systems will be inspected and maintained on a regular basis as suggested by the manufacturer of the associated system, or based on best management practices.

4.4.2.6 Railway Maintenance

It is assumed that most railcar maintenance will be performed in the IY, including light maintenance, wheel changes, hose replacement, brakes, and general minor repairs. For railcars that are not repaired in the IY (bad order), repairs will be performed in the DPU/Bad Order Setout Yard, or moved to larger CN or CP repair facilities elsewhere. Light locomotive maintenance may occur on the causeway in the DPU/Bad Order Setout Yard.

Canadian National and CP mainline and DPU locomotives are not expected to refuel within the Project footprint. Local yard switching locomotives are expected to continue to be maintained and refuelled in one of the existing BCR yards as per current practice.

The rail infrastructure will be maintained as per Transport Canada Rules Respecting Track Safety requirements (Transport Canada 2011). These rules specify the frequency of routine inspections of rail, switches, ties, and ballast. Any settlement issues will be addressed through re-ballasting. Ties and rails will be replaced on an as-required basis depending on degradation and rail wear.

4.4.2.7 Roadway Maintenance

Paved roads and the RBT2 overpass will be inspected and maintained at a frequency and manner similar to the existing Roberts Bank Way North, Roberts Bank Way South, and DTRRIP overpass. Potholes, cracks, or other surface imperfections noted will be repaired on an as-required basis. Roadway maintenance, including snow and ice removal, is contracted out by PMV to a road maintenance contractor for these services. This quite often is the same maintenance contractor as used by the Ministry of Transportation and Infrastructure and the existing Roberts Bank terminals operators for their respective causeway and terminal roadway maintenance.

Pavement has been designed for a 20-year life. No major repaving of the Project roads is anticipated for 20 years.

The emergency access road along the north side of the widened causeway will be graded, and gravel will be added on an as-required basis. Wear and tear of this road is expected to be minimal, as it will primarily be used for maintenance access.

4.5 REFERENCES

AECOM, 2012a. Robert Banks Terminal 2 - Planning and Capacity Study

AECOM, 2012b. Roberts Bank Terminal 2 - Fast-time Ship Navigation Simulation Study

Ausenco-Sandwell. 2011. Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use Guidelines for Management of Coastal Flood Hazard Land Use. Guidelines, BC Ministry of Environment, Victoria, B.C.

Seaport Consultants Canada Inc. 2012. Functional Requirements – Design Vessels, Container Capacity Improvement Program (CCIP) - Project Definition Report (PDR) Phase

Transport Canada. 2011, Rules Respecting Track Safety (TC-E54)

5.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

5.1 INTRODUCTION

This section describes the results of the assessment of technically and economically feasible alternative means of carrying out the Project. The *EIS Guidelines*, part 2, section 8, require certain steps be followed to identify and consider the effects of alternative means of carrying out the Project. Port Metro Vancouver has organised this section of the EIS to comply with the *EIS Guidelines* and the guidance document entitled *Operational Policy Statement: Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2013), as follows:

- Identify the alternative means to carry out the Project (**Section 5.2** to **Section 5.5**) –
  - Develop criteria to determine the technical and economic feasibility of the alternative means, and
  - Identify those alternative means that are technically and economically feasible, describing each alternative means in sufficient detail;
- Identify the effects of each technically and economically feasible alternative means (**Section 5.6**) –
  - Determine criteria to examine the effects of each remaining alternative means, and
  - Identify those elements of each alternative means that could produce effects in sufficient detail to allow a comparison with the effects of the Project to identify the preferred means; and
- Identify the preferred means (**Section 5.7**) –
  - Identify the preferred means based on the relative consideration of effects, and of technical and economic feasibility.

As stated in the *EIS Guidelines*, section 8, the following alternative means have been considered in the analysis:

- Location of the marine terminal within B.C.;
- Location, orientation, and layout of the approach channel, harbour basin, and berth(s) for both the marine terminal and tug basin[1];
- Location, orientation, configuration, and construction of the marine terminal and tug basin;

[1] As defined in **Section 4.0 Project Description**, the approach channel, harbour basin, and berths for the marine terminal are referred to in the EIS as the berth pocket and marine approach areas. There is no approach channel for the tug basin, and the tugs will be moored to mooring floats, not specific berths, within the tug basin that forms the tugs' harbour basin.

- Configuration and construction of the causeway and the road and rail corridors;
- Location and configuration of the sediment transfer pit[2];
- Alternatives to dredging;
- Methods for dredging;
- Alternatives to disposal at sea (DAS) of sediments; and
- DAS location(s).

For purposes of this assessment, these nine alternatives have been regrouped within three main categories as follows:

- Location of Marine Terminal within B.C. Alternatives (**Section 5.3**) –
  - Increase capacity and efficiency at existing container terminals within PMV's jurisdiction,
  - Convert existing other terminals and properties within PMV's jurisdiction to handle containers,
  - Build a new terminal within PMV's jurisdiction, and
  - Pursue other west coast container terminal plans and concepts;
- Location, Orientation, Layout, and Configuration Alternatives at Roberts Bank (**Section 5.4**) –
  - Marine terminal (including berth pocket and marine approach areas),
  - Causeway,
  - Rail and road corridors, and
  - Tug basin;
- Construction Alternatives at Roberts Bank (**Section 5.5**) –
  - Dredging,
  - Temporary sand storage,
  - Construction of supporting land (terminal and causeway),
  - Construction of the terminal's three-berth wharf,
  - Disposal of sediments, and
  - Construction of tug basin mooring wharves.

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2 As defined in **Section 4.0 Project Description**, the *EIS Guidelines* term sediment transfer pit is referred to as the intermediate transfer pit (ITP) in the EIS sections.

5.2 TECHNICAL AND ECONOMIC FEASIBILITY CRITERIA

Port Metro Vancouver proposes to build RBT2 to meet increasing demand for containerised trade on the west coast of Canada and to continue to capture the benefits of PMV's competitive position for the benefit of the Canadian economy. Port Metro Vancouver retains an independent third-party consultant to prepare annual container traffic forecasts to predict demand and meet its mandate to promote and support national trade. The Project aligns with federal and provincial strategies, such as the Government of Canada's Global Markets Action Plan, New Building Canada Plan, and Asia-Pacific Gateway and Corridor Initiative, in addition to the Province of B.C.'s Pacific Gateway Transportation Strategy.

To meet the forecasted demand, technically and economically feasible alternative means were identified based on the following information sources:

- Professional judgement of PMV and external container industry professionals (i.e., consultants, industry representatives);
- Industry evidence (i.e., comparisons with similar existing or planned types of projects); and
- Economic feasibility studies where available (i.e., net present value or internal rate of return).

5.2.1 Technical Feasibility Criteria

When determining the technical feasibility of Project alternatives in B.C., PMV considered whether the potential alternatives (either individually or collectively) would be able to meet the long-term container capacity demand on the west coast of B.C. by the mid-2020s (see **Section 2.0 Project Overview** for more information on container capacity supply and demand forecasts).

To meet anticipated growth and demand in container capacity in the mid-2020s, PMV also identified technical criteria for the marine terminal, including a requirement for the necessary road and rail connections to efficiently transport containers to and from the market. In addition, a minimum berth depth requirement of approximately 18.4 m has been established to allow for access by post-Panamax-sized vessels and ultra-large container ships, which are replacing the current smaller-sized ships, as described in **Section 4.0 Project Description**.

Technical criteria specific to each category are provided in descriptions of that category in **Section 5.3** through to **Section 5.5**.

Within the Alternative Means section, PMV also provides comment on projects that could provide additional container capacity outside of PMV's jurisdiction (see **Section 5.3.4**). However, these projects are not technically feasible for PMV to undertake since PMV has no control of projects undertaken outside PMV's jurisdiction.

5.2.2 Economic Feasibility Criteria

When alternatives were considered technically feasible, additional considerations were undertaken to determine if these alternatives were economically feasible. In determining the economic feasibility of Project alternatives, PMV considered a range of conceptual-level cost estimates, depending on the type of alternative and the level of design information available. These cost estimates ranged from conceptual-level order of magnitude costs (i.e., plus or minus 30% to 50%) to more refined cost estimates generated through internal financial models. Alternatives were ruled out as being not economically feasible if their capital cost estimates were an order of magnitude higher than the other options being considered.

5.3 Location of Marine Terminal within British Columbia Alternatives

Port Metro Vancouver's Land Use Plan (PMV 2014) requires maximising the use of existing terminals before building any new facilities. In planning for future capacity within the guidelines of the Land Use Plan, PMV's Container Capacity Improvement Program (CCIP) considered the following alternatives for creating container capacity to meet the forecasted demand:

- Increase the capacity and efficiency of existing container terminals within PMV's jurisdiction;
- Convert existing under-utilised terminals within PMV's jurisdiction to handle containers; and
- Build a new terminal (within PMV's jurisdiction).

In addition to these projects and initiatives under consideration within PMV's jurisdiction, other initiatives could result in the addition of container capacity on the west coast of B.C.

Table 5-1 summarises the specific alternatives that were considered as part of this assessment. The locations of the marine terminal options discussed are shown in **Figure 5-1**.

Table 5-1 Location of Marine Terminal within British Columbia – Alternative Means Considered in the Assessment

Category	Specific Alternatives Considered
Increase capacity and efficiency at existing container terminals within PMV's jurisdiction (**Section 5.3.1**)	Increase capacity at Deltaport Terminal
	Increase capacity at Centerm
	Increase capacity at Vanterm
	Increase capacity at Fraser Surrey Docks (FSD)
Convert other existing terminals/properties within PMV's jurisdiction to handle containers (**Section 5.3.2**)	Lynnterm conversion
	Develop vacant site at Fraser Richmond properties
Build a new terminal within PMV's jurisdiction (**Section 5.3.3**)	Construct a new terminal at Roberts Bank
Pursue other west coast container terminal plans/concepts (**Section 5.3.4**)	Prince Rupert expansion(s)

5.3.1 Increase Capacity and Efficiency of Existing Container Terminals within Port Metro Vancouver Jurisdiction

This section presents the alternatives for increasing capacity at PMV's existing container terminals, including Deltaport Terminal at Roberts Bank, as well as Vancouver's Inner Harbour terminals, Vanterm and Centerm, and Fraser Surrey Docks (FSD) on the Fraser River. Potential expansions for these terminals are discussed individually in the sections below and then collectively as a suite of alternatives to meet the forecasted long-term container demand.

5.3.1.1 Deltaport Terminal

Deltaport Terminal at Roberts Bank (**Figure 5-1**) was most recently expanded in 2010 with the addition of Deltaport Third Berth (DP3), which added 600,000 twenty-foot equivalent units (TEUs) of container capacity, bringing the terminal's total design capacity to 1.8 million TEUs. A series of improvements under the Deltaport Terminal Road and Rail Improvement Project (DTRRIP), which is further described in **Appendix 3-A Descriptions of Projects and Activities Contributing to Existing Conditions and Expected Conditions**, will improve efficiency and further increase capacity at Deltaport Terminal by 600,000 TEUs to 2.4 million TEUs by 2017. Deltaport Terminal is expected to reach its maximum capacity by 2017. No additional expansions were considered feasible as early feedback from regulatory agencies on the potential environmental effects of a Deltaport Terminal expansion within the inter-causeway area suggested that the potential environmental effects were unacceptable by regulators (see Design Alternative E1 in **Section 5.4.1.1**).

These planned Deltaport Terminal improvements through DTRRIP will help to meet short-term container demand, but are not expected to meet forecasted long-term container demand. As a result, this alternative will not be subject to further consideration.

5.3.1.2 Centerm

Located in Vancouver's Inner Harbour, Centerm (**Figure 5-1**) was expanded and upgraded in 2005 to increase container capacity to 900,000 TEUs. Port Metro Vancouver recently initiated an investigation into design options (spring 2014) to accelerate plans for additional expansion of container capacity at Centerm. The opportunity arose with the closure of the Ballantyne Cruise Terminal adjacent to Centerm at the end of the 2014 season, and the consolidation of cruise operations at Canada Place starting in the 2015 cruise season. The proposed preliminary design concept could potentially increase the existing capacity at Centerm from 900,000 TEUs up to 1.5 million TEUs.

The Centerm Expansion Project is currently at the beginning of the preliminary design phase. Together with DP World Vancouver, PMV and its Centerm Expansion Project team is considering design options and preparing the Project Definition Report, which is expected by May 2015.

The proposed Centerm expansion project alone can address near-term capacity constraints within PMV's jurisdiction, but it cannot meet the long-term capacity needs. As a result, this alternative will not be subject to further consideration.

5.3.1.3 Vanterm

Vanterm, located in Vancouver's Inner Harbour (**Figure 5-1**), was also expanded and upgraded in 2005 to increase container handling capacity. The physical area where additional expansion could potentially occur is on properties located adjacent to the Vanterm property; however, these lands have lease tenures that will persist until at least the late 2020s, and converting them to containers would displace other trade-related activities. One of PMV's mandates is to facilitate multiple types of trade; therefore, it is important that PMV provide terminals that can accommodate a variety of products.

For these reasons, if expansion of Vanterm were feasible, it would not be anticipated until sometime after 2030, and therefore would not meet the need to deliver additional container capacity required by the mid-2020s.

Given the existing tenure on the adjacent lands, terminal expansion at Vanterm was not considered technically feasible at this time. As a result, this alternative will not be subject to further consideration.

5.3.1.4 Fraser Surrey Docks

Fraser Surrey Docks is a multi-use terminal located on the south side of the Fraser River shipping channel in Surrey (**Figure 5-1**). The terminal handles containerised cargo, break bulk general cargo, forest products, and bulk commodities. The terminal has land available for re-development; however, larger vessels, such as those currently visiting PMV's primary container terminals, cannot be accommodated within the Fraser River channel due to their draught requirements and lengths. Container ship size limits navigation, specifically with respect to both the ability to reach the terminal due to draught, and then to turn around due to length to return downriver.

Fraser Surrey Dock's container capacity was designed to accommodate up to 600,000 TEUs. Due to a combination of the river channel navigation constraints and the world market trend toward larger container ships, this capacity has not been realised. Fraser Surrey Docks typically handles less than 100,000 TEUs per year from small to mid-size container ships (in niche trades). These ships have a length overall (LOA) in the range of 200 m to 225 m. In comparison, ships that currently call on Deltaport Terminal have an LOA ranging from 300 m to 350 m. The largest design ship selected for RBT2 (i.e., Maersk Triple E) has an LOA of 400 m.

In 2013, the Province of B.C. announced plans to replace the George Massey Tunnel with a new bridge at the same location on the Highway 99 corridor. The replacement of the tunnel with a bridge and the subsequent removal of the tunnel will increase the depth of the river shipping channel in that location, creating the possibility of dredging the channel, thus allowing upriver access to deeper-draught vessels; however, the constraints for longer container ships transiting to FSD being unable to turn around will remain. These restrictions limit FSD's ability to accommodate larger container vessels.

This technical (navigation) constraint limits the economic viability of FSD as the vessels in this market continue to grow longer and deeper. Although current container handling operations involving smaller container vessels may be maintained for some time, for planning purposes, FSD is not expected to be a reliable source of container capacity beyond 2018. As a result, the FSD alternative will not be subject to further consideration.

5.3.1.5 Combined Increases at Existing Port Metro Vancouver Terminals

As noted in the previous sections, PMV has evaluated opportunities to increase the capacity and efficiency of existing container terminals within PMV's jurisdiction. These opportunities have been included in the west coast of B.C. supply-demand forecast (refer to **Figure 2-4 Canadian West Coast Container Traffic Forecast (2014) and Planned Capacity Increases to 2030**). Although there are some opportunities to meet short-term demand (i.e., DTRRIP (under construction), and Centerm Expansion Project (in preliminary design phase)), there are no further options to meet long-term demand at existing terminals. As a result, capacity increases at existing terminals within PMV's jurisdiction will not be carried further in this assessment.

5.3.2 Convert Other Existing Terminals or Properties within Port Metro Vancouver Jurisdiction to Handle Containers

This section presents information pertaining to opportunities to establish container capacity at other locations within PMV's jurisdiction, including the conversion of Lynnterm Terminal and PMV Fraser River properties in the City of Richmond (referred to as the Richmond Properties). Locations for these alternatives are shown in **Figure 5-1**.

No other vacant sites within PMV's jurisdiction are available to develop additional container capacity that would meet the technical feasibility criteria for the Project. Similarly, there are no properties available for purchase within PMV's jurisdiction that could be developed to provide additional container capacity.

5.3.2.1 Lynnterm Conversion

Lynnterm, an existing multi-use terminal in North Vancouver (**Figure 5-1**), had previously been considered for conversion to container handling, and feasibility studies were conducted in the early 2000s. Upon further evaluation, however, PMV determined that substantial road constraints would limit the ability of Lynnterm to accommodate additional container truck traffic. In addition, conversion to containers would conflict with other priorities for this terminal (i.e., handling bulk commodities in addition to retaining existing break-bulk handling capabilities at the terminal), and PMV is committed to facilitate multiple types of trade. Furthermore, the existing tenant is not interested in converting to containers.

For these reasons, conversion to a container terminal is not economically or technically feasible and cannot fulfill future capacity needs; therefore, this alternative will not be subject to further consideration.

5.3.2.2 Richmond Properties

Richmond Properties is identified as an off-dock transload and distribution centre located on lands managed by PMV on the north side of the Fraser River shipping channel in the City of Richmond, upstream of the George Massey Tunnel (**Figure 5-1**). The portion of the Richmond Properties that is currently vacant has significant constraints, which affect its ability to provide large-scale container capacity, including:

- Road congestion and limited rail capacity (with expansion constraints due to its urban location); and
- Navigation constraints for larger container ships (as noted previously with respect to navigation to FSD).

Given these constraints, developing the vacant site at PMV's Richmond Properties to provide additional container capacity does not meet the technical feasibility criteria; therefore, this alternative will not be subject to further consideration.

5.3.3 Develop a New Container Terminal within Port Metro Vancouver Jurisdiction

Given the constraints associated with the terminals and properties located in the Inner Harbour and Fraser River as discussed above, and given the forecasted future demand, a new terminal at Roberts Bank was considered to be the only viable option within PMV's jurisdiction to provide the necessary long-term container capacity on the west coast of B.C. Roberts Bank has the required depth to accommodate the anticipated container ships, and provides connections to an existing road and rail network (in contrast, Sturgeon Bank (where PMV has navigational jurisdiction) has deep-water access, but no connections to road and rail (and PMV has no adjacent land-based jurisdiction), thereby limiting its potential for a new terminal location).

Other specific advantages of Roberts Bank include the following:

- Roberts Bank is an established trade corridor that is well positioned to accommodate future growth in international containerised trade activity;
- Terminals at Roberts Bank are proximal to major transportation corridors for both truck and rail movements; and
- The deep-water location, capable of handling the largest container ships, makes the proposed RBT2 design one of the most efficient ship-to-rail designs of any port in North America.

A new terminal at Roberts Bank will allow PMV to meet forecasted container demand by the mid-2020s.

5.3.4 Other West Coast Container Terminal Plans and Concepts

Other proposals outside of PMV's jurisdiction that could potentially add container capacity on the west coast of B.C. were considered. One such proposal is for the Prince Rupert Port Authority Fairview Terminal expansions. Information pertaining to this proposal provided below was publicly available at the time of this assessment.

5.3.4.1 Prince Rupert Port Authority

The Prince Rupert Port Authority (refer to **Figure 5-1** for location) is a part of Canada's Asia-Pacific Gateway connecting Canada with Asian trading economies. In 2007, the Prince Rupert Port Authority converted Fairview Terminal from break-bulk commodity handling to a container terminal with a design capacity of approximately 750,000 TEUs. Planned expansions (referred to as Fairview Phase 2 – Stage 1 and Stage 2 expansions) of the Fairview Terminal are anticipated to increase capacity to 2.0 million TEUs within the next 8 to 10 years. Stage 1 expansion is anticipated to start in 2015 (PMV and PRPA 2014). The timing of the Stage 2 expansion is anticipated in the latter years of the present decade (i.e., 2017 to 2019), or during the early years of the 2020s (2020 to 2024). Maher Terminals, the operator of Fairview Terminal, is currently for sale, and while it coordinates with the Prince Rupert Port Authority, it also makes independent decisions on a commercial basis regarding the timing and nature of future infrastructure improvements.

