WesPac Tilbury Marine Jetty Project

Tilbury Island, Delta, BC

Project Description CEAA Summary

Presented under the

Canadian Environment Assessment Act

and the

British Columbia Environmental Assessment Act

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1.0 Introduction

1.1 Project Overview and Location

WesPac Midstream–Vancouver LLC ("WesPac") proposes to construct and operate a marine jetty for loading Liquefied Natural Gas (LNG) onto LNG carriers and LNG barges (the "Project") on Tilbury Island along the South Arm of the Fraser River, in Delta, British Columbia (BC) (Figure 1). The Project site is situated adjacent to the existing FortisBC Tilbury LNG Liquefaction Plant (Tilbury LNG Plant) and Varsteel / Dominion Pipe (Varsteel), approximately 21 km from the mouth of the Fraser River (Sand Heads), and 300 m downriver from Seaspan Ferries' Tilbury terminal (the "Project site") (Figure 2). The onshore portion of the Project site is situated on private land, while the offshore portion of the Project site is situated on crown lands (water lots) on the South Arm of the Fraser River, which have recently come under the jurisdiction of the BC Ministry of Forests, Lands and Natural Resource Operations (FLNR). Geographic ccoordinates for the approximate center of the Project site are 49° 8'30'N 123° 02'14"W. The closest identified permanent residents to the Project are three farm dwellings located approximately 750 m south on 68th Street, south of River Road. No other seasonal or temporary residents were identified within 1 km of the site (Figure 2).

The onshore portion of the Project (the "Onshore Facilities") will include all land-based components located on easements and rights-of-way inside the FortisBC property, parts of which are within the Project site boundary (Figure 3). The offshore portion of the Project (the "Offshore Facilities") will include all foreshore and water based components located outside the FortisBC property, but within the Project site boundary.

The Project is comprised of the following components:

- Removal of existing abandoned marine infrastructure currently occupying a portion of the water lots and shoreline;
- Dredging a maximum area of 18.7 ha and an initial dredge area of approximately 12.0 ha (Figure 3);
- Construction of a new marine jetty, including a vessel loading platform, access trestle and berthing dolphins, mooring dolphins and associated infrastructure (Figure 4); and
- Construction of associated Onshore Facilities (e.g., pipe rack, transfer pump, transfer pipe, access road, parking area and utilities).

Storage and processing of LNG are not part of this Project. The Project will receive processed LNG for transfer to LNG carriers and barges from the Tilbury LNG Plant (Figure 3). The marine jetty will accommodate one vessel at a time, either self-propelled LNG carriers up to 90,000 m^3 of LNG capacity that would serve offshore markets, or individual LNG barges up to 4,000 m^3 that would service regional markets. The marine jetty will support LNG transfer and loading from shore, above riparian areas via installation of an above ground pipe- rack system both offshore and onshore. The system to be installed will support service lines that connect to the Tilbury LNG Plant, enabling the transfer of LNG and other utilities. Project transfer facilities and control systems will be powered by electricity provided by BC Hydro.

Photographs of the Project site showing the locations proposed for components and activities of the Project are presented in Appendix A.

1.2 Project Jurisdictions

Jurisdictions and other parties, including Aboriginal groups and stakeholders, that WesPac has met with during the preparation of this Project Description include the following:

- Musqueam Indian Band;
- Tsawwassen First Nation;
- Cowichan Tribes;
- Halalt First Nation;
- Penelakut Tribe;
- Stz'uminus First Nation;
- Kwantlen First Nation;
- EAO;
- CEA Agency;
- British Columbia Oil and Gas Commission (OGC);
- FLNR;
- PMV;
- Corporation of Delta;
- Fraser River Pilots Association; and
- Adjacent landowners and operating companies, including FortisBC, Varsteel and Seaspan Ferries.

1.3 Regulatory Context

1.3.1 Environmental Assessment Act, SBC 2002, c. 43 (EAA)

The requirement for the Project to obtain an Environmental Assessment Certificate (EAC) under the EAA is based on thresholds prescribed in the *Reviewable Projects Regulation B.C*. Under Part 8 (4) of these regulations, the Project would be classified as a Marine Port Facility and would be a Reviewable Project according to the following:

> "*The proposals exceed the threshold for dredging, filling or other direct physical disturbance of 1,000m or more of linear shoreline, and/or 2 hectares (ha) or more of foreshore or submerged lands, below the natural boundary of a marine coastline or marine estuary".*

The Project exceeds the *Reviewable Projects Regulations* under EAA as the maximum dredge area is expected to be 18.7 ha, and an initial dredge area of approximately 12.0 ha is proposed. To date, WesPac has provided an overview of the Project, initiated consultation with the EAO regarding the Project's design, and proposed measures to mitigate potential effects that may occur as a result of the Project.

1.3.2 Canadian Environmental Assessment Act, 2012 S.C. 2012, c.19, s.52, (CEAA)

The requirement for the Project to obtain an environmental assessment decision to proceed under CEAA is based on thresholds prescribed in the *Regulations Designating Physical Activit*ies (*Section 24 (c)).* The following threshold specifies that a federal environmental assessment is triggered for a:

> *"Marine terminal designed to handle ships larger than 25,000 DWT unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation*"

The Project is designed to receive LNG carriers of approximately 47,000 DWT (90,000 m^3 of LNG capacity), therefore, it exceeds this threshold.

1.3.3 Past and Current Environmental Studies in the Region

The Project is not located in a region of the province that has been subjected to a regional environmental study as defined in CEAA. In addition, the Project does not require federal funding support from federal authorities. The EA prepared for the Vancouver Airport Fuel Facilities Corporation's Vancouver Airport Fuel Delivery Project, situated approximately 1.2km northwest of the Project, and has been identified as the closest EA to the Project site (Figure 2). That project received an EAC on December 11, 2013. Publicly available information from that EA and other relevant EA's in the surrounding area will be reviewed, and any relevant information will be incorporated into an EA for the Project as appropriate. Where necessary Project-specific studies on human and biophysical environments will be conducted to support a Project EA.

1.3.4 Other Environmental Review Requirements

PMV, as mandated by the *Canada Marine Act,* elected not to renew its head lease for the offshore portion of the Project site as of year-end 2014, therefore the Project is not situated within waters or lands administered by the Canada Port Authority and not subject to a PMV environmental review.

Other specific federal, provincial and municipal regulatory permitting and approvals the may be required for the Project to proceed have been outlined in Section 5.0.

1.4 Project and Tentative EA Deliverable Schedule

A tentative schedule for deliverables associated with the EA process is presented in Table 1-1. A preliminary sequencing schedule for each phase of the Project is also presented in Table 1-2. As shown the targeted construction duration of the Project is 15 months and the Project is expected to operate for a minimum of 30 years.

Table 1-1: Tentative EA Deliverable Schedule

Deliverable		2015			
BCEAA EA Process	**CEAA EA Process**	**Q1**	**Q2**	**Q3**	**Q4**
Project Description					
Valued Component (VC) Selection Document					
Draft Application Information Requirements (AIR)	Draft Environmental Impact Statement (EIS) Guidelines				
Final AIR	Final EIS Guidelines				
EAC Application	EIS				

Table 1-2: Preliminary Project Sequencing Schedule

Project Phase	Duration	Targeted Year
Project Procurement	18 months (A portion of this phase will overlap with Project preparation and construction)	2016 - 2017
Project Preparation	3 months	2016
Project Construction	15 months	2016 - 2017
Project Operation	30 years (minimum)	2018 - 2048
Project Decommissioning	2 months	2048 or later

1.5 Project Team

This Project Description – CEAA Summary has been prepared on behalf of WesPac by Golder Associates Limited (Golder). Contact information for WesPac and Golder is provided in Table 1-3.

Table 1-3: Project Team Contact Information

Proponent: WesPac Midstream–Vancouver LLC (WesPac)	
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Project Website	www.wespactilbury.ca
Company Website	www.wespac.com
Environmental Assessment Consultant: Golder Associates Limited (Golder)	
Address	Golder Associates Limited 200 - 2920 Virtual Way Vancouver, BC V5M 0C4 Canada
Key Contact	**Mr. Dave Carter** **Project Manager – Senior Environmental Scientist** Email: David_Carter@golder.com Tel: +604 296-4200

2.0 Project Information

2.1 General Project Description and Objectives

The purpose of the Project is to provide berthing and loading facilities to LNG carriers up to 90,000 m^3 of LNG capacity, to serve offshore markets and LNG barges up 4,000 m^3 to serve regional markets. The Project is advantageously located adjacent to the existing Tilbury LNG Plant, which processes and stores LNG. The Project will allow WesPac to obtain LNG from FortisBC and transfer it to a single LNG carrier or barge berthed at the jetty (Figure 2). FortisBC is currently building an LNG liquefaction expansion along with an additional LNG storage tank capable of storing approximately 46,000 m^3 of LNG at the Tilbury LNG Plant. The expansion of the Tilbury LNG Plant is occurring irrespective of this Project. The Project will take custody of the LNG from FortisBC at the point where the flange of the Project's LNG transfer pump connects to the FortisBC storage tank. A vapour return pipe will carry boil off gas (BOG) back to the Tilbury LNG Plant BOG compressor, where custody of the natural gas will be returned to FortisBC. The Project will not require the construction of a new natural gas supply pipeline or additional major transmission infrastructure common in other large-scale LNG projects currently under consideration in BC.

Natural gas is currently unavailable in many communities and countries and in these locations; typically people rely on higher-impact fuels such as diesel or coal for energy production. Marine transportation of LNG would provide customers access to a cleaner energy alternative, providing cost savings and environmental benefits to these communities. At present, the price of natural gas in North American markets is significantly lower than international markets. LNG exports offer Canadian producers an opportunity to access international markets.

The Project will also provide a point from which LNG supply can be transported to local and regional markets for use as fuel in marine vessels or for electric power generation. LNG is seen as a commercially robust and environmentally viable alternative to heavy fuel oil currently used in the marine industry, as LNG has much lower emissions then heavy fuel oil. LNG fuelled passenger ferries have been in operation for over a decade with more than a million operational hours without the occurrence of a safety incident. BC Ferries recently awarded a contract to build three new intermediate class vessels with LNG fuel capabilities, which will accommodate 145 vehicles and 600 passengers. These new intermediate class vessels will be the first vessels in BC Ferries' fleet capable of operating on LNG as a fuel and are expected to lead the way into further expansion of LNG fuelled vessels.

All LNG carriers or barges calling at the Project site will be operated by qualified shipping companies engaged in the business of LNG transportation. LNG carriers will transit to the Project site from the Pacific Ocean along established shipping routes through the Strait of Juan de Fuca, the Strait of Georgia and the South Arm of the Fraser River (Figure 5). Marine transportation on these shipping routes is governed by a comprehensive set of statutes and regulations. Vessels intending to call at the Project site are separate from the Project and will be subject to requirements including, but not limited to, the *Canada Shipping* Act, *2001* the *Pilotage Act,* the *Canada Marine Act*, the *Marine Transportation Security Act*, and numerous regulations issued pursuant to those acts.

2.2 Legal Description of Lands and Water Lot

The Project site is located within the municipal boundary of Delta, BC on Tilbury Island on the southern shoreline of the South Arm of the Fraser River (Figure 1). The Offshore Facilities portion of the Project is located in the water area in front of land owned by FortisBC, Varsteel, and the Federal Government (DFO). The Onshore Facilities portion of the Project is located on easements and rights of way within the FortisBC property, located at 7651 Hopcott Road, in the Tilbury Industrial Area of Delta, BC legal lot LT 1 DL 135 GP 2 NWD PL EPP28232 EX PL EPP36476 (PID:016-198-506). (Figure 3 & Figure 6a). Varsteel is located adjacent to the Project access road at 6845 Tilbury Road (Figure 2). The strip of land bordering the Fraser River to the south-west of the Varsteel property is owned by the Crown in Right of Canada, represented by the Minister of Fisheries and Oceans. WesPac has received consent from Varsteel and anticipates receiving consent from FortisBC and (if necessary, as described in Section 3.4) DFO representing the Federal Crown, to use the water lot area in front of their respective properties.

The offshore portion of the Project site comprises approximately 69,000 m^2 of Crown land water area under the administration of FLNR (Figure 6a). A new waterlot lease extending approximately 150 m along the Fraser River foreshore will be required for the Project, and the new lease will be issued by FLNR. The majority of the Project site was previously leased by Weyerhaeuser Company Limited (Weyerhaeuser), where they operated their Northwest Hardwood Mill which included a marine jetty. This waterlot lease was recently transferred to Varsteel, and Varsteel is in the process of executing a new, temporary lease with FLNR until the Project is approved for its new water lot lease, at which time Varsteel will cease to use any portion of the Project site.

The land surrounding the Project site is predominately designated for industrial and marine uses. Marine terminals situated in the surrounding area include Seaspan Ferries, Lehigh Hanson Cement, Annacis Auto Terminals, and Fraser Surrey Docks. The Seaspan Ferries Tilbury freight terminal is located approximately 300 m upstream of the Project site, and the Lehigh Hanson Cement plant is approximately 650 m upstream of the Project site (Figure 2).

The Project site has been designated in previous Corporation of Delta Official Community Plans (OCP) and in PMV land-use planning processes. Both the Delta OCP and PMV land-use planning processes included public, stakeholder and agency consultations during the plan development. The current Corporation of Delta OCP designates the onshore portion of the Project site as I2 (Heavy Industrial) (Figure 6b). The OCP goals related to future industrial land use have designated the Project site as industrial; i.e., intended for light, heavy, and water-related industrial uses (OCP, Map 2 - Future Land Use). As described in the 2010 PMV Consolidated Land Use Plan, the Project occupies an area intended for port services and industrial uses. The FortisBC property situated to the east and south of the Project site is designated as I7 (Special Industrial) which allows for the manufacturing, processing, finishing, and storage of natural gas.

The offshore portion of the Project site is currently zoned as I5 (River Zone). The Corporation of Delta has indicated intent to rezone the waterlot portion of the Project site to reflect the possibility of LNG activity. WesPac expects to pursue the rezoning of the waterlot concurrently with the EA process. The majority of properties surrounding the Project are industrial and privately owned except for the narrow strip of federal Crown land and two properties located to the east along Ross Rd which occupy provincial Crown land (Figure 6a).

2.3 Federal Land, Federal Funding and Trans-boundary Effects

There is no proposed or anticipated federal financial support being provided to carry out the Project. There are also no federal lands that will be used for the purpose of carrying out the Project. The nearest federal land is located directly adjacent and downstream, approximately 0.2 km the Project site (Figure 6a). This federal property (LT 16 DL 135 GP 2 NWD PL LMP44262) is owned by the Crown in Right of Canada, represented by the DFO and was transferred to the Crown as a condition of a review undertaken by the Fraser River Environmental Management Program (FREMP). If the waterlot lease to be issued by FLNR includes that area of the Fraser River immediately adjacent to this shoreline property, the consent of DFO, representing the Federal Crown, to the use of the water lot area may be required.

There are no expected changes to the environment that may occur, as a result of carrying out the Project, on the adjacent federal property or any other federal lands. Additionally, there are no trans-boundary effects from the Project expected outside of British Columbia or Canada (e.g., air quality effects, effects on marine mammals, etc.). The Project location is more than 15 km from the United States border. The Project has a small air emissions profile, and therefore, is unlikely to result in distinguishable changes to air quality beyond the local study area. The geographic extent and ambient concentrations of project-related emissions will be assessed as part of the scope of the environmental assessment to validate this conclusion.

2.4 Aboriginal Communities, Treaty Lands and Asserted Traditional Territories

Aboriginal groups that have communities in close proximity to the Project include Musqueam Indian Band and Tsawwassen First Nation (Figure 1). The established or asserted traditional territories of other Aboriginal groups that may overlap the Project site, include:

- Cowichan Tribes;
- Halalt First Nation;
- Lake Cowichan First Nation;
- Lyackson First Nation;
- Penelakut Tribe (including Hwiltsum);
- Stz'uminus First Nation;
- Tsleil-Waututh Nation;
- Semiahmoo First Nation;
- Katzie First Nation;
- Squamish Nation;

- First Nations of the Stó:lō Nation; and
- First Nations of the Stó:lō Tribal Council.

