Centerm Container Terminal Improvements: Meeting Demand for Increased Container Throughput

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Summary
The Centerm container terminal in Vancouver, BC, Canada has undergone a transformation that involves major works to extend quay lines, reclamation and reconfiguration of the terminal to optimise terminal operations and major road works. The expanded and modified facility will accommodate modern container vessels and will enable efficient terminal operations, all while meeting highly regulated environmental and sustainability requirements.

Keywords: Centerm, expansion, containers, dredging, caisson

Introduction

The Vancouver Fraser Port Authority (Port Authority) is the federal authority responsible for the lands and waters that make up the Port of Vancouver. The port of Vancouver, located on the west coast of Canada, is Canada's largest port.

The Port Authority is building the Centerm Expansion Project and South Shore Access Project to meet the needs of increasing demand for containers shipped through the Port of Vancouver, enabling larger vessels to be accommodated at the terminal and remove port-related traffic from the local roads around Vancouver.

Project Details

The Centerm terminal is located within Burrard Inlet, within the Inner Harbour of Vancouver Harbour. The location of the Centerm Terminal is shown in Figure 1, together with the main features of the project.

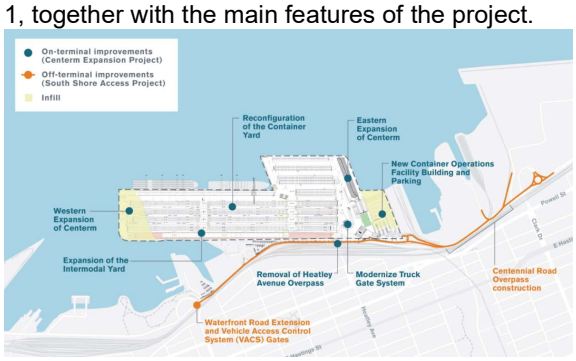

Figure 1 Overview and main features of Centerm Expansion Project (source: Port Authority web site)

The improvements will help:

- Increase capacity and efficiency at Centerm to support Canada's growing trade demand for goods shipped in containers
- Provide a continuous port road from Canada Place to Highway 1
- Reduce travel delays for port users and businesses by building an overpass over two rail crossings and removing one rail crossing on port roads
- Reduce port-related traffic on local roads in the Downtown East Side and East Vancouver

Dredging and Infilling

Prior to the start of construction, crabs, sea cucumbers, crustaceans and fish were relocated to other areas in Burrard Inlet.

The marine works involved dredging of soft sediments from below the proposed reclamation and dredging to enhance the turning basin between the western end of the terminal and the nearby Seabus Terminal for cruise ships accessing the Canada Place cruise terminal. Most dredged materials were disposed at sea, with some being reused onsite and the remainder sent to an offsite contaminated receiving facility.

Dredging was carried out using a clamshell on a barge mounted crawler crane and a trailer suction hoper dredge (TSHD). During the dredging process monitoring of turbidity was carried out continuously.

To reduce the impact on fish habitat, dredging was restricted to windows of time prescribed by Department of Fisheries and Oceans. Dredging activities were also carried out in a manner to not impact marine operations.

Existing basins were infilled with armoured rock dykes built across the seaward ends, prior to reclamation behind being constructed with sand fill, using clamshell, TSHD and Submersible Dredge Pump.

Marine Habitat Offset

The Port Authority's Habitat Enhancement Program (HEP), Is a key initiate which the Port Authority has been running for the past 20 years, where their mandate is to proactively create, restore and enhance habitat within their jurisdiction. The

Maplewood Marine Restoration Project, delivered under HEP and completed in 2021, included 5ha of restoration including planting 125,000 eelgrass shoots to create a highly productive 1.5-hectare eelgrass bed. This project was used to offset the 4ha of marine habitat that was disrupted as part of the Centerm Expansion Project.

The project Centerm Expansion Project could not have proceeded with dredging or marine infilling, without this marine habitat offset initiative.

Berth Extension
The existing Berth 6, which was made up of both concrete caissons and