

Wespac Tilbury Marine Jetty

WesPac Midstream – Vancouver LLC is proposing to build a marine jetty in the lower Fraser River at a former industrial site next to FortisBC’s Tilbury Liquefied Natural Gas Storage Facility in Delta, B.C. The project is named Tilbury Pacific. The jetty will transfer LNG onto ships for transportation over the water.

This will involve the phased construction of:

- A temporary floating berth
- A marine jetty with berthing and mooring facilities
- An access trestle connecting to the shoreline
- An LNG line linking to FortisBC’s Tilbury LNG facility
- A vapour return line, water supply, and other utilities

Connecting B.C.’s LNG to the World

The marine jetty will open the door for B.C.’s abundant natural gas resources to provide communities overseas with the energy they need while reducing global greenhouse gas emissions and air pollutants.

Specifically, it will:

- Supply fuel to local ships and ocean-going vessels
- Export LNG through specialized carrier ships

About WesPac Midstream – Vancouver LLC

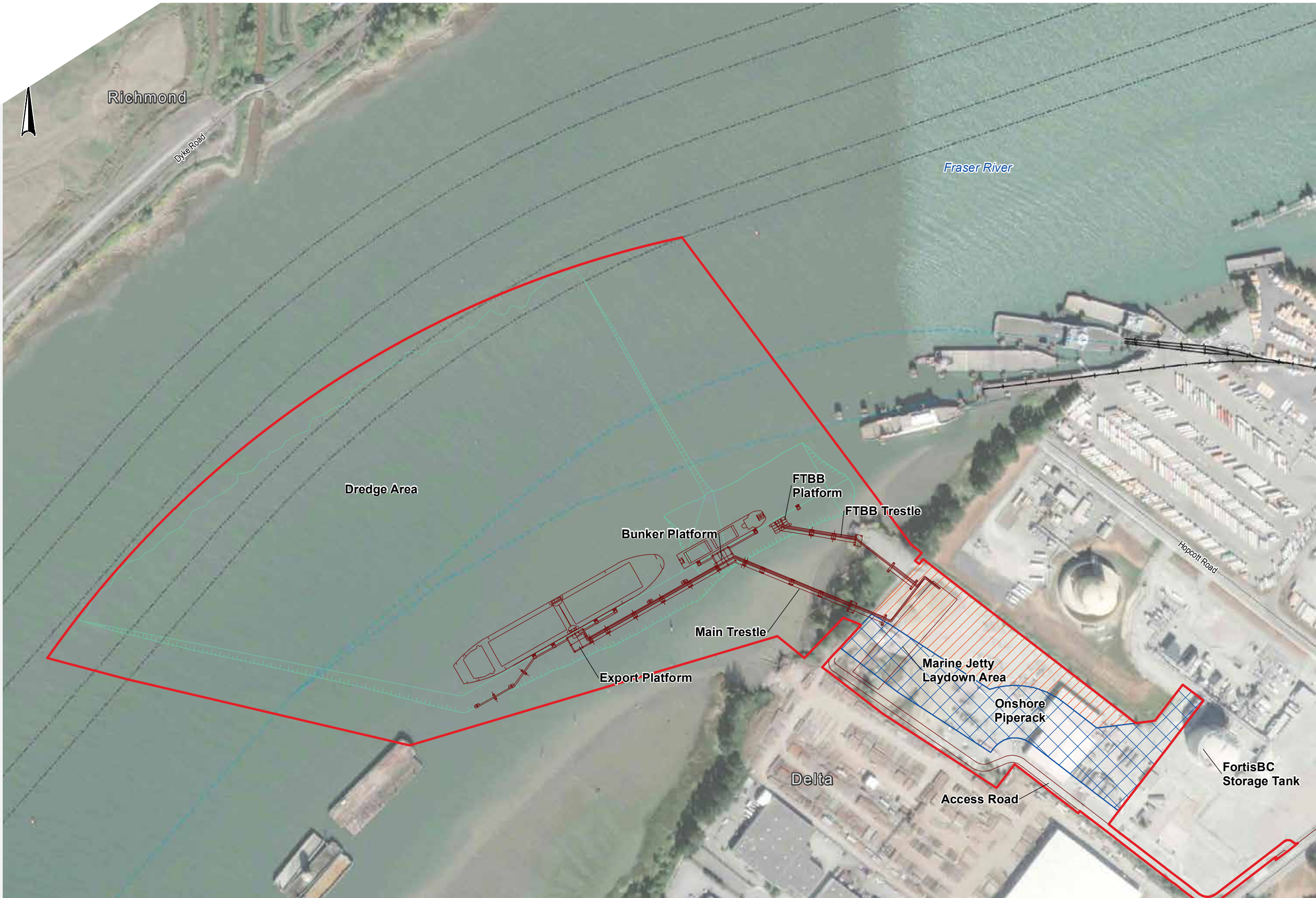
WesPac Midstream – Vancouver LLC is a wholly owned subsidiary of WesPac Midstream LLC (WesPac), which develops, constructs, owns and operates energy infrastructure throughout North America.