While no Métis communities have been identified in proximity to the Project site to date, WesPac understands that there may be a requirement by the federal government to consult with the Métis Nation British Columbia. WesPac intends to update this list as the Project moves forward, with input from Aboriginal groups and as advised by regulatory agencies.

2.5 Project Components

The Project is comprised of the following components, described in more detail in the sections below:

- Marine Jetty (access trestle, loading platform, mooring dolphins and berthing dolphins);
- LNG Transfer System;
- Process Control and Power Supply Systems;
- Fire Protection and Emergency Systems; and
- Project Access (access road and parking).

The marine jetty is part of the Offshore Facilities and will be comprised of a loading platform (16.5 m x 25 m) and an access trestle (360 m x 10.6 m). The access trestle will connect the structure to the shoreline and support all LNG pipeline transfer systems including, a vapour return line, fire-fighting water supply pipe and other utilities (Figure 4). The design of the access trestle will accommodate both a walkway and a separate roadway for light vehicles and is designed to be above ground to pass over sensitive shoreline habitats.

The LNG transfer system has components in both the Offshore Facilities and the Onshore Facilities. The system will include a 2000 m^3/hr transfer pump installed within the FortisBC LNG storage tank. In addition, the transfer system will comprise two stainless steel insulated pipes (one 76 cm and one 15 cm diameter) and one 50 cm diameter vapour return pipe of approximately 470 m in length that will terminate at the BOG compressor. The LNG transfer system will extend on both sides of the FortisBC property line (Figure 3). To facilitate vessel loading three 40 cm diameter stainless steel loading arm pipes will be installed on the loading platform facing the river channel. Two of the arms will be used for LNG loading and the other arm will be used for natural gas vapour return. All of the arms will be remotely controlled from a portable control box. The ends of the arms will have quick connect/disconnect leak-tight connectors. The Offshore Facilities will also accommodate a control room, fire protection and emergency systems and a small floating dock. The jetty operator will monitor all operating conditions and maintain communication with the FortisBC operator during all loading operations. The Project will use a 4160 V electrical power supply from BC Hydro's existing electric power distribution system. The connection point will be at an existing transformer located within the Tilbury LNG Plant. The load will be approximately 25 kW. A backup generator will be installed on the jetty to provide sufficient power to operate critical equipment during an electrical failure. The Project fire protection system will include a 25 cm fire water pipe of approximately 795 m, extending on both sides of the FortisBC property line. This will be installed

from the loading platform; along the entire pipe rack system, and fed from the water system at the adjacent Tilbury LNG Plant. Access to the Project site will be via Tilbury Road through a shared entrance with the FortisBC (Figure 3). A small parking area will be constructed on the existing concrete deck at the Project site, with enough space for up to eight vehicles.

2.6 Project Activities

2.6.1 Preparation, Construction and Commissioning

The Project will require the following construction and commissioning activities, including expected offshore and onshore construction machinery requirements, in the Sections below:

- Site Preparation;
- Site Set-up and Removal of Existing Marine Infrastructure;
- Ground Stabilization Works;
- Support Pile Driving;
- Marine Jetty and LNG Transfer Pipe Construction;
- Capital Dredging;
- Shoreline Restoration; and
- Project Commissioning Activities.

As part of site preparation a construction laydown area, temporary site office with power connection and worker amenities and sanitary facilities will be established on the FortisBC property immediately adjacent to the Project site (Figure 7). Access to the Project site during construction will be through the adjacent property that is owned by FortisBC and an entrance will be provided on Tilbury Road (Figure 3). Existing abandoned marine infrastructure currently present in the water lot will be removed during this phase using a marine crane and support barge (Figure 7). The existing infrastructure to be removed includes timber piles, mooring dolphins, steel piles and concrete deck. To enable access, the onshore portion of the Project site will be cleared of logs and debris using excavators and other machinery as required. Any waste materials from site clearance activities including timber and steel piles, abutment deck slabs and foundations will be stockpiled in the construction laydown area pending removal to a suitably permitted offsite facility.

Ground stabilization works are required for portions of both the Onshore Facilities and Offshore Facilities to meet post-seismic performance requirements necessary to support the installation of Project infrastructure. It is expected that in-situ ground densification to depths in the order of 20 m to 25 m will be required. An area of 48,600 m^3 along the foreshore will require ground stabilization in addition to an area of 120,600 m^3 along the pipe rack corridor and an area of 540 m^3 at the cut off wall. Ground stabilization techniques will include vibro-replacement and stone column installation. During offshore ground stabilization activities flat deck barges may be used to transfer equipment or, alternatively, temporary rock berms may be constructed from the foreshore into the riverine environment. The exact extent of stabilization works within the confines of the Fraser River will depend on the results of a geotechnical investigation being undertaken by Golder Associates on behalf of WesPac. This investigation will determine the specific characteristics of riverbed sediments within the Project site and the results of this investigation and subsequent stabilization requirements will be summarized in the EAC Application/EIS.

The loading platform, adjoining access trestle, and mooring dolphins will be supported by 64 steel friction piles. As the site is underlain by soft and compressible deltaic soils, pile depths are expected to range between 30 to 40 m below the final dredged elevation. Jetty construction activities will include the installation of trestle bridge sections, catwalks, platforms and decks principally from the water outside of the established navigational channel using a crane barge and support flattop barges (Figure 4). Where necessary, reinforcement steel (rebar) will be used to reinforce concrete structures. Following the construction of the access trestle, loading platform, berthing dolphins, and mooring dolphins: catwalks, fenders and quick release mooring hooks will be installed. Construction activities on the topside of the jetty will include installation of the LNG transfer piping, vapour return line, loading arms, lighting, control systems, and supporting utilities. The specific stipulations for navigational safety and lighting requirements, along with the addition of navigational aids will be developed with Transport Canada (TC) through the *Navigation Protection Program* (NPP) review process under the *Navigation Protection Act* (NPA). The onshore portion of the jetty topsides (LNG transfer pipe, vapor return pipe, loading arms and other utilities), the LNG transfer pipeline, and the pipe rack system will be constructed on land using cranes and other machinery as required.

To allow the necessary clearance for the largest LNG carriers with drafts in excess of 9 m during low tidal conditions an approach channel and berth pocket will require dredging For the purposes of the Project Description the maximum dredge area is estimated to be 18.7 ha (Figure 3). This dredge area would better accommodate LNG carriers up to 90,000 m^3 of LNG capacity to access to the jetty. A smaller dredge area of approximately 12.0 ha (Figure 3) is proposed during initial jetty operations when smaller LNG carriers are more likely. The dredging will enable a design elevation of -9.5 m Chart Datum (CD) in the approach channel and -11.0 m CD in the berth pocket. The final depth of the dredge cut will be based on a ratio of 1.1 times the maximum design draft of the largest LNG carriers expected to call at the Project site with an additional provision for vessel clearance. Capital dredging of the Project mooring basin will be undertaken by a Trailing Suction Hopper Dredge (TSHD) (Figure 7). In addition, a Grab Clamshell Dredge (GCD) may also be used to dredge the final section slopes at the shore side of the basin. All dredging activities will be undertaken outside of the freshet period, which runs from April to June. Also dredging will be conducted following Best Management Practices (BMPs) including windows of least risk and may be undertaken in conjunction with the annual navigational dredging program conducted in the Fraser River. Every effort will be made by WesPac to find a beneficial end use for dredge material. If determined to be suitable following testing dredge material can have many beneficial end uses for productive purposes such as construction, foreshore restoration and creation of upland habitats. However, at this time the specific end uses for material and locations of the end use have not been identified. If ocean disposal is the only available option dredge material would be subject to the *Canadian Environmental Protection Act, 1999 (COPA)* and a permit application would be submitted by WesPac under Section 127 of *CEPA*, pursuant to the limitations detailed in *CEPA* Schedules 5 and 6. Prior to dredging a Sampling and Analysis Plan (SAP) will be developed to address the sampling requirements outlined by EC's guidance, as well as guidance received from EC through the consultation process. If testing determines that the material is not suitable for beneficial use or ocean disposal, the material will be disposed of at a permitted onshore disposal facility.

The existing shoreline at the Project site has been disturbed by previous industrial activities conducted on the shoreline. The Project is designed to have a limited footprint in the existing riparian and foreshore area (Figure 4). There is an opportunity for shoreline enhancement at the site and early discussions to date have identified the potential for creation of a substantial amount of marsh and mudflat habitat in the area. There is approximately 100 m of disturbed shoreline that may be suitable for enhancement.

WesPac intends to work with regulatory agencies and Aboriginal groups to develop a plan for enhancing the shoreline. If habitat offsets as a condition of an authorization under the *Fisheries Act* are a requirement, it is expected that those offset requirements could be incorporated into the shoreline enhancement plan.

Prior to operation, all installed mechanical and electrical equipment will be tested under non-load conditions. In addition, installed pipework will be hydrotested (filled with water and pressurized to prove system integrity) and pneumatically pressure tested and a final survey of all components including the dredge area will be conducted.

2.6.2 Project Operation Activities

Project operation activities will include:

- Berthing;
- Jetty operations; and
- Maintenance dredging.

The Project will provide berthing space suitable for LNG carriers and barges at the jetty. The specifications for the largest LNG carriers and barges expected to call at the Project are presented in Table 2-1. As shown, the largest vessels have a smaller DWT than many of the Panamax sized deep-sea container vessels that currently transit through the established shipping channels on the Fraser River.

Table 2-1: Specification of LNG Carriers, Barges and Current Deep-Sea Traffic

Specifications (Approximate)	Project LNG Barge	Project LNG Carrier	Typical Panamax sized Container Ship
Length (m)	106	242	180-220
Beam width (m)	16.5	38	32
Draft (m)	5.1	10	12
Capacity to ship LNG (m^3)	4,000	90,000*	n/a
Dead weight tonnes (DWT)	NA	Up to 47,000	50,000 to 90,000

*Note: The marine jetty and marine safety items described and evaluated in this Project Description are for LNG Carriers with capacities of up to 90,000 m^3. This size vessel exceeds the current beam width dimension limits for vessels on the Fraser River. Although the vessel dimension policies are under review by PMV in response to the widening of the Panama Canal, dimensions exceeding a beam width of 32.25 m are currently only allowed via an exception from PMV. The beam width currently approved by PMV is 32.25 m. WesPac has requested PMV to evaluate allowing a beam of up to 38.0 m for this Project. PMV has granted exemptions for non- LNG vessels wider than 32.25 m in the past.

Each LNG carrier will berth directly at the jetty using a tug escort upon approach. All tugs will be provided by a suitably qualified tug operator that will be contracted by the operator of the LNG carrier. Once vessels are alongside the jetty fenders one or two of the tugs will be used to 'push-to-hold' the vessel firmly against the fender panels. Following this the docked vessel will cast lines and move into the final

position with its manifolds aligned with the shore loading arms. During this process one or two line boats may be employed to assure the efficient transfer of the individual mooring lines to the appropriate fore and aft mooring dolphins. On departure, vessels will be pulled off the berth using a tug assist by a distance of approximately one beam width and, while the stern is held in position by tugs, the bow will be swung down river from a virtually stopped position off the berth. Once a vessel is securely fastened at the jetty, the LNG loading arms on the jetty loading platform will be connected to the vessel. LNG will then be transferred to the vessel via the Project's LNG loading system. LNG carriers and barges may remain tied up at the jetty for up to approximately eight days. However, under normal operating conditions LNG carriers will be tied up at the jetty for approximately 24 to 48 hours, and LNG barges are expected to complete loading operations in a much shorter timeframe. When the LNG loading process is complete vessels moored at the jetty will depart the berth following a reverse of the docking procedure described above.

During construction and throughout the operational phase of the Project a marine security zone will be established around jetty operations and the Offshore Facilities. Once the security zone is established, only Project-related and authorized vessel traffic will be permitted to enter this restricted area. A small craft will be stationed at the floating dock to patrol the security zone if necessary. The exact extent of the security zone will be determined through the final design of the Project. During this process, consideration will also be given to local river conditions, applicable marine regulatory BMPs requirements, input from Aboriginal groups, and PMV.

In general, WesPac intends to deliver LNG to LNG carriers and barges berthed at the jetty. The receivers of LNG will be required to arrange for marine transportation. The exact number of vessel calls at the jetty will depend on market conditions during operation, but it is estimated that up to 90 LNG barge calls and up to 122 LNG carrier calls (of various sizes) could occur at the jetty per year.

WesPac will require vessel operators to comply with all applicable national and international safety requirements when at the Project. However, responsibility for the care, safety and control of the LNG carriers, LNG barges and, upon loading, the LNG product will generally lie with the receivers and with the vessel operators. WesPac understands that all LNG carriers calling at the jetty will be operated by qualified shipping companies engaged in the business of LNG transportation, and that they must comply with requirements including, but not limited to, the *Canada Shipping Act, 2001*, the *Pilotage Act*, the *Canada Marine Act*, the *Marine Transportation Security Act*, and numerous regulations issued pursuant to those acts. Shipping activities will also comply with applicable national and international safety regulations, such as requirements established by the International Maritime Organization. WesPac also understands that where applicable, consideration will also be given by vessel operators to BMPs for the safe operation of LNG vessels presented by the Society of International Gas Tanker and Terminal Operators (SIGTTO), and the World Association for Waterborne Transport Infrastructure.

Once a vessel is securely fastened at the jetty, the LNG loading arms on the jetty loading platform will be connected to the vessel. LNG will then be transferred to the vessel via the Project's LNG loading system. LNG carriers and barges may remain tied up at the jetty for up to approximately eight days. However, under normal operating conditions LNG carriers will be tied up at the jetty for approximately 24 to 48 hours, and LNG barges are expected to complete loading operations in a much shorter timeframe.

When the LNG loading process is complete vessels moored at the jetty will depart the berth following a reverse of the docking procedure described above.

Maintenance dredging of the Project berth is expected to be undertaken on a regular basis after the annual freshet period. All dredging activities are expected to be undertaken by either a TSHD or GCD as described (Figure 7). Maintenance dredge material would be subject to the same regulatory and sampling requirements and every effort would be made to find a suitable end use for the material rather than ocean disposal of the material.

2.6.3 Project Decommissioning and Closure

Decommissioning and closure activities for the Project are expected to include the dismantling of both Offshore Facilities and Onshore Facilities. In summary, decommissioning and closure activities will comprise, but not be limited to the following:

- Removal of all LNG-transfer systems, pipes, loading arms and control facilities;
- Removal of all associated jetty infrastructure (including the access trestle, railings, catwalks and other structures);
- Demolition of concrete decks and the dredging of the spilled concrete from the riverbed;
- Pulling and removal of pile foundations, or cutting of piles below the mud-line; and
- Foreshore slope protection where applicable and re-planting vegetation.

2.7 Anticipated Emissions, Discharges and Waste

A summary of emissions discharges and waste anticipated during all phases of the Project has been provided in Table 2-2.

Table 2-2: Summary of Emissions Discharges and Waste Anticipated During Project Phases

Preparation and Construction Phase		Operational/Mitigation Measure
Air and Dust Emissions	• Combustion engine exhaust emissions from offshore and onshore based construction equipment/machinery/vessels (e.g., hydraulic excavator, crane, tugs, grab dredge and dump barges). • Dust emissions from construction activities.	• Air and dust controls and mitigation measures will be outlined in a Construction Environmental Management Plan (CEMP).
Noise and Vibration Emissions	• Noise and vibration emissions related to construction machinery operation (e.g., dredging activities, pile driving machinery and excavator movements etc.).	• As part of mitigation a noise monitoring and management section would be included in the CEMP.