The influence of Fairview Phase 2 expansion completions (Stage 1 and Stage 2) is shown in **Figure 2-4 Canadian West Coast Container Traffic Forecast (2014) and Planned Capacity Increases to 2030**. Additional capacity will be required at both Prince Rupert and PMV container handling facilities to meet long-term forecasted demand for containerised trade-handling capacity on the west coast of B.C. As a result, the Prince Rupert expansions are not an alternative for providing the additional required long-term capacity. Accordingly, this alternative will not be subject to further consideration.

Other terminal sites in Prince Rupert include Ridley Terminals and Watson Island. Ridley Terminals Inc. owns and operates the marine bulk handling terminal in Prince Rupert, which provides an export point for metallurgical and thermal coal, and petroleum coke from B.C., Alberta, and the U.S.A. to Asia. As it is currently a successful bulk terminal, there are no plans to convert this terminal from bulk handling to containers. The remainder of Ridley Island, which is owned by the Prince Rupert Port Authority, is optioned for a variety of other port uses, including dry and liquid bulk export facilities. Ridley Island is not, therefore, available to host the construction of a new marine container terminal.

Watson Island was the site of the former Skeena Cellulose Mill from 1951 to 2001 and this site is being considered for repurposing as a marine terminal. The latest consideration is by Watson Island LNG, which in July 2014 entered into an exclusivity agreement with the City of Prince Rupert, owners of the Watson Island site (Perry 2014). Watson Island LNG is evaluating the potential to develop a small LNG facility at the site to ship product to overseas markets. The Watson Island site has a single dock, 360 m long with a 10.6-m draught, limiting its use to smaller ships (ruling out any potential use for post-Panamax or ultra large container-sized ships).

Ridley Terminal or Watson Island alternatives will therefore, not be subject to further consideration.

5.3.5 Location of Marine Terminal within British Columbia Alternatives – Summary

Even with recent and current improvements at PMV's terminals, in addition to planned investments at the Fairview Terminal in Prince Rupert, the west coast of Canada will still need further new container capacity to meet the anticipated long-term demand.

A new terminal at Roberts Bank is the only technically and economically feasible alternative to meet the long-term needs of the containerised market; the other alternatives identified in **Table 5-1** and described above were not carried forward in this assessment.

5.4 Location, Orientation, Layout, and Configuration Alternatives

In planning for a new terminal at Roberts Bank a number of location, orientation, layout, and configuration alternatives were considered for the marine terminal (including berth pocket and marine approach areas), causeway, rail, and road corridors within PMV's jurisdiction, and the tug basin. **Table 5-2** summarises the specific alternatives that were considered as part of this assessment.

Table 5-2 Location, Orientation, Layout, and Configuration – Alternative Means Considered in the Assessment

Project Category	Specific Alternative Means Considered
Marine terminal (including berth pocket and marine approach areas)	Historical options (conceptual designs known as W1, W2, W3, E1)
	Terminal Location and Orientation • W2 (500 m): 500 m setback from −10 m chart datum (CD) contour • W2 (275 m): intermediate setback from −10 m CD contour • W2 (0 m): 0 m setback from −10 m CD contour • W1 (500 m): 500 m setback from −10 m CD contour • W1 (275 m): intermediate setback from −10 m CD contour • W1 (0 m): 0 m setback from −10 m CD contour
Causeway	Elevated (double-decked) causeway
	Separate parallel causeway
	Widening of existing causeway (with lagoon)
	Widening of existing causeway (without lagoon)
Rail and road corridors	Intermodal yard (IY) configuration on: • Causeway • Mainland • Marine terminal
	Project rail tie-ins to the existing rail network: • Both tie-ins on causeway • One tie-in on causeway and one tie-in on mainland
	Project road tie-in to the existing road corridor at Roberts Bank Way North
Tug basin	Location options at the north, east, and west sides of the RBT2 marine terminal
	Expanding the existing Roberts Bank tug basin • Option 1 • Option 2

5.4.1 Marine Terminal (including Berth Pocket and Marine Approach Areas)

5.4.1.1 Historical Options

Preliminary planning studies for RBT2 conducted from 2003 to 2004 considered four potential location options identified as E1, W1, W2, and W3 for the Project location at Roberts Bank (**Figure 5-2**). Options were given the labels of W1, W2, and W3 to represent that they were located on the west side of the existing terminal, and E1 for the east side option.

These four historical options were reduced to two concept sites (W1 and W2) located immediately west of the existing Roberts Bank terminals in deeper waters. The rationale for exclusion of the other two sites, E1 and W3, which were both located in the intertidal areas closer to shore, was identified as follows:

- Discussions with Fisheries and Oceans Canada (DFO) and the Canadian Wildlife Service (CWS) indicated potential increased adverse effects if the Project was located on the more productive intertidal habitat areas, as compared to a location in deeper waters (W1 and W2);
- Previous environmental field studies related to the construction of Deltaport Terminal and DP3 had identified areas of valuable fish habitat (eelgrass) and high-value habitat areas for marine invertebrates in intertidal areas; and
- Monitoring conducted during implementation of the DP3 Adaptive Management Strategy further confirmed areas of high-value habitat in intertidal areas.

Early correspondence from DFO in 2003 suggested that potential environmental effects were potentially unacceptable by regulators for options W3 and E1 (DFO 2003).

Port Metro Vancouver continued discussions with DFO and Environment Canada (CWS) throughout 2003 and 2004. As a result of these early agency discussions, initial planning work, and knowledge gained from previous environmental field work and monitoring, PMV discontinued consideration of the E1 and W3 options and focused further studies on the W1 and W2 design concepts. The E1 and W3 locations will therefore not be subject to further consideration.

5.4.1.2 Terminal Location and Orientation

Following the identification of concepts at sites W1 and W2, PMV initiated planning in 2011 to evaluate conceptual layout alternatives (**Figure 5-3**). The W1 and W2 conceptual layouts are distinguished by their berth orientations, with W1's berth face facing offshore and parallel to the mainland shoreline, and W2's berth face oriented perpendicular to the mainland shoreline.

Port Metro Vancouver conducted planning workshops to identify trade-offs amongst the conceptual layout alternatives, and integrated technical input from separately documented engineering, economic, environmental, and public consultation reports, including the professional judgement of PMV's senior management team.

The planning work included examinations of the advantages and disadvantages of positioning the terminal in six orientations from the −10 m CD depth contour. These options ranged from a 0 m offset from the −10 m CD contour (the furthest offshore position, constrained by practical design limitations for seismic events) to a setback of 500 m from the −10 m CD contour, which would align the offshore edge of fill with the offshore edge of the existing Roberts Bank terminals (**Figure 5-3**). For example, W1 (500 m) refers to the W1 option with a 500 m setback from the -10 m CD contour.

Six alternatives were considered based on their configuration and setback distance as W2 (500 m), W2 (275 m), W2 (0 m), W1 (500 m), W1 (275 m), and W1 (0 m). All six alternative terminal layouts shown in **Figure 5-3** were determined to be technically and economically feasible.

Potential effects were considered in the context of the following:

- Ecological importance of Roberts Bank with respect to marine subtidal and intertidal habitats;
- Proximity of location to residential areas with respect to potential noise effects; and
- Feasibility of successfully mitigating Project-related effects.

For each alternative, PMV considered the extent of habitat loss or change resulting from the terminal footprint and dredge area, and indirect effects arising from coastal processes.

As all six options were considered technically and economically feasible, all six options were carried forward as part of the comparison of effects for the terminal layouts (refer to **Section 5.6.2** and **Table 5-8**).

5.4.1.3 Terminal Optimisation

As illustrated in the effects comparisons, the W1 orientation with 0 m set back was confirmed as the preferred means for developing the Project. Following selection of Option W1 (0 m) as the preferred alternative, and submission of the Project Description on September 12, 2013, further engineering studies were conducted to optimise the preliminary terminal design. Initial coastal geomorphology studies indicated that the terminal design, although preferred from a coastal geomorphology perspective, had the potential to create a scour area near the northwest corner of the terminal footprint, potentially resulting in indirect Project-related effects (i.e., habitat loss through erosion and subsequent sedimentation in intertidal areas).

Three approaches to reduce scour were considered, using a zone of high flow velocity as an indicator of scour area:

- Rounding the northwest corner of the terminal – In the preliminary design, the terminal's northwest corner was right-angled in plan view; it was determined that rounding of this corner would reduce the areal extent of hydraulic effects associated with water moving around a square corner.
- Rotation of the terminal – In the preliminary design, the berth face of the terminal was aligned approximately with the -10 m CD depth contour. Based on tidal flows and wave conditions, it was thought that scour at the northwest corner might be reduced by rotating the terminal by 3 to 6 degrees in a counter-clockwise direction. Modelling results determined that this rotation would have a negligible effect on reducing flow velocities.
- Adding a flow passage channel – The addition of a flow passage channel between the existing Westshore Terminals and RBT2 was evaluated to determine if the volume of water that would otherwise flow around the northwest corner could be reduced. It was determined that a 100-m-wide flow passage would slightly reduce flow velocities at the northwest corner, but it would generate additional local scour in the passage itself and adjacent areas unless other mitigation measures were installed.

The results of these coastal geomorphic studies indicated that rounding the northwest corner of the terminal would have the greatest positive effect in terms of decreasing the areal extent of footprint-related effects (i.e., scour induced by flow acceleration around the west side of the terminal). Rounding the corner on a 120-m radius would reduce the scour area as compared to the square corner. The optimised configuration incorporated into the preliminary Project design is a 120-m radius rounded corner, as previously described in **Section 4.0 Project Description** and as shown on **Figure 5-4**.

The optimised design was carried forward as part of the comparison of effects for the terminal layouts (refer to **Section 5.6.2** and **Table 5-8**).

5.4.2 Causeway

Four alternatives were considered with respect to the conceptual design of the Roberts Bank causeway, as follows:

- Development of an elevated structure (i.e., double-decked causeway);
- Development of a second parallel causeway;
- Widening of the existing causeway with a lagoon at the terminal end; and
- Widening of the existing causeway without a lagoon at the terminal end.

As part of the 2011 planning work, PMV determined that development of an elevated structure was deemed to be not economically feasible for the following reasons:

- Overall construction costs; and
- Operational cost related to efficiency and commercial viability of rail and road operations on a double-decked structure.

For these reasons, this alternative will not be subject to further consideration.

Figure 5-5 presents the remaining three options, along with the current optimised widened causeway design. The remaining three options are carried forward to consider the effects of each of the options. A second parallel causeway would involve development of a new causeway, completely separate from the existing Roberts Bank causeway. Another causeway option included widening of the causeway with and without a lagoon. In early planning, a lagoon concept was considered at the terminal end because it would reduce the curvature of the rail tracks (thereby potentially increasing efficiency of rail operations) as well as potentially reducing effects to the marine environment. All three of these options were considered technically and economically feasible and were carried forward as part of the comparison of effects.

5.4.3 Rail and Road Corridors

This section presents the alternatives associated with the location of the Project's intermodal yards (IYs), the rail tie-ins to the existing rail network, and road corridors along the Project's causeway.

5.4.3.1 Intermodal Yard Locations

The IY is the area where containers are loaded onto or unloaded from trains. Currently at all container terminals within PMV's jurisdiction, the IY is located within the marine container terminals. For RBT2, three IY location alternatives were considered, as follows:

- IY on the widened causeway;
- IY on land adjacent to Deltaport Way off of the causeway; and
- IY on the marine terminal.

During consultation associated with the Project Definition in 2012 (**Section 7.3 Local Government and Public Engagement and Consultation**), PMV provided information about the three options and their anticipated effects, and asked the public for input pertaining to an IY location.

Port Metro Vancouver noted that the potential effects of the IY alternatives on the widened causeway, and on the marine terminal, would include potential effects to:

- Marine mammals and their habitats;
- Marine fish and their habitats;
- Marine vegetation; and
- Coastal seabirds and waterfowl (including migratory birds).

Port Metro Vancouver also noted that the potential effects of the IY on the mainland adjacent to Deltaport Way would include potential effects to:

- Agricultural land and productivity;
- Terrestrial (land-based) wildlife and habitat;
- Terrestrial (land-based) vegetation; and
- Coastal seabirds and waterfowl (including migratory birds).

The land-based IY option is a technically and economically feasible option; however, it is located outside of PMV's jurisdiction and would require a third-party proponent. In addition, a portion of the land-based IY would be located within the Agricultural Land Reserve. Results of PMV's 2012 consultation indicated the public favoured the IY to be located on the marine terminal. For these reasons (outside of PMV's jurisdiction, third party proponent, and public preference), the land-based IY option was not investigated further, and this option will not be subject to further consideration.

Evaluations of the on-causeway and on-marine-terminal options were conducted. An IY study was undertaken to determine the feasibility of establishing an IY on the causeway that would serve both the existing Deltaport Terminal and the proposed RBT2 (AECOM 2012). This option required new technical feasibility criteria of the IY being capable of handling a combined Deltaport Terminal and RBT2 annual capacity of 4.8 million TEUs. If technically and economically feasible, this combined IY would reduce the terminal footprint required at RBT2.

The study found that a combined IY option would be technically feasible; however, overall combined operations were determined to be not economically viable; therefore, this option will not be subject to further consideration.

As a result, the on-marine-terminal IY option was considered as PMV's only technically and economically feasible option.

5.4.3.2 Project Rail Tie-ins to the Existing Rail Network

Two alternatives were considered for tying in the on-causeway rail tracks to the existing rail network as follows:

- Two causeway lead tracks tying in to the existing rail network on the causeway; and
- Two causeway lead tracks tying in to the existing rail network on and off the causeway.

Both of these options are technically and economically feasible. The original conceptual design considered both tracks on the causeway. The alternative with one rail track extending into the existing BC Rail right-of-way off the causeway was considered in order to reduce the encroachment of the eastern-most end of the widened causeway into the intertidal habitat by approximately 15 m in width (thus reducing the footprint by approximately 0.32 ha) (**Figure 5-5**).

Both of these options were carried forward as part of the effects comparisons (**Section 5.6.2** and **Table 5-8**).

5.4.3.3 Road Corridor

With a widened causeway alternative, road traffic to the marine terminal would travel to and from the Project using the existing provincial highway (Deltaport Way), the existing DTRRIP overpass, and the existing Roberts Bank Way North road. Project design includes a new overpass and access road leading from Roberts Bank Way North into the marine terminal, and no further road alternatives were considered for the Project. Refer to **Section 4.0 Project Description (Figure 4-6 Widened Causeway Layout)** for more information pertaining to road corridor additions.

5.4.4 Tug Basin

This section describes the alternatives associated with the location of the tug basin at both RBT2 and through an expansion of the existing Roberts Bank terminals' tug basin. The technical criterion was established to have the tug basin support a second tug operation contractor, with independent access to its fleet of seven vessels, as specified in more detail in **Section 4.0 Project Description**.

5.4.4.1 Project Marine Terminal Alternative Tug Basin Locations

Early in the Project's conceptual design phase, three tug basin locations were considered adjacent to the Project's marine terminal (**Figure 5-4**). Upon completion of further engineering studies, two of these options were determined to be not technically feasible, based on the following rationale:

- If the tug basin was placed on the east side of RBT2, the wave climate would be too extreme; and
- If the tug basin was placed on the west side of RBT2, this location would limit the ability to accommodate a potential future short-sea-shipping wharf[3].

These two alternatives will therefore not be subject to further consideration.

The remaining technically and economically feasible tug basin option located on the north side of RBT2 was carried forward as part of the comparison of effects (as discussed in **Section 5.6.2** and **Table 5-8**).

5.4.4.2 Existing Roberts Bank Tug Basin Alternative Locations

Two technically and economically feasible options were considered for expanding the existing Roberts Bank tug basin adjacent to Deltaport Terminal (**Figure 5-6**). The first option expanded shoreward toward the causeway, while the second option expanded along the existing Deltaport Terminal.

All three options (RBT2 North, Option 1, and Option 2) were carried forward as part of the effects comparisons (**Section 5.6.2** and **Table 5-8**).

5.4.5 Location, Orientation, Layout, and Configuration Alternatives – Summary

The technically and economically feasible alternatives identified in **Table 5-3** were carried forward for further consideration.

[3] The use of short-sea-shipping within PMV's jurisdiction would not be able to replace the need for a new terminal.

Table 5-3 Summary of Technically and Economically Feasible Locations, Orientations, Layouts, and Configurations

Project Category	Specific Alternative Means Considered
Marine terminal (including berth pocket and marine approach areas)	Terminal Location and Orientation W2 (500 m): 500 m setback from −10 m CD contour W2 (275 m): intermediate setback from −10 m CD contour W2 (0 m): 0 m setback from −10 m CD contour W1 (500 m): 500 m setback from −10 m CD contour W1 (275 m): intermediate setback from −10 m CD contour W1 (0 m): 0 m setback from −10 m CD contour
Causeway	Separate parallel causeway
	Widening of existing causeway (with lagoon)
	Widening of existing causeway (without lagoon)
Rail and road corridors	IY configuration • On marine terminal
	Causeway rail tie-in of two tracks • Both on causeway • On causeway and on mainland
	Tie-in to the existing road corridor at Roberts Bank Way North
Tug basin	Located on the north side of RBT2 marine terminal
	Original concept at existing Roberts Bank tug basin (Option 1)
	Alternative design at the existing Roberts Bank tug basin (Option 2)

5.5 CONSTRUCTION ALTERNATIVES

This section describes the assessment of alternatives for how the Project described in **Section 4.0 Project Description** could be constructed, including dredging alternatives and methods; temporary sand storage locations; construction methods for the supporting land, marine terminal and associated three-berth wharf, and widened causeway; disposal of sediments; and construction methods for expanding the existing tug basin. **Table 5-4** below presents the alternative means considered in the assessment during the Project's construction phase.

Table 5-4 Construction – Alternative Means Considered in the Assessment

Construction Category	Specific Alternative Means Considered
Dredging	Alternatives to dredging
	Alternative methods for dredging
Temporary sand storage	In-river storage
	Inter-causeway storage (ITP)
Construction of supporting land (terminal and causeway)	Floating container terminal
	Pile and deck (terminal and causeway)
	Land development using fill (terminal and causeway)
Construction of terminal three-berth wharf	Pile and deck wharf structure
	Caisson wharf structure
Disposal of sediments	Settling pond
	DAS at existing location (Sand Heads); and
	DAS at new location (Project-specific DAS)
Construction of tug basin mooring wharves	Filled wharf
	Pile and deck wharf
	Floating wharf and piles

5.5.1 Dredging

5.5.1.1 Alternatives to Dredging

There are no alternatives to dredging. Dredging is required as part of the Project terminal component to meet the following objectives:

- Create the berth pocket (e.g., dredging of the dredge basin);
- Construct a seismically stable terminal (e.g., dredging as part of deep native soil ground improvements); and
- Provide safe navigation depths for ships of up to 19 m draught.

The location of the terminal (W1 with 0 m setback from the −10 m CD contour) has minimised the amount of dredging required for terminal development.

Dredging is also required to reclaim deposited sand from the ITP, and to expand and deepen the existing tug basin to allow for sufficient under-keel clearance of the large escort tugs.

5.5.1.2 Alternative Methods for Dredging

The following methods and types of equipment for dredging in the dredge basin, ITP, and tug basin are included in the Project:

- Dredge basin – Initial dredging would be by a cutter-suction dredge since it can be outfitted with a ladder extension to reach −30 m CD depths. Following backfilling and densification, a clamshell dredge would be used to remove fines generated during densification;
- ITP – A trailing-suction hopper dredge would be used for dumping sand into the ITP from the annual Fraser River maintenance dredging program. Two cutter–suction or trailing-suction hopper dredges would be used to pump sand from the ITP to the terminal and causeway widening land development areas; and
- Tug basin – A clamshell dredge would be used to remove substrates from the basin area for subsequent placement on barges for transport to the DAS site.

Dredging equipment was chosen based on the Project's required production rates to meet the construction schedule, and working depths to meet technical design criteria. Dredges that meet these economically and technically feasible criteria are available locally (e.g., *FRPD309, Columbia*, and the *Titan* from Fraser River Pile and Dredge). The Project team did not consider foreign-owned dredges due to the *Coasting Trade Act*, which limits the use of foreign vessels where a suitable Canadian vessel is available. Changes resulting from the proposed Canada-European Union Comprehensive Economic and Trade Agreement may alter or potentially eliminate this foreign dredge constraint.