Visit **wespac.com** to learn more about our company and our work. Learn more about the Tilbury Pacific LNG marine jetty project at **TilburyPacific.ca**.

Project Layout

Legend

- PROJECT BOUNDARY
- PRELIMINARY BERTH CONCEPT - PROJECT LAYOUT
- PRELIMINARY BERTH CONCEPT - DREDGE POCKET
- PIPE RACK - LIKELY ROUTING CORRIDOR
- PIPE RACK - POSSIBLE ROUTING CORRIDOR
- WATERCOURSE
- ROAD
- RAILWAY
- FRASER RIVER SHIPPING CHANNEL
- FERRY ROUTE
- HIGH PRESSURE PIPELINE





Why Tilbury?

We chose this site because it is a former industrial site next door to FortisBC’s Tilbury LNG storage facility. The site also features a few other advantages:

- **Experienced LNG Operator**
The FortisBC facility has been safely producing LNG since 1971.
- **Established Shipping Route**
It is just 21 km from the mouth of the Fraser River, in an industrial area with existing marine terminals.
- **Brownfield Site**
Weyerhaeuser’s Northwest Hardwood Mill was once located at the site and included a marine terminal.
- **Industrial Zoning**
City of Delta’s Official Community Plan has zoned the site for light, heavy and water-related industrial uses.
- **Isolated Location**
The site is in an industrial area at a safe distance from residential and commercial neighbourhoods.
- **Existing Infrastructure**
FortisBC’s facility is already connected to existing natural gas supply pipelines.



Environmental Assessment Process

WesPac has filed an Application for an Environmental Assessment Certificate with the Environmental Assessment Office of B.C. (EAO). The project is being reviewed under:

- The British Columbia Environmental Assessment Act, and concurrently,
- The Canadian Environmental Assessment Act 2012.

The project is in the Application Review phase, which provides a forum for Indigenous communities, regulatory agencies, stakeholders and the general public to review and comment.

To learn more about the B.C. Environmental Assessment (EA) process or view EA documents for this project on the EAO Project Information Centre website, please visit www.eao.gov.bc.ca.