Preparation and Construction Phase		Operational/Mitigation Measure
Strom-Water Runoff	• Storm-water runoff during the construction period, following rainfall events and silt and soil control (e.g., access roads, laydown areas, storm-water drainage facilities and general dust control).	• To control adverse effects of erosion and sedimentation on surface waters, construction activities will be conducted in accordance with a CEMP. • Precautions will be taken during construction to avoid hydrocarbon spills, both onshore, offshore and in near shore areas and the CEMP will include a spill prevention and control section.
Solid and Sanitary Wastes	• Overburden and debris from removal of any site surfacing (e.g., abutment deck slabs and foundations). • Existing abandoned marine infrastructure removal. • Construction waste (e.g., construction trash, food trash, and other wastes). • Hazardous waste (e.g., unserviceable batteries, used motor and hydraulic oils, contaminated filters, used chemical cleaning fluids, paints and other waste items considered as hazardous by jurisdictional authorities). • Sanitary waste from worker amenities.	• A CEMP will be developed that presents procedures to minimize, segregate, safely store, and dispose of all wastes generated from the Project. • Solid and liquid hazardous waste (e.g., unserviceable batteries, used motor and hydraulic oils, contaminated filters, used chemical cleaning fluids, paints and other waste items considered as hazardous by jurisdictional authorities) will be collected on-site segregated, secured, contained in the lay down area and disposed of at a suitably licensed facility. • Sanitary and solid waste from worker on site amenities that will be disposed at a suitably licensed facility.
Dredge Material	• Material from capital dredging activities.	• Material samples will be collected and tested for the specified contaminants in line with the SAP, which will be approved by EC. • Before commencing dredging activities every effort will be made to find a suitable end use for this material and ocean disposal or disposal at a permitted onshore disposal facility will only be considered as an option as a last resort. • Dredge material will be transported in barges or trucks to a final use or disposal site, and will not be stored on the Project site or elsewhere prior to an end use being identified.

Preparation and Construction Phase		Operational/Mitigation Measure
Light Emissions	• Site safety lighting, construction machinery, and equipment during construction activities.	• Light emissions will be mitigated appropriately using various methods that may include directional lighting, height of lighting and low lumen fixtures.
Accidents and Malfunctions	• Events involving spills of toxic or hazardous materials (e.g., hydrocarbon fuels, lubricants, into environmentally sensitive habitat) • Structural failure of a sediment containment measure resulting in erosion and sedimentation on the aquatic environment.	• The CEMP will provide mitigation measures in the event of a structural failure of sediment containment issues. • An emergency spill response procedure will prepared to address events related to accidents and malfunctions.
Operational Phase		
Air and Dust Emissions	• Emissions from LNG carriers, barges and other support vessels (e.g., tugboats) during berthing, departure from the jetty, and operations while at berth. • Emissions from backup power generation during the event of a power outage. • Potential fugitive emissions from LNG loading operations (e.g., connecting and disconnecting loading arms); Emissions from periodic maintenance dredging activities.	• Ship owners will be required to ensure that emissions from the LNG carriers and barges will comply with the regulations on emissions of NOx and SO_2 in MARPOL convention Annex VI and applicable Canadian regulations. • There will be no significant point source air emissions from the Project as all natural gas processing and LNG pumping facilities will be provided offsite at the existing Tilbury LNG Plant. • Any fugitive emissions from loading operations are expected to be low as loading arms will be drained and nitrogen purged before connection is broken with the vessel. The LNG transfer system is a closed system with no vents to the atmosphere. Pressure safety valves and thermal relief valves will direct their outputs into the BOG return pipe, which recycles the gas into the LNG liquefaction process (Figure 3).

Preparation and Construction Phase		Operational/Mitigation Measure
Noise and Vibration Emissions	• Emissions from intermittent docking and loading of LNG carriers and barges. • Emissions related to periodic maintenance dredging. • Emissions related to servicing of Project components and worker arrival and departure from the site.	• Acoustical enclosures, blankets, and other measures will be installed on infrastructure connected to the Project, as necessary to ensure noise-generating machinery and equipment operates within acceptable limits and mitigation. • Mitigation measures related to noise will be outlined in a section in the Operational Environmental Management Plan (OEMP).
Storm-Water Runoff	• Storm-water runoff on site during operation, following rainfall events and silt and soil control (e.g., access ways and storm-water drainage facilities).	• To control the specific adverse effects of erosion and sedimentation on surface waters, operational activities will be conducted in accordance with a sediment control and storm-water management sections outlined in a section in the OEMP.
Solid and Sanitary Wastes	• Operational worker waste including food trash and other wastes. • Hazardous waste (e.g., unserviceable batteries, used motor and hydraulic oils, contaminated filters, used chemical cleaning fluids, paints and other waste items considered as hazardous by jurisdictional authorities). • Sanitary waste from worker amenities.	• An operational waste management section in the OEMP will be developed for the Project that presents procedures to minimize, segregate, safely store, and dispose of both regular waste and hazardous waste.

Preparation and Construction Phase		Operational/Mitigation Measure
Maintenance Dredge Material	• Dredge material from maintenance dredging.	• Material samples will be collected and tested for the specified contaminants in line with the SAP, which will be approved by EC. Before commencing dredging activities effort will be made to find a suitable end use for this material and ocean disposal or disposal at a permitted onshore disposal facility will only be considered as an option as a last resort. • Dredge material will be transported in barges or trucks to a final use site or disposal site, and will not be stored on the Project site or elsewhere prior to an end use being identified.
Light Emissions	• Fixed on-site lighting for health and safety. • Ship light emissions for health and safety.	• Light emissions will be mitigated appropriately using various methods that may include directional lighting, height of lighting, and low lumen fixtures.
Accidents and Malfunctions	• Events involving spills of toxic or hazardous materials (e.g., hydrocarbon fuels, lubricants, into environmentally sensitive habitat). • Loss of containment of LNG during loading operations.	• During operation, measures will be implemented to mitigate the consequences of an accident or malfunction through adherence to legislated requirements and BMPs. • An emergency spill response procedure will prepared to address events related to accidents and malfunctions. • Precautions will be taken during Project operations to avoid hydrocarbon spills, both onshore and in the aquatic environment. • To prevent accidental discharges during operations all personnel will be trained in fuel-handling procedures and a spill prevention management plan will be prepared in the OEMP. • Provisions have been included in the design of Project to contain LNG if a spill was to occur on the Loading Platform.

Preparation and Construction Phase		Operational/Mitigation Measure
Decommissioning and Closure		
Decommissioning and Closure	• It is expected that emissions associated with site decommissioning and closure will relate to air emissions from combustion engines, noise emissions, stormwater and accidental runoff and general waste expected from closure operations. Therefore, the emissions related to these aspects and the control measures identified are expected to be the same as those outlined.	• See construction and operational phase control and mitigation measures.

2.8 Project Capital Costs and Employment Estimates

The operational lifespan of the Project is anticipated to be 30+ years. Depending on the final Project configuration, the estimated direct capital cost of the Project including topsides is expected to be approximately to $175 million. The capital cost of the Project will be revised during the preliminary and detailed design phases. During preparation and construction, the Project will create approximately 131.5 person-years of temporary employment. During operation, the Project is anticipated to employ in shifts approximately 19 full time equivalent operational employees for 30 years (570 person-years).

2.9 Project Environmental and Social Setting

2.9.1 River Processes

The Project is located on the South Arm of the Fraser River, which conveys 80% to 85% of the total river discharge. Currents in the South Arm of the river average 1.5 knots. The level of river discharge and tides create alternating flood and ebb currents. Ebb currents during periods of high river discharge may reach 5 to 6 knots in narrower sections of the lower sections of the South Arm (FREMP 2006). The faster flowing deep water portion of the South Arm channel, such as the outside curve of Tilbury Bend, consists predominantly of sand substrate (Swain et al. 1998). The slower near shore areas, like the Project site on the inside curve of Tilbury Bend, accumulate finer substrates that form intertidal flats in sheltered near shore areas (FREMP 2006).

The spring freshet of the Fraser River transports millions of tonnes of material into the lower reaches of the river. The conveyed material is sorted, with larger gravels deposited between Agassiz and Mission. Coarser sands and fines tend to be deposited between below Mission and Sand Heads. Approximately 30% of the sediment carried by the river is conveyed all the way to Sand Heads and the remaining 70% is deposited in the lower channels of the river. Material deposition within the channel creates in stream features such as bars and beaches that provide habitat for fish and wildlife (FREMP 2006). These same features can be hazards for navigation that requires sufficient depth within the channel. An annual dredging program is conducted to maintain the navigational channel through the South Arm of the Fraser River.

2.9.2 Fish and Aquatic Resources

The Project site is located in the South Arm Meso-Tidal segment of the Fraser River, which extends upstream from Deas Island to the eastern tip of Annacis Island (FREMP 2006). The Fraser River Estuary Management Program (FREMP) classified the Fraser River estuary foreshore as red, yellow or green based on productivity. While the FREMP has been discontinued, the classification system is still regularly used by DFO. The FREMP classification system is based on habitat classification of intertidal, near-shore and riparian habitat along the Fraser River (FREMP 2002). Red coded shorelines are considered areas of high productivity. These areas include diverse habitat types, which provide important fish and wildlife features or are sites of previous habitat compensation. Shoreline fish habitat in the South Arm of the Fraser River is limited to a narrow band of riparian forest with intertidal marsh and mudflat along the shore (FREMP 2006). Much of the shoreline along this segment of the river is used in industrialized activity, as reflected in the relatively higher percentage of low productivity shoreline (green coded shoreline) under FREMP. Although the majority of this Fraser River segment is classified as low-productivity shoreline, the habitat area in the immediate vicinity of the Project is a mixture of high, moderate and low productivity shoreline (Figure 8). The shoreline intertidal zone within the Project site mainly consists of mudflat and estuarine marsh habitat with some shrub and deciduous tree riparian vegetation. A review of the FREMP Habitat Atlas on the Community Mapping Network website (http://cmnmaps.ca/FREMP) indicates that these are the main shoreline habitats present at the Project site. There is no documented evidence of any marine plants, as defined in the *Fisheries Act*, (e.g. eel grass or marine algae) being present at the Project site. Marine vegetation including macroalgal species such as rockweed (*Fucus spp*.), sea lettuce (*Ulva spp.*) and bull kelp (*Nereocystis luetkeana*), as well as marine vascular plant species such as eelgrass (*Zostera marina)* are present beyond the mouth of the Fraser River and more than 20 km from the Project site.

The South Arm of the Fraser River is considered an estuarine ecosystem, given the presence of a tidally driven salt-water wedge underneath a freshwater surface layer (FREMP 2002). The salt-water wedge from the Strait of Georgia moves upstream along the river bottom, while the freshwater flows over the surface. Salinity levels vary based on levels of freshwater discharge and the daily tides.

The lower section of the Fraser River, between Mission and Sand Heads supports as many as 37 native fish species (Richardson et al. 2000). Salmonid use of the South Arm of the river is mainly confined to upstream adult migration in the fall and downstream juvenile migration and rearing in the spring to mid-summer months. All five Pacific salmon species (Chinook [Oncorhynchus tshawytcha], chum [Oncorhynchus keta], coho [Oncorhychus kisutch], pink [Oncorhynchus gorbuscha] and sockeye [Oncorhynchus nerka]) spend at least part of their life in the area. Adult salmonids use the South Arm to migrate upriver to spawning grounds, while juvenile salmonids use the channel of the South Arm to move downriver to the ocean. Juvenile salmon use the shallower brackish near shore areas, including the shoreline portion of the Project site, within the South Arm to feed and rear prior to moving out into the ocean. The South Arm of the river also supports white sturgeon year round and an annual eulachon spawning migration in the spring (FREMP 2006). The benthic community at the Project site will consist mainly of epibenthic and burrowing invertebrates associated with soft sediment mudflat and marsh habitats. Benthic invertebrates at the Project site are expected to include Harpacticoid copepods, Chironomid larvae and Oligochaetes (Stronach, 1995).

Harbour seals (Phoca vitulina) are the only marine mammal species likely to venture up the Fraser River to the Project site. A total of 16 marine mammal species have been documented in Georgia Strait. Marine mammals such as sea lion, dolphin, porpoise, and Killer whales do occur within Georgia Strait. The following provincially and/or federally designated at-risk marine mammal species may occur within the Strait of Georgia:

- Grey whale (Eschrichtius robustus): Provincially blue-listed, Federally listed as Special Concern;
- Humpback whale (Megaptera novaeangliae): Provincially blue-listed, Federally listed as Special Concern;
- Killer whale (Orcinus orca) southern resident: Provincially blue-listed, Federally listed as Endangered;
- Sea otter (Enhydra lutris): Provincially blue-listed, Federally listed as Special Concern; and
- Steller sea lion (Eumetopias jubatus): Provincially blue-listed, federally listed as Special Concern.

The identified critical habitat for southern resident killer whales includes the Strait of Georgia that is more than 20 km from the Project site. It is not anticipated that the Project will affect critical habitat for killer whales within the Strait of Georgia. Four provincially and/or federally designated at-risk species could potentially occur adjacent to the Project site.

Table 2-3 includes fish species that are listed on the BC Conservation Data Centre website (http://a100.gov.bc.ca/pub/eswp/) and are identified as migratory, semi-resident or resident species in the Meso-Tidal segment of the Fraser River (FREMP 2006). No identified areas of critical habitat, as defined in the *Species at Risk Act*, 2002 (SARA) for aquatic species have been documented on or near the Project site.

Table 2-3: Summary of Federally and Provincially-Listed Fish Species Potentially Occurring in the Project Site

Fish Species	Listed (Provincial)	Listed (Federal)
Green sturgeon (*Acipenser medirostris)*	Red-listed	Special concern on SARA Schedule 1
White sturgeon (*Acipenser transmontanus)*	Red-listed (Upper Fraser River population)	Endangered
Cutthroat trout (*Oncorhynchus clarkii lewisi*)	Blue-listed	Special concern on SARA Schedule 1
Coho salmon (*Oncorhynchus kisutch*) Interior Fraser population		Endangered

Dredging and pile driving activities connected to the Project will be conducted in an area that has previously been disturbed by regular dredging activities associated with the former terminal facility. The shoreline has also been historically modified by previous barge loading and log handling. Due to the level of previous disturbance at the Project site and available best management practices for the expected construction methods, it is anticipated that potential effects on fish and fish habitat can be avoided through appropriate Project design and mitigation. The project is not anticipated to impact existing sensitive ecosystems or critical aquatic habitats.

2.9.3 Terrestrial Ecological Setting

The Project site is located within the moist maritime (mm) subzone of the Coastal Douglas Fir (CDF) Biogeoclimatic Zone (iMap BC 2014). The CDFmm biogeoclimatic zone experiences warm, dry summers and mild, wet winters, which lends to a long growing season (Meidinger and Pojar 1991). Common tree species in zonal sites of the CDFmm include coast Douglas fir (Pseudotsuga menziesii var. menziesii), grand fir (Abies grandis) and western red cedar (Thuja plicata); (Green and Klinka 1994). Dominant understory species include salal (Gaultheria shallon), dull Oregon grape (Mahonia nervosa), ocean-spray (Holodiscus discolor), and lesser amounts of baldhip rose (Rosa gymnocarpa), snowberry (Symphoricarpos albus), honeysuckle (Lonicera sp.), and vanilla leaf (Achlys triphylla; Green and Klinka 1994). Terrain in the Project site is generally flat. Riparian and cleared (paved) portions of the Project site are several meters above the high-water mark of the Fraser River estuary.

2.9.3.1 Vegetation and Sensitive Habitats

The onshore portion of the Project site is mostly paved. Patches of vegetation exist at the northern extent of the alignment where the access trestle will connect to the land and at the southeast extent of the Project site where the LNG pipeline will be connected to Tilbury LNG Plant.

The eastern extent of the proposed access trestle will bisect estuarine marsh and riparian vegetation. Estuarine marsh habitat located directly adjacent to the Fraser River is dominated by grasses and sedges (*Carex* sp.), interspersed with herbs such as silverweed (*Potentilla* sp) and angelica (*Angelica* sp.), and lesser amounts of common cattail (*Typha latifolia*). Scattered red-osier dogwood (*Cornus stolonifera*) and willow (*Salix* sp.) shrubs occur closer to the treeline. Driftwood is scattered throughout the shrubs suggesting that the marsh habitat is inundated at high tide. Riparian habitat upslope of the estuarine marsh habitat varies in width from 20 to 40 m and is dominated by red alder (*Alnus rubra*) and black cottonwood (*Populus trichocarpa*). Dense Himalayan blackberry (*Rubus armeniacus*), a non-native plant species, growth occurs southeast of the riparian trees.