The identified dredging methods above were deemed to be the only technical and feasible means for dredging, and all three methods (cutter suction dredge, trailing suction hopper dredge, and clamshell dredge) will be used for the Project.

5.5.2 Temporary Sand Storage

5.5.2.1 In-river Storage

Given that RBT2 is located near the mouth of the Fraser River, fill materials could be temporarily stored at in-river storage locations in the Main Arm of the Fraser River. This alternative was deemed to be neither technically nor economically feasible because the volumes required for the Project (approximately 2.5 to 3.0 million m^3 per year) would exceed the capacity at these in-river storage locations. This alternative will therefore not be subject to further consideration.

5.5.2.2 Inter-causeway Storage

The former inter-causeway ITP used during DP3 construction (**Figure 5-7**) is a technically and economically feasible option for RBT2. The ITP is bounded on the east and southeast by the Roberts Bank Wildlife Management Area described in **Section 3.2 Geographical Setting, Natural Elements** (**Figure 3-1 Conservation Areas**) and on the northwest by the perimeter of the existing Roberts Bank terminals' turning basin. The ITP is suitably configured to hold the majority of an annual volume of Fraser River sand supply obtained from annual maintenance dredging required to maintain adequate depth of the Fraser River navigation channel.

5.5.3 Construction of Supporting Land (Marine Terminal and Causeway)

The marine terminal and causeway construction requires the development of supporting land. Three alternatives for supporting land were considered:

- A floating marine terminal structure;
- A pile and deck structure (for terminal and causeway); and
- Land development using fill (for terminal and causeway).

These alternatives are described in the subsections below.

5.5.3.1 Floating Structure

A literature review was conducted to investigate previous or existing use of floating structures for container terminals. While a floating dock is potentially feasible to accommodate multiple container vessels and gantry cranes, it is an unproven concept for a three-berth terminal that could accommodate ultra-large container vessels. A floating dock option was therefore, eliminated as an alternative by PMV due to risk and uncertainty pertaining to this unproven concept. As a result, this alternative will not be subject to further consideration.

A floating deck for the causeway was not considered, since the majority of the causeway is located in intertidal areas (i.e., this option would not be technically feasible).

5.5.3.2 Pile and Deck Structure

In order to construct an entire terminal built on a pile-supported deck structure, the load-bearing capacity requirements for the container storage yard and equipment area would require many large-diameter piles, effectively in-filling the area below the deck with piles.

Similarly for the causeway, the number of piles required for a pile and deck causeway would effectively in-fill the area below the deck with piles, as well as creating more noise for the community and marine environment. Due to the number of piles required, the size of the piles required, and the amount of time required for pile driving, PMV determined that this alternative was not economically feasible (with no environmental benefit); therefore, it will not be subject to further consideration.

5.5.3.3 Land Development Using Fill

The terminal and causeway would be built using fill obtained from the annual Fraser River maintenance dredging, Project dredging, and aggregate fill shipments transported to the site via tugs and barges. This is the preferred method of construction, which is described in **Section 4.0 Project Description**. Direct and indirect habitat losses occur with this option, but effects have been minimised as much as possible through selection of terminal location and terminal design (**Section 5.4.1**).

5.5.4 Construction of Terminal Three-Berth Wharf

For the terminal's three-berth wharf, two options were considered: a pile and deck wharf structure and a caisson wharf structure. The two alternatives were shared with the public as part of PMV's Pre-design Public Consultation in 2011 (**Section 7.3 Local Government and Public Engagement and Consultation**). These alternatives are described in the sections that follow and are both considered technically and economically feasible.

5.5.4.1 Pile and Deck Wharf Structure

During the Project's preliminary engineering assessment in the Project Definition Phase, a pile and deck structure was considered as an option for wharf construction. This type of berth would require approximately 1,500 steel piles to be driven into the ground to depths of up to 70 m below the seabed. The steel piles considered would need to be approximately 1.2 m in diameter and up to 80 m long, supporting a reinforced concrete deck. Significant ground improvements were anticipated to be required with this option to achieve seismic performance criteria.

5.5.4.2 Caisson Wharf Structure

This method of construction for the Project involves the use of pre-cast reinforced concrete caisson structures (filled with crushed rock to provide enough weight to resist berth impact loads), with soils underlying the caisson structure requiring both removal and densification in order to meet seismic performance criteria.

Caissons are considered to perform better during significant seismic events, require less maintenance than piles, and are expected to be a slightly lower-cost option. Feedback from PMV's Project Description Consultation in 2012 indicated the public supported the caisson wharf structure over the pile and deck structure (largely due to the reduction of noise to the community and marine environment from pile driving).

Both the pile and deck and caisson options are carried forward as part of the effects comparisons (**Section 5.6.2** and **Table 5-8**).

5.5.5 Disposal of Sediments

Three main alternatives were considered for the disposal of sediment-laden water generated from the dredge basin dredging, and the vibro-densification processes, as follows:

- Creation of settling ponds;
- DAS at an existing site; and
- DAS at a Project-specific site.

These alternatives are described in the subsections below.

5.5.5.1 Creation of Settling Ponds

During initial Project planning, consideration was given to the potential development and use of settling ponds for the settlement and disposal of fines (**Figure 5-8**). During this evaluation, it was determined that the technical feasibility was uncertain (operational uncertainties with respect to settling effectiveness), construction costs were not economical, and the direct loss to intertidal habitat would likely outweigh the benefits to avoiding DAS. For these reasons, this alternative was not carried forward in the assessment.

5.5.5.2 Disposal at Sea at Sand Heads Location

Disposal at Sand Heads, an existing Environment Canada ocean disposal site located approximately 10 km west of Westham Island and approximately 14 km north-north west of the Project site (**Figure 5-7**), would involve pumping excess sediment-laden water from the east and west terminal basins onto barges, which would then be towed via tugs to the Sand Heads disposal location. Although this option was considered to be technically feasible, it would have economic challenges due to double-handling of material and tug operation costs. This option was, however, carried forward as part of the effects comparisons (**Section 5.6.2** and **Table 5-8**).

5.5.5.3 Disposal at Sea at a Project-specific Location

For disposal of fine sediments at a Project-specific DAS location, a total of 52 potential locations were identified between −40 m CD and −100 m CD depths (**Figure 5-7**). Of these sites, three candidate discharge sites were preferred based on proximity to Project construction activities, and preferred depth at −45 m CD. The preferred −45 m CD disposal depth was selected as sediment disposal operations become challenged when depth exceeds −45 m CD (from a deep-sea diver safety perspective and from a logistics and timing perspective). All three sites at −45 m CD were deemed to be similar in terms of potential effects; a detailed assessment of discharges to this depth is provided in **Section 9.6 Surficial Geology and Marine Sediment**. Disposal may need to occur at any, or all, of the three sites depending on final design, and will be subject to Environment Canada approval.

This option was carried forward as part of the effects comparisons (**Section 5.6.2** and **Table 5-8**).

5.5.6 Construction of Tug Basin Mooring Wharves

All three alternatives considered for construction of the tug basin moorage were determined to be technically and economically feasible:

- Wharves constructed using fill;
- Pile and deck wharves; and
- Floating pontoon wharves anchored by piles.

All three alternatives were carried forward as part of the effects comparisons (**Section 5.6.2** and **Table 5-8**).

5.5.7 Construction Alternatives – Summary

Of the alternatives identified in **Table 5-4**, only those considered technically and economically feasible are carried forward in **Table 5-5** for further consideration.

Table 5-5 Summary of Technically and Economically Feasible Construction Alternative Means

Project Category	Specific Alternative Means for Effects Assessment
Dredging	There are no alternatives to dredging
	All three identified dredging methods will be used as part of the Project
Temporary Sand Storage	Inter-causeway storage (ITP)
Construction of supporting land (terminal and causeway)	Land development using fill
Construction of terminal three-berth-wharf	Pile and deck wharf structure
	Caisson wharf structure
Disposal of sediments	DAS at Sand Heads
	DAS at Project-specific DAS
Construction of tug basin mooring wharves	Filled wharf
	Pile and deck wharf
	Floating wharf and piles

5.6 IDENTIFICATION OF THE EFFECTS OF TECHNICALLY AND ECONOMICALLY FEASIBLE ALTERNATIVE MEANS

5.6.1 Effects Criteria for Remaining Alternative Means

Section 8.0 Effects Assessment Methods describes the process that was followed to identify and select 16 natural and human environment components to be considered during the Project's environmental assessment. From these 16 VCs, six key VCs were selected for consideration in the analysis of the alternative means of carrying out the Project. The key VCs (**Table 5-6**) were chosen for the purpose of comparing the effects of feasible alternative means based on their potential to be directly or indirectly affected by one or more of the alternative means identified in **Section 5.2** to **Section 5.5**. Although other VCs have the potential to be affected by the alternatives, the anticipated effects to the selected key VCs were considered key drivers for comparing effects and determining preferred means. While other VCs may be equally affected and not be a good proxy for clearly differentiating between alternatives, this does not diminish their importance within the main Project assessment.

Table 5-6 Key Valued Components Considered in the Analysis of Alternative Means

Key Valued Components
Coastal Birds
Human Health – including Noise and Air Quality intermediate components
Marine Fish
Marine Invertebrates
Marine Mammals
Marine Vegetation

As per the guidance provided in the *Operational Policy Statement: Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2013), a detailed assessment of the effects associated with each alternative means is not required. The key VCs are used to compare effects at a high level for each feasible alternative considered. Detailed assessments of the preferred means (as described in **Section 4.0 Project Description**) are presented in subsequent effects assessment sections in the EIS. **Table 5-7** summarises the criteria used to evaluate the effects of the feasible alternative means.

The comparative potential effects of each alternative means identified previously on the key VCs are described in the subsections below.

Table 5-7 Criteria Used to Evaluate the Effects of the Alternative Means on Key Valued Components

Key Valued Component	Criteria Considered
Coastal Birds, Marine Fish, Marine Invertebrates, Marine Mammals, Marine Vegetation	• Amount (less or more) of intertidal and subtidal habitat loss or change resulting from footprint-related effects anticipated to have potential effects on marine species; • Amount (less or more) of habitat loss or change resulting from effects to coastal geomorphology or water quality anticipated to have potential indirect effects on marine species; and • Amount (less or more) of noise emissions anticipated to have potential direct effects on coastal birds.
Marine Fish, Marine Mammals	• Amount (less or more) of underwater noise anticipated to have potential direct effects on marine fish and mammals.
Human Health	• Amount (less or more) of noise and/or air emissions anticipated to have potential effects to local residents or communities.

5.6.2 Comparison of Effects of Remaining Alternative Means

No technically and economically feasible alternative marine terminal locations were identified in **Section 5.3**, so no effects comparison was completed.

For the technically and economically feasible alternatives to the location, orientation, layout, and configuration alternatives at Roberts Bank identified in **Section 5.4** and **Table 5-3**, the subsequent **Table 5-8** compares the potential effects of each alternative means to key VCs.

For the technically and economically feasible construction alternatives identified in **Section 5.5** and **Table 5-5**, the subsequent **Table 5-9** compares the potential effects of each alternative means to key VCs.

Table 5-8 Location, Orientation, Layout, and Configuration Alternative Means Effects Comparison

Alternative Means (by category)	Comparison of Potential Effects for Key Valued Components
Marine Terminal (including berth pocket and marine approach areas)	
W2 (500 m)	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Greatest area of intertidal habitat loss compared to all options; ▫ Decreased amount of indirect habitat change from altered coastal geomorphic processes (wave-induced scour) compared to W1 options, but increased compared to W2 (0 m); ▫ Highest potential for dendritic channel formation from berth pocket dredging and location compared to all options; and ▫ Highest susceptibility to future changes on the tidal flats. • **Marine Mammals:** ▫ Least amount of terminal encroachment into open water. • **Marine Invertebrates, Marine Fish:** ▫ Highest potential for berth pocket infilling (i.e., the dredged area in front of the wharf face to allow ships to berth at the terminal has the potential for being filled in with sediments over time, requiring maintenance dredging (greater disturbance to marine invertebrates and fish). • **Coastal Birds, Human Health:** ▫ Increased noise as berth face located closest to communities compared to W1 options.
W2 (275 m)	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Larger area of intertidal habitat loss, compared to W1 and W2 (0 m) options; ▫ Decreased amount of indirect habitat change from altered coastal geomorphic processes (wave-induced scour) compared to W1 options, but increased compared to W2 (0 m); and ▫ High potential for dendritic channel formation from berth pocket dredging and location compared to W1 options. • **Coastal Birds, Human Health:** ▫ Increased noise as berth face located closer to communities compared to W1 options.

Alternative Means (by category)	Comparison of Potential Effects for Key Valued Components
W2 (0 m)	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Larger area of intertidal habitat loss compared to all W1 options, but smaller area compared to W2 (500 m) and (275 m) options; ▫ Decreased amount of indirect habitat change from altered coastal geomorphic processes (wave-induced scour) compared to W1 and W2 (500 m) options; and ▫ Higher potential for dendritic channel formation from berth pocket dredging and location compared to W1 options. • **Marine Invertebrates, Marine Fish:** ▫ Increased loss of subtidal habitat compared to other W2 options, but decreased loss compared to all W1 options. • **Coastal Birds, Human Health:** ▫ Increased noise as berth face located closer to communities compared to W1 options.
W1 (500 m)	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Larger area of intertidal habitat loss compared to other W1 options (but decreased area compared to all W2 options); ▫ Decreased potential for dendritic channel formation compared to W2 (500 m) option; ▫ Greatest amount of indirect habitat change from altered coastal geomorphic processes (wave-induced scour); and ▫ Limited to no susceptibility to future changes on the tidal flats. • **Marine Invertebrates, Marine Fish:** ▫ Least amount of subtidal habitat loss from terminal footprint compared to other W1 options, but greatest subtidal dredging area for berth pocket compared to all options. • **Coastal Birds, Human Health:** ▫ Decreased noise as berth face located further from communities compared to W2 options.

Alternative Means (by category)	Comparison of Potential Effects for Key Valued Components
W1 (275 m)	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Larger area of intertidal habitat loss compared to other W1 (0 m) option (but decreased area compared to all W2 options); ▫ Decreased potential for dendritic channel formation compared to W2 options; ▫ Increased amount of indirect habitat change from altered coastal geomorphic processes (wave-induced scour) compared to W2 options; and ▫ Limited to no susceptibility to future changes on the tidal flats. • **Marine Invertebrates, Marine Fish:** ▫ Increased amount of subtidal habitat loss from terminal footprint compared to all options except W1 (0 m). • **Coastal Birds, Human Health:** ▫ Decreased noise as berth face located further from communities compared to W2 options.
W1 (0 m)	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Smallest area of intertidal habitat loss compared to all options; ▫ Least potential for dendritic channel formation compared to all options – mitigation not required; ▫ Increased amount of indirect habitat change from altered coastal geomorphic processes (wave-induced scour) compared to W2 options; and ▫ Limited to no susceptibility to future changes on the tidal flats. • **Marine Invertebrates, Marine Fish:** ▫ Largest amount of subtidal habitat loss from terminal footprint compared to all options, but smallest berth pocket dredge area; and ▫ Lowest potential for berth pocket infilling. • **Marine Mammals:** ▫ Largest encroachment into open water. • **Coastal Birds, Human Health:** ▫ Least noise as berth face located furthest from communities compared to W2 options.

Alternative Means (by category)	Comparison of Potential Effects for Key Valued Components
W1 (0m) Optimised Design	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Decreased amount of indirect habitat change from altered coastal geomorphic processes (current-induced scour at northwest corner) compared to W1 (0 m) option with square corner.
Causeway	
Separate Parallel Causeway	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Greatest area of intertidal habitat loss compared to all options; and ▫ Greatest amount of indirect habitat change from altered coastal geomorphic processes (restricted flow) compared to all options.
Widened Causeway with Lagoon	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Greater area of intertidal habitat loss compared to widened causeway without lagoon option; and ▫ Greater amount of indirect habitat change from altered coastal geomorphic processes compared to widened causeway without lagoon option.
Widened Causeway without Lagoon	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Smallest area of intertidal habitat loss compared to other options; and ▫ Smallest amount of indirect habitat change from altered coastal geomorphic processes compared to other options.
Road and Rail Corridors	
IY Configuration – on RBT2	• No other technically or economically feasible alternatives; this option assessed fully in EIS.
On-causeway rail tie-ins to existing rail network	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Increased intertidal habitat loss due to additional 15 m width at northeast end of the causeway.
On- and off-causeway rail tie-ins to existing rail network	• **Marine Vegetation, Marine Invertebrates, Marine Fish, Coastal Birds:** ▫ Reduced intertidal habitat loss (by 0.32 ha) due to narrower width at northeast end of the causeway.
Road Corridor	• No alternatives; the Project road design of a new overpass and access road leading from Roberts Bank Way North into the marine terminal method is assessed in EIS.

Alternative Means (by category)	Comparison of Potential Effects for Key Valued Components
Tug Basin	
Tug Basin located on north shore of RBT2	• **Marine Vegetation, Marine Invertebrates, Marine Fish:** ▫ Increased intertidal habitat loss compared to all other options due to basin in continuous eelgrass beds; and ▫ Increased potential for alteration in tidal flows compared to Option 2.
Option 1	• **Marine Vegetation, Marine Invertebrates, Marine Fish:** ▫ Increased intertidal habitat loss due to larger basin in continuous eelgrass beds compared to Option 2; ▫ Increased potential for alteration in tidal flows and water ponding compared to Option 2; and ▫ Increased potential for habitat loss due to tidal channel formation compared to Option 2. • **Marine Invertebrates, Marine Fish:** ▫ Potential barrier to species movement with water ponding.
Option 2	• **Marine Vegetation, Marine Invertebrates, Marine Fish:** ▫ Increased footprint compared to Option 1, but within area of patchy eelgrass habitat so decreased eelgrass habitat loss compared to Option 1; ▫ Lowest potential for tidal channel formation; and ▫ Lowest potential for alterations in tidal flow and no potential for water ponding.

Table 5-9 Construction Alternative Means Effects Comparison

Alternative Means (by category)	Comparison of Potential Effects for Key Valued Components
Dredging	
Alternatives to dredging	• No alternatives; this method assessed in EIS.
Alternative methods for dredging	• All three technically or economically feasible dredging methods will be used. • All three dredging methods will be assessed fully in EIS.
Temporary Sand Storage	
Inter-causeway storage	• No other technically or economically feasible alternatives; this option assessed fully in EIS.
Construction of Supporting Land (Terminal and Causeway)	
Land development using fill	• No other technically or economically feasible alternatives; this option assessed fully in EIS.
Construction of Terminal Three-berth Wharf	
Pile and deck wharf structure	• **Marine Invertebrates, Marine Fish:** ▫ Allows for some water movement and substrate under the deck, reducing the amount of marine habitat loss. • **Marine Fish, Marine Mammals:** ▫ Structure requires a large number of piles to be driven, resulting in lengthy (1+ years) period of increased underwater noise; and ▫ Underwater noise mitigation measures could include bubble curtains, stoppage of work when mammals proximal, etc. • **Coastal Birds, Human Health:** ▫ Structure requires a large number of piles to be driven, resulting in lengthy (1+ years) period of increased noise.
Caisson wharf structure	• **Marine Fish, Marine Mammals:** ▫ Decreased underwater noise effects due to lack of piles for structure support. • **Coastal Birds, Human Health:** ▫ Decreased noise effects due to lack of piles for structure support. • **All Key VCs:** ▫ Shorter construction period than pile and deck, resulting in a shorter overall construction period.

Alternative Means (by category)	Comparison of Potential Effects for Key Valued Components
Disposal of Sediments	
DAS at Sand Heads location	• **Human Health:** ▫ Additional tug/barge traffic for disposal of material offsite, resulting in increased air and noise emissions. • **Marine Fish, Marine Mammals:** ▫ Additional tug/barge traffic for disposal of material offsite, resulting in increased underwater noise.
DAS at Project–specific location	• **Human Health, Marine Fish, Marine Mammals:** ▫ Decreased air and noise emissions compared to disposal at existing DAS location, as no transportation-related activities with pumping to local DAS site.
Construction of Tug Basin Mooring Wharves	
Filled wharf	• **Marine Vegetation, Marine Invertebrates, Marine Fish:** ▫ Greatest direct loss of habitat; and ▫ Greatest amount of indirect habitat change through altered coastal geomorphic processes. • **Marine Fish, Marine Mammals:** ▫ Underwater noise minimal as pile driving not used during construction. • **Coastal Birds, Human Health:** ▫ Construction noise minimal as pile driving not used during construction.
Pile and deck wharf	• **Marine Vegetation, Marine Invertebrates, Marine Fish:** ▫ Reduced habitat loss compared to filled wharf and increased habitat loss compared to floating wharf. • **Marine Fish, Marine Mammals:** ▫ Increased underwater noise associated with pile driving. • **Coastal Birds, Human Health:** ▫ Increased noise associated with pile driving.
Floating wharf and piles	• **Marine Vegetation, Marine Invertebrates, Marine Fish:** ▫ Least amount of habitat loss; and ▫ Least amount of habitat change through altered coastal geomorphic processes. • **Marine Fish, Marine Mammals:** ▫ Minimal piles resulting in less underwater noise than pile and deck option. • **Coastal Birds, Human Health:** ▫ Minimal piles resulting in less noise than pile and deck option.