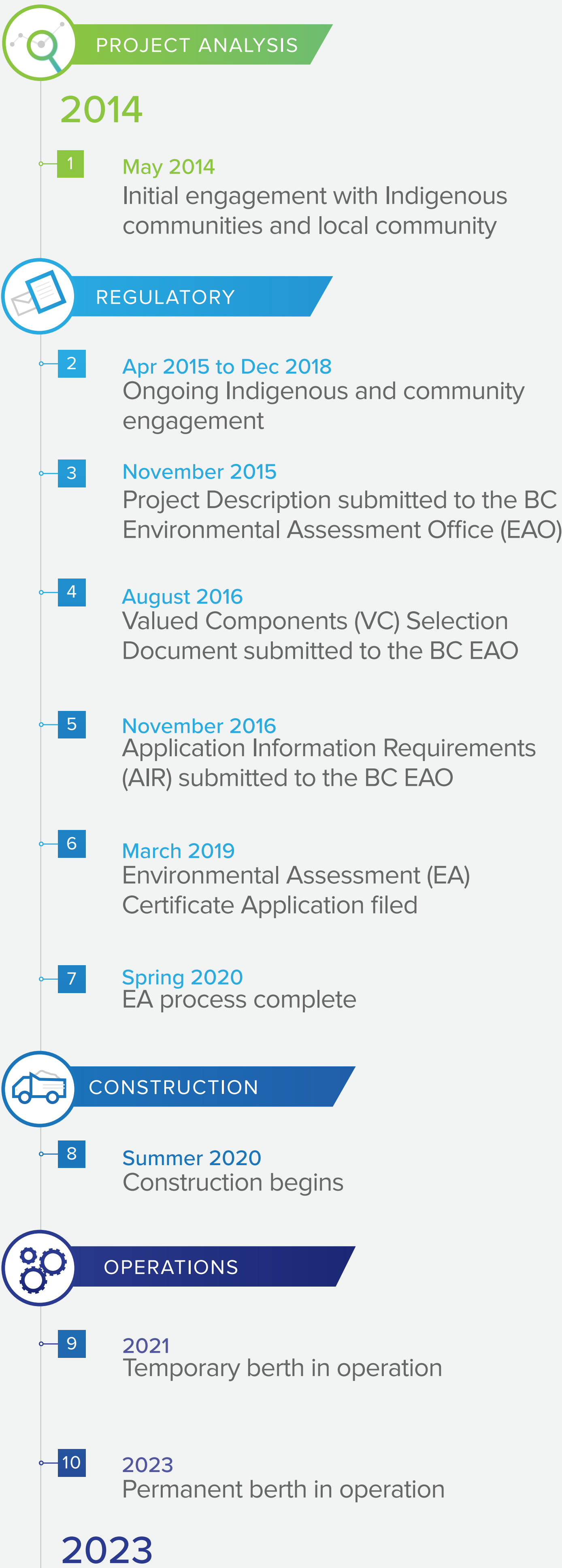
Other Regulatory Processes

Following completion of the EA process as basis for project approval and certification, several regulatory federal, provincial, and local government permits and approvals will be required before WesPac can begin construction and operation.

Regulatory permits and approvals that may be required for this project include:

- B.C. Oil and Gas Activities Act and Regulation Permit
- B.C. Land Act Crown Licence of Occupation
- B.C. Water Act Section 11 Approval
- B.C. Wildlife Act Permit
- B.C. Heritage Conservation Act permits
- B.C. Environmental Management Act, Oil and Gas Waste Regulation Permit
- National Energy Board Act Export Licence
- Fisheries Act Authorization
- Navigation Protection Act Approval
- Disposal at Sea Regulation Permit
- City of Delta Rezoning Application

Project Timeline



Local Benefits

New International Maritime Organization standards in 2020 are creating an opportunity for the marine jetty project to reduce emissions in BC by supplying fuel for LNG powered ships.

- Annually, BC coastal and trans-Pacific vessels produce 70 million tonnes of carbon dioxide equivalent.
- 70 million tonnes is more GHG emissions than the rest of the province combined.
- LNG-powered marine vessels reduce their carbon intensity by about 20% compared with traditional marine fuels.
- Converting one deep sea vessel to LNG from heavy fuel oil would reduce GHG emissions by 93,500 tonnes per year, which is like taking 19,800 cars off the road.

Global Benefits

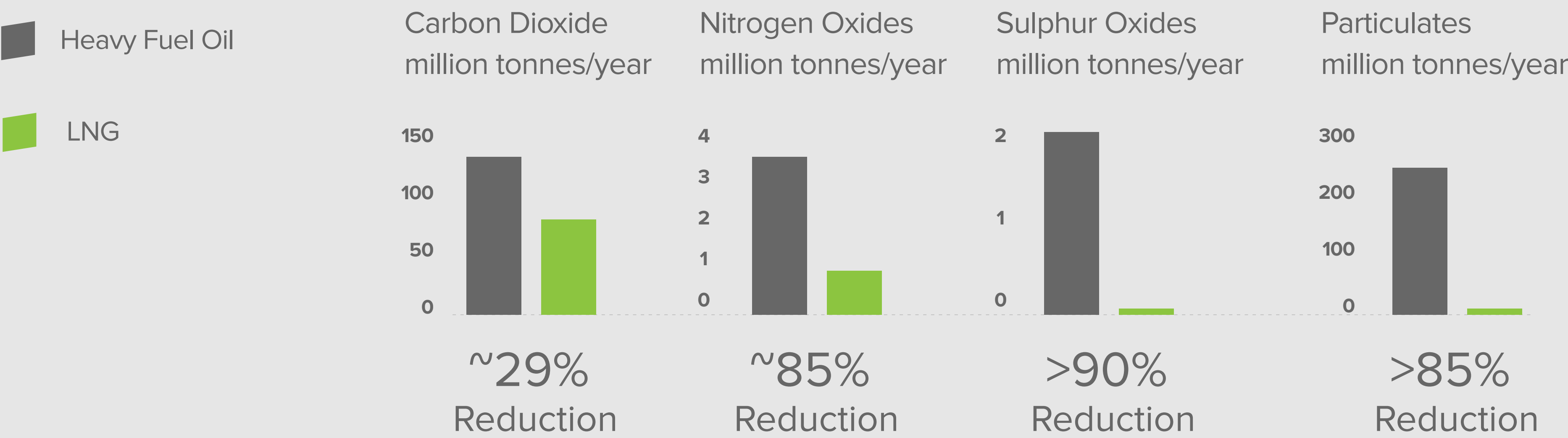
LNG exports from North America are a key part of the global effort to reach the climate change targets outlined in the 2015 Paris Agreement.