A strip of trees, approximately 2 m wide, dominated by red alder and black cottonwood exists at the northern end of the onshore transfer pipe route approximately 30 m east of the jetty. Southeast from this patch of trees, the proposed above ground transfer pipe parallels a ditch with common cattail and black cottonwood saplings. The transfer pipe route alignment turns 90 degrees to the northeast and crosses an open field of maintained grass approximately 340 m southeast of the Fraser River.

The design of the access trestle will limit the effect of the Project on riparian habitat. The access trestle will cross the foreshore in an area of lower shoreline productivity (Figure 7). The design seeks to avoid interaction of the Project with higher productivity mudflat and marsh habitats.

2.9.3.2 Wildlife

Reptiles and Amphibians

Amphibian species occurring in the Lower Mainland Region breed in aquatic and terrestrial habitats. Aquatic breeding amphibians use a variety of slow moving aquatic habitats, including slow moving streams, ditches, wetlands, and shallow edges of pond and lakes (except for coastal tailed frog [Ascaphus truei] and Pacific giant salamander [Dicamptodon tenebrosus]) (Matsuda et al. 2006). Terrestrial breeding amphibians lay eggs in crevices in moist locations such as rock crevices and rotting wood (Matsuda et al. 2006). Adults of most aquatic and terrestrial breeding amphibians inhabit uplands outside of the breeding season. Upland habitats are typically moist and provide shelter and thermoregulatory microhabitat features such as decaying logs, shrub cover, moist hollows and debris or rock piles (Matsuda et al. 2006). In addition, adult amphibians require access to hibernation sites such as talus slopes, debris piles, burrows and holes, and wetland or pond habitats. The ditch running parallel to the pipeline and access road alignment could provide breeding habitat for amphibian species adapted to urban environments, such as Pacific treefrog (*Pseudacris regillia*). In addition, the Project site may support terrestrial breeding amphibians.

Reptile species occur in terrestrial and aquatic habitats. Terrestrial portions of the Project site may support several species of garter snake (*Thamnophis* sp) which occur in a variety of habitat types including marshes, lakes, riparian habitat, and other habitat where its prey (i.e., amphibians and earthworms) are found (Matsuda et al. 2006). Species, such as terrestrial garter snake (T. *elegans*), are strongly associated with aquatic habitat and are typically found around fresh or marine waterbodies (Matsuda et al. 2006). In the winter, garter snakes congregate in communal hibernacula, where suitably deep hibernating sites are available (Matsuda et al. 2006).

Birds

Bird species occur in a wide variety of habitat types including young and old forests, wetlands, and riparian areas. Tolerance to human activity, human presence, and habitat alteration is variable, with some species dependent on mature to old forests (*e.g.,* northern goshawk [*Accipiter gentilis]*), while others are associated with anthropogenic features (*e.g.,* barn swallow [*Hirundo rustica*]), or are abundant in urban areas (*e.g.,* northwestern crow [*Corvus caurinus*]). Variation in landscape and vegetation communities provide the diversity of habitat and microhabitat features that may be required for activities such as singing and breeding displays, nesting, chick rearing, foraging, and overwintering for multiple species (Squires *et al 1997)*. Mudflat and other intertidal habitat along the banks of the Fraser River provide suitable foraging habitat for a variety of migratory shorebirds and waterfowl. Waterfowl are frequently concentrated in the intertidal marshes and mudflats along the shoreline, although some diving ducks utilize deeper water for foraging for fish. Some waterfowl species may nest on the ground and in cavities in riparian, upland grass and forested habitat. Deciduous vegetation along the shoreline provides suitable nesting and foraging habitat for a variety of passerine species.

The CDF biogeoclimatic zone supports 322 bird species (Stevens 1995). Additionally, approximately 140 migratory bird species occur within the Greater Vancouver region (Toochin 2013), some of which may occur in the Project site.

The Project site is situated along the Pacific Flyway migration route. The Pacific Flyway is used by a variety of bird species during migration to move between central America and Alaska. The Project site is also located in the vicinity of Ramsar site 243 which encompasses Burns bog, Sturgeon bank, South arm marches, Boundary bay, the Serpentine River, and the former "Alaksen" Ramsar Site (Ramsar 2015). In addition, the Province has designated Wildlife Management Areas at Boundary Bay, Roberts Bank, and the South arm marshes which is situated 4 km southwest (downstream) of the Project site (MoE 2015).

The Project site is adjacent to Important Bird Area (IBA) BC017 within the terrestrial environment and extends into the IBA at the Fraser shoreline. The aquatic portion of the Project site is within IBA BC017. This IBA supports 50 species of shorebird, as well as a variety of raptors and waterfowl (IBA Canada 2014). This IBA supports globally or continentally significant populations of fifteen species of shorebirds and waterfowl, and supports species at-risk (IBA Canada 2014). Birds overwintering in and migrating through the IBA use the complex of marine, estuary, freshwater and agricultural habitat that occurs along Boundary Bay, Roberts Bank and Sturgeon Bank. Agricultural fields, estuarine marshes, wetlands and eelgrass beds provide foraging habitat for overwintering and migratory birds. The terrestrial portion of the Project site has been historically modified by industrial use and is mostly paved, no longer providing suitable foraging habitat. The riparian habitat bordering the Fraser River and mudflat within the aquatic portion of the Project site may provide some forging and resting habitat; however, have also been modified by historical industrial use.

Mammals

Mammal species abundant in urban environments, such as raccoons (*Procyon lotor*) and rats, are expected to occur in the Project site. Small mammals (i.e., rodents), small carnivores (mustelids [i.e., weasels]) and canids (e.g., coyotes [*Canis latrans*]) are expected to occur in the vegetated habitat within and adjacent to the Project site. Large mammals (i.e., large carnivores and ungulates) are not expected to occur in the Project site. Bats may forage in open areas within the Project site.

Invertebrates

The riparian and foreshore of the Fraser River provides habitat for invertebrate species. These species are an important component of the local ecology and food chain, providing a food source for shorebirds (Harrison et al., unknown date), and other insectivore birds and mammals.

2.9.4 Atmospheric Conditions and Acoustic Environment

The area surrounding the Project site is predominately in industrial and marine use. The closest identified sensitive residential receptors (farm dwellings) are located 750 m south of the site on 68th street, off River Road. The nearest Metro Vancouver air quality monitoring stations are as follows:

- North Delta;
- Burnaby South;

- Richmond South; and
- Tsawwassen.

Air contaminants, such as particulate matter (i.e., $PM_{2.5}$ and PM_{10}), dust, NO_x, Sulphur Dioxide (SO_2) and Volatile Organic Compounds (VOCs) are emitted from existing industrial activities, shipping traffic and on road traffic in the area surrounding the Project site and have the potential to affect receptors.

Human activities in the area surrounding the Project site contribute to the acoustic environment. These activities include commercial shipping on the South Arm of the Fraser River, the loading and unloading of vessels at nearby terminals and industrial activities at the adjacent properties. In addition, to human activity, natural sounds from wind, rain, waves, and marine wildlife contribute to the acoustic environment.

2.9.5 Socio-economic Setting

The Project site is located within the Corporation of Delta and Metro Vancouver. Delta encompasses 180 km^2 bordered by the Fraser River on the north, the United States border and Boundary Bay on the south, the City of Surrey on the east and the Strait of Georgia on the west. Delta includes three different communities: Ladner, Tsawwassen and North Delta, with Ladner designated as its administrative centre (Corporation of Delta 2015).

Delta is the seventh largest municipality by population out of 21 municipalities within Metro Vancouver and tenth largest in the province. Delta's population was 99,863 in 2011, or 4.32% of the population of Metro Vancouver (approximately 2.3 million) (Statistics Canada, 2012a, b). The population of Metro Vancouver has grown in recent years, primarily due to international migration, while Delta's population growth has remained relatively stable over the last decade. Population growth in Delta from 2001-2011 decade was small (at 3.0%) relative to Metro Vancouver (at 16.4%) and the B.C. average (at 12.6%) and smaller than several other Metro Vancouver member municipalities (Statistics Canada 2012a, b).

Delta has a limited land base, with almost 50% of the municipal land base part of the Agricultural Land Reserve and 25% covered by the Burns Bog Ecological Conservancy. Delta has historically been dependent on agriculture and fishing, and while these industries have remained important, Delta has considerable industrial development (Corporation of Delta, 2014; The Corporation of Delta, 2015). Delta is home to Port Metro Vancouver's Deltaport Container Terminals facility and the Westshore Terminals coal shipping facility at Roberts Bank, as well as two industrial parks located along the Fraser River (Tilbury and Annacis Island) (Corporation of Delta, 2014). The Fraser River acts as an important marine corridor for the movement of cargo through the Lower Mainland (Richmond Chamber of Commerce and D.E. Park & Associates Ltd., 2014) as well as from Canada in general.

In addition to its commercial and industrial uses, the Fraser River is used for recreational purposes, including fishing, recreational boating, and marine transportation.

2.9.6 Marine Transportation

There are established deep-sea shipping routes from the Pacific Ocean through the Strait of Juan de Fuca, Haro Strait, Boundary Pass, Strait of Georgia to Sand Heads and along the South Arm of the Fraser River to the Project site (Figure 5). LNG carriers operating in BC coastal waters are expected to require BC Coast Pilots who would board incoming vessels at Brotchie Ledge, near Victoria. BC Coast Pilots would be onboard approaching LNG vessels until the mouth of the Fraser River, at which point Fraser River Pilots would take over the final river transit to the jetty. During river transits, Fraser River Pilots must be advised of bathymetric conditions and the current traffic situation via VHF channel 74, Victoria Traffic. During seasonal fishing openings on the Fraser River, the deep-sea channels within the Fraser River are kept free of interference from fishing vessels with the assistance of the Canadian Lifeboat Institute and DFO patrol vessels.

The estimated transit time for LNG carriers from Brotchie Ledge to Sand Heads is approximately 4.6 hours and the time from Sand Heads to the jetty including vessel slowdown is approximately 1.5 hours. Within the Fraser River, LNG barges and carriers will transit along a well-established and maintained navigational channel to the Project.

3.0 Potential Environmental, Economic, Social, Heritage and Health Effects

3.1 Potential Project Effects

An outline of the potential environmental, economic, social, heritage and health effects of the Project based on current knowledge of the Project and the existing environment is presented in Table 3-1. Potential effects are linked to Project components and activities.

Table 3-1: Identified Issues and Potential Project-related Effects

Issues	Project Components/Activities	Potential Project-related Effects
Environmental		
Fish and Fish Habitat (as defined in the *Fisheries Act*), Water Quality, Benthic Invertebrates and Marine Plants (as defined in the *Fisheries Act*)	• **Construction:** Site setup activities, removal of existing abandoned marine infrastructure, ground stabilization works, support pile driving, construction of the marine jetty, dredging activities, shoreline restoration, vessel traffic • **Operation:** Maintenance dredging activities, berthing and jetty operations • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Potential changes in water and sediment quality may occur during the removal of existing creosote pilings and concrete infrastructure • Potential changes in water quality may occur in association with dredging activities • Potential changes in fish habitat quality and function associated with construction and maintenance dredging activity • Potential loss or degradation of benthic invertebrate habitat associated with construction and dredging activity • Potential loss or degradation of benthic invertebrate habitat associated with localized changes to depth and currents related to dredging and construction of the jetty • Potential changes in benthic community effecting food availability for fish rearing along the shoreline of the Project site • Potential changes in fish habitat quality and function associated with ocean disposal of dredged material in a designated offshore disposal site • Potential fish habitat loss or degradation associated with site preparation and densification activities both onshore and offshore • Potential fish habitat loss or degradation associated with the placement of the jetty infrastructure into the river channel • Potential fish habitat loss or degradation associated with changes in local depth and currents related to construction of the jetty and dredge pocket • Potential fish habitat changes associated with changes in currents leading to erosion or sediment deposition • Temporary noise and vibration effects on fish associated with dredging and pile driving activities • Localized shading effects on riparian and aquatic habitat related to the installation of the jetty structure

Issues	Project Components/Activities	Potential Project-related Effects
		• Land clearing and construction resulting in loss of riparian habitat and sediment transport into the aquatic environment • Potential changes in water and sediment quality associated with a fuel or hydraulic fluid spill during construction • Potential changes in water and sediment quality associated with a spill of LNG during operations • Potential wake and prop-wash impacts to shoreline habitat during construction and operation • Potential fish habitat changes associated with removal of jetty infrastructure during decommissioning Potential effects on marine plants, no marine plants (as defined in the *Fisheries Act*) are expected to occur at the Project site
River Processes	• **Construction:** Site setup activities, removal of existing abandoned marine infrastructure, ground stabilization works, support pile driving, construction of the marine jetty, dredging activities, shoreline restoration, vessel traffic • **Operation:** Maintenance dredging activities, berthing and jetty operations, • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Local changes in hydraulics resulting in changes in water velocity around the structure • Local changes in hydraulics (velocity) resulting in scour and or sedimentation (i.e., development of scour hollows or sediment trapping areas) • Local changes in hydraulics resulting in deflected flow patterns that result in downstream impacts of changed flow conditions, scour and/or sedimentation • Local trapping or scouring of sediment resulting in modified hydraulics (flow direction and velocity) • Migration of the dredge pocket through alteration of the hydraulics (flow direction and velocity) leading to scour at the downstream edge and sedimentation at the upstream edge

Issues	Project Components/Activities	Potential Project-related Effects
Marine Mammals	• **Construction:** Site setup activities, removal of existing abandoned marine infrastructure, ground stabilization works, support pile driving, construction of the marine jetty, dredging activities, shoreline restoration, vessel traffic • **Operation:** Maintenance dredging activities, berthing and jetty operations and associated noise and light from operation of Project • **Decommissioning:** Removal of Offshore Facilities and Offshore Facilities and site clean-up and reclamation	• Behavioral response changes, injury, or mortality as a result of Project activities that result in underwater noise, collisions with vessels, changes in marine water quality, reduction in prey availability
Vegetation	• **Construction:** Site setup activities, site clearing, removal of existing abandoned infrastructure, ground stabilization works, support pile driving, construction of the marine jetty, shoreline restoration • **Operation:** Maintenance dredging activities, • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Direct loss of vegetation communities during Project construction • Indirect effects to native vegetation from fugitive dust during construction • Indirect effects to native vegetation from accidental spills or releases of deleterious substances • Indirect effects to native vegetation from proliferation of non-native and invasive vegetation • Restoration/ enhancement
Terrestrial Wildlife including migratory birds (as defined in the *Migratory Birds Convention Act*)	• **Construction:** Site setup activities, site clearing, removal of existing abandoned marine infrastructure, ground stabilization works, support pile driving, construction of the marine jetty and LNG transfer pipe, dredging activities, shoreline restoration, construction vehicle and vessel traffic • **Operation:** Maintenance dredging activities, berthing and jetty operations and associated noise and light • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Direct loss of potential foraging, shelter, resting and breeding habitat during Project construction • Indirect effects to foraging, shelter, resting and breeding habitat due to increase in ambient noise levels and artificial light levels during Project construction and operation • Potential habitat fragmentation and creation of movement barriers during Project construction and operation • Potential mortality due to interactions with Project components during Project construction and operation