5.7 IDENTIFICATION OF THE PREFERRED MEANS

Through the consideration of relative effects described in **Section 5.6.2** and the supporting effects assessment comparison summary tables (**Table 5-8** and **Table 5-9**), the preferred alternatives have been identified based on a combination of technical and economic feasibility, and overall effects as summarised in **Table 5-10**.

A new terminal at Roberts Bank is the only technically and economically feasible alternative to meet the long-term needs of the containerised market.

The W1 (0 m) terminal layout is the preferred configuration for a terminal at Roberts Bank due to fewer direct and indirect environmental effects relative to other alternatives considered. In addition to reducing impacts in the intertidal area, the W1 (0 m) alternative was determined to have the least amount of dredging required.

Following selection of Option W1 (0 m) as the preferred alternative, further engineering studies were conducted to optimise the preliminary terminal design, which resulted in rounding the northwest corner to further reduce Project-related effects of bed scour post construction. The optimised configuration incorporated into the preliminary Project design is shown on **Figure 5-4**. The reduction of Project-related effects as a result of this optimisation is discussed in **Section 5.4.1.3**.

The widened causeway without the lagoon was determined to be the preferred option as it will minimise intertidal habitat loss amongst the alternatives considered, and will have the least amount of indirect habitat change from altered coastal geomorphic processes. The widened causeway was further optimised by varying widths to minimise effects to the known biofilm intertidal habitat at the east end of the causeway.

The preferred alternative for the intermodal yard is on the marine terminal. The preferred alternative for the rail tie-in is to have one of the two tracks join the main rail network outside PMV's jurisdiction to reduce intertidal habitat loss (by approximately 0.32 ha) with a narrower width at the northeast end of the causeway. The tie-in to the existing road corridor at Roberts Bank Way North via a new overpass and access road to the marine terminal was the only technically and feasible alternative considered.

The preferred option for the location of the tug basin is to expand the existing tug basin with a configuration adjacent to the existing Deltaport Terminal. If the tug basin was placed on the north shore of RBT2, the footprint would affect higher-valued intertidal habitat than at the existing Roberts Bank tug basin location, and the shoreward tug-basin expansion layout at the existing tug basin would result in a higher potential for alterations in tidal flow and the potential for water ponding between the tug basin and Deltaport Terminal.

For construction, no alternatives for dredging, temporary sand storage, or construction of supporting land were considered technically or economically feasible.

The caisson wharf structure is the preferred alternative to pile and deck wharf due to the reduced noise effects, public opinion, improved seismic performance, and costs.

Disposal of sediments at the Project-specific location is the preferred alternative to reduce transportation-related effects and costs.

Lastly, as tug wharves constructed using the fill or pile and deck options would result in greater effects to habitat from a larger footprint, the floating pontoons and piles option is preferred.

Table 5-10 Summary of Preferred Alternative Means

Main Category	Sub-Category	Preferred Alternative Means
Location of Marine Terminal within B.C. Alternatives	Develop new container terminal within PMV’s jurisdiction	Construct a new terminal at Roberts Bank.
Location, Orientation, Layout, and Configuration Alternatives	Marine terminal (including berth pocket and marine approach areas)	W1 (0 m) – 0 m setback from −10 m CD contour.
	Causeway	Widening of existing causeway (without lagoon).
	Rail and road corridors	IY on the marine terminal.
		One causeway rail tie-in to existing rail network on mainland and one on the causeway – narrower north causeway option.
		The tie-in to the existing road corridor at Roberts Bank Way North via a new overpass and access road to the marine terminal.
	Tug basin	Option 2 at the existing Roberts Bank terminals tug basin.

Main Category	Sub-Category	Preferred Alternative Means
Construction Alternatives	Dredging	Dredging is the only alternative.
	Temporary sand storage	Inter-causeway storage (ITP).
	Construction of supporting land (terminal and causeway)	Land development using fill.
	Construction of terminal three-berth wharf	Caisson wharf structure.
	Disposal of sediments	DAS at Project-specific site.
	Construction of tug basin mooring wharves	Floating wharf and piles.

The preferred alternative for each category is described in detail in **Section 4.0 Project Description**. The detailed assessment of the preferred alternative (i.e., the Project) is presented in subsequent sections of the EIS.

5.8 REFERENCES

AECOM. 2012. Deltaport and Terminal 2 Causeway Intermodal Yard Study. Prepared for Port Metro Vancouver, Vancouver, B.C.

Canadian Environmental Assessment Agency (CEA Agency). 2013. Operational Policy Statement: Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012. Available at http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=1B095C22-1. Accessed August 2014.

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Perry, M. 2014. The Northern View. Ship Access Being Examined for Watson Island LNG Terminal. July 25, 2014. Available at http://www.thenorthernview.com/news/268607492.html. Accessed December 2014.

Port Metro Vancouver (PMV). 2014. Land Use Plan. Available at http://www.portmetrovancouver.com/docs/default-source/planning-land-use-plan/land-use-plan.pdf?sfvrsn=0. Accessed December 2014.

PMV and Prince Rupert Port Authority (PRPA). 2014. Personal communication with C. Stewart (PMV) and D. Krusel (PRPA), Nov 12, 2014.

6.0 ENVIRONMENTAL ASSESSMENT AND PERMITTING PROCESS

This section describes the regulatory framework and role of government in the Project's environmental assessment (EA) and provides an overview of the EA process, as required in the *EIS Guidelines*, part 2, section 6.2. This section also identifies the main participants in the EA, as required in the *EIS Guidelines*, part 2, section 6.3.

Port Metro Vancouver has undertaken extensive environmental studies, considered alternate designs and means of carrying out the Project, and consulted with Aboriginal groups, local communities, stakeholders, and the public with the expectation that the Project will be subject to a thorough and independent EA.

On September 12, 2013, PMV submitted a Project Description to the Canadian Environmental Assessment Agency (CEA Agency) and the B.C. Environmental Assessment Office (EAO). The CEA Agency determined that the Project met the definition of a designated project under the *Canadian Environmental Assessment Act*, *2012* (*CEAA 2012*) because the Project involves the construction and operation of a marine terminal designed to handle vessels larger than 25,000 deadweight tonnes, and will be located on lands not routinely or historically used as a marine terminal or designated for such use in a land use plan that has been the subject of public consultation. The EAO determined that the Project met the definition of a reviewable project under the B.C. *Environmental Assessment Act* because the Project will require dredging and filling of more than 2 ha of submerged lands.

In addition, the *Tsawwassen First Nation Final Agreement* sets out rights of Tsawwassen First Nation (TFN) to participate in the EA of a proposed project which could reasonably be expected to adversely affect TFN Lands or rights set out in the *Tsawwassen First Nation Final Agreement* (TFN et al. 2006).

6.1 FEDERAL INVOLVEMENT AND PROCESS

On November 7, 2013, the CEA Agency issued a *Notice of Determination* indicating that the Project would require a federal EA, and on the following day issued a *Notice of Commencement of an Environmental Assessment*.

On January 7, 2014, the CEA Agency posted a *Notice of Referral to a Review Panel*, indicating that the Honourable Leona Aglukkaq, Minister of the Environment and Minister responsible for the CEA Agency, had referred the Project to an independent review panel. The timelines for the EA were set as follows:

- Establishment of the review panel (pre-panel phase) up to 150 days (5 months) from the date of referral of the Project;

- Submission of the review panel's report (panel review phase) 430 days (14 months) from the date of establishment of the review panel; and
- Issuance of a decision statement by the federal Minister (post-panel phase) 150 days (5 months) from the date of submission of the review panel's report.

The *EIS Guidelines*, setting out the information required to be provided by PMV, were issued January 7, 2014.

The timelines established by the Minister reflect the duration of federal government activities only and do not include the time required by PMV to provide required information, such as preparation of the Environmental Impact Statement (EIS) or responding to information requests.

Federal powers, duties, or functions potentially to be exercised with respect to the Project are set out in **Table 6-1**.

Table 6-1 Federal Regulatory Approvals Potentially Required for Roberts Bank Terminal 2

Federal Authority	Act	Activity	Authorisation Potentially Required
Environment Canada	*Canadian Environmental Protection Act, 1999*	Disposal of dredged material	Disposal at Sea Permit, pursuant to section 127
Fisheries and Oceans Canada	*Fisheries Act*	Construction of in-water works	Section 35 authorisation for works, undertakings, and activities in or around water
	Species at Risk Act (*SARA*)	Construction and operation within southern resident killer whale (SRKW) critical habitat	Agreement or Permit under section 73 of *SARA*, or under another enactment pursuant to section 74 or 77 of *SARA*, authorizing an activity affecting SRKW or their critical habitat
Vancouver Fraser Port Authority (PMV)	*Canada Marine Act*	Construction of terminal	PMV Project Permit pursuant to section 27 of the *Port Authorities Operations Regulations*

The federal regulatory approvals set out in **Table 6-1** each represent the exercise of a power or performance of a duty or function that would permit the carrying out of the Project.

The federal departments and agencies involved in the EA process and their respective specialist or expert knowledge are listed in **Table 6-2**.

Table 6-2 Federal Departments or Agencies and Specialist or Expert Knowledge

Federal Department or Agency	Specialist or Expert Knowledge
Environment Canada	Wildlife – • Protection of migratory birds and their associated habitats (e.g., wetlands) under the *Migratory Birds Convention Act, 1994*; • Non-aquatic species at risk under the *Species at Risk Act (SARA)*, including recovery strategies and management plans and their related processes; and • Application and implementation of the *Federal Policy on Wetland Conservation* to ecological wetland communities supporting migratory birds and species at risk.
	Vegetation – Species at risk under *SARA*
	Water quality – Section 36(3) of the *Fisheries Act* prohibits the discharge of deleterious substances to fish-bearing waters, or placement of those substances where they might enter such waters.
	Air quality – • Environmental effects of transportation emissions; • Pollutants of concern under *Canadian Environmental Protection Act, 1999* (*CEPA 1999*), Schedule 1; and • Transboundary air pollution as recognised by Article V of the 1991 *Canada–U.S. Air Quality Agreement*
	Accidents and malfunctions – Environmental effects of potential accidents and malfunctions.
	Meteorological and climate conditions – Interactions of the Project with meteorological and climate conditions.
	Disposal at sea – Environmental effects of potential disposal-at-sea activities regulated under *CEPA 1999*.
Fisheries and Oceans Canada	Fish, fish habitat, and aquatic species at risk under *SARA.*

Federal Department or Agency	Specialist or Expert Knowledge
Health Canada	Human Health Risk Assessment (HHRA) – • Single and multi-media HHRAs; • Exposure scenarios; • Toxicological reference values; • Methodologies and calculations; and • Rationales for selection and use of the above throughout the HHRA.
	Air quality – Potential contaminants in ambient air, with reference to health-based evaluation tools, guidelines, and toxicological reference values.
	Country foods – Potential contaminants in country foods (e.g., fish, wild game, garden produce, berries), considering the type, amount, and frequency of foods consumed.
	Drinking and recreational water quality – Changes (physical or chemical) to source waters that are used for drinking water, and/or to recreational waters, with reference to Canadian and/or provincial guidelines.
	Noise – Characterisation of noise, exposure, and health endpoints with reference to internationally recognised standards for acoustics.
	Electric and magnetic fields – Consideration of the state of scientific knowledge regarding the possible health effects of exposure to electric and magnetic fields.
Natural Resources Canada	Geotechnical – Geology and terrain (e.g., slope stability).
	Geohazards – Tsunamis and seismic motion.
	Coastal geomorphology and seabed stability – • Changes to landforms in coastal areas; and • Sediment quality (e.g., changes to erosional patterns).
Parks Canada	Marine-protected areas planning and management.
	Species at risk.
	Management of protected areas, national parks, national historic sites, and historic rivers.
	Cultural resources.
	Historical, archaeological, paleontological, and architectural resources.
Transport Canada	Shipping and navigation, including marine pilotage and tug escort/assist.
	Transportation of dangerous goods – Provision of regulatory oversight with respect to the handling and transportation of dangerous goods in accordance with the *Transportation of Dangerous Goods Act, 1992.*
	Emergency response planning.

Port Metro Vancouver has been advised by CEA Agency that Environment Canada, Canadian Transportation Agency, Transport Canada, Aboriginal Affairs and Northern Development Canada, Fisheries and Oceans Canada, Health Canada, and Natural Resources Canada will be participating in the whole-of-government approach to Aboriginal consultation, working with other federal departments and agencies in a coordinated manner throughout the EA process.

6.2 Provincial Involvement and Process

Some of the submerged land required for the Project is provincial Crown land. Those lands are subject to Order in Council 908/77, which prevents certain activities from being taken (such as leasing, dredging or filling, and construction of structures) unless an environmental impact assessment is prepared by the proponent and reviewed and approved by the provincial Minister of Environment.

On December 19, 2014 the B.C. Minister of Environment issued an order under section 14 of the B.C. *Environmental Assessment Act*, establishing the Province's scope of assessment and procedures and methods for conducting the EA for the Project. There are no differences in the scope of assessment between the federal and provincial environmental assessments for this Project. As set out in the section 14 order,

- The scope of the Project is as defined by the CEA Agency in the *EIS Guidelines*;
- The scope of the assessment must include factors established by the federal Minister and potential adverse environmental, economic, social, heritage, and health effects, including cumulative effects, and practicable means to mitigate such potential adverse environmental effects, and potential adverse effects on Aboriginal groups;
- The EAO will principally rely on the EA to be conducted by the federal review panel and on consultation conducted by the CEA Agency with Aboriginal groups, whose interests are potentially affected by the Project; and
- The EAO must make a recommendation to the Minister within 30 days of receiving notice of the decision from the federal Minister.

The information presented in the EIS is intended to satisfy both federal and provincial EA requirements. As no specific additional provincial requirements have been identified, no separate concordance table which addresses provincial requirements has been attached.

As set out in **Section 26.0 Land and Water Use**, a provincial land lease is required in order to construct on provincial lands.

6.3 TSAWWASSEN FIRST NATION

The *Tsawwassen First Nation Final Agreement*, Chapter 15 – Environmental Management, sets out the rights of TFN regarding the EA of projects that may be reasonably expected to adversely affect TFN lands or rights set out in the *Tsawwassen First Nation Final Agreement* (TFN et al. 2006).

For projects subject to a federal EA, the *Tsawwassen First Nation Final Agreement* requires Canada to ensure that TFN is provided with timely notice to determine whether it is interested in participating and, if so, to provide TFN with the opportunity to comment on the following:

- Scope of the project;
- Environmental effects of the project;
- Any mitigation measures to be implemented; and
- Any follow-up programs to be implemented.

These comments must, in turn, be given full and fair consideration during the course of the EA, and responses to the comments must be provided by the federal government to TFN before any related federal decision can be taken. When a project involves a federal panel review, as is the case for RBT2, TFN is to be given an opportunity to propose a list of names of panel appointees to the federal Minister. The Minister may then consider these names for appointment to the review panel. In addition, Canada is to provide TFN with formal standing before the panel.

For a project subject to a provincial EA, the *Tsawwassen First Nation Final Agreement* provides that B.C. will give full and fair consideration to the comments received from TFN and will respond to those comments during the EA process before making a decision that would have the effect of enabling a project to be carried out.

Further discussions regarding the relevance of the *Tsawwassen First Nation Final Agreement* to the Project, and the Project's potential effects on the ability of TFN to exercise its treaty rights, are presented in **Section 32.0 Potential or Established Aboriginal and Treaty Rights and Related Interests, Including Current Use of Lands and Resources for Traditional Purposes**.

6.4 OTHER ABORIGINAL GROUPS

With the exception of TFN, to date, none of the Aboriginal groups with a potential interest in the vicinity of the Project have signed treaties or self-government agreements with the federal and provincial governments.

6.5 LEGISLATION, POLICIES, AND INITIATIVES

Federal, Provincial, Regional and Municipal Legislation applicable to the Project and cross-references to the EIS sections in which the legislation is referenced are set out in **Appendix 6-A Legislation Relevant to the Project**.

Relevant land use plans, land zoning, community plans, and Aboriginal community plans, as well as policies, plans, and study initiatives developed and implemented by various levels of government and TFN and the EIS sections in which they are referenced, are set out in **Appendix 6-B Land Use and Resource Management Policies, Plans, and Initiatives of Relevance to Roberts Bank Terminal 2**.

The objectives, standards, and guidelines that have been used by PMV to assist in the evaluation of predicted environmental effects and the EIS sections in which they are referenced are set out in **Appendix 6-C Summary of Objectives, Standards, and Guidelines used by Port Metro Vancouver to Assist in the Evaluation of and Mitigation for Any Predicted Environmental Effects.** The participants in the EA process are presented in **Appendix 6-D Participants in the Environmental Assessment of the Project**.

6.6 REFERENCES

Tsawwassen First Nation, Government of Canada, and Government of British Columbia. 2006. Tsawwassen First Nation Final Agreement. Available at https://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-BC/STAGING/texte-text/tfnfa_1100100022707_eng.pdf. Accessed September 2014.

7.0 ENGAGEMENT AND CONSULTATION

Port Metro Vancouver began a comprehensive engagement and consultation process regarding the Project in 2011, early in Project development, and prior to the initiation of the environmental assessment (EA) process. Since 2011, PMV has participated in over 300 engagement and consultation meetings associated with the Project.

Engagement and consultation activities with government agencies, technical experts, Aboriginal groups, local government, and the public were designed to obtain the benefit of their expertise, experience, and traditional and community knowledge. Several of these activities were undertaken in addition to Canadian Environmental Assessment Agency (CEA Agency) and B.C. Environmental Assessment Office (EAO) requirements of an EA, and include the following:

- Establishing a Technical Advisory Group (TAG) process in 2012 to engage and consult with leaders in the technical and scientific community to provide guidance on key topic areas;
- Initiating a Working Group process in 2014 that convened a multi-stakeholder group to share study methodology and information to be included in the EIS. Participation in the Working Groups included representatives from federal, provincial, local and regional governments, and Aboriginal groups;
- Conducting a thorough and comprehensive engagement and consultation program with Aboriginal groups that started in 2011 and culminated in rounds of EIS-specific workshops in 2014;
- Building on PMV's ongoing relationships with local communities, initiating an RBT2-specific Local Government Engagement and Outreach Program in 2012 with several municipalities to facilitate information exchange;
- Conducting a multi-round PMV-led public consultation process to gather input to assist with the development of the Project and the EIS; and
- Opening a Delta Community Office in October 2014, as a place for community members to speak with PMV staff about RBT2 and port operations.

The input that PMV received through the Project's engagement and consultation activities has been considered in the development of this EIS, and this consideration is documented in issues and interest tables appended to this section (**Appendix 7.2-B Aboriginal Groups Issues and Interests Table**, **Appendix 7.3-A Local Government Issues and Interests Tables**, and **Appendix 7.3-B Public Issues and Interests Tables**). Port Metro Vancouver is appreciative of the broad range of individuals and organisations that have participated in the engagement and consultation program to date. Port Metro Vancouver will continue engagement and consultation throughout the panel review phase, and should the Project proceed, into the construction and operation phases.

This section summarises PMV's past, current, and planned Project-related engagement and consultation activities, and is organised by the following broad groups:

- Regulatory agencies (**Section 7.1**);
- Aboriginal groups (**Section 7.2**); and
- Local government and the public (**Section 7.3**).

This section demonstrates how PMV considered engagement and consultation input during Project planning and EIS preparation (either within the following subsections or in associated Appendices). The engagement and consultation activities for all three above-noted groups are divided into two main phases: the pre-EIS submission phase and the future planned engagement and consultation phase.