- Globally, power generation plants are switching from coal and oil to LNG to reduce emissions.
- LNG is an attractive alternative fuel because its GHG, nitrogen oxides, sulphur oxides and particulate matter emissions are significantly lower than coal and oil.



Graphic 1.
Heavy fuel oil emission vs. clean burning LNG

Source: Liquefied Natural Gas: A Marine Fuel for Canada’s West Coast (cngva.org/)



LNG is made from the same natural gas we use in our homes and businesses every day.

- LNG is natural gas cooled to -162 degrees Celsius.
- Cooling natural gas condenses it into a liquid.
- Natural gas is easier to store and transport long distances by truck or ship as a liquid (LNG) than as a gas.

Key LNG Facts

LNG is colourless, non-toxic, and non-corrosive.

- LNG is stored and transported at low pressure in double-walled tanks designed to keep it cold.
- The tanks are vapour tight, so air cannot leak into the tanks and LNG cannot leak out.
- LNG in a double-walled tank cannot burn because there is no oxygen to react with.

In the unlikely event of a leak, LNG will warm, rise and dissipate.

- If spilled it will quickly warm up and revert to a gaseous state.
- LNG is flammable only in a narrow range (if the gas to air ratio is between 5% and 15%).
- When ignited, LNG burns slowly with a lazy flame.

Tilbury Pacific LNG Marine Jetty

The Tilbury Pacific LNG Marine Jetty project will have procedures and safety measures for preventing and managing spills, leaks and vapour clouds. These safeguards will protect the facility, employees and the public including:

- Spill containment systems
- On-site fire control and response systems

- Multiple gas, flame, smoke and low- and high-temperature detectors and alarms
- Automatic and manual shutdown and isolation systems
- Emergency backup power to maintain safety monitoring and control system operation

The LNG marine shipping industry has an outstanding safety record. Since the first commercial shipment, LNG vessels have safely delivered more than 92,000 cargoes.

Risk Assessment

We conducted a Navigation Risk Assessment to determine the risk levels to the public along the route.

- The assessment determined the level of risk associated with the worst-case consequence of a cargo release.
- The assessment was conducted for the shipping route from the terminal to the Pacific Ocean.
- It considered collision and grounding events that would result in a cargo release.

Assessment results did not exceed the acceptable risk standard used by the BC Oil & Gas Commission at any point along the shipping route.

Navigation Measures

Project shipping will follow port guidance for safe navigation including:

- Three escort tugs will be tethered to each laden LNG carrier
- A safety zone will be maintained during vessel berthing and loading
- Local pilots will be onboard to guide the ship

LNG Vessels

During operation, two types of vessel will dock at the jetty:

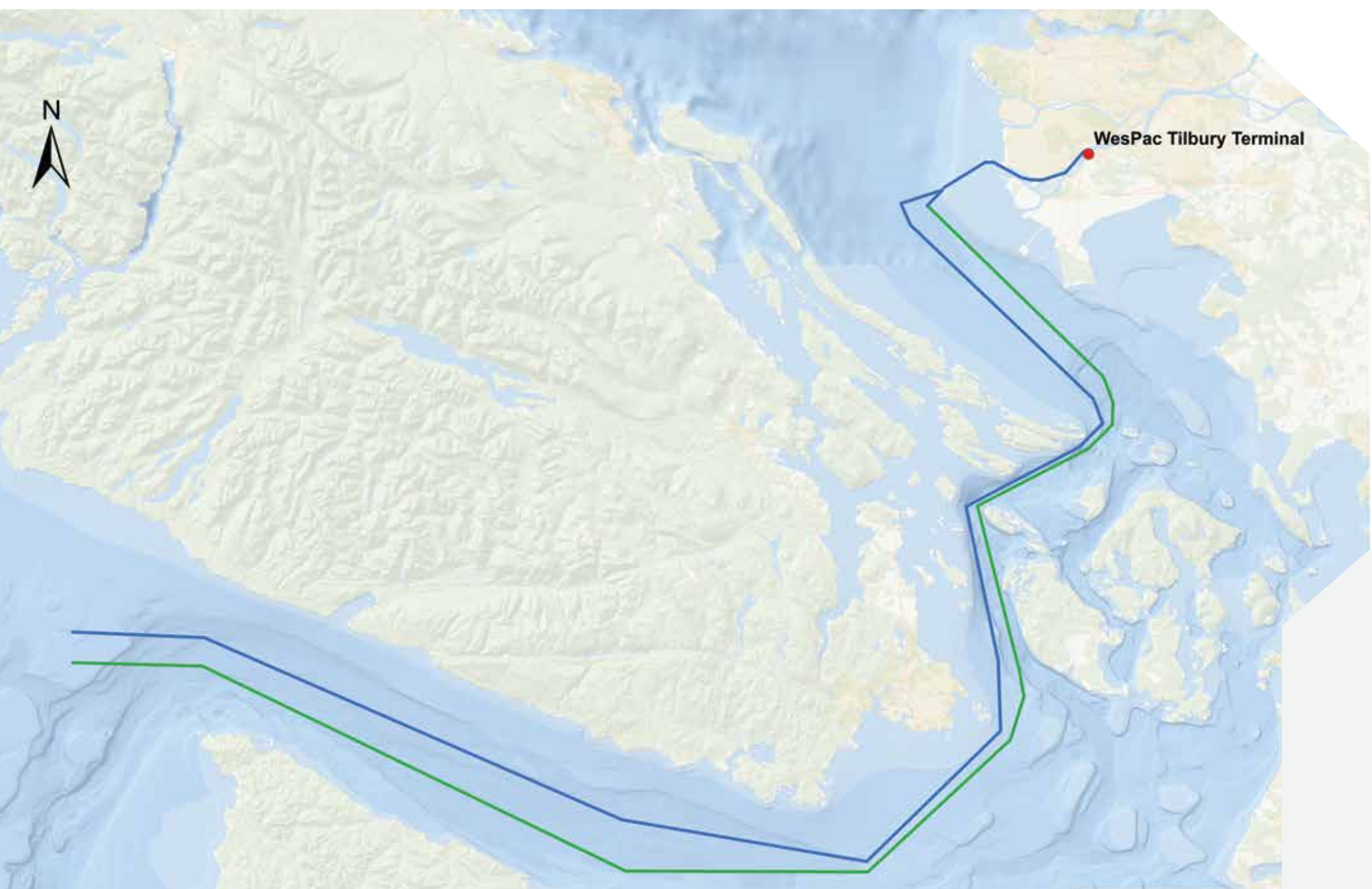
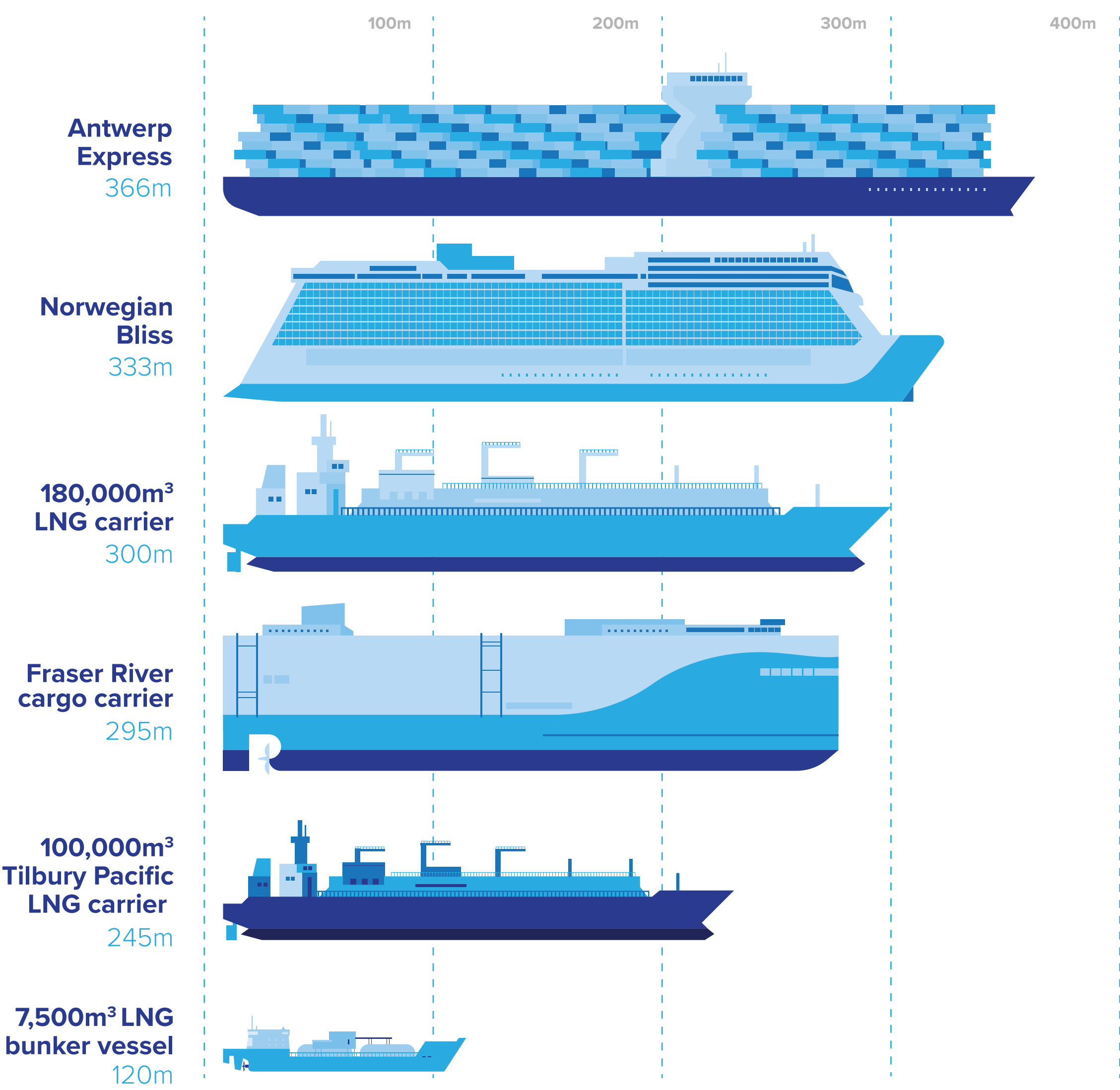
LNG bunker vessels