Issues	Project Components/Activities	Potential Project-related Effects
Air Quality and Climate Change	• **Construction:** Air emissions from site clearing, removal of existing abandoned infrastructure, ground stabilization works, support pile driving, construction of the marine jetty and LNG transfer pipe, dredging activities, fuel combustion, construction vehicle and vessel traffic • **Operation:** Emissions from berthing and jetty operations transfer of LNG, maintenance dredging, backup power generation (when required) • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Change in ambient concentrations of selected compounds for Canadian ambient air quality criteria available, including Criteria Air Contaminants (CACs) and VOCs from construction activities, dredging and back up-power generation (if required) • Potential fugitive emissions from LNG loading operations (connecting and disconnecting) • Emissions of GHGs associated with ships at the dock and transportation of dredge material
Noise and Vibration	• **Construction:** Noise emissions site clearing, removal of existing abandoned infrastructure, ground stabilization works, support pile driving, construction of the marine jetty and LNG transfer pipe, dredging activities, fuel combustion, construction vehicle and vessel traffic • **Operation:** Emissions from berthing and jetty operations transfer of LNG, maintenance dredging, backup power generation (when required) • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Change in ambient sound in the vicinity of the human populations and displacement and disturbance of wildlife • Increase in low frequency noise • Vibration effects from pile driving • Increase in underwater noise, resulting in physical or biological disturbance to marine mammals
Light	• **Construction:** Light emissions from fixed and mobile light sources, vehicles and vessels calling at the Project for health and safety. • **Operations:** Light emissions from fixed lighting, vehicles, vessels, navigational lights installed on the jetty for health and safety • **Decommissioning:** Light emissions from fixed and mobile light sources, vehicles, vessels, navigational lights installed on the jetty for health and safety.	• Change in light trespass and sky glow during nighttime hours

Issues	Project Components/Activities	Potential Project-related Effects
Contaminated Sites	• **Construction:** Site clearing, removal of existing abandoned marine infrastructure, ground stabilization works, support pile driving, construction of the marine jetty and LNG transfer pipe, dredging activities, shoreline restoration • **Operation:** Maintenance dredging • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Effects to marine water quality and sediment quality from the removal of potentially contaminated dredge material • Effects to freshwater and marine flora and fauna from: 1) The removal of existing treated wood pilings in the river and associated sediment disturbance; and 2) Disturbance of contaminated fill soil on the foreshore • Effects to human health if contaminated fill soil from the foreshore is excavated and improperly handled and/or disposed during construction work
Economic		
Economic	• **Construction:** All Project construction activities • **Operation:** All Project operation activities • **Decommissioning:** All Project decommissioning activities	• Project construction and operations will create new economic opportunities for workers and businesses, which in turn will generate spin- off employment in goods, services, and supply and in retail and personal services. The combination of labour demand and employment income may affect overall community income and disposable income levels. • Project construction and operation may result in local or regional supply shortages and increased costs • For municipal and regional governments and, where relevant, Aboriginal groups/communities, the Project construction and operation may have fiscal benefits or involve direct fiscal outlays • The Project's operation-phase business may or may not be compatible with local or regional economic plans and strategies, and/or areas designated in local government plans • Project construction and operation may displace or affect commercial marine users, including Aboriginal commercial activities and tourism • Economic interests and effects (including benefits) on Aboriginal groups

Issues	Project Components/Activities	Potential Project-related Effects
Social		
Social	• **Construction:** All Project construction activities • **Operation:** All Project operation activities • **Decommissioning:** All Project decommissioning activities	• Direct demand from the Project during construction and operation on municipal infrastructure, resulting in changes in service and infrastructure capacity utilization, resource requirements, costs, and planning • The Project construction and operation may displace recreational activity, affect access to recreational areas, affect the productivity of fish and wildlife, reduce public safety, and may affect certain environmental conditions (noise, air quality, and visual resources) and therefore may affect recreational user • Potential effects will be considered for the general population and Aboriginal groups
Heritage		
Archaeological, Historical and Heritage Resources	• **Construction:** Site clearing, removal of existing abandoned marine infrastructure, ground stabilization works, support pile driving, construction of the marine jetty and LNG transfer pipe, dredging activities, shoreline restoration • **Operations**: Maintenance dredging activities, berthing and jetty operations • **Decommissioning:** Removal of Offshore Facilities and Onshore Facilities and site clean-up and reclamation	• Damage or destruction of heritage resources through horizontal and vertical displacement, compaction and changes in soil chemistry

Issues	Project Components/Activities	Potential Project-related Effects
Health		
Human Health Risk Assessment and Community Health and Well-being	• **Construction:** All Project construction activities • **Operation:** All Project operation activities • **Decommissioning:** All Project decommissioning activities	• Increased concentrations of air contaminants and particulate matter (i.e., PM2.5 and PM10), which may cause potential adverse health risk to local communities including recreational users, residents and Aboriginal groups • Deposition of dust to plants and soil, which can result in uptake of metals from dust to plants which are then consumed by people, including Aboriginal users • Changes in downstream water quality may result in potential adverse health effects to humans consuming untreated surface water while undertaking recreational activities • Changes in downstream water quality may result in adverse health effects to people, including Aboriginal groups, consuming fish • Worker and public health and safety • Stress and annoyance (due to environmental changes)
Accidents and Malfunctions (With the potential to effect sensitive or vulnerable environment, economic, social, heritage or health issues)		
Accident or Malfunctions	• **Construction:** Project construction activities • **Operation:** Project operation activities • **Decommissioning:** Project decommissioning activities	• Events involving spills of toxic or hazardous materials (e.g., hydrocarbon fuels, lubricants, but not LNG) into environmentally sensitive habitat • Structural failure of a sediment containment measure resulting in erosion and sedimentation on the aquatic environment • Accidents or malfunction of machinery or equipment that leads to a disturbance of environmentally sensitive habitat or accidental mortality of animals • Collision of a Project related vessel with the marine jetty structure leading to potential loss of cargo • Loss of containment of LNG during loading operations • Unplanned facility shutdown, including process upset, or power outage • Fire: - During loading of LNG carriers - During transfer of LNG from the Tilbury LNG Plant

3.2 Potential Effects of Changes to the Environment on Aboriginal Peoples

The Project has the potential to result in changes to the environment that may affect Aboriginal peoples in relation to the following *CEAA 2012,* subsection 5(1) (c) factors:

- Health and socio-economic conditions;
- Physical and cultural heritage;
- The current use of lands and resources for traditional purposes; and
- Any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance.

A preliminary identification of potential Project effects as a result of changes to the environment on Aboriginal peoples is presented in **Table 3-2**. This information is based on consultation and engagement efforts to date with Aboriginal groups. In the course of ongoing consultation, WesPac will work with Aboriginal groups to confirm and identify potential Project effects to subsection 5(1)(c) factors, including through Project-specific studies.

Table 3-2: Preliminary Identification of Potential Effects of Changes to the Environment on Aboriginal Peoples

Subsection 5(1)(c) Factor	Project Phase	Potential Effects
Health and Socio-Economic Conditions	**Construction, Operation, and Decommissioning**	• See Section 4.1 for potential changes in the environment, including Human Health Risk and Social and Economic conditions as a result of Project activities. How Aboriginal peoples may experience these changes specifically or differently from the general population will be considered in the assessment. • Potential effects of changes to the environment on Aboriginal peoples' health or socio-economic conditions as a result of Project activities may include, but may not be limited to possible increases in: o exposure to noise, light, and air emissions o exposure to biological resource contamination o vessel traffic safety risks o job and contracting opportunities o revenue loss associated with potential disruption to commercial fishing

Subsection 5(1)(c) Factor	Project Phase	Potential Effects
Physical and Cultural Heritage, including any Structure, Site or Thing of Historical, Archaeological, Paleontological or Architectural Significance	Construction, Operation, and Decommissioning	• Changes in Visual Resources and Heritage Resources as a result of Project activities that may affect the physical and cultural heritage of Aboriginal peoples, including any structure, site, or thing of historical, archaeological, paleontological or architectural significance. How Aboriginal peoples may experience these effects specifically or differently from the general population will be considered in the assessment. • As a result of Project activities, potential effects of changes to the environment on the physical and cultural heritage of Aboriginal peoples, including any structure, site, or thing of historical, archaeological, paleontological or architectural significance, may include but may not be limited to: o Physical disturbance to sites or landscapes / waterscapes of cultural importance o Changed sense of place
Current Use of Lands and Resources for Traditional Purposes	Construction, Operation, and Decommissioning	• Potential changes in the ability to access preferred locations for traditional purposes as a result of Project activities across all Project phases (e.g., navigational closures, safety exclusion zones, increased vessel traffic congestion) • Potential changes in presence or absence, abundance, or spatial distribution of preferred marine, freshwater, terrestrial, or other resources that are currently used for traditional purposes, such as fish (including invertebrates), marine plants, marine mammals, terrestrial vegetation and wildlife, migratory birds, and freshwater fish, leading to potential loss of fishing, hunting, trapping, or gathering opportunities across all Project phases • Potential changes in the quality of preferred resources that are currently used for traditional purposes, such as marine fish, marine plants, marine mammals, terrestrial vegetation and wildlife, migratory birds, and freshwater, leading to avoidance of traditional foods or otherwise disrupting patterns of use and levels of consumption across all Project phases

Subsection 5(1)(c) Factor	Project Phase	Potential Effects
		• Potential changes in the quality of experience associated with the current use of lands and resources for traditional purposes across all Project phases may include but may not be limited to: o Potential displacement from or avoidance of preferred locations as a result of sensory disturbance (e.g., increased noise, light), perceived health or safety risks (e.g., increased air emissions, vessel traffic), or changed sense of place o Potential interference with or loss of ability to achieve cultural purposes associated with use of specific locations or resources, such as intergenerational knowledge transfer of practices, customs, or traditions • See Section 5.3 for further information on current use of lands and resources for traditional purposes by Aboriginal groups identified in Table 7.

4.0 Consultation and Engagement

4.1 Aboriginal Consultation and Engagement

The Aboriginal consultation and engagement program has been designed to share information about the Project and provide Aboriginal groups with the opportunity to ask questions and provide feedback.

Consultation and engagement with Aboriginal groups has the following objectives:

- Provides Aboriginal groups with access to relevant and meaningful Project information, and communicates technical information to a non-technical audience in a manner that supports understanding and facilitates feedback;
- Provides a communication stream for Aboriginal groups that is separate from the public communications stream, in recognition of the unique history, interests, and concerns of the Aboriginal groups in relation to the Project and Project site;
- Provides a process for tracking and considering input received from Aboriginal groups and reporting how comments will be addressed that will meet requirements and expectations of applicable federal / provincial agencies and programs for the Project;
- Fosters support for the Project from Aboriginal groups;
- Establishes realistic expectations for what the Project will achieve in the short term and the long term; and
- Anticipates and address potential issues and concerns brought forth by Aboriginal groups;
- Reports outcomes of consultations.

The Project consultation and engagement strategy is based on the following principles:

- Providing reasonable opportunities for Aboriginal groups to identify how they wish to engage in the Project, and understand how WesPac can assist in facilitating that engagement;
- Facilitating timely access to relevant and readily understandable (i.e., “plain language”) Project information to promote informed feedback from Aboriginal groups, including meeting with leadership and membership, as appropriate, in their communities;
- Working jointly with appropriate representatives from Aboriginal groups to identify concerns regarding potential effects of the Project on their use of areas near the Project site; and
- Identifying other opportunities for WesPac to work collaboratively with Aboriginal groups, to mutually benefit from the Project.

4.2 Potentially Affected Aboriginal Groups

Based on publicly available information from Aboriginal groups, the Statement of Intent maps available through the BC Treaty Commission, and information derived from the public version of the Consultative Areas Database maintained by the Province of British Columbia, there are 19 Aboriginal groups whose established or asserted traditional territories overlap the Project site. No Métis communities have been identified in the Project site to date. The following is a list of the Aboriginal groups identified to date; however, this list is neither exhaustive nor exclusive.

- Musqueam Indian Band;
- Tsawwassen First Nation;
- Cowichan Tribes*[1];
- Halalt First Nation*;
- Lake Cowichan First Nation*;
- Lyackson First Nation*;
- Penelakut Tribe*
- Stz'uminus First Nation*;
- Tsleil-Waututh Nation;
- Semiahmoo First Nation;
- Katzie First Nation;
- Squamish Nation;
- First Nations of the Stó:lō Nation; and
- First Nations of the Stó:lō Tribal Council.

WesPac will update this list as the Project moves forward, with input from Aboriginal groups and regulatory agencies. WesPac also understands that there may be a requirement by the federal government to consult with the Métis Nation British Columbia and the BC Métis Federation.

4.3 Aboriginal Interests, Including Current Use of Land and Resources for Traditional Purposes

WesPac understands that identifying and recommending measures to address potential adverse effects to Aboriginal Interests from the Project, or from its cumulative interaction with past, present, or reasonably foreseeable projects, will be an important element of the EA.

WesPac also understand that environmental effects on Aboriginal peoples pursuant to subsection 5(1) (c) of CEAA will have to be considered including, but not limited to, their "current use of lands and resources for traditional purposes".

A review of available information indicates that each of the Aboriginal groups identified in Section 5.2 is known to have or assert claims of:

- Aboriginal title to the lands, waters, and resources within their territories; and/or,
- Aboriginal rights related to the use of terrestrial, freshwater, marine, and other resources within these territories for traditional purposes.

*These First Nations are members of the Hul'q'umi'num Treaty Group. Hul'qumi'num assert a collective core (title) territory that includes the lower Fraser River, including the area of the Project.

These established or asserted Aboriginal rights include, but may not be limited to, fishing, hunting, trapping, and gathering activities for food, trade, ceremonies, medicines, and materials (DFO 2014; EAO and PMV 2012).

Based on information regarding the existing conditions and potential Project effects to lands and resources at or near the Project site, WesPac anticipates the Project may affect Aboriginal Interests. These Aboriginal Interests in lands and resources (e.g., freshwater biological resources, marine biological resources, terrestrial vegetation and wetlands, terrestrial wildlife, heritage resources) include access to those lands and resources and their importance to cultural integrity. WesPac is aware that there is a potential interaction of marine aspects of the proposed Project and the importance of use of the Fraser River for fishing to the Aboriginal groups identified above.

Ongoing consultation for the Project with Aboriginal groups will seek to confirm and expand upon Aboriginal traditional use, Aboriginal interests and appropriate measures to avoid or mitigate any adverse effects.

4.4 Overview of Aboriginal Consultation and Engagement Activities to Date

WesPac has been consulting and engaging with Aboriginal groups since February 2014. To date the engagement and consultation process has taken the form of individual and group meetings, written correspondence, emails, and telephone communications with community leaders and technical and business representatives. Following is a summary of the consultation and engagement activities that WesPac has undertaken with Aboriginal groups to February 28, 2015.

4.4.1 Musqueam

WesPac has engaged with Musqueam through emails, telephone calls, letter correspondences, meetings, and agreements between February 6, 2014 and February 28, 2015 During this period:

- Thirty-two emails were exchanged discussing various components of the Project, including meeting arrangements, agreements, and feedback from Musqueam;
- Seven phone calls were made confirming receipts of correspondences, discussing project-specific matters, offering invitations to meetings and/or events, and discussing expectations regarding engagement and consultation;
- Five letters were exchanged that introduced the project and discussed the details of the requirements of consultation;
- Three meetings occurred between WesPac and Musqueam to:
    1. Conduct a boat tour with WesPac to view and discuss -specific details at the Project site;
    2. Conduct a community tour and meeting; and
    3. Discuss a draft capacity funding agreement letter.

- Two agreements were finalized between WesPac and Musqueam;
    1. A Capacity Funding Agreement; and
    2. A sponsorship agreement for a Musqueam event.
- A work plan, figure, and application regarding a soil sampling project at Tilbury Island were also shared with Musqueam.

4.4.2 Tsawwassen

WesPac has engaged with Tsawwassen through emails, telephone calls, letter correspondences, meetings, and agreements between June 24, 2014 and February 28, 2015. During this period:

- Eighteen emails were exchanged discussing various components of the Project, including meeting arrangements, agreements, and requesting feedback from Tsawwassen;
- Seven telephone calls were made concerning the project, confirming receipts of correspondences, offering invitations to meetings and/or events, and discussing expectations regarding engagement and consultation;
- One letter was sent to Tsawwassen regarding agreements made between WesPac and Tsawwassen; and
- Two meetings occurred between WesPac and Tsawwassen representatives to:
    1. Conduct a boat tour with WesPac to view and discuss specific details at the Project site and a community tour and meeting; and
    2. Discuss a draft capacity funding agreement and expectations regarding the proposed Project.

4.4.3 Cowichan Tribes, Halalt, Penelakut and Stz'uminus

Cowichan Tribes, Halalt, Penelakut and Stz'uminus instructed WesPac to coordinate engagement through the Cowichan Nation Alliance. All correspondence on the Project to Cowichan Nation Alliance has included the individual First Nations.