This section addresses requirements of the *EIS Guidelines* with respect to engagement and consultation, as set out in sections 9.2, 10.2, 10.3, 11.2, 11.3, 12.2, 12.3, and 14.

7.1 REGULATORY ENGAGEMENT AND CONSULTATION

This section describes PMV's engagement and consultation approach and activities with provincial, federal, and international (United States (U.S.A.)) regulatory agencies during the Project's pre-EIS submission phase. Future planned regulatory engagement and consultation activities are also presented in this section.

7.1.1 Pre-Environmental Impact Statement Submission Engagement and Consultation

Activities conducted by PMV's RBT2 team during the pre-EIS submission phase included the following:

- Regulatory engagement and consultation prior to formal (November 2013[1]) initiation of the EA process, including –
    - Early regulatory engagement (2011 to 2013),
    - Federal and provincial engagement on the Project Description (2013);
- Engagement and consultation associated with PMV's RBT2 Working Group (2014);
- Federal authority and agency engagement (2014 to EIS submission);
- Provincial agency engagement (2014 to EIS submission); and
- Trans-boundary agency engagement (2014 to EIS submission).

[1] The CEA Agency issued a Notice of Determination on November 7, 2013 stating that the Project would be subject to an EA under the *Canadian Environmental Assessment Act, 2012*.

7.1.1.1 Regulatory engagement and consultation prior to formal initiation of the environmental assessment

Early Regulatory Engagement (2011 to 2013)

Port Metro Vancouver initiated Project-related meetings with provincial and federal regulators in 2011. The purpose of these meetings was to introduce the Project, review regulatory procedures and processes, discuss issues that might arise during Project planning, construction, and operation, and receive feedback on technical work plans related to field studies.

Port Metro Vancouver held early (2011 to 2013) engagement meetings in Vancouver, Victoria, and Ottawa with the following provincial and federal agencies and departments:

- CEA Agency;
- B.C. EAO;
- Environment Canada (EC) – Canadian Wildlife Service (CWS);
- EC – Marine Programs;
- EC – Environmental Protection Branch – Disposal at Sea (DAS);
- Fisheries and Oceans Canada (DFO) – Major Projects Office, Habitats Division, Fisheries Protection, Species At Risk;
- Transport Canada – Environmental Programs;
- B.C. Ministry of Transportation and Infrastructure; and
- The Major Ports Projects Review Steering Committee[2].

Through these early regulator meetings, it was determined that coordinated joint meetings between regulators, as well as with experts in the scientific community, would be beneficial to effectively share Project information and discuss potential approaches for undertaking effects assessments for specific subject areas. As a result, PMV initiated the TAG process; details of the TAG process are summarised in **Section 7.4**.

[2] The Major Ports Projects Review Steering Committee is an Ottawa-based federal committee that includes representatives from Transport Canada, EC, DFO, CEA Agency, Canadian Transportation Agency, Aboriginal Affairs and Northern Development, Health Canada, and Natural Resources Canada.

7.1.1.2 Federal and Provincial Engagement on the Project Description (2013)

Prior to submission of the Project Description, PMV consulted with the CEA Agency and the EAO on a draft Project Description document (see **Table 7-1** below). Meetings took place in Vancouver, Victoria, and Ottawa. This consultation was initiated by PMV in order to ensure that PMV's Project Description would meet the CEA Agency's and EAO's requirements prior to formal submission.

Table 7-1 Draft Project Description Engagement with Federal and Provincial Agencies

Meeting Date	Topic	Attendees
June 14, 2013	PMV presented a high-level introduction to the proposed Project Description and Project consultation plan.	CEA Agency, EAO
June 24, 2013	Discussions involved port jurisdiction and authority, EA process, and coordination of consultation process.	CEA Agency, EAO
July 12, 2013 and throughout July and August 2013	Discussions focused on CEA Agency comments on the draft Project Description and followed up on teleconference discussions.	CEA Agency
August 28, 2013	Discussions involved plans to formally submit the Project Description, as well as planning for and coordination of post-submission communications and consultation.	CEA Agency, EAO

On September 12, 2013, PMV submitted the Project Description to the CEA Agency and the EAO (see **Section 6.0 Environmental Assessment and Permitting Process**). On November 8, 2013 the CEA Agency issued the Notice of Commencement of the environmental assessment and the draft *EIS Guidelines*.

7.1.1.3 Working Group Process (2014 to 2015)

In February 2014, following the issuance of the *EIS Guidelines* by the CEA Agency on January 7, 2014, PMV initiated a Working Group engagement process. This process is not a requirement of the federal EA process; however, both the CEA Agency and the provincial EAO were supportive of PMV's initiative. Port Metro Vancouver was of the view that this multi-stakeholder engagement process would be a good venue to solicit input from participants and provide an opportunity for PMV to share Project and EIS-related information to the Working Group. The Working Group process also provided additional opportunities for Aboriginal consultation, in addition to the Project's Aboriginal Groups Engagement and Consultation program (**Section 7.2**). Port Metro Vancouver structured the Working Group meetings to address participants' interests.

The purpose of the Working Group meetings was to provide opportunities for engagement on study methodology and information to be included in the EIS between PMV and representatives from federal, provincial, local and regional governments, and Aboriginal groups.

Terms of reference for the Working Group process (see **Appendix 7.1-A Roberts Bank Terminal 2 Working Group Terms of Reference**) were developed based on the provincial *Environmental Assessment Advisory Working Group Terms of Reference* (EAO 2013).

The Working Group engagement process focused on the content of the EIS, including the specific technical topics within the EIS that were of interest to regulators, local and regional governments, and Aboriginal groups. The key focus of the Working Group meetings was to provide an opportunity for PMV to present its proposed assessment approach and receive feedback and address questions from Working Group members on the proposed approach.

The objectives of the Working Group included the following:

- Increase participants' knowledge in relation to container movements and the Project (i.e., context, need for the Project);
- Assist PMV in developing an understanding of the specific interests of key reviewers associated with the EIS;
- Solicit input from Working Group members on proposed valued components (VCs) (as defined in **Section 8.0 Effects Assessment Methods**) to be assessed as part of the EIS;
- Share information on the approach and methodology for data collection and analysis and for assessing potential effects of the Project; and
- Receive advice and guidance from Working Group members on ways to prevent or reduce potential Project-related effects.

The Working Group meeting format consisted of presentations on proposed EIS topics, followed by question-and-answer periods. After each Working Group meeting, members were asked to submit additional questions to PMV, either through question-and-answer forms provided at the meetings or via email directly to PMV.

The Working Groups were held in Tsawwassen (one meeting) and Vancouver (three meetings) between February 2014 and June 2014. **Table 7-2** lists the groups represented at the Working Group meetings and **Table 7-3** outlines the dates and key topics covered.

The Working Group process was undertaken in addition to other local government and Aboriginal group engagement and consultation activities, as described in **Section 7.2** and **Section 7.3**, respectively.

Table 7-2 Working Group Participants

Represented Organisations	Aboriginal Groups[1]
Federal	Tsawwassen First Nation
Canadian Environmental Assessment Agency	Tsleil-Waututh Nation
Transport Canada	Musqueam First Nation
Fisheries and Oceans Canada	Hwlitsum First Nation[2]
Natural Resources Canada	Stz'uminus First Nation
Health Canada	Lyackson First Nation
Environment Canada	Cowichan Tribes
Provincial	Penelakut Tribe
Environmental Assessment Office	Métis Nation B.C.
Ministry of Transportation and Infrastructure	
Local and Regional	
Corporation of Delta	
City of Richmond	
Township of Langley	
City of Surrey	
City of Langley	
Metro Vancouver	

1. The Aboriginal groups listed in this table attended one or more Working Group meetings. All of the Aboriginal groups identified in the *EIS Guidelines* were invited to participate. Refer to **Section 7.2** for information on Aboriginal group engagement and consultation.
2. Up until September 2014, the Hwlitsum First Nation participated as a member of the Cowichan Nation Alliance, which at that time consisted of Cowichan Tribes, Penelakut Tribes, Halalt First Nation, Stz'uminus First Nation, and Hwlitsum First Nation. Further details of this relationship are presented in **Appendix 7.2-A Consultation Activities by Aboriginal Group**.

Table 7-3 summarises the topics addressed in each Working Group. As noted previously, PMV was responsive to participants' requests on Working Group topics, and agendas were developed based on the issues participants indicated were of particular interest. Information gathered through the Working Group process helped inform the EIS and the development of other initiatives to address participant concerns regarding goods movement within the Asia-Pacific Gateway, such as the Gateway Transportation Collaboration Forum.

Table 7-3 Working Group – Meeting Dates and Key Topics

Working Group # and Date	Key Topics
Working Group #1 (February 25, 2014, Tsawwassen)	• PMV Overview; • Project Description; • EA Process overview; • Consultation to date; • TAG process; and • Site tour.
Working Group #2 (April 15, 2014, Vancouver)	• Container movement in the Asia-Pacific Gateway; • Container movement at Roberts Bank; • Scope of transportation within RBT2 EIS; • Pacific Gateway transportation infrastructure and initiatives; • Container movement outside of PMV jurisdiction; • Approach to EA; and • Air quality study, noise and vibration study.
Working Group #3 (May 27, 2014, Vancouver)	• Issues scoping process for candidate VCs; • RBT2 proposed approach to EA; • Cumulative effects assessment; • Proposed intermediate components (ICs) (as defined in **Section 8.0 Effects Assessment Methods**); • Proposed biophysical VCs; and • Summary of proposed social and economic VCs.
Working Group #4 (June 17, 2014, Vancouver)	• Proposed social and economic VCs; • Assessment of the human health VC; and • Ongoing productivity of Roberts Bank ecosystem.

After each Working Group meeting, members received copies of the presentations and were given an opportunity to comment on the draft meeting record before finalisation and distribution. At the end of all of the Working Group meetings held in 2014, PMV compiled a Working Group summary, which included the following:

- Terms of reference for the Working Group;
- Meeting agendas;
- PowerPoint presentations;
- Meeting records; and
- PMV responses to participant inquiries.

This material is available publicly through PMV's Project website (PMV 2012a) and the RBT2 CEA Agency registry website (CEA Agency 2014).

7.1.1.4 Federal Authority and Agency Engagement (2014 to 2015)

In addition to engaging with federal regulators as part of the Working Group process described above, PMV continued to engage with individual federal departments on specific topics. This engagement focused on gaining clarity or a greater understanding of the expectations of individual federal departments with respect to specific sections of the *EIS Guidelines* and agency-specific permitting requirements. Engagement with specific federal departments is summarised below. The number of engagements noted refers to emails, meetings, phone calls, and information exchanges.

Fisheries and Oceans Canada – Species at Risk Program

As of November 30, 2014, PMV's RBT2 team participated in 16 Project-related engagements with representatives from DFO's Species at Risk (SAR) Program through the Ecosystem Management Branch. These engagements focused on the following:

- Provision of information regarding the Project from PMV and advice from DFO on how to address *Species at Risk Act* (*SARA*) requirements related to at-risk marine mammals, including Southern Resident Killer Whale (SRKW); and
- Provision by PMV of proposed marine mammal studies and approaches to assessing potential Project-related effects on SRKW, and DFO feedback on such studies and approaches.

Specific advice was provided by representatives from DFO's SAR Program during the pre-EIS submission phase. The SRKW-related topics on which representatives from DFO's SAR Program provided comment on include the following:

- Critical habitat;
- Individual and population-level effects on SRKWs;
- Dredgeate quality with respect to dredgeate disposal at potential DAS sites located within SRKW critical habitat;
- Tables depicting functions, features, and attributes of SRKW critical habitat, as well as activities that may adversely affect SRKW critical habitat;
- Project effects on juvenile salmon and related adult salmon food sources for SRKWs; and

- Specific feedback on study methodology with respect to –
  - Northern Resident Killer Whale (as a proxy for SRKW),
  - Dose response curves with respect to underwater noise,
  - Broadband vs. weighted audiogram approach for determining underwater noise,
  - Proxies for larger container ships,
  - Approach for identifying population consequences of disturbance, and
  - Preliminary results.

Fisheries and Oceans Canada – Fisheries Protection Program

As of November 30, 2014, PMV's RBT2 Project team has participated in 25 Project-related engagements with representatives from DFO's Fisheries Protection Program. These engagements focused on the following:

- Provision of Project-related information from PMV and advice from DFO on fisheries policies and associated regulations that may relate to the Project;
- Proposed fish, fish habitat, and productive capacity studies and approaches to assessing potential Project-related effects (including data collection and analysis) on fish and fish habitat (including productive capacity) and DFO feedback on such studies and approaches; and
- Preliminary results.

Direction and comment was provided by representatives from the Fisheries Protection Program during the pre-EIS submission phase. The fish and fish habitat-related topics on which the Fisheries Protection Program provided comment on included specific feedback on study methodology with respect to the following:

- Approach to evaluating productive capacity (as a follow-up to the 2012 and 2013 Productive Capacity TAG meetings);
- Ecosystem Ecopath with Ecosim (EwE) Model (for modelling productive capacity);
- Approach to describing marine habitat mitigation in the EIS;
- Juvenile Chinook studies (linked to SRKW studies, since Chinook are the main food source for SRKW); and
- Proposed crab fishery closure area.

Environment Canada – Canadian Wildlife Service

As of November 30, 2014, PMV's RBT2 Project team has participated in 20 Project-related engagements with representatives from CWS. These engagements focused on the following:

- Provision of information regarding the Project from PMV and advice from CWS on coastal bird and wildlife policies and associated regulations that may relate to the Project;
- Proposed PMV coastal bird-associated habitat and productive capacity studies and approaches to assessing potential Project-related effects on coastal birds, as well as CWS feedback on such studies and approaches; and
- Preliminary results and wetland compensation.

Comments were provided by representatives from CWS during the pre-EIS submission phase and, where appropriate, were incorporated in the development of this EIS. Potential Project-related effects on coastal birds and their associated habitat are considered in **Section 15.0 Coastal Birds** and **Section 11.0 Marine Vegetation**.

The coastal birds and habitat-related topics on which representatives from CWS provided comment on include specific feedback on study methodology with respect to the following:

- Approach to bird studies and productive capacity (as follow-up to the 2012 and 2013 TAG meetings);
- Studies with respect to artificial light and potential effects on birds; and
- Supporting models (Ecosystem EwE Model for modelling productive capacity) and the Shorebird Opportunity Model (for modelling bird habitat use and behaviour).

Environment Canada – Disposal at Sea Program

As of November 30, 2014, PMV's RBT2 Project team has participated in six Project-related engagements with representatives from the DAS Program. These engagements focused on the following:

- Provision of information regarding the Project from PMV and advice from the DAS Program on regulations that may relate to the Project; and
- Proposed approach to disposal of dredgeate with respect to DAS sites and DAS Program feedback on this approach.

Comments were provided by representatives from the DAS Program during the pre-EIS submission phase. Potential Project-related effects from DAS activities are considered in **Section 9.6 Surficial Geology and Marine Sediment**, **Section 9.7 Marine Water Quality**, and **Section 14.0 Marine Mammals.**

The DAS-related topics on which representatives from EC's DAS Program provided comment on include the following:

- Feedback on PMV's proposed sediment sampling and analysis plan; and
- Feedback on preliminary findings (sediment and benthic sampling, and sediment transport modelling).

Environment Canada – Air Quality Group

As of December 04, 2014, PMV's RBT2 Project Team has participated in 18 Project-related engagements with representatives from EC's Air Quality group. These engagements also include the two multi-stakeholder Air Quality Scoping Study Workshops held by PMV in February 2013 and September 2013. These workshops included representatives from EC, Metro Vancouver, Tsawwassen First Nation, the B.C. Ministry of Environment, and the Corporation of Delta.

The EC – Air Quality group engagements focused on the following:

- Provision of Project-related information from PMV and advice from EC's Air Quality group on air quality regulations, policies, and guidance materials that may relate to the Project; and
- Proposed approach to air quality and human health studies and the approach to assessing potential Project-related effects on air quality and human health and EC's Air Quality group feedback on such approaches.

Comments were provided by representatives from EC's Air Quality group during the pre-EIS submission phase. Potential Project-related effects from air quality are considered in **Section 9.2 Air Quality** and **Section 27.0 Human Health**.

The air quality and human health-related topics on which EC's Air Quality group provided comments on include the following:

- EC confirmed that PMV's contaminant selection process was appropriate based on the rationale provided during March 25, 2014 meeting[3]; and
- Specific feedback was provided on study methodology with respect to the spatial scope of study and the modelling methodology.

[3] April 08, 2014 email from EC (Roxanne Vingarzan) to PMV (Jody Addah).

Health Canada

As of November 30, 2014, PMV's RBT2 Project Team met with Health Canada five times regarding air quality and human health topics.

Health Canada provided comments with respect to human health, which is summarised as follows:

- Specific feedback was provided on appropriate regulatory guidance documents with respect to evaluating human health effects;
- Specific feedback was provided on receptors for potential Project-related noise effects (i.e., schools, childcare facilities);
- Specific feedback was provided with respect to understanding health of Aboriginal group populations (such as quantitative food consumption study); and
- Specific feedback was provided to update the contaminant list and provide justification for contaminant selection used in the human health assessment.

Other Federal Agencies

In addition to engaging with the above-noted federal agencies, PMV also engaged other federal entities. These include:

- Natural Resources Canada, who provided comments with respect to the applicable regulations and guidelines relating to natural hazards;
- Transport Canada, who provided updates on navigational regulations, confirmed that RBT2 would not qualify for its voluntary TERMPOL review process (since RBT2 is not an oil or gas project[4]), and provided comments with respect to the Quantitative Risk Assessment (see **Section 30.0 Potential Accidents or Malfunctions**); and
- Canadian Coast Guard (including Marine Communications and Traffic Services), who provided comments with respect to the Quantitative Risk Assessment.

Canadian Environmental Assessment Agency

Throughout the pre-EIS submission phase, PMV also communicated regularly with the CEA Agency between January 2013 and December 2014. The discussions primarily focused on EA procedures and timelines. The CEA Agency also provided advice on transboundary engagement and consultation with the U.S.A.

4 Transport Canada chairs the voluntary **TERMPOL** Review Process, a federal government initiative that assesses the safety and risks associated with oil or gas tanker movements to, from, and around Canada's marine terminals.

7.1.1.5 Provincial Agency Engagement (2014 to 2015)

In addition to engaging with federal regulators, PMV also engaged with provincial agencies during the pre-EIS submission phase. Port Metro Vancouver's primary point of provincial contact is the EAO, with engagement focused on the provincial EA review process required under the B.C. *Environmental Assessment Act*.

Other engagement activities with provincial agencies included discussions with the Ministry of Environment; the Ministry of Forests, Lands and Natural Resource Operations; Ministry of Transportation and Infrastructure; and the Provincial Health Services (through its regional Fraser Health Authority). A brief summary of the engagement topics with provincial regulators is provided below:

- **Environmental Assessment Office** – Provided direction on provincial EA procedures and provincial requirements;
- **Ministry of Environment** – Provided feedback on study methodology with respect to the spatial scope of air quality study and the modelling methodology;
- **Ministry of Forests, Lands and Natural Resource Operations** – Provided direction and confirmation on the methodology proposed for the visual resources assessment;
- **Ministry of Transportation and Infrastructure** – Provided feedback relating to proposed federal – provincial land transfers; and
- **Fraser Health Authority** – Provided comments on the topics of air quality and human health.

7.1.1.6 Transboundary Engagement (2014 to 2015)

The CEA Agency undertook the initial engagement with the U.S. Environmental Protection Agency (U.S. EPA) by introducing the Project and PMV. On July 14, 2014, PMV followed up on this initial outreach by providing the U.S. EPA (Region 10) with links to the two key Project websites (PMV 2012a, CEA Agency 2014)[5,6]. Port Metro Vancouver also discussed the Project with the Washington State Department of Ecology and offered to provide additional information about the Project, if requested. Port Metro Vancouver had not received any other information requests from the U.S. EPA or other U.S. departments (as of December 31, 2014). This engagement is consistent with the 2003 Memorandum of Understanding between the Washington State Department of Ecology and the BC Environmental Assessment Office.