- Transport LNG locally and throughout the Pacific Northwest
- Smaller than BC Ferries Coastal Series vessels

LNG Carriers

- Export LNG to offshore markets
- Similar size vessels currently operate on the Fraser River

Graphic 2.
Port of Vancouver vessel size comparison



Shipping Routes

Legend:

- Nominal Inbound Route
- Nominal Outbound Route

Land



WesPac is committed to leaving the shoreline in better condition than we found it through creating and enhancing aquatic and terrestrial habitats and removing abandoned marine infrastructure.

Project design minimizes effects on vegetation, wildlife and wildlife habitat by:

- Using tandem berths connected by a walkway to reduce overall footprint
- Using grating on the walkways to allow 70% more sunlight to pass through, minimizing shading effects to marine life
- Using lamp shields and other best practice technologies to reduce light trespass

Vegetation

Key findings:

- The project site is disturbed and paved.
- Estuarine marsh and riparian vegetation is present along the foreshore.
- Remaining natural ecosystems are degraded with non-native plant species.
- Potential effects:
 - loss of wetland and riparian ecosystem,
 - loss of at-risk species,
 - and introduction and expansion of invasive plants.

Mitigation:

- Creation of wetland and riparian ecosystem habitat, resulting in an overall net gain of 0.92 ha of productive habitat.
- A Wetland Mitigation Plan prescribing restoration and monitoring details
- A Vegetation Management Plan, including invasive species management and vegetation monitoring

With the application of mitigation measures no adverse residual effects to vegetation are predicted.

Land



Wildlife and Wildlife Habitat

Key findings:

- The project site is within the Boundary Bay – Roberts Bank Important Bird Area.
- Wildlife habitat includes wetland and riparian habitat that have been altered by industrial use.
- Wildlife in the project area have adapted to the industrial environment.
- Potential effects include habitat loss, disturbance to wildlife from noise and light, and mortality due to collisions with equipment or vessels.

Mitigation:

- Proposed mitigations will increase wetland habitat and improve habitat function.
- A Wildlife Management Plan will provide measures including:
 - identifying and delineating sensitive areas
 - identifying and avoiding sensitive wildlife periods (i.e. nesting)
 - conducting pre-construction surveys
 - managing noise and light sources
 - protecting species to reduce effects to wildlife populations during construction and operation

With the application of mitigation measures no residual effects to wildlife and wildlife habitat are predicted.



Water



The Fraser River is a dynamic system that naturally carries a high sediment load. In the system, natural sources of metals are remobilized and sediment is transported downstream to the Salish Sea. This natural loading influences sediment deposits, and water and sediment quality in the lower reaches of the river.

River Processes

Key findings:

- Hydrology, river currents and the riverbed are affected by river discharge and tidal flows.
- Short-term changes to river processes can occur through sediment transport.
- Some longer-term trends in the shape of the channel have occurred as a result of human activity, such as dredging.
- Potential effects to river processes include local and regional changes in hydraulics and sedimentation around the dredge area, scour protection, and in-river structures.
- The effects are expected to be within the natural variation of Fraser River hydraulics.

Water Quality

Key findings:

- Potential effects to water quality include:
 - Increased suspended sediment
 - Remobilization of trace metals and organic constituents
 - Release of PAHs
 - Release of alkaline material
- Changes in suspended sediment during dredging is not expected to be distinguishable from existing conditions.
- Changes in water quality or sediment quality are not expected to be detectable.