WesPac has engaged with Cowichan Tribes, Halalt, Penelakut (including Hwlitsum), Stz'uminus and the Cowichan Nation Alliance through letter and email correspondences, meetings and telephone between October 12, 2014 and February 28, 2015. During this period:

- Two letters were exchanged between WesPac and Cowichan Nation Alliance:
    - WesPac sent notification letters introducing the Project to Cowichan Tribes, Halalt First Nation, Penelakut Tribe and Stz'uminus First Nation; and
    - WesPac received a letter in response from the Cowichan Nation Alliance, stating that it would act on behalf of Cowichan Tribes, Halalt First Nation, Penelakut Tribe and Stz'uminus First Nation, describing their interests in the area and expectations regarding engagement and consultation.
- One meeting was held between WesPac representatives from Cowichan Tribes, Halalt, Penelakut, Stz'uminus and the Cowichan Nation Alliance regarding the Project;
- Eight emails were exchanged with the First Nations through the Cowichan Nation Alliance regarding the Project. Email correspondence focused on First Nations' expectations regarding engagement and consultation, and coordinating meeting times; and
- Three telephone exchanges occurred regarding the Project during the period.

4.4.4 Tsleil-Waututh

WesPac has engaged with Tsleil-Waututh through letter and email correspondences between October 12, 2014 and February 28, 2015. During this period:

- Three letters were exchanged:
  - A notification letter from WesPac introducing the Project;
  - A letter from Tsleil-Waututh including a copy of the Tsleil-Waututh Stewardship Policy, which identified specific consultation steps; and
  - A letter from WesPac including payment of Tsleil Waututh's Referral Administration File Set-up fee with a copy of the introductory letter previously sent out.
- Indirect messages were received to WesPac through third-parties, indicating Tsleil-Waututh has been too busy with other projects to respond, though they were aware of WesPac's desire to meet.

4.4.5 Kwantlen

WesPac has engaged with Kwantlen through letter and email correspondences and a meeting between October 12, 2014 and February 28, 2014. During this period.

- Two letters were exchanged between WesPac and Kwantlen:
  1. A letter from WesPac to Kwantlen introducing the project; and
  2. A response from Kwantlen describing their interests in the Project and Project site, expectations regarding engagement and consultation, and inviting WesPac to their community to present their project and being preliminary discussions.
- Three emails were exchanged to coordinate a meeting, which had not occurred on February 28, 2014.
- One meeting was held between WesPac representatives from Kwantlen.

4.4.6 Katzie

WesPac has engaged with Katzie through letter and email correspondences between October 12, 2014 and February 28, 2015. During this period:

- One notification letter was sent to Katzie introducing the Project and providing a project information brochure; and
- WesPac received an email and letter describing Katzie's interests in the Project and Project site and their expectations regarding engagement and consultation with WesPac.

4.4.7 Additional Aboriginal Groups

WesPac sent out notification letters to introduce the Project but has yet to receive a response from the following Aboriginal groups:

- Hwlitsum;
- Lake Cowichan;
- Lyackson;
- Semiahmoo;
- Squamish;
- Seabird Island First Nation;
- Shxw'ow'hamel First Nation;
- Skawahlook;
- Soowahlie First Nation;
- Stó:lō Nation;
- Stó:lō Tribal Council; and
- Tsawout First Nation.

4.5 Key Issues Identified by Aboriginal Groups to Date

A summary of the key interests and issues that Aboriginal groups have brought forth is provided in Table 4-1. This list is a high-level summary and is not exhaustive. As WesPac has only received preliminary comments and concerns from a few Aboriginal groups, the following summary is not representative of the comments and concerns for all Aboriginal groups.

Table 4-1: Summary of Preliminary Comments and Concerns from Aboriginal Groups to Date

Issue	Comments
Fish, Fishing and Fish Habitat	• Minimizing any impacts of the Project upon traditional activities • Dredging in the Fraser River potentially impacting fish habitat • Use of large ships creating wakes or affecting flow direction • Marine spills • Safe access to Fraser River for fishing • Recognition of fishing windows and timing
Terrestrial Habitat	• Construction activities • Environmental stewardship • Restoration of Project site to pre-industrial state • Access to terrestrial component of Project site
Heritage Sites	• Presence of heritage sites • Protection of heritage sites

Issue	Comments
Regulatory and Permitting	• Environmental assessment process and timeline • Adequacy of the Federal navigation risk assessment process lead by Transport Canada • Limitations of First Nations time and resources for environmental assessment • Tsawwassen First Nation Final Agreement has specific requirements related to environmental assessment.
Capacity Funding	• Support for Aboriginal participation in the environmental assessment process
Project Benefits	• Business opportunities • Support for community initiatives

4.6 Ongoing and Proposed Consultation and Engagement with Aboriginal Groups

WesPac is committed to ongoing consultation and engagement with Aboriginal groups that are interested in the Project. Engagement will be guided by information gathered to date and continued consultation with the potentially affected Aboriginal groups identified in Section 5.2. Consultation and engagement will be initiated with additional Aboriginal groups as required by regulatory agencies. WesPac will work with Aboriginal groups to develop consultation and engagement processes to meet the interests of each Aboriginal group and the requirements of the regulatory process. WesPac will work with Aboriginal groups to support communications within Aboriginal communities to provide timely information on the Project.

Engagement and consultation activities are anticipated to include the following:

- Continued discussions with Aboriginal groups regarding development of the Project;
- Participation in field studies;
- Discussions about potential benefits and opportunities for Aboriginal groups such as employment and training and business opportunities;
- Discussions about potential adverse Project effects and mitigation measures that may be employed; and
- Technical session (s) on specific topics of interest to Aboriginal groups.

WesPac has a process for tracking and considering comments received from Aboriginal groups on the Project. A report of how those comments have been addressed will be included in the EA application. Should regulators require that additional Aboriginal groups be consulted and engaged, WesPac will seek opportunities to engage those groups as early as possible.

4.7 Public Consultation

4.7.1 Identification of Stakeholders & Consultations to Date

Preliminary stakeholder discussions have included adjacent landowners, river users, local government and other stakeholders with environmental and economic interests that may relate to the Project. Discussion have taken place with or will take place with the following groups:

Federal Government Agencies

- Canadian Coast Guard;
- Canadian Environmental Assessment Agency;
- Environment Canada;
- Fisheries and Oceans Canada;
- Navigation Protection Program;
- National Energy Board;
- Natural Resources Canada;
- Pacific Pilotage Authority;
- Port Metro Vancouver; and
- Transport Canada.

Provincial Government Agencies

- BC Environmental Assessment Office;
- BC Ministry of Aboriginal Relations & Reconciliation;
- BC Ministry of Environment;
- BC Ministry of Forests Lands and Natural Resources;
- BC Ministry of Jobs, Tourism & Stills Training;
- BC Ministry of Justice & Attorney General;
- BC Ministry of Natural Gas Development;
- BC Oil and Gas Commission; and
- Climate Action Secretariat.

Local Government Staff

- Corporation of Delta;
- City of Richmond; and
- Metro Vancouver.

Federal Elected Officials (MPs)

- Hon. Kerry-Lynne Findlay – MP Delta-Richmond East; and
- Hon. Alice Wong – MP Richmond.

Provincial Elected Officials (MLAs)

- Scott Hamilton – MLA Delta North;
- Vicki Huntington – MLA Delta South;
- Hon. Linda Reid – MLA Richmond East; and
- John Yap – MLA Richmond –Stevenston.

Local Elected Officials

- Corporation of Delta Mayor & Council; and
- City of Richmond Mayor & Council.

Adjacent Land Owner Stakeholders

- FortisBC Tilbury LNG Plant;
- Seaspan Ferries Tilbury Terminal;
- Seaspan International; and
- Varsteel.

Economic Development Stakeholders

- Delta Chamber of Commerce;
- Richmond Chamber of Commerce;
- BC Business Council; and
- Vancouver Board of Trade.

Marine Stakeholders

- Fraser River Pilots Association;
- British Columbia Coast Pilots;
- Chamber of Shipping BC;
- BC Wharf Operations Association;
- Council of Marine Carriers;
- Marine Communications & Traffic;
- BC Maritime Employers Association;
- Greater Vancouver Gateway Council;
- Fraser Basin Council;
- Fish Safe;
- BC Seafood Alliance;
- Georgia Straight Alliance;
- Fraser River Users Group;
- Friends of the Fraser; and
- Canadian Lifeboat Institute.

General Public

4.7.2 Overview of Key Comments

A summary of comments and questions identified during meetings with agencies, elected officials and stakeholders to February 28, 2015 is provided in Table 4-2. WesPac is preparing materials and information to be used during the consultation process that will respond to these initial questions and comments.

Table 4-2: Summary of Preliminary Comments and Concerns

General Issue	Comments/Concerns
General	• How is the Project related to the existing Fortis BC Tilbury LNG Plant? • Who is WesPac Midstream LLC and what is their experience in LNG Marine Jetties? • What is the timeline for the Project? • What studies are being done for the Project?
Project Site	• What will be built at the Project site? • Why was this location selected for the Project? • What power source will be available at the jetty? • Could solar power be considered?
Environmental Impacts and Assessment	• What are the anticipated environmental impacts and how will they be mitigated? • What are the anticipated impacts on fish? • What are the anticipated impacts on Pacific migratory birds? • How much dredging will be required? • What regulatory applications is the Project subject to?
Shipping & Marine	• Where will the LNG be shipped? • What is the size of the ships that will be using the Project and how do they compare with ships currently on the Fraser? • How many ships will transit the Fraser River to call at the Project? • How will the marine transport impacts be evaluated? • What route will ships use to navigate to the Project?
About LNG	• What pressure is LNG under when on a carrier vessel? • Is LNG refrigerated while on the vessel? • How is it kept at its required storage temperature? • Who is liable for LNG while it is in transit? • Is shipping LNG safe? What is the industry's safety record? • What safety measures will be in place? • What are the potential impacts of an LNG spill?
Project Economics	• How much will this Project cost? • Who is funding the Project? • What property taxes will the Project pay? • What are the benefits to the local community? • How many people will be employed by this Project?
Public Involvement	• How can input be provided? • How will input be considered? • Where can people find more information about this Project?

4.7.3 Proposed Consultation Activities

WesPac will continue to work with all stakeholders to identify the most appropriate methods of consultation going forward. The following consultation initiatives are proposed for the Project as part of the EA process and ongoing Project development:

- Project Website;
- Project Informational Brochure;
- Project Presentation;
- Public Open Houses;
- Public Comment Periods;
- Issues Tracking Database; and
- Public Consultation Reporting.

5.0 Project Permitting Requirements

Permit and approvals anticipated based on the current Project design are outlined in Table 5-1. Depending on construction conditions and methodologies, municipal permits from the Corporation of Delta may also be required.

To support Transport Canada and PMV's review of the Project a marine navigational risk assessment is currently being prepared on behalf of WesPac by DNV GL. This assessment is independently funded and will address relevant aspects of the Transport Canada (2014) Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL).

Table 5-1: Preliminary Summary of Permits, Licences and Authorisations Required

Regulation/ Legislation	Regulatory Obligation	Regulator	Activity	Status
Anticipated Provincial Requirements				
Oil and Gas Activities Act and *Regulation*	Permit	BC OGC	Construction and operation of the facility	Pending
BC Land Act	Investigative Use Permit	FLNR	Required for access to Crown land in order to conduct baseline studies	Pending
BC Land Act	Crown Licence of Occupation	FLNR	A new waterlot lease extending approximately 150m along the Fraser River foreshore will be required	Pending
BC Water Act	Approval	BC MOE, Water Stewardship Branch	Required for activities in and around a stream including dredging, clearing, shoreline modification activities.	Pending
BC Wildlife Act	Permit	BC MOE, Environmental Stewardship Branch	Wildlife surveys and sampling of wildlife and their habitat	Pending
BC *Heritage Conservation Act*	Heritage Inspection Permit	FLNR, Archaeology Branch	Archaeological inspections to support the EA on non-federal land.	Pending
BC *Heritage Conservation Act*	Heritage Investigation Permit	FLNR, Archaeology Branch	Systematic study and data recovery from an archaeological site	Pending
BC Heritage Conservation Act	Site Alteration Permit	FLNR, Archaeology Branch	Alteration of an archaeological site	Pending
BC *Environmental Management Act Oil and Gas Waste Regulation*	Permit	BC OGC	Solid waste disposal	Pending

Regulation/ Legislation	Regulatory Obligation	Regulator	Activity	Status
Anticipated Federal Requirements				
National Energy Board Act	Export License	NEB Agency	To export LNG outside of Canada to international markets	Application submitted June 20, 2014.
Fisheries Act	Authorization	DFO	• Dredging activities • Disturbing a riparian area • Construction of marine jetty infrastructure	Pending
Navigation Protection Act	Approval	TC	Construction and operation of marine jetty infrastructure	Pending
Canadian Environmental Protection Act and *Disposal at Sea Regulation*	Permit	EC	Marine disposal of dredge material	Pending

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Figures

FIGURE 1
PROJECT LOCATION

LEGEND

- PROJECT LOCATION
- MUNICIPAL BOUNDARY
- INDIAN RESERVE
- TSAWWASSEN FIRST NATION LANDS
- URBAN AREA
- FOREST AREA
- COMMUNITY PARK
- PARK
- WETLAND
- GEORGE C. REIFEL MIGRATORY BIRD SANCTUARY
- ALAKSEN NATIONAL WILDLIFE AREA
- BURNS BOG ECOLOGICAL CONSERVATION AREA
- NON RESIDENTIAL AREA
- AIRPORT
- WATER
- WATERCOURSE
- FERRY ROUTE
- HIGHWAY
- ARTERIAL ROAD
- TRAIL
- RAILWAY
- POWER TRANSMISSION LINE

2.5 0 2.5

SCALE 1:125,000 KILOMETRES

REFERENCE

MUNICIPAL BOUNDARIES AND PROVINCIAL BOUNDARY OBTAINED FROM GEOBASE®. TSAWWASSEN FIRST NATION LANDS, FISHING AREA AND FIRST NATION RESERVES OBTAINED FROM THE PROVINCE OF BRITISH COLUMBIA, COPYRIGHT © 2014. TRANSIT, RAILWAY, WATER, FOREST, PARKS AND URBAN AREA DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
PROJECT LOCATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-28
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO. 13-1422-0049 | CONTROL 5000 | Rev. A | FIGURE 1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B
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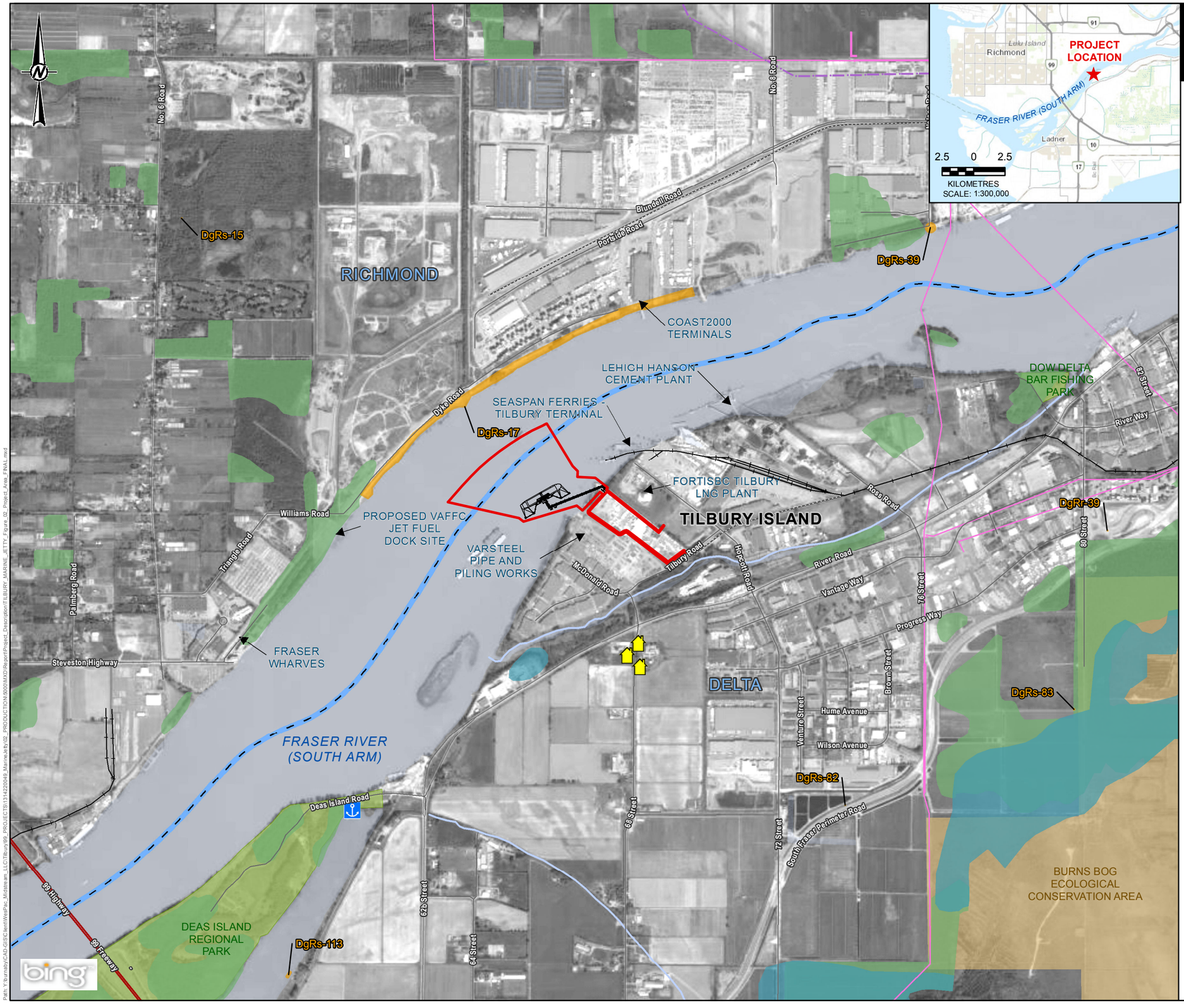
FIGURE 2
PROJECT SITE AND SURROUNDING AREA