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5 PMV's Project website is available at http://www.robertsbankterminal2.com

6 CEA Agency's website is available at http://www.ceaa-acee.gc.ca/050/details-eng.cfm?evaluation=80054

7.1.2 Future Planned Engagement and Consultation

The future planned engagement and consultation phase includes the panel review phase, as well as the construction phase and the early years of Project operation. Prior to commencement of construction, PMV will continue to engage and consult with regulatory agencies regarding mitigation and follow-up measures and the site and activity-specific permits, licences, and authorisations that will be required, in addition to the EA decision.

Port Metro Vancouver will take direction from the CEA Agency with respect to trans-boundary engagement with U.S. agencies during all phases of the proposed Project, and will inform agencies as required about opportunities for participation in the panel review phase, as well as the availability of key Project documents (i.e., EIS submission).

7.2 ABORIGINAL GROUPS ENGAGEMENT AND CONSULTATION

This section describes the engagement and consultation process undertaken with Aboriginal groups. Details regarding engagement and consultation activities that have occurred throughout the pre-EIS submission phase, as well as future planned engagement and consultation, are also provided.

7.2.1 Engagement and Consultation Process Overview

Port Metro Vancouver began its Aboriginal group engagement and consultation activities early in the Project planning process and focused on Aboriginal people and groups that may be affected by the Project or that have potential or established Aboriginal and Treaty rights and related interests in the Project area. This engagement effort included 14 Aboriginal groups, including those specifically identified in the *EIS Guidelines*.

This section describes the approach, methods, and actions that PMV has undertaken to work with Aboriginal groups to establish an engagement approach, provide opportunities for Aboriginal groups to learn about the Project and its potential effects, and identify any potential effects. This section also describes the opportunities for Aboriginal groups to discuss potential measures to mitigate such effects.

Comments raised by Aboriginal groups are outlined in this section, including a description of PMV's process to address such comments and outstanding issues. An overview of past, present, and planned consultation activities is also provided. Specific details regarding the engagement and consultation undertaken with each of the 14 Aboriginal groups identified in **Section 7.2.1.2** are presented in **Appendix 7.2-A Consultation Activities By Aboriginal Group**, while **Appendix 7.2-B** provides a summary of the comments and concerns raised by Aboriginal groups and the responses provided by PMV.

Port Metro Vancouver began Project-related planning for Aboriginal engagement and consultation in January 2011. The scope and extent of engagement and consultation with each of the Aboriginal groups has varied based on the following:

- The scope of Aboriginal and Treaty rights and related interests in the Project area identified by each group;
- The degree to which the respective interests of individual Aboriginal groups may be potentially affected by the Project; and
- The interest of each Aboriginal group in being engaged or consulted about the Project.

In support of Project planning and for information-gathering purposes, PMV has provided or offered funding support to ensure the ongoing participation of Aboriginal groups involved in the Project's consultation processes. Additional agreements were also initiated to support the development of studies regarding the current use of lands and resources for traditional purposes. As a result of these engagement and consultation activities, Aboriginal groups have provided traditional use information relating to the Project area (see **Section 7.2.1.7**).

Port Metro Vancouver has also consulted with Aboriginal groups regarding Project components and activities, selection of VCs, the potential effects of the Project, proposed mitigation measures, potential changes to the environment related to the Project, and potential impacts of the Project on Aboriginal groups' ability to exercise asserted or established Aboriginal or treaty rights and related interests. Port Metro Vancouver acknowledges that the information provided related to potential adverse effects on potential or established Aboriginal or Treaty rights will be considered by the CEA Agency in meeting its obligations regarding its common law duty to consult.

Through the course of the consultation process conducted to date, Aboriginal groups have identified interests and raised issues. Port Metro Vancouver responded to the Aboriginal groups, and has developed a process and approach for addressing outstanding issues. A summary table of issues identified by Aboriginal groups, and PMV's responses can be found in **Appendix 7.2-B**. Should the Project proceed to construction and operation, PMV intends to continue to implement this approach.

7.2.1.1 Consultation Objectives

The primary objective of PMV's Aboriginal engagement and consultation process is to support positive, productive, and lasting relationships between PMV and Aboriginal groups while ensuring all applicable legal, regulatory, and policy requirements are effectively addressed. Accordingly, communications materials and activities have been and will continue to be designed and delivered to meet the following objectives:

- Provide potentially affected Aboriginal groups with timely access to relevant information that allows them to understand the proposed Project and determine its impacts on their community, activities, and other interests;
- Consider the input of Aboriginal groups with respect to methods of engagement and consultation;
- Facilitate Aboriginal participation in the EA process through provision of capacity funding and access to technical expertise as it relates to the Project;
- Seek Aboriginal input into EA processes and methods, such as the selection of VCs;
- Facilitate the identification and collection of **Aboriginal traditional knowledge** (ATK), including the consideration and incorporation of ATK into the EIS;
- Provide Aboriginal groups with reasonable opportunities to present and communicate their interests and issues in relation to the Project to both PMV and relevant regulatory agencies throughout Project planning;
- Consider the feedback of Aboriginal groups related to potential effects on their asserted or established rights or interests during the development and implementation of the Project, and address concerns raised by avoiding, mitigating, or otherwise accommodating such issues; and
- Facilitate effective working relationships among PMV, regulatory agencies, and potentially affected Aboriginal groups.

Port Metro Vancouver is committed to continued and active engagement with Aboriginal groups with interests that may be potentially affected by the Project.

7.2.1.2 Identification of Aboriginal Groups

Port Metro Vancouver has engaged and consulted with the Aboriginal groups identified below on Project-related topics or themes. These Aboriginal groups were identified based on the following factors:

- Potential or established Aboriginal and Treaty rights and related interests in the Project area;
- Aboriginal groups potentially affected by the Project; and
- Aboriginal groups identified in the *EIS Guidelines*.

In 2011, the initial phase of PMV's Aboriginal engagement and consultation process was developed to facilitate discussions regarding the preferred approaches to engagement and consultation by Aboriginal groups. At that time, PMV initiated general Project-related engagement with Aboriginal groups whose traditional territories (land or marine components) overlapped with the proposed Project area. This preliminary process identified the following Aboriginal groups:

- Tsawwassen First Nation (TFN);
- Musqueam First Nation (MFN);
- Semiahmoo First Nation (SFN);
- Tsleil-Waututh Nation (TWN);
- Cowichan Tribes;
- Halalt First Nation (HFN);
- Penelakut Tribe;
- Stz'uminus First Nation;
- Lake Cowichan First Nation (LCFN);
- Lyackson First Nation (LFN);
- Stó:lō Tribal Council –
  - Seabird Island First Nation,
  - Scowlitz First Nation,
  - Soowahlie Band,
  - Kwaw'Kwaw'Apilt First Nation,
  - Kwantlen First Nation,
  - Shxw'ow'hamel First Nation,
  - Chawathil First Nation, and
  - Cheam Indian Band; and
- Stó:lō Nation**: –**
  - Aitchelitz First Nation,
  - Leq'a:mel First Nation,
  - Matsqui First Nation,
  - Popkum First Nation,
  - Skawahlook First Nation,
  - Skowkale First Nation,
  - Shxwha:y Village,

- Squiala First Nation,
- Sumas First Nation,
- Tzeachten First Nation, and
- Yakweakwioose Band.

Part 2, section 9.2 of the *EIS Guidelines* issued by the CEA Agency in January 2014 confirmed those Aboriginal groups listed above, as well as Métis Nation British Columbia. The CEA Agency also determined on a preliminary basis the depth of the duty to consult with each respective Aboriginal group. Whereas TFN and MFN were identified in the high end of the consultation spectrum, nine Aboriginal groups were acknowledged as being within the moderate end. Stó:lō Nation and Stó:lō Tribal council were determined to be on the low end of the consultation spectrum.

In addition to those groups included within the *EIS Guidelines*, PMV also engaged with, and provided Project-related information to, Hwlitsum First Nation. Meetings were also held between PMV and the Hwlitsum First Nation in order to provide an opportunity to hear and respond to any concerns or questions about the Project. On February 21, 2014, CEA Agency directed that information regarding current use of land and resources for traditional purposes in the Project area by the Hwlitsum First Nation should be included in the EIS.

A description of each Aboriginal group is presented in **Section 32.1.1 Potential or Established Aboriginal and Treaty Rights and Related Interests, Component Overview and Regulatory Setting, Aboriginal Groups**. The location of treaty settlement areas, asserted traditional territories, and Indian Reserves of each of these Aboriginal groups are included in **Section 3.3.2 Geographical Setting**, **Aboriginal Groups**.

7.2.1.3 Participation Support

Participation funding agreements have been negotiated between PMV and Aboriginal groups, either individually or through associations representing the Aboriginal groups, and were designed to support the consultation process for the Project. Port Metro Vancouver has provided participation funding to the following Aboriginal groups or associations representing these groups:

- Tsawwassen First Nation;
- Musqueam First Nation;
- Semiahmoo First Nation;
- Tsleil-Waututh Nation;

- Cowichan Tribes;
- Penelakut Tribe;
- Halalt First Nation;
- Stz'uminus First Nation;
- Lake Cowichan First Nation;
- Lyackson First Nation;
- Métis Nation British Columbia; and
- Hwlitsum First Nation.

Port Metro Vancouver has also entered into agreements with all of the above-listed Aboriginal groups to support the collection and identification of new information related to ATK or current use for traditional purposes. The outcomes of such agreements are presented in **Section 7.2.1.7**.

7.2.1.4 Aboriginal Engagement and Consultation Methods

Port Metro Vancouver implemented a broad range of engagement and consultation methods to support the process of compiling detailed information related to the scope and nature of Aboriginal groups' interests in the Project area. This included identifying and discussing Aboriginal groups' asserted or established rights and use in the Project area, and identifying the potential for Project-related effects on those rights and interests. These engagement and consultation methods include the following:

- Distribution of materials for information, review, and input;
- Meetings with Aboriginal leadership and representatives;
- Attendance and presentations by PMV at Council and community meetings (as scheduled or requested);
- Involvement of Aboriginal groups in the implementation of environmental studies through participation in field programs;
- Distribution and review of EA-related process documents, such as the PMV's draft Project Description;
- Organisation and hosting of Project-specific workshops to facilitate Aboriginal input in relation to ATK or current use for traditional purposes in the Project area;
- Organisation and hosting of workshops to provide information and receive feedback regarding EA methodology, potential VCs, and plain language summaries of preliminary EIS findings, including existing and expected conditions, potential effects, and proposed mitigation measures;
- Recording of Aboriginal groups comments; and
- Follow-up on issues identification and resolution.

7.2.1.5 Information Distribution Methods

Throughout the Aboriginal engagement and consultation process, participants were provided with Project-related information via the methods outlined below.

Project Information Disclosure

The Project website (PMV 2012a) was launched in October 2012 and provides access to Project information, historical and technical reports related to environmental studies and development at Roberts Bank, PMV and Project contact information, and Project updates including notifications about public consultation and consultation materials (**Section 7.3.2.1**).

Throughout the engagement and consultation process, PMV provided Aboriginal groups with Project-related information and updates by email, and alerted them when new information was added to the website. Port Metro Vancouver also provided Aboriginal groups with discussion guides, which were used to support public RBT2 consultation (**Section 7.3.2.3**). These discussion guides contain general and technical background information about the Project and identified consultation topics.

Aboriginal groups were given an opportunity to review and comment on EIS-related documents such as the Project Description, archaeological overview assessment, draft Aboriginal group profiles, and draft content on Aboriginal and treaty rights and related interests as they pertained to each group. Plain-language summaries of draft EIS content were also provided and presented. Subsequent feedback was then considered and incorporated into the EIS and associated documents. Details are included in **Appendix 7.2-B**.

In addition, PMV offered to provide Aboriginal groups with Project-specific technical data reports and technical reports, which were undertaken in support of Project planning and EA activities.

Direct Communication

Port Metro Vancouver directly engaged with Aboriginal groups through meetings, interviews, workshops, telephone calls, conference calls, site visits, letters, reports, and emails. Communications were often supplemented by the use of visual aids, including PowerPoint presentations and Project maps.

Throughout the pre-EIS submission phase PMV has also sought opportunities to directly engage with members of Aboriginal communities by organising and attending community meetings, and often made technical staff available at these meetings to engage directly with community members and leaders.

Technical Workshops and Working Groups

Aboriginal groups were invited to participate in PMV's Working Group process from February to June 2014, as described in **Section 7.1**. The purpose of the Working Group meetings was to provide opportunities for engagement on study methodology and information to be included in the EIS between PMV, Aboriginal groups, and representatives from federal, provincial, and local and regional governments. Aboriginal groups who participated in one or more of the Working Group meetings included the following:

- TFN;
- MFN;
- TWN;
- Cowichan Tribes;
- Penelakut Tribe;
- LFN;
- MNBC; and
- Hwlitsum First Nation.

Port Metro Vancouver also held technical workshops with Aboriginal groups at which PMV and technical specialists engaged directly with members of Aboriginal groups, discussing specific areas of Aboriginal interest and reviewing related technical topics.

Two technical workshops were held in June and July 2014 to consult with Aboriginal groups on the selection of VCs. A further four technical workshops were held in October 2014 on preliminary EIS results (with TFN, MFN, Semiahmoo First Nation, TWN, LCFN, LFN, MNBC, and Hwlitsum First Nation participating in at least one each). An additional two technical workshops on preliminary EIS results and proposed mitigation were held in October and November 2014 for Aboriginal groups affiliated with Cowichan Nation Alliance (Cowichan Tribes, Halalt First Nation, Penelakut Tribe, and Stz'uminus First Nation). The topics covered in these technical workshops included preliminary information for EIS sections on the following:

- EA process (presented by CEA Agency);
- Project Description;

- Alternative means of undertaking the Project;
- Accidents and malfunctions;
- Effects assessment methods;
- Potential onsite habitat development;
- Coastal geomorphology;
- Sediment quality;
- Water quality;
- Air quality;
- Noise and vibration;
- Light;
- Underwater noise;
- Visual resources;
- Roberts Bank ecosystem;
- Marine vegetation;
- Marine invertebrates;
- Marine fish;
- Marine mammals;
- Coastal birds;
- Commercial, recreational, and Aboriginal fisheries;
- Labour market;
- Economic development;
- Marine commercial use; and
- Archaeology and heritage.

Plain-language summaries of the respective workshop topics (presentations and handouts) were provided to the Aboriginal groups approximately two weeks in advance of all workshops. Aboriginal group input provided at the workshops and in written correspondence following the workshops was later incorporated into the EIS as detailed in **Appendix 7.2-B**.

Following the draft EIS workshops, PMV met individually with Aboriginal groups to present and discuss the preliminary findings of the assessments on human health (**Section 27.0**); potential or established Aboriginal and treaty rights and related interests (**Section 32.3**); and current use of land and resources for traditional purposes (**Section 32.2**), and sought input from each Aboriginal group. Materials were sent approximately two weeks in advance and meetings were held with the following Aboriginal groups:

- TFN;
- MFN;
- Semiahmoo First Nation;
- TWN;
- Cowichan Tribes;
- Penelakut Tribe;
- LCFN; and
- LFN.

Workshops were scheduled with the following Aboriginal groups; however, unfortunately they were unable to attend:

- Halalt First Nation;
- Stz'uminus First Nation; and
- MNBC.

Attempts were made to schedule a workshop with Hwlitsum First Nation; however, they did not provide a time that they were available to meet.

In their absence, all information that was to be presented or discussed at these meetings was provided by PMV with a request for feedback and an opportunity to meet and discuss further.

Information on preliminary EIS findings was provided to Stó:lō Council and Stó:lō Nation with a request for feedback. No meetings were proposed by PMV.

7.2.1.6 Canadian Environmental Assessment Agency Consultation

In the course of its consultation processes for the Project, PMV has also reviewed the publicly available comments by Aboriginal groups who have participated in CEA Agency's independent consultation process for the Project. Port Metro Vancouver has considered and incorporated this information into the EIS, where appropriate.

7.2.1.7 Collection of Aboriginal Traditional Knowledge

The Aboriginal engagement and consultation process also involved the collection and integration of ATK to inform Project planning, effects assessment, and identification of proposed mitigation measures.

As part of its consultation planning process, PMV consulted CEA Agency's published document entitled, *Considering Aboriginal traditional knowledge in environmental assessments conducted under the Canadian Environmental Assessment Act - Interim Principles* for general guidance on the consideration of ATK in the EA. Aboriginal traditional knowledge refers to knowledge that is held by and unique to Aboriginal peoples, and is generally acquired and accumulated by an Aboriginal community through generations of living in close contact with nature. This knowledge is both cumulative and dynamic, adapting to social, environmental, spiritual, and political change (CEA Agency 2013). Aboriginal traditional knowledge includes traditional ecological knowledge about the local environment, how it functions, and its characteristic ecological relationships, as well as knowledge about past and current traditional use.

Port Metro Vancouver collected ATK through the methods presented below.

Aboriginal Traditional Knowledge Literature Reviews

In 2013, PMV conducted a gap analysis of existing ATK, prior to EIS development, to review accessible information contained in reports or readily available filings relating to areas at or near the proposed Project area. Secondary sources of ATK were reviewed with respect to different Aboriginal groups and VCs. These sources included ethnographic (e.g., Rozen 1985, Marshall 1999, Carlson 2001, Thom 2005, Lepofsky et al. 2007) and ethno-botanical references (e.g., Turner 1995, 1998, Turner and Hebda 2012).

Aboriginal Traditional Knowledge Meetings and Workshops

Aboriginal engagement and consultation included a fisheries-related meeting with MFN fisheries department staff (January 2013) and a TFN workshop with elders and fishers (December 2012 and April 2013), respectively. While crabs and finfish were the focus of these workshops, shellfish and traditional plants were also discussed. Aboriginal traditional knowledge and other information shared in these workshops influenced field study designs. Port Metro Vancouver sent correspondence in July 2013 to other Aboriginal groups offering to discuss options for gathering additional ATK. Follow-up contacts were made regarding traditional use study areas and access to traditional use information.

Aboriginal Traditional Knowledge Questions and Interviews

To collect and integrate additional ATK, consultants undertaking studies on behalf of PMV developed initial lists of questions that PMV could pose to elders and community members. Refined lists of questions were developed for different Aboriginal groups based on information contained in previous correspondence and reports, and meetings were arranged, where possible. Consent forms informed participants about the purpose of the ATK collection process and how the information would be used. Upon completion of the interviews, ATK that was permitted to be shared publicly was provided to the Project team. Additional interviews were then conducted to seek further clarification on the ATK. Where interviews were not possible, PMV provided a list of questions related to ATK to the Aboriginal group requesting further information, if and where available. The finalised ATK was then collated and summarised in a manner that could be readily integrated (and cited) in the EIS.

Sponsorship of Additional Studies

As noted in **Section 7.2.1.3**, PMV has entered into agreements with all of the identified Aboriginal groups to support the collection and identification of additional ATK, as well as current use for traditional purposes. **Table 7-4** identifies those additional ATK and current use reports sponsored by PMV and provided by Aboriginal groups for the purpose of further informing the Project.

In discussions with TFN, PMV was advised to use information contained in the *Tsawwassen First Nation Final Agreement*, and in documents prepared pursuant to that agreement. Following a review of the *Tsawwassen First Nation Final Agreement* information, and conducting of ATK-related interviews (as described above), TFN informed PMV that the information gathered was sufficient for the purposes of the EIS.

Table 7-4 Aboriginal Traditional Knowledge and Current Use Reports Provided for the Project

Aboriginal Group	Report Provided
Cowichan Nation Alliance	Port Metro Vancouver: *Roberts Bank Terminal 2: Cowichan Occupation and Use*. (Kennedy 2014)
Cowichan Nation Alliance	Port Metro Vancouver: *Roberts Bank Terminal 2: Cowichan Nation Alliance Current and Planned Use*. (Hwitsum Consulting 2014)
Hwlitsum First Nation	*The Hwlitsum First Nation's Traditional Use and Occupation in the Area Now Known as British Columbia*, Volume 1. (Wilson et al. 2009)
Hwlitsum First Nation	*The Hwlitsum First Nation's Traditional Use and Occupation in the Area Now Known as British Columbia*, Volume 2. Hwlitsum Marine Traditional Use Study. (Wilson et al. 2013)
LCFN	*Ts'uubaasatx Traditions: Roberts Bank Marine and Terrestrial Resource Use.* (Chuuchkamalthnii 2014)
LFN	*Lyackson First Nation Knowledge and Use: Existing Data Summary Report for Port Metro Vancouver's Proposed Roberts Bank Terminal 2 Project*. (Candler et al. 2014)
MNBC	*Métis Use and Occupancy Study Port Metro Vancouver Roberts Bank Terminal 2 Project 2014.* (MNBC 2014)
MFN	*Contemporary Musqueam Use of the South Fraser Delta. Preliminary Draft, Musqueam First Nation*. (Woolman, J. 2014)
MFN	*Traditional Musqueam Use of the Southern Fraser Delta.* (Ham. 2014)
Semiahmoo First Nation	*An Interim Report on the Traditional Land and Marine Resource Use and Practices of the Semiahmoo First Nation for the Proposed Roberts Bank Terminal 2 Project Port Metro Vancouver (PMV), British Columbia –* DRAFT. (Semiahmoo First Nation 2014)
TWN	*Tsleil-Waututh Nation Knowledge Study Roberts Bank Terminal 2 Project*. (TWN 2014)

7.2.2 Pre-EIS Submission Consultation Process

This section describes consultation activities undertaken with Aboriginal groups between January 2011 and December 2014, which occurred in three phases, as identified below:

- Pre-EIS engagement and consultation (January 2011 to August 2013);
- Project Description engagement and consultation (September to December 2013); and
- EIS development engagement and consultation (January to December 2014).