Mitigation:

- Environmental Management Plan during construction and operation to reduce effects to water quality.
- Location and activity specific plans for construction and operation to minimize sediment disturbance and manage potential run-off, concrete wash, and other deleterious substances from entering the Fraser.

After application of the proposed mitigation measures, such as refining the project design to reduce the project's potential impact, residual effects on water quality are predicted to be negligible.

Aquatic Life



The lower Fraser River is an important estuarine ecosystem and supports a variety of fish and marine mammal species. It supports various fish species including salmon, eulachon, and white sturgeon, and also invertebrates including shellfish.

Marine Mammals

Key findings:

- Nine species of marine mammals have potential to occur in the southern Salish Sea region, including southern resident orcas.
- Shipping will cross southern resident orca habitat near Sand Heads.
- Potential effects include:
 - Habitat loss
 - Changes to habitat quality from underwater noise
 - Changes in the abundance and distribution of marine mammals

Mitigation:

- Monitoring of a safety zone by marine mammal observers during construction.
- Use measures, such as bubble curtains, to reduce underwater noise produced during construction.
- A Marine Mammal Management Plan will be implemented and include construction soft-start, timing windows and underwater sound verification.
- Project vessels will follow established shipping lanes and maintain reduced speeds to limit interactions with marine mammals.

After application of the proposed mitigation measures, residual effects on marine mammals are predicted to be not significant.

Fish and Fish Habitat

Key findings:

- Aquatic habitat at the project area lacks spawning substrate for fish and has a poorly developed benthic community.
- Anadromous fish use the river for upstream migration and downstream out-migration.
- There is some shoreline use by resident fish species, such as white sturgeon.
- Potential effects are changes in habitat quality and function, habitat loss, fish mortality or behavioural changes, and riparian habitat loss.

Mitigation:

- Restore and enhance wetland habitat to improve habitat quality and function
- Implementation of Environmental Management Plans to manage site conditions and reduce adverse effects to fish.
- Implementation of environmental monitoring and follow-up programs to continue monitoring fish use of the project area.

The residual effects resulting to fish and fish habitat after application of mitigation measures are considered negligible.

Air



Air quality and greenhouse gas management is important for the health of humans and air can be a pathway for the transmission of contaminants. Reducing and minimizing effects from these sources is an important consideration for the project.

Air Quality

Key findings:

- The project is located within an industrialized area of the Metro Vancouver airshed.
- Existing ambient air quality concentrations are below current Metro Vancouver criteria.
- Concentrations for 24-hour and annual Particulate Matter (PM)10 are predicted to remain below their respective Metro Vancouver air quality objectives during operations.

Mitigation:

- Potential effects can be reduced by:
 - Increasing the use of LNG fuelled vessels
 - Reducing engine use
 - A leak detection and repair program

Human Health

Key findings:

- The human health assessment evaluated potential health risks at receptor locations near the project where people are known to be present, including communities, Indigenous peoples' harvesting areas and recreational areas. Predicted health risks to people living or carrying out activities near the project are low.

Mitigation:

- Mitigation of effects to human health is achieved through mitigating effects to water and air quality.

The residual effects and residual cumulative effects resulting to air quality after application of mitigation measures are considered not significant.

Residual effects to human health were considered low.



Within the past 20 years, growth and development along the lower Fraser River has included a mix of industrial use, urban and rural residential development, and transportation infrastructure development. The Fraser River is an important commercial marine transportation route with numerous barges, container ships, and bulk carriers regularly transiting the South Arm to access marine terminals and foreshore industrial areas.

Key Findings:

- Marine transportation and shipping during construction, operation, and decommissioning, and maintenance of a marine security zone could affect marine use and access.

Mitigation:

- The project will comply with maritime regulations and legislation.
- WesPac is voluntarily participating in Transport Canada's shipping and navigational risk assessment TERMPOL review process.
- A Marine Access and Transportation Management Plan, Marine Communication Management Plan, and Aboriginal Communication Plan will be developed and implemented.
- Construction activities will be timed, where feasible, to reduce interactions with commercial salmon fisheries openings.

Project-related residual effects on commercial and non-commercial marine use and access remaining after implementation of mitigation measures are considered to be not significant.



The Tilbury Pacific LNG Marine Jetty project is located on Tilbury Island along the South Arm of the Fraser River within the City of Delta, the 7th largest municipality in Metro Vancouver.

Economy

Key Findings:

- Project construction is expected to create 276 direct full time equivalent (FTE) positions and indirectly 407 FTEs. Seven FTEs will be required throughout project operation.
- The goods and services revenues for direct supplier industries are approximately \$132.8 million during construction.
- The total tax revenues for the B.C. government over the construction period is estimated at \$9.8 million.
- Property tax and fee payments during the construction phase are estimated at \$1.3 million to \$1.7 million.