LEGEND

- PROJECT BOUNDARY
- PRELIMINARY BERTH CONCEPT PROJECT LAYOUT
- MUNICIPAL BOUNDARY
- ARCHAEOLOGICAL SITE
- FOREST AREA
- PARK
- WETLAND
- BURNS BOG ECOLOGICAL CONSERVATION AREA
- WATER
- HIGH PRESSURE PIPELINE
- POWER TRANSMISSION LINE
- WATERCOURSE
- ARTERIAL ROAD
- HIGHWAY
- RAILWAY
- MARINA
- CLOSEST PERMANENT RESIDENCE

400 0 400
SCALE 1:20,000 METRES

REFERENCE

PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K50-A 04-17-2015. MUNICIPAL BOUNDARIES OBTAINED FROM GEOBASE®. HIGH PRESSURE PIPELINE OBTAINED FROM IHS ENERGY INC. TRANSIT, RAILWAY, WATER DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. ARCHAEOLOGICAL SITES 20150105 OBTAINED FROM GEOBASE®. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009. TOPO BASEMAP © ESRI AND ITS LICENSORS. SOURCE: GEOEYE IKONOS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
PROJECT SITE AND SURROUNDING AREA

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-28
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	5000	A	**2**

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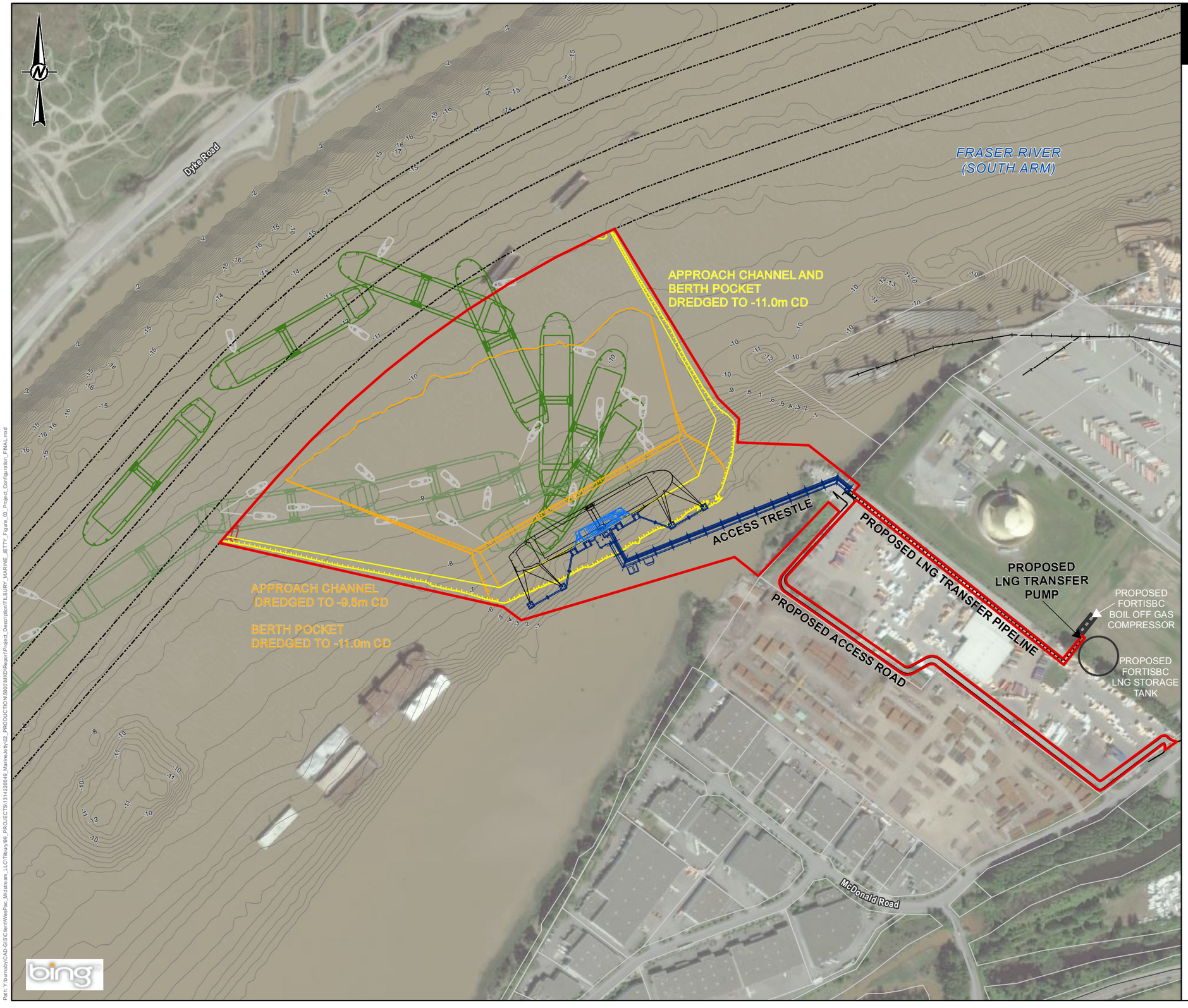
FIGURE 3
PROJECT CONFIGURATION



LEGEND

- PROJECT BOUNDARY
- FORTISBC LNG PLANT
- PARCEL

DREDGING LAYOUT AND BERTH POCKET

- INITIAL DREDGE AREA
- MAXIMUM DREDGE AREA

PRELIMINARY BERTH CONCEPT

CONVENTIONAL LAYOUT

- 2,200m^3 LNG CARRIER
- 90,000m^3 LNG CARRIER
- BERTH STRUCTURE

SHIP MOVEMENT

- 90,000m^3 VESSEL MOVEMENT - ARRIVAL
- 90,000m^3 VESSEL MOVEMENT - DEPARTURE
- TUG

NAVIGATION

- NAVIGATION AID
- FRASER RIVER SHIPPING CHANNEL
- LOCAL ROAD
- RAILWAY
- BATHYMETRY (0.5m)

100 0 100

SCALE 1:5,000 METRES

REFERENCE

PRELIMINARY BERTH CONCEPT, SHIP AND FORTIS BC STRUCTURES FROM AUSENCO-100761-0000-W-K50-A 04-17-2015. BATHYMETRY ELEVATIONS RELATIVE TO CHART DATUM. PARCEL DATA FROM CORPORATION OF DELTA. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
PROJECT CONFIGURATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-28
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO. 13-1422-0049 | CONTROL 5000 | Rev. A | FIGURE 3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B
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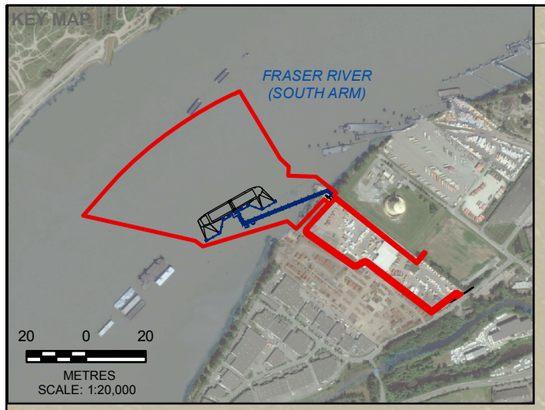
FIGURE 4
ACCESS TRESTLE AND LOADING PLATFORM DESIGN

KEY MAP



FRASER RIVER
(SOUTH ARM)

90,000m^3 LNGC

2,200 m^3 LNGC

BOW-LINE
MOORING DOLPHINS

PIPE RACK

PARKING
AREA

ACCESS TRESTLE

ROADWAY

WALKWAY

BERTHING
DOLPHINS

BERTHING
DOLPHINS

FLOATING DOCK

CONTROL ROOM

LAUNCHING PLATFORM

STERN-LINE
MOORING DOLPHINS

-10 -11 -12 -9 -8 -7 -6 -5 -4 -3 -2 -1

bing

LEGEND

- PROJECT BOUNDARY

PRELIMINARY BERTH CONCEPT
CONVENTIONAL LAYOUT

- 2,200m^3 LNG CARRIER
- 90,000m^3 LNG CARRIER
- BERTH STRUCTURE
- MIDSHIP
- BATHYMETRY (0.5m)

40 0 40
SCALE 1:2,000 METRES

REFERENCE

PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K50-A 04-17-2015. BATHYMETRY ELEVATIONS RELATIVE TO CHART DATUM. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
ACCESS TRESTLE AND LOADING PLATFORM DESIGN

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-25
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	5000	A	**4**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B
0 25mm

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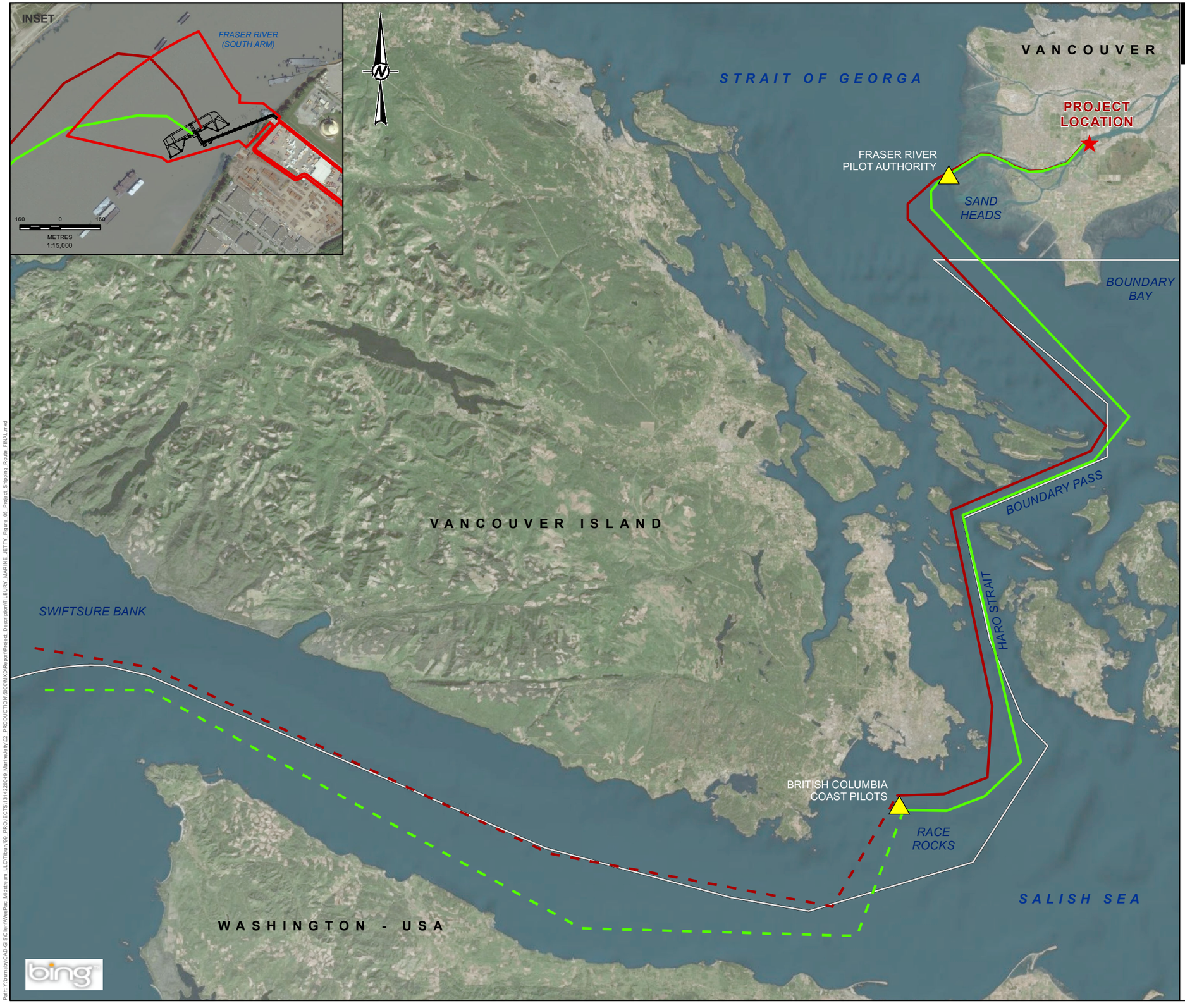
FIGURE 5
PROJECT SHIPPING ROUTE



LEGEND

- PROJECT BOUNDARY
- SHIPPING NAVIGATION ROUTE
  - INBOUND
  - OUTBOUND
- PRELIMINARY BERTH CONCEPT CONVENTIONAL LAYOUT
- CANADA - USA BOARDER
- PILOT BOARDING POINT

10 0 10

SCALE 1:500,000 KILOMETRES

REFERENCE

SHIPPING AND PILOT DATA PROVIDED BY AUSENCO 20141125. PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K50-A 04-17-2015. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009. ESRI IMAGERY COPYRIGHT © 20140514 ESRI AND ITS LICENSORS. SOURCE: GEOEYE IKONOS. USED UNDER LICENSE, ALL RIGHTS RESERVED
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
PROJECT SHIPPING ROUTE

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-21
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	5000	A	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B