Specific details on each phase of the Aboriginal engagement and consultation process, as undertaken with each of the 14 Aboriginal groups identified above is presented in **Appendix 7.2-A**. Information on future plans for engagement and consultation during the panel review phase and following Project review and approval, construction, and operation are presented in **Section 7.2.3**.

7.2.2.1 Pre-EIS Engagement and Consultation

Beginning in January 2011, the initial phase of PMV's Aboriginal engagement and consultation process was developed to facilitate discussions regarding the preferred approaches to engagement and consultation by Aboriginal groups. Introductory meetings were also conducted to identify an agreed-upon process for consultation with each respective Aboriginal group.

In October 2012, PMV notified Aboriginal groups that it was proceeding with the Project. Along with the preliminary notification letter, PMV provided general Project-related information and communicated PMV's interest in initiating Project-related engagement and consultation processes.

During this phase, Aboriginal groups were also provided with copies of the *Pre-Consultation Discussion Guide* (PMV 2011), which included a preliminary design and provided directions for Aboriginal groups on how to provide feedback. In addition to direct meetings and discussions with community representatives, communication methods included email and follow-up phone calls and provision of a variety of Project-related information (hard copy and digital format) for information and comment.

Starting in August 2013, Aboriginal groups were provided with copies of their respective community profile information for review and comment as part of the development of the Project Description. Following receipt of feedback on the respective community profiles, Aboriginal input was incorporated and the Project Description was submitted to the CEA Agency in September 2013.

7.2.2.2 Project Description Engagement and Consultation

Through the Project Description phase, PMV continued to engage and consult with those Aboriginal groups described above. From September to December 2013, PMV conducted engagement and consultation activities that focused on obtaining feedback on the Project Description. Building on input from previous engagement and consultation activities, PMV developed goals for this phase of engagement and consultation, which are identified as follows:

- Provide Aboriginal groups with additional details about the Project's preliminary design;
- Deliver presentations regarding the Project Description; and
- Seek specific input regarding potential Project-related effects and mitigation measures.

To meet these objectives, PMV focused engagement and consultation activities on the Project Description. The following activities and mechanisms were implemented in support of this objective.

Project Information Disclosure

Port Metro Vancouver and Aboriginal groups continued to communicate by letter, email, and phone calls to organise meetings, exchange ideas, and discuss a variety of Project-related information including the following:

- Funding in support of the Project's consultation process and development of a study on current use of lands and resources for traditional purposes;
- Review and solicitation of input on the draft archaeological overview assessment; and
- Request for feedback on the TAG Summary Reports (see **Section 7.4**).

In addition, PMV also provided Aboriginal groups with technical reports related to environmental studies and port development at Roberts Bank, including the following:

- *Preliminary Container Traffic Projections for Port Metro Vancouver: 2011 to 2030* (Executive Summary), May 2011;
- *Micro Economic Impact Study of Container Activity at Port Metro Vancouver*, November 2011;
- *Projections of Vessel Calls and Movements at Deltaport and Westshore Terminals*, November 2011;
- *Roberts Bank Terminal 2 Project Trade-Off Summary*, February 2012;
- *Port Metro Vancouver Container Forecasts*, August 2012;
- *Roberts Bank Terminal 2 Project Overview*, October 2012;
- *RBT2 Project Definition Consultation Summary Report*, October 2012;
- *RBT2 Project Definition Consideration of Consultation Input*, October 2012; and
- *RBT2 Baseline Field Studies Terms of Reference*, February 2013.

Direct Communication

Port Metro Vancouver organised meetings with Aboriginal groups to build on the previously listed topics of discussion and provide Project updates including details on the anticipated EA process. Tsawwassen First Nation and Musqueam First Nation were also invited to participate in the TAG process outlined in **Section 7.4**.

Meetings provided an opportunity to discuss capacity funding and identify an efficient and effective way for Aboriginal groups to participate in the EA process, including means for providing information on the current use of lands and resources for traditional purposes. Port Metro Vancouver also provided an opportunity for Aboriginal groups to express any concerns or identify potential effects on their asserted or established rights and interests in order for PMV to consider any related potential design or operational changes with respect to the Project.

7.2.2.3 EIS Development Engagement and Consultation

On January 7, 2014 CEA Agency finalised the *EIS Guidelines* and formally informed those Aboriginal groups identified as requiring consultation for the Project.

From January to December 2014, Aboriginal group engagement and consultation focused on PMV activities and deliverables associated with EIS development. These activities focused on sharing information and receiving feedback on effects assessment methods and findings, and on identifying and considering strategies or measures to mitigate potential adverse Project-related effects. Goals associated with this phase of the Aboriginal group engagement and consultation included the following:

- Identifying how Aboriginal groups wished to be consulted;
- Identifying interests of Aboriginal groups and potential options for addressing such issues and interests;
- Sharing information and receiving feedback on proposed methods for the EIS;
- Sharing information and receiving feedback on potential VCs;
- Obtaining information on ATK;
- Obtaining information on current use of lands and resources for traditional purposes;
- Sharing information and receiving feedback on preliminary EIS results, potential effects, and proposed mitigation; and
- Discussing options for engagement and consultation activities during future phases of the EA process.

To meet the goals of the engagement and consultation activities associated with EIS development, activities that were implemented are described below.

Direct Communication

In 2014, PMV continued to engage with Aboriginal groups via meetings, telephone calls, letters, and emails to build on the previous topics of discussion and to provide Project updates. This consultation also focused on presenting information on EIS-related studies of interest to Aboriginal groups and soliciting feedback from Aboriginal groups on the consultation undertaken to date. Discussions continued to take place with regard to identifying options for consultation activities during future phases of the EA process.

Technical Workshops and Working Groups

Aboriginal groups were invited and attended PMV-led Working Group meetings. Details of Working Group discussions are presented in **Section 7.1.1.3**. All groups, regardless of their participation, received meeting notes from each of the events and were provided with the opportunity to provide feedback.

During the EIS development phase, as described in **Section 7.2.1.5,** PMV hosted two workshops to consult on the proposed VCs (June 6 and July 3, 2014), and six additional workshops to consult on the draft EIS (October and November 2014). Individual meetings were then undertaken to further discuss the status of preliminary findings of the assessment of potential effects on Aboriginal group current use and Aboriginal rights and related interests (November and December 2014).

Input provided from Aboriginal groups at the meetings, and in written correspondence following the workshops, was subsequently incorporated into the EIS.

7.2.2.4 Process for Tracking and Responding to Comments and Issues Raised by Aboriginal Groups

Issues raised by Aboriginal groups have been documented throughout the consultation process. Port Metro Vancouver has responded, where answers have been available, in meetings, by email, and by phone. Formal written responses have been provided for questions that could be addressed with information available at the time and for those topics where written correspondence would advance the consultation or Project planning. The issues and interests raised by Aboriginal groups during the engagement and consultation processes have been compiled in **Appendix 7.2-B**, which also includes PMV responses as to how these issues and interests have been incorporated and addressed within the EIS (based on the information available at the time of EIS submission).

7.2.2.5 Summary of Aboriginal Group Issues and Interests

Key issues and interests raised by Aboriginal groups throughout the engagement and consultation process are identified as follows:

- The capacity to engage with PMV in consultation about the Project, and specifically funding for this engagement;
- Potential Project-related effects to marine invertebrates, fish, and marine mammals, and the ability for Aboriginal groups to harvest invertebrates and fish;
- Potential Project-related effects to birds and the ability for Aboriginal groups to harvest birds;
- Potential Project-related effects on Aboriginal groups' current use of land and resources for traditional purposes;
- Potential Project-related effects on the ability to exercise asserted or established Aboriginal and treaty rights;
- Potential Project-related effects associated with accidents and malfunctions;
- Potential Project-related effects associated with changes in noise, light, and visual aesthetics on the activities of Aboriginal groups;
- Potential Project-related effects associated with environmental changes caused by the Project, such as changes in air quality, on the health of Aboriginal group members; and
- The importance of addressing cumulative effects from the Project and other past, present, and future (reasonably foreseeable) projects.

During PMV's consultation with Aboriginal groups on potential VCs (April to July 2014), Aboriginal groups provided input and asked questions. Through this process, PMV determined that the proposed VCs included the input provided by Aboriginal groups to identify specific components as either a VC, a sub-component, or a sub-component species or topic. As a result of this consultation, no additional VCs were included.

7.2.2.6 Process for Resolving Outstanding Issues Raised by Aboriginal Groups

A description of the potential adverse effects on asserted or established Aboriginal and treaty rights or related interests is provided in **Section 32.3 Potential Adverse Impacts on Aboriginal and Treaty Rights and Related Interests Analysis.** Topics raised by Aboriginal groups that PMV considers to be outstanding are documented in **Section 32.3.3.4 Outstanding Aboriginal Issues**.

Port Metro Vancouver is committed to working with Aboriginal groups to identify potential adverse effects of the Project on established and asserted Aboriginal or treaty rights and related interests. In addition PMV continues to seek and identify ways to avoid, mitigate, or otherwise accommodate those effects, and will continue to do so through the panel review process.

7.2.3 Future Planned Engagement and Consultation

Following EIS submission, PMV will continue to consult with Aboriginal groups to clarify information on the Project and EIS; provide additional information; and discuss potential environmental effects from the Project, potential impacts on their ability to exercise asserted Aboriginal or Treaty rights and related interests, and potential mitigation and accommodation. Information received by PMV after submission of the EIS will continue to be tracked and addressed outside of the EIS and made available to CEA Agency.

Port Metro Vancouver will continue to implement and document the following:

- Engagement and consultation activities with Aboriginal groups;
- Opportunities provided to Aboriginal groups to identify asserted or established Aboriginal and treaty rights, interests, and issues related to the Project;
- The means of information distribution used to support engagement and consultation with Aboriginal groups;
- The proposed process for tracking and reporting issues and interests raised during all future stages (EA review stage, permitting stage, and through construction and operation phases); and
- The issues and interests identified during post-EIS submission consultations, and how these matters have been or will be addressed.

7.3 LOCAL GOVERNMENT AND PUBLIC ENGAGEMENT AND CONSULTATION

This section presents the details of the engagement and consultation process that PMV undertook with local government and the public regarding the Project. Engagement activities that took place during the pre-EIS submission phase are described, along with PMV's local government outreach and engagement program. Future planned engagement and consultation activities are also identified.

7.3.1 Engagement and Consultation Process Overview

In January 2011, during early Project planning stages, PMV initiated a process to engage and consult with local government and the public about the Project. This process has been undertaken through the development of the Project Description, as well as the EIS, and will continue throughout the EA process.

The purpose of PMV's local government and public engagement and consultation process is as follows:

- Engage with and inform local government and the public about the Project and facilitate opportunities for these parties to provide input to PMV;
- Consult with these parties regarding Project features and potential Project-related effects and benefits; and
- Consider local government and public input and community knowledge related to technical, environmental, economic, social, heritage, and health effects and benefits of the Project.

Section 7.3.2 outlines pre-EIS submission and current engagement and consultation activities. These engagement activities are listed chronologically. **Section 7.3.3** outlines future planned engagement and consultation activities that will be undertaken by PMV throughout and following the EA process.

The CEA Agency's *Public Participation Guide* (CEA Agency, 2013) notes that the terms **engagement** and **consultation** can mean different things to different groups. In the context of local government and the public, engagement refers to ongoing information exchange, primarily through meetings, responding to public enquiries, as well as information disclosure using various print and online methods.

Consultation in **Section 7.3.2** refers to specific periods of time where PMV requested input on specific topics, as well as general comments on the Project. These rounds of consultation are in addition to public comment periods provided by the CEA Agency. Ongoing engagement activities are described in **Section 7.3.2.1**. Engagement activities specifically focused on local government are described in **Section 7.3.2.2**. **Section 7.3.2.3** describes the purpose, process, methods, and activities PMV used to notify and consult with the public, as well as how input was documented and considered during each round of engagement and consultation.

7.3.2 Pre-EIS Submission Engagement and Consultation Activities

7.3.2.1 Engagement through Information Distribution

Since 2011, PMV has been using a variety of methods to engage with the public regarding the Project. These methods are identified as follows.

Public Enquiry–Response Program

Port Metro Vancouver receives and responds to public enquiries regarding the Project through a dedicated phone line, email and mail, and in person at PMV's Delta Community Office. The issues and interests raised in these enquiries have been considered during Project planning and preliminary design, and in development of the EIS, and are presented in **Appendix 7.3-B**.

Between January 1, 2011 and December 31, 2014, a total of 114 public enquiries were received.

Appendix 7.3-C Public Enquiries Program Sources and Topics lists the sources and topics of public enquiries.

Field Study Notices and Project Information Sheets

In response to public requests for information about environmental studies being undertaken for the Project, PMV provides regular notifications regarding Project-related technical and environmental studies taking place at Roberts Bank and the surrounding area. Beginning in February 2011, monthly field study notices have been emailed to individuals and organisations included in the Project email database, and have been posted to the Project website (PMV 2012a). In addition, information sheets about the Project, developed in August and November 2014, are available on the Project website and at the Delta Community Office.

See **Appendix 7.3-D List of Communications and Consultation Materials** for a list of Field Study Notices and Project Information Sheets.

Port Community Liaison Committee – Delta

The Port Community Liaison Committee – Delta (PCLC) provides a forum for dialogue about Port-related issues in Delta. The PCLC, which includes participants from the Corporation of Delta, Tsawwassen First Nation, industry representatives, members of the community, and

PMV, meets to discuss issues related to the existing port operations and development in Delta. The PCLC was modelled after the community liaison committee for the Deltaport Third Berth Project. The PCLC meets four to six times per year, or on an as-needed basis.

The PCLC-Delta was notified and engaged during each round of consultation.

Twenty-two meetings of the PCLC took place between May 2011 and December 31, 2014, although RBT2 was not always a topic of discussion during these meetings. Meeting notes are available on the PMV website (available at the following link: http://www.portmetrovancouver.com/en/community/CommunityLiaisonCommittees/PCLC.aspx).

Community Outreach Program

Community outreach activities have been focused on engagement with a network of stakeholders, including academics, industry associations, and businesses in the port supply chain, and have involved regular updates and information about the Project.

Between December 2011, when community outreach activities began, and December 31, 2014, PMV participated in 36 meetings and met with more than 180 stakeholders. During these meetings, PMV delivered presentations regarding the Project, responded to questions, and notified attendees about upcoming consultation opportunities.

A list of these community outreach meetings is presented in **Appendix 7.3-E List of Engagement and Consultation Meetings**.

Project Website and PortTalk

The Project website, launched in October 2012 (PMV 2012a), provides the following information:

- Project information and technical reports related to RBT2 environmental studies;
- Documents related to environmental studies undertaken for historic port development at Roberts Bank over the last 40 years;
- PMV and Project contact information; and
- Project updates, including notifications about public consultation events and how to access consultation materials.

As of December 2014, the website contained the following sections:

- **About the Project** – Provides an overview of the Project, as well as information regarding the Container Capacity Improvement Program;
- **News & Updates** – Lists all Project updates and notifications in reverse chronological order and allows readers to sign up to receive Project updates;
- **Consultation** – Provides an overview and summary of the local government and public consultation process undertaken to date. During consultation rounds, this section includes links to consultation materials and an online feedback form;
- **Environment** – Provides an overview of the RBT2 EA process and field studies program, including the terms of reference for field studies and monthly notification of field study activities; and
- **Information Centre –** Includes more than 50 documents about the Project related to past public consultation, environmental studies, and technical reports. In response to requests received from the public, this component of the website also includes approximately 100 technical reports related to historic development at Roberts Bank.

In addition to the Project website, PMV hosts PortTalk, an online engagement platform (PMV 2014) that includes information about the Project and provides an opportunity for members of the public to ask questions, contribute community knowledge, and provide feedback.

Project Video

In September 2014, PMV developed a Project video, which includes a computer animation of the Project components. The video can be found on the Project website (http://www.robertsbankterminal2.com/).

Project Email Database

Port Metro Vancouver provides information via email regarding Project updates, opportunities for participation in consultation, and other Project information to stakeholders registered in the Project email database. This database includes stakeholders who were registered to receive updates regarding previous port development at Roberts Bank (e.g., Deltaport Third Berth Project), and those who signed up to receive Project updates through the Project website. The database includes a broad range of stakeholders, including members of the public, community groups, businesses, and environmental groups, as well as representatives of local and regional governments. As of December 31, 2014, the database contained more than 1,200 email addresses.

Media Relations

Media relations activities have been and continue to be undertaken to provide information and updates regarding the Project, as well as to provide public notification of consultation opportunities. Media relations activities conducted to date include the following:

- Responses to media enquiries and interview requests;
- Provision of technical media briefings;
- Submission of Information Bulletins or News Releases to local newspapers; and
- Media notifications regarding opportunities for public consultation and other events.

Delta Community Office

Port Metro Vancouver opened a community office in the Trenant Park Square Shopping Centre in Delta in October 2014. The Delta Community Office provides a place for community members to speak with PMV staff about port operations, initiatives, and projects, including RBT2, and to obtain Project information. The office is open Wednesday to Friday from 10:00 a.m. to 6:00 p.m., and on Saturday from 10:00 a.m. to 4:00 p.m.

Between the office opening and December 31, 2014, more than 500 people visited the Delta Community Office.

7.3.2.2 Local Government Outreach and Engagement Program

Since May 2011, PMV has engaged with local and regional governments regarding the Project.

During the pre-consultation period, small group meetings were held with representatives of local governments to support the development of PMV's Local and Regional Government Outreach and Engagement Program. The program includes two streams of activity, which are described below.

Local Government Elected Roundtable

The Local Government Elected Roundtable is an information-sharing committee that provides a forum in which PMV and elected officials from local and regional governments can discuss community interests, issues, and benefits related to the Project. Commencing in June 2013, the Local Government Elected Roundtable includes representatives from the Corporation of Delta, City of Langley, Township of Langley, City of Richmond, City of Surrey, Metro Vancouver's Transportation Committee, Tsawwassen First Nation, and PMV. Port Metro Vancouver provides the Local Government Elected Roundtable with regular updates about Project planning and development.

The location of the meetings rotates among participating municipalities. Each meeting is chaired by PMV's Vice-President of Corporate Social Responsibility, and the Local Government Elected Roundtable representative of the host municipality has the option to co-chair.

The Local Government Elected Roundtable meets quarterly. Between June 2013 and December 2014, five meetings took place in Vancouver, Delta, Surrey, the Township of Langley, and City of Langley.

Local Government Technical Liaison Committee

Commencing in October 2012, Local Government Technical Liaison Committees provide a forum for regular communications between Project staff and staff from the Corporation of Delta, City of Langley, Township of Langley, City of Richmond, and City of Surrey. Meeting with each municipality individually or jointly, at their request, the Local Government Technical Liaison Committees provides opportunities to address the interests of the participating local governments pertaining to Project-related technical components or activities. These meetings also allow members to review draft study outlines, completed studies, and technical information related to the Project. Meetings are co-chaired by representatives from PMV and the respective host municipality.

Between October 2012 and December 2014, 36 Local Government Technical Liaison Committee meetings were held.