Mitigation:

- WesPac will require its Engineering, Procurement and Construction (EPC) contractor to have formal local business and Indigenous hiring and procurement policies in place throughout project construction to maximize local business and Indigenous hiring consistent with industry best practices.

Socio-Community

Key Findings:

- No change in demand for community infrastructure is anticipated.

Mitigation:

- WesPac will work with FortisBC and local emergency service providers to host workshops onsite to orient responders with the facilities, operations, and potential hazards.

- With mitigation, change in demand for community services is anticipated to be negligible.
- With mitigation, effects to community wellbeing due to reduced access to areas used by Indigenous communities for traditional purposes are expected to be negligible.

No project-related residual effects are expected after the implementation of mitigation measures.

Visual

The project is located on Tilbury Island in a developed corridor of the South Arm of the Fraser River where the visual landscape includes a mix of urban, suburban, and industrial land use settings.

Key Findings:

- Construction activities are anticipated to create temporary changes in visual quality.
- The largest anticipated effect to visual quality will occur during operation.
- From viewpoints within 1 km of the project, visible components will be perceived as prominent.
- Visual contrast from project components results in a small change to existing views.
- Light sources will result in a small perceptible change to existing lighting conditions.

Mitigation:

- The Project design reduces effects on visual quality and incorporates:
 - External surface treatment
 - Lighting management practices
- Residual effects of the project on visual quality are considered perceptible with a small change to daytime and nighttime viewing.

Consequently, effects are considered to be not significant.

Noise

Project-related effects to noise are linked to the health and socioeconomic conditions of Indigenous peoples, the public, and stakeholders. Potential changes in noise levels have the potential to affect the well-being of local people and may affect how wildlife use the project area.

The construction phase will be planned to take advantage of technologies and site features to reduce potential adverse effects from noise.

Key Findings:

- Noise levels are mainly influenced by constant traffic along River Road, truck traffic on Tilbury Road, construction and industrial activity, intermittent airplane and shipping traffic, and barking dogs living at the animal shelter.
- Potential effects to noise considered included predicted changes in daytime and nighttime noise levels due to project activities.

Mitigation:

- A Noise Management Plan with details on mitigation measures, such as acoustical screening, will be implemented during construction.
- Construction will comply with all municipal noise bylaws.
- The construction phase will be planned to take advantage of technologies and site features to reduce potential adverse effects from noise.

Project activities during construction have potential to increase noise levels but the residual effects are predicted to be not-significant.

Heritage resources consist of three sub-components:

1. Paleontological resources consisting of paleontological sites, features, and objects
2. Archaeological resources consisting of archaeological sites, features, and objects
3. Historical resources consisting of historical sites

Key Findings:

- There are no known heritage resources located within the project area.
- There is potential for unrecorded heritage resources to exist.
- Archaeological and Historical Resources existing in the larger regional assessment area including the *Tl'uqtinus* village site, pre-contact fish weirs, surface lithics, fire broken rock, historic buildings, marine shipwrecks, and surface refuse.
- Ground-altering activities have the potential to affect undocumented archaeological or historical sites.
- Construction activities have the potential to change the level of accessibility to archaeological and historical sites.

Mitigation:

- Complete an Archaeological Impact Assessment (AIA) prior to ground-disturbing construction activities.
- Realign or redesign project components to avoid heritage resources if detected through the AIA.
- Protect discovered resources by protective covering, stabilization, and physical barriers.
- Offset effects to heritage resources discovered if avoidance is not feasible.
- Implement a Heritage Resources Chance Find Management Procedure.

No residual effects are expected after the implementation of mitigation measures.



The lower Fraser River is an important resource area for a number of Indigenous communities and ongoing use is integral to the maintenance of their culture and identity. Indigenous communities have asserted and established rights within their traditional territories and identified areas of use that overlap the project area.

Key findings:

- WesPac considered a range of publicly available information and requested project-specific studies from Indigenous communities.
- Studies identified ongoing food, social and ceremonial, domestic fishing and harvesting, and cultural activities of some Indigenous communities within the project area.
- Potential effects could impact Indigenous communities' food, social, and ceremonial or domestic fishing locations.

Mitigation:

- Potential effects can be reduced by the implementation and monitoring of mitigation measures including:
 - Marine Access and Transportation Management Plan
 - Marine Communications Plan
 - Aboriginal Communications Plan
 - Marine Use and Fisheries Advisory Group
- Effects to Indigenous fishers are expected to be reduced or avoided through ongoing communication and the coordination of project activities

Project-related residual effects remaining after the implementation of mitigation measures are considered negligible.