0 25mm

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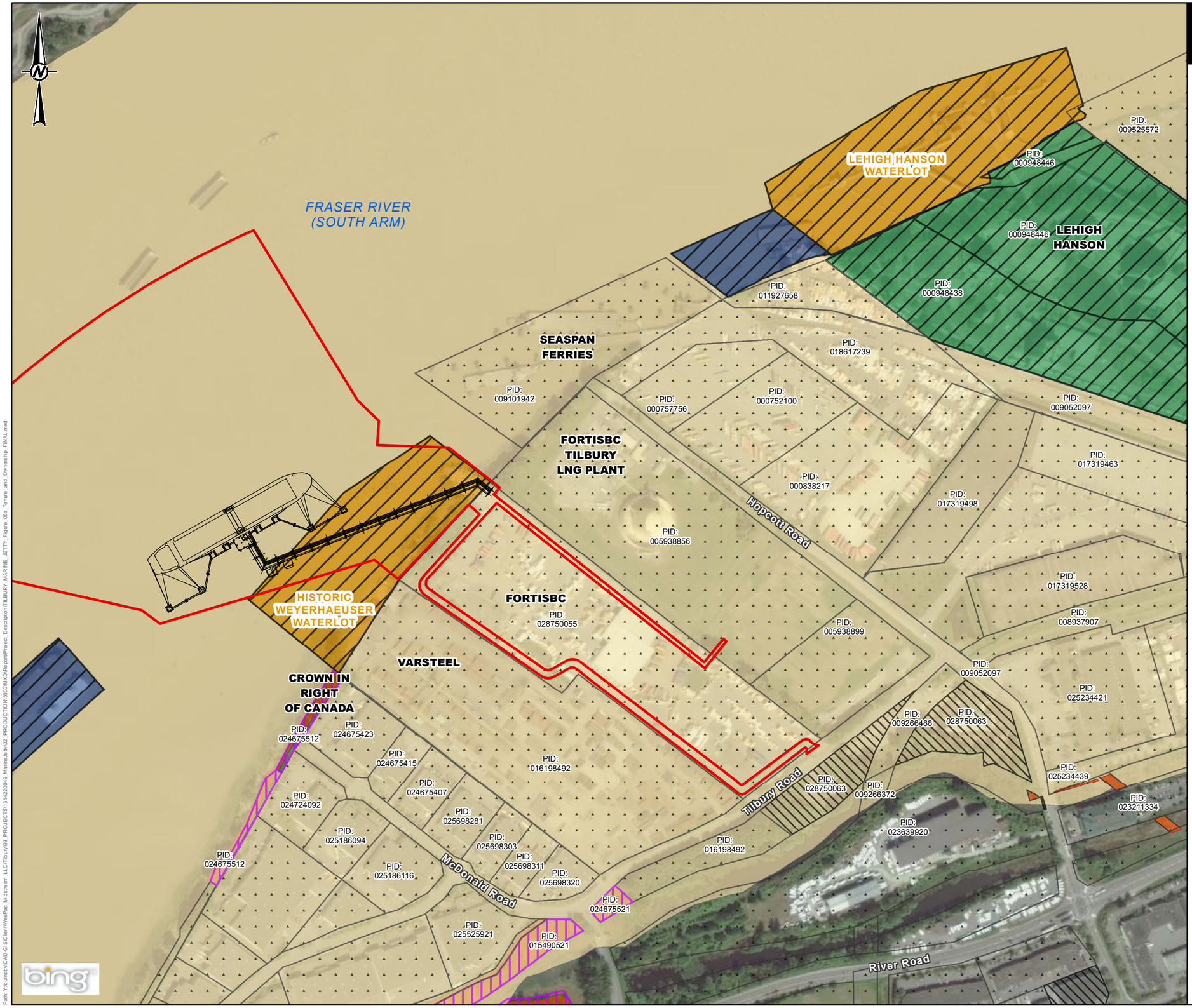
FIGURE 6a
LAND TENURE AND OWNERSHIP



100 0 100

SCALE 1:5,000 METRES

LEGEND

- PROJECT BOUNDARY
- PRELIMINARY BERTH CONCEPT CONVENTIONAL LAYOUT

LAND OWNERSHIP

- PRIVATE LAND
- CROWN FEDERAL LAND
- CROWN PROVINCIAL LAND
- CROWN MUNICIPAL LAND

LAND TENURE TYPE

- LICENCE - COMMERCIAL (GENERAL)
- LICENCE - INDUSTRIAL (GENERAL)
- LEASE - INDUSTRIAL (LIGHT INDUSTRIAL)
- CROWN - INDUSTRIAL (LIGHT INDUSTRIAL)
- RIGHT OF WAY - UTILITY (GAS AND OIL PIPELINE)

REFERENCE

PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K50-A 04-17-2015. TENURE AND LAND OWNERSHIP DATA FROM GOVERNMENT OF BRISTISH COLUMBIA AND CORPORATION OF DELTA. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
LAND TENURE AND OWNERSHIP

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-25
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO. 13-1422-0049 | CONTROL 5000 | Rev. A | FIGURE **6a**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B

25mm

0

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FIGURE 6b
ZONING AND LAND USE

LEGEND

- PROJECT BOUNDARY
- PRELIMINARY BERTH CONCEPT CONVENTIONAL LAYOUT
- PARCEL

ZONING

- I2 - HEAVY INDUSTRIAL
- I2 - I7 - SPLIT ZONE
- I7 - SPECIAL INDUSTRIAL
- C5A - LIMITED PRIVATE RECREATIONAL

LAND USE

- INDUSTRIAL
- SPLIT
- TRANSPORTATION TERMINAL
- ENVIRONMENTALLY SENSITIVE AREA

100 0 100

SCALE 1:5,000 METRES

REFERENCE

PRELIMINARY BERTH CONCEPT, SHIP AND FORTIS BC STRUCTURES FROM AUSENCO-100761-0000-W-K50-A 04-17-2015. ZONING AND LAND USE DATA FROM CORPORATION OF DELTA. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009. PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
ZONING AND LAND USE

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-25
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO. 13-1422-0049 | CONTROL 5000 | Rev. A | FIGURE **6b**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSI B

0 25mm

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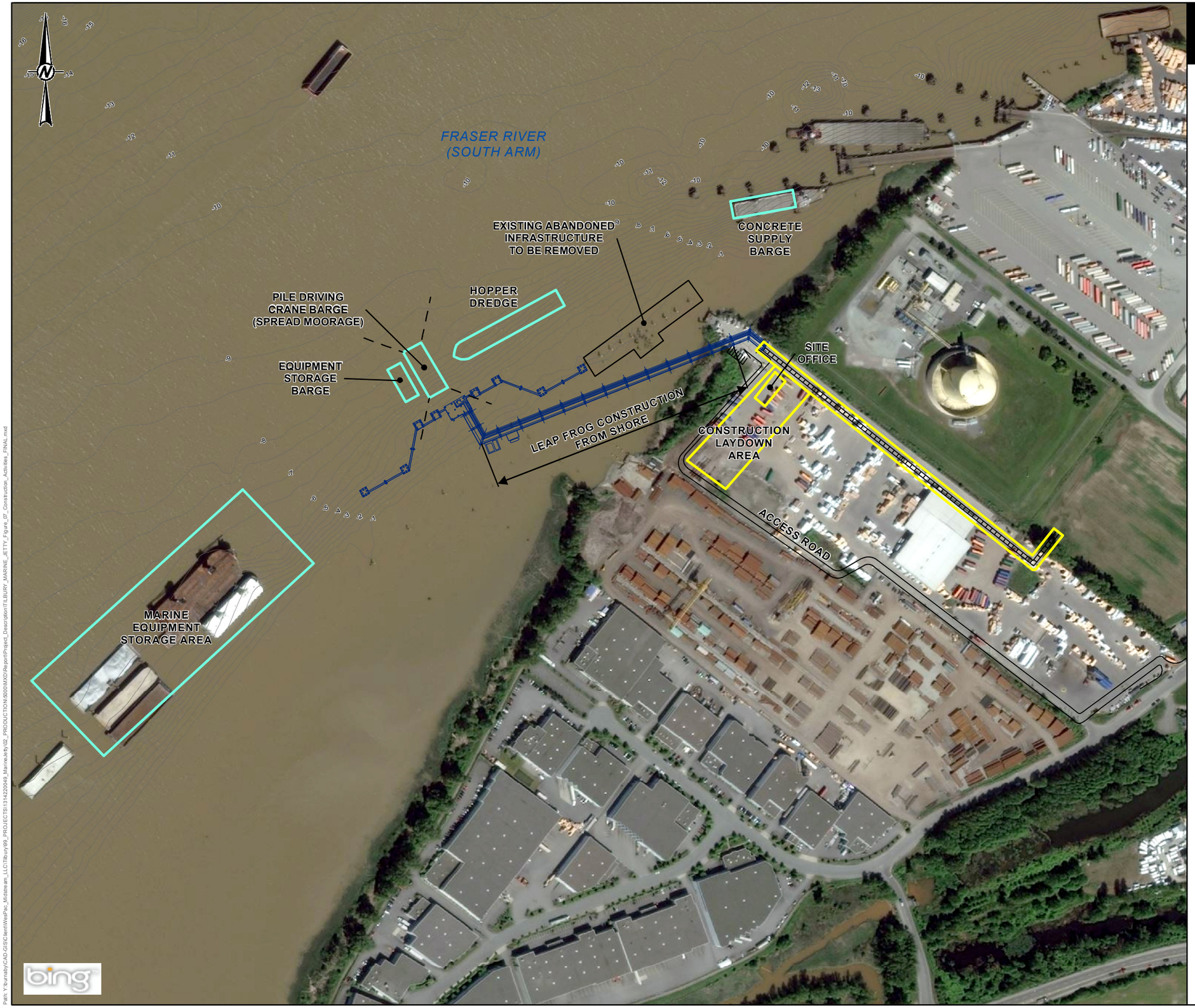
FIGURE 7
CONSTRUCTION ACTIVITIES



LEGEND

- OFFSHORE CONSTRUCTION LAYDOWN FEATURE
- ONSHORE CONSTRUCTION LAYDOWN FEATURE

PRELIMINARY BERTH CONCEPT

CONVENTIONAL LAYOUT

- BERTH STRUCTURE
- BATHYMETRY (0.5m)

CONSTRUCTION LAYDOWN SUBJECT TO FURTHER CONSULTATION WITH FORTISBC

100 0 100

SCALE 1:4,000 METRES

REFERENCE

PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K50-A 04-17-2015. CONSTRUCTION LAYDOWN CONCEPT FROM AUSENCO-100761-0000-W-K01-A 01-26-2015. BATHYMETRY ELEVATIONS RELATIVE TO CHART DATUM. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
CONSTRUCTION ACTIVITIES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-25
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	5000	A	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B

0 25mm

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FIGURE 8
ENVIRONMENTAL SETTING

INSET

50 0 50
METRES
SCALE: 1:3,500

FRASER RIVER
(SOUTH ARM)

Hopcott Road

Tilbury Road

McDonald Road

River Road

68 Street

bing

LEGEND

- PROJECT BOUNDARY
- PRELIMINARY BERTH CONCEPT CONVENTIONAL LAYOUT
- WETLAND
- WATER
- WATERCOURSE
- RAILWAY

SHORELINE (FREMP)

- HIGH PRODUCTIVITY
- MODERATE PRODUCTIVITY
- LOW PRODUCTIVITY

FIRST ORDER COMMUNITY (FREMP)

- MARSH
- MUD
- MEADOW, VASCULAR
- LOW SHRUB WOODLAND
- DECIDUOUS TREE WOODLAND

160 0 160
SCALE 1:8,000 METRES

REFERENCE

FRASER RIVER ESTUARY MANAGEMENT PROGRAM (FREMP) DATA DIGITIZED BASED ON INFORMATION OBTAINED FROM THE BURRARD INLET ENVIRONMENTAL ACTION PROGRAM WEBMAP. PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K07-A 02-05-2015. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
ENVIRONMENTAL SETTING

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-25
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	5000	A	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B
0 25mm

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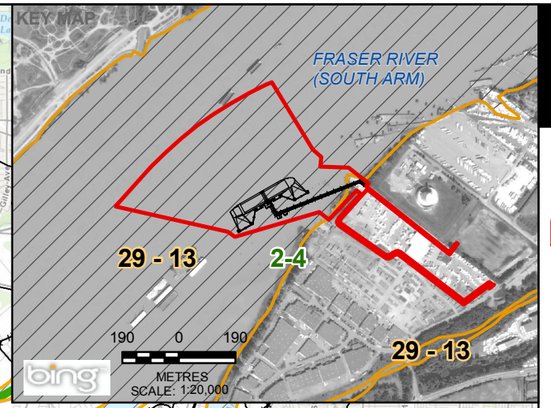
FIGURE 9
COMMERCIAL AND RECREATIONAL FISHERIES

KEY MAP



LEGEND

- PROJECT LOCATION
- PROJECT BOUNDARY
- PRELIMINARY BERTH CONCEPT CONVENTIONAL LAYOUT
- RECREATIONAL BOATING ROUTE
- RAILWAY
- COMMERCIAL FISHERIES MANAGEMENT AREA 28 - PACIFIC REGION SUB-AREA
- BC FISHERIES SUB-REGION
- RECREATIONAL FISHING AREA - CRAB
- RECREATIONAL FISHING AREA - ANADROMOUS FISH
- FIRST NATION FISHING AREA TSAWWASSEN
- TSAWWASSEN FIRST NATION LANDS
- INDIAN RESERVE

2 0 2
SCALE 1:100,000 KILOMETRES

REFERENCE

FISHERIES MANAGEMENT DATA DIGITIZED BASED ON MAPS PROVIDED BY THE FEDERAL DFO. BC FISHERIES DATA BASED ON WILDLIFE MANAGEMENT UNITS OBTAINED FROM GEOBASE®. TSAWWASSEN FIRST NATION FISHING AREA AND FIRST NATION RESERVES OBTAINED FROM THE PROVINCE OF BRITISH COLUMBIA, COPYRIGHT © 2014. RECREATIONAL FISHING AREA DATA OBTAINED FROM BCMCA. PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K07-A 02-05-2015. ESRI BASEMAP COPYRIGHT © ESRI AND ITS LICENSORS. SOURCE: GEOEYE IKONOS. USED UNDER LICENSE, ALL RIGHTS RESERVED PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

PROJECT
TILBURY MARINE JETTY

TITLE
COMMERCIAL AND RECREATIONAL FISHERIES

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-04-25
PREPARED	RH
DESIGN	EJC
REVIEW	DC
APPROVED	BW

PROJECT NO. 13-1422-0049 | CONTROL 5000 | Rev. A | FIGURE 9

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25mm
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Appendices

Appendix A:

Photographs of the Project Site

PROJECT

Tilbury Marine Jetty

TITLE

View upstream of the Project site showing
Seaspan's existing terminal

Golder Associates

PROJECT No.	13-1422-0049	Phase / Task No.	
DESIGN		SCALE	NTS REV.
CADD			
CHECK			1
REVIEW			

PROJECT

Tilbury Marine Jetty

TITLE

Existing paved area where car park area will be located

Golder Associates

PROJECT No.	13-1422-0049	Phase / Task No.	----
DESIGN	--	SCALE	NTS
CADD	--	REV.	
CHECK	--		2
REVIEW			

PROJECT

Tilbury Marine Jetty

TITLE

Shoreline downstream of where the jetty will be located

Golder Associates

PROJECT No. 13-1422-0049			Phase / Task No.
DESIGN			SCALE NTS REV.
CADD			3
CHECK			
REVIEW			

PROJECT

Tilbury Marine Jetty

TITLE

View showing the impacted shoreline downstream of the Project

Golder Associates

PROJECT No.	13-1422-0049	Phase / Task No.	
DESIGN		SCALE	NTS REV.
CADD			
CHECK			4
REVIEW			

PROJECT

Tilbury Marine Jetty

TITLE

View from the water of existing marine structures to be removed

Golder Associates

PROJECT No.	13-1422-0049		Phase / Task No.
DESIGN			SCALE NTS REV.
CADD			5
CHECK			
REVIEW			

PROJECT

Tilbury Marine Jetty

TITLE

Location proposed for dredging prior to construction of the marine jetty

Golder Associates

PROJECT No.	13-1422-0049	Phase / Task No.	
DESIGN		SCALE	NTS REV.
CADD			6
CHECK			
REVIEW			

PROJECT

Tilbury Marine Jetty

TITLE

Location of concrete deck where the access trestle will extend from

Golder Associates

PROJECT No.	13-1422-0049	Phase / Task No.	
DESIGN		SCALE	NTS REV.
CADD			7
CHECK			
REVIEW			

PROJECT

Tilbury Marine Jetty

TITLE

View south: showing the corridor where the onshore above ground LNG pipeline will be constructed

Golder Associates

PROJECT No. 13-1422-0049			Phase / Task No.
DESIGN			SCALE NTS REV.
CADD			8
CHECK			
REVIEW			