Local Government Engagement Reporting

Port Metro Vancouver produced Local Government Outreach Summary reports in February 2014 (covering meetings held in 2012 and 2013) and November 2014 (covering meetings held in 2014). These reports present the various meeting minutes and summarise the issues and interests raised in the Local Government Elected Roundtable and Local Government Technical Liaison Committees meetings, as well as PMV's response. These reports are distributed to the Local Government Elected Roundtable and Local Government Technical Liaison Committee members, and are available on the Project website (PMV 2012a).

Summary of Topics Raised through Engagement Activities

A summary of the interests and issues raised by local government through the Local Government Outreach and Engagement Program and other government enquiries can be found in **Appendix 7.3-A**, along with PMV's response.

Key issues and interests raised by local government through ongoing engagement and consultation activities include the following:

- Desire for information about the Project;
- Interest in information regarding alternatives to the Project and design alternatives;
- Enquiry regarding the EA process, including timelines, opportunities for public comment, approach to effects assessment and presentation of effects assessment results;
- Changes caused by the Project to air quality, noise, and light;
- Benefits of the Project;
- Effects of the Project on traffic and congestion on local roads; and
- Cumulative effects of the Project in combination with other projects and activities that have been and will be carried out.

7.3.2.3 Public Consultation

In addition to these ongoing engagement activities, PMV undertook a multi-year, multi-round public consultation process. Public consultation was conducted to seek input regarding the following:

- How participants wanted to be consulted and on which topics;
- Elements of Project design;
- Scope of environmental studies;
- Potential Project-related effects; and
- Preliminary environmental mitigation concepts.

Four rounds of public consultation were held during the pre-EIS submission phase, which are identified as follows:

- Pre-Consultation (June 2011);
- Project Definition Consultation (October to November 2012);
- Pre-Design Consultation (October to November 2013); and
- Preliminary Environmental Mitigation Concepts (September to October 2014).

Public input received during each of these rounds is presented in **Appendix 7.3-B**, along with PMV's response. Port Metro Vancouver has documented its consideration of issues and interests raised by members of the public. Port Metro Vancouver acknowledges that there may be some issues or interests, such as opposition to the Project, items outside of the scope of the Project EA, or policies outside of PMV's jurisdiction, which may remain unresolved from the perspective of a member of the public. From PMV's perspective, there are no issues within the scope of the Project EA which have not been considered and resolved as a result of changes to the Project or development of mitigation measures.

Public Notification

Port Metro Vancouver issued broad public notifications regarding opportunities for public participation in each round of consultation, using the following means:

- **Newspaper advertisements –** Prior to each round of public consultation, notification of consultation opportunities (e.g., small group meetings, open houses, online consultation) was placed in community newspapers including –
    - Delta Optimist,
    - Langley Advance,
    - Langley Times,
    - Richmond News,
    - Richmond Review,
    - South Delta Leader,
    - Surrey Leader, and
    - Surrey Now;
- **Emails to the Project email database –** PMV sent invitation emails to the Project email database, inviting recipients to participate in small group meetings and open houses, or to complete an online feedback form. Emails were also sent to remind recipients to submit their feedback prior to the end of consultation.
- **Website –** The Project website is updated regarding the date, time, and location of upcoming consultation. Consultation discussion guides and feedback forms were hosted online during rounds of consultation.
- **Household mailers –** PMV sent mailers to approximately 18,000 households in Delta, B.C., prior to Pre-Design Consultation (October to November 2013) and consultation regarding Preliminary Environmental Mitigation Concepts (September to October 2014). These mailers included information about opportunities to participate in consultation and a schedule of open houses and small group meetings.
- **Phone-call reminders** – Prior to each round of consultation, phone calls were made by PMV to remind people about small group meetings and open houses.
- **Media –** Local media were advised of the consultation opportunities in their respective communities.
- **Social media –** Tweets were sent from the PMV Twitter account (@PortMetroVan) to approximately 7,000 followers (as of October 2014), providing notification of opportunities to participate in consultation, including small group meetings, open houses, and opportunities to complete the online feedback form.

Consultation Methods

Consultation methods included the following:

- **Consultation discussion guides and feedback forms -** A discussion guide was produced for each round of consultation, providing general and technical information about the Project and defining the consultation topics. Each discussion guide included a feedback form with questions related to the consultation topics, as well as space for providing additional comments. Discussion guides and feedback forms were made available at in-person consultation events (i.e., small group meetings and open houses, discussed below), as well as through the Project website (PMV 2012a). An online version of the feedback form was available, which allowed participants to submit feedback directly using a web-based format.

  For a list of consultation discussion guides and feedback forms, please see **Appendix 7.3-D**.

- **Small group meetings –** Small group meetings (up to 40 people per meeting) were held with members of the public and local government. Participants were provided with a discussion guide and a feedback form. Members of the Project team presented the content of the discussion guide and responded to questions. Small group meetings were moderated by a professional facilitator. Meeting notes were taken and made available on the Project website as part of the consultation summary reports.
- **Open houses –** Open houses provided an opportunity for the public to view information about the Project on display boards, and have informal one-on-one or small-group discussions with members of the PMV Project team. Feedback forms were collected at the open houses and the input was considered by PMV during the consultation process. At some open houses, a question-and-answer session was held, facilitated by a professional facilitator. Meeting notes were taken at question-and-answer sessions, and are available on the Project website as part of the consultation summary reports.
- **Submissions –** The Project received submissions and input regarding the Project through email, phone, and PortTalk throughout each period of consultation.

Consultation Rounds and Activities

The following section summarises PMV's consultation activities from June 2011 to December 2014.

- **Pre-Consultation, June 2011**

  Port Metro Vancouver undertook pre-consultation activities from June 6 to June 30, 2011 to seek input from the public about the design of the Project's consultation program. Specifically, participants were asked how they wanted to be consulted and what topics they wished to discuss regarding the Project.

In total, 73 people attended seven small group meetings, 55 feedback forms were returned, and one submission was received by email. Additionally, four local government meetings were held during this pre-consultation period with the Corporation of Delta, City of Langley, Township of Langley, and the City of Richmond.

The feedback received during the pre-consultation period is summarised in the Pre-Consultation Summary Report (2011), and PMV's consideration of pre-consultation input is presented in the Consideration of Pre-Consultation Input document (2012), available on the Project website (accessible at portmetrovancouver.com/RBT2).

- **Project Definition Consultation, October to November 2012**

  From October 22 to November 30, 2012, PMV conducted Project Definition consultation. During this round of consultation, 86 people attended 7 small group meetings, 72 people attended 5 open houses, 17 people participated in community interviews, 47 feedback forms were returned, and 27 submissions were received through mail or email. Additionally, meetings were held with the Corporation of Delta, City of Langley, City of Richmond, Metro Vancouver, and the Delta Farmers' Institute.

  Based on input received during Pre-Consultation, Project design, the development of the environmental studies program, and engagement with local governments, PMV provided information and sought feedback regarding the following topics –

  - Type of berth structure for the new terminal,
  - Location of rail intermodal yard,
  - Compensation for potential loss of agricultural productivity,
  - Issues scoping for environmental studies, and
  - Community legacy benefits.

  The input received during Project Definition Consultation is summarised in the Project Consultation Summary Report (2012) and PMV's consideration of Pre-Consultation input is found in the Consideration of Pre-Consultation Input document (2013).

- **Pre-Design Consultation, October to November 2013**

  From October 7 to November 12, 2013, PMV held Pre-design consultation. During this round of consultation, 100 participants attended 6 small group meetings, 96 people attended 5 open houses, 84 feedback forms were returned, and 44 submissions were received by mail or email.

  Building on community input from previous rounds of consultation regarding the Project, PMV provided information and sought feedback regarding the following topics –

  - Four potential categories of habitat mitigation, including
    - Development of multiple smaller, species-specific habitat areas,
    - Restoration or protection of a large habitat area,

        - Infrastructure (e.g., construction or funding for infrastructure development that would benefit fish, wildlife, and birds), and
        - Community resources (e.g., provision of funding to groups dedicated to protecting or supporting fish, wildlife, and birds),
    - Port-related operational and technical improvements, and
    - Community legacy benefits – Based on public input received during Project Design Consultation, PMV shared and sought feedback regarding the potential for community legacy benefits in the categories of environment, community well-being, and transportation.

- **Preliminary Environmental Mitigation Concepts, September to October 2014**

  From September 15 to October 10, 2014, PMV held Preliminary Environmental Mitigation Concepts consultation. During this round of consultation, 44 participants attended 2 small group meetings, 9 people attended a Local Government Elected Roundtable meeting, 39 people attended 9 open houses, 25 feedback forms were returned, and 11 submissions were received by email.

  In support of PMV's focus on identifying ways to mitigate potential Project-related effects and, in the interest of receiving public input on mitigation concepts, PMV provided information and sought feedback on the following topics –

    - Light mitigation - Proposed measures that may be implemented during construction and operation to prevent or reduce Project-related effects of light on marine fish, coastal birds, and human health, and visual quality from viewpoints near the Project,
    - Noise mitigation – Proposed measures that may be implemented during construction and operation to prevent or reduce potential Project-related effects of noise on coastal birds, human health, marine commercial use, outdoor recreation, and current use of land and resources by Aboriginal groups for traditional purposes,
    - Air quality mitigation – Proposed measures that may be implemented during construction and operation to prevent or reduce potential Project-related effects of air emissions on human health, and
    - Onsite habitat concepts for marine vegetation, marine invertebrates, marine fish, and coastal birds – Feasibility of constructing onsite habitat mitigation adjacent to the terminal and causeway to soften the shoreline and provide habitats similar to those that exist today. Port Metro Vancouver sought feedback regarding five proposed habitat types including -
        - Tidal marsh,
        - Mudflat,
        - Subtidal reef,
        - Sand-gravel beach, and
        - Eelgrass bed.

Consultation Reporting

Following each round of consultation, a Consultation Summary Report was developed. Each report identified the consultation topics and presented a summary of discussions, as well as a list of the input provided by the public. The reports were written by a professional consultation firm and an independent research firm that undertook an analysis of the input provided. These reports, which are available on the Project website, include the following:

- Consultation methods and participant numbers;
- Notification of consultation opportunities;
- Quantitative results and qualitative summaries from feedback forms;
- Key themes from small group meetings and open house question-and-answer sessions;
- Meeting notes from small group meetings and open house question-and-answer sessions; and
- Feedback forms and submissions received during the consultation period.

Consideration of Consultation Input

To address input received during consultation, PMV developed a Consideration of Input Memo for each round of consultation from 2011 to 2013. These documents describe how PMV considered consultation input when refining Project designs or developing mitigation measures. The Consideration of Input Memos are available on the Project website.

The consideration of input from all rounds, including consultation held in 2014, is presented in **Appendix 7.3-B**.

Summary of Topics Raised through Engagement and Consultation

Key topics raised through engagement and consultation with the public include the following:

- Robustness of container demand forecasts and desire for information about the justification for the Project;
- Interest in information regarding alternatives to the Project and design alternatives;
- Enquiry regarding the EA process including timelines, opportunities for public comment, approach to effects assessment, and presentation of effects assessment results;
- Changes caused by the Project to air quality, noise, and light;

- Effects of the Project on terrestrial and marine wildlife, including vegetation (such as biofilm) and animals (such as birds and SRKWs);
- Benefits of the Project;
- Effects of the Project on traffic and congestion on local roads;
- Cumulative effects of the Project in combination with other projects and activities that have been and will be carried out; and
- Mitigation efficacy of the Habitat Enhancement Program and the ability to mitigate the effects of the Project.

Port Metro Vancouver has provided responses to the issues and interests raised by the public in **Appendix 7.3-B**.

7.3.3 Future Planned Engagement and Consultation Activities

This section presents PMV's future planned engagement and consultation activities with local governments and the public, including distribution of information regarding future engagement activities and other consultation activities planned following EIS submission.

7.3.3.1 Engagement and Information Distribution

Port Metro Vancouver will continue to provide local government and the public with up-to-date information regarding the Project during and subsequent to the EA process. Activities may include but will not be limited to those outlined in **Section 7.3.2.1**.

In addition, PMV will continue to engage local government through the established Local Government Elected Roundtable and Local Government Technical Liaison Committees described in **Section 7.3.2.2**. These activities will continue during and subsequent to the EA process and during construction. Should the Project proceed to construction, a construction communications plan will be developed to ensure that local residents and other stakeholders are aware of construction activities.

7.3.3.2 Consultation

Port Metro Vancouver will undertake additional consultation with local government and the public throughout and following the EA process. Should the Project proceed, potential future consultation topics may include mitigation for construction-related activities, construction communications activities, and detailed design features of the Project. Consultation notification and methods will be similar to those described in **Section 7.3.2.3**.

7.4 TECHNICAL ADVISORY GROUP PROCESS (2012 TO 2013)

In 2012, PMV conducted field studies and initiated development of effects assessment methods and work plans. Through the course of this work, PMV sought guidance on four focus areas to ensure a scientifically defensible assessment of potential Project-related effects and develop effective, technically and economically feasible mitigation strategies. These four topic areas, and the rationales for their inclusion as TAG topics, are as follows:

- *Coastal geomorphology* – The Project may introduce changes in coastal geomorphology (i.e., physical features and processes at Roberts Bank in the vicinity of the Project area), which can influence marine biological and ecological conditions; therefore, PMV recognised the merit in entering into dialogue with technical experts on how to best describe and interpret changes in coastal geomorphology in the Roberts Bank area.
- *Productive capacity* – The Project may introduce changes to the productive capacity[7] of the marine environment; therefore, PMV recognised the merit in entering into dialogue with technical experts on how to best describe and interpret changes in productive capacity of habitat associated with Roberts Bank.
- *Biofilm and shorebirds* – These environmental components were recognised as particularly important to federal and provincial regulatory agencies (EC – CWS; Ministry of Environment – Wildlife Branch), as well as Aboriginal groups, stakeholders, and the public. In addition, there was uncertainty related to biofilm science. Given the importance of biofilm and shorebird resources, coupled with the uncertainty in scientific knowledge of biofilm, PMV recognised the merit in entering into dialogue with technical experts on how to best describe and interpret biofilm and shorebird data in the Roberts Bank area.
- *Southern Resident Killer Whales (SRKWs)* – This topic was recognised as particularly important to federal and provincial regulatory agencies, as well as Aboriginal groups, stakeholders, and the public. Southern Resident Killer Whales are endangered under *SARA*. A recovery strategy for this species was developed in 2008 and subsequently amended in August 2011 (DFO 2011). The construction and ongoing operation of RBT2 will introduce noise and other physical changes to the environment, which could in turn have effects on SRKWs. In addition, there was uncertainty with respect to the applicability of and information requirements pertaining to *SARA*. PMV therefore recognised the merit in entering into dialogue with technical experts on how to best describe and interpret SRKW data for the RBT2 EIS.

[7] Defined as the maximum natural capability of habitats to produce healthy fish that are safe for human consumption, or to support or produce aquatic organisms upon which fish depend, this term is superseded by **ongoing productivity** (productivity) in the RBT2 environmental impact statement (EIS), as defined by the Fisheries Productivity Investment Policy.

Port Metro Vancouver established a TAG for each of the four topic areas. Each TAG consisted of leading technical experts from within regulatory agencies, academia, and non-governmental organisations (**Table 7-5**). Select Aboriginal groups were also invited to attend the TAG sessions; however, they declined to participate.

Each TAG was led by an independent and neutral facilitator and guided by Terms of Reference established for the TAG (PMV 2012b). One of the key statements in the TAG Terms of Reference was that "participation in this voluntary, pre-EA process will in no way fetter a TAG member's ability to later participate in, review, or intervene on a future EA associated with the proposed Terminal 2 Project" (PMV 2012b).

Table 7-5 Groups Represented in the Roberts Bank Terminal 2 Technical Advisory Groups

Coastal Geomorphology TAG	Biofilm and Shorebirds TAG
Dr. William McDougal, University of Florida	Dr. Tomohiro Kuwae, Coastal and Estuarine Environment Research Group, Port and Airport Research Institute
Dr. Michael Church, University of B.C.	Mark Drever, Environment Canada CWS
Dr. John Clague, Dr. Jeremy Venditti, Simon Fraser University	Dr. Terri Sutherland, DFO
Dr. Philip Hill, Pacific Geoscience Centre, Natural Resources Canada	Dr. Rob Butler, Independent consultant
Dr. Diane Masson, Dr. Terri Sutherland, DFO	Juergen Baumann, Independent consultant
Juergen Baumann, Independent consultant	Dr. John Takekawa, U.S. Geological Survey Western Ecological Research Centre
Proponent representatives (PMV, Hemmera, Northwest Hydraulic Consultants)	Dr. Matthew Fields, Montana State University
Facilitator (Compass)	Dr. Maycira Costa, University of Victoria
Andrew Robinson, Environmental Canada - CWS (Observer)	Dr. S David Lank, Ron Ydenberg, Simon Fraser University
	Proponent representatives (PMV, Hemmera, Northwest Hydraulic Consultants, WorleyParsons)
	Facilitator (Compass)
	Andrew Robinson, Environmental Canada - CWS (Observer)

Coastal Geomorphology TAG	Biofilm and Shorebirds TAG
Productive Capacity TAG	**SRKW TAG**
Dr. Sean Boyd, Environment Canada – CWS	Dr. Rob Williams, University of St. Andrews (Scotland)
Dr. Steve Macdonald, Brian Naito, Dr. Terri Sutherland, DFO	Dr. John Ford, DFO
Dr. Rob Butler, Independent consultant	Dr. Harald Yurk, Dr. Dominic Tollit, Sea Mammal Research Unit (SMRU Ltd.)
Juergen Baumann, Independent consultant	Dr. Lance Barrett-Lennard, Vancouver Aquarium
Proponent representatives (PMV, SENES, Hemmera)	Proponent representatives (PMV, Hemmera)
Facilitator (Compass)	Facilitator (Compass)
Andrew Robinson, Environmental Canada - CWS (Observer)	Dr. Louise Blight, Hussein Alidina, World Wildlife Fund (observer)

Each TAG shared a similar set of objectives as identified below:

- Build a common understanding of potential Project-related effects based on best available information;
- Provide input on methods for data collection and analysis, as well as input on methods for assessing potential adverse effects (on coastal geomorphology, biofilm and shorebirds, productivity, and SRKW);
- Identify priority information needs and related studies; and
- Identify opportunities for collaboration.

Participants in each TAG met on several occasions between November 2012 and May 2013.

Over the course of the TAG process, participants were tasked with the following:

- Review, discuss, and comment on information, studies, data collection and analysis, assessment methods, and work plans presented by PMV and its consultants;
- Provide input on potential key effects and cause-effect pathways;
- Provide input to help identify and prioritise key uncertainties and studies in support of the EA;
- Provide input on appropriate methods for data collection, data analysis, and assessing potential effects (e.g., field studies, modelling, etc.);
- Identify opportunities to mitigate potential adverse effects, and provide input on the likely effectiveness of such mitigation measures;
- Provide input on the definition of, and methods to assess and determine, the significance of potential effects (SRKW TAG only);

- Identify issue-specific considerations in the assessment of potential cumulative effects;
- Seek input from others within their organisations and share this input with PMV and other TAG participants;
- To the best of their ability, advise PMV of existing regulatory expectations, requirements, management objectives, or other guidance related to the TAG scope of work;
- Identify potential partnerships and collaborations with respect to improving the information base; and
- Provide input to guide the work of a focus group to address specific technical topics in detail.

Additional focus groups involving TAG participants and other technical experts were convened to discuss questions about potential effects pathways and effects hypotheses. Input provided by these focus groups was synthesised and presented to the TAGs to assist in the interpretation of study findings and identification of next steps.

Input provided by TAG process participants was compiled into a TAG Summary Report for each TAG topic (made available on PMV's Project website (PMV 2012a)). These reports document meeting dates, topics of discussion, existing information, the rationale and foundation for the topic-specific effects assessment, priority information requirements, and field study work plans relative to each topic. In addition to the TAG summary reports, PMV issued periodic summary updates throughout the TAG process to keep Aboriginal groups informed.

Appendix 7.4-A Technical Advisory Group Engagement Record provides a summary of the TAG meetings and **Appendix 7.4-B Technical Advisory Group Direction and Advice Tables** provides a summary of TAG feedback and endorsements (and documents how these were incorporated into the assessment).

The TAG process, with its emphasis on providing a forum for technical input, was intended to complement other forms of engagement with regulatory entities, Aboriginal groups and the public. Overall, the TAG process provided the basis from which PMV developed its approach to developing a thorough and scientifically defensible EA.

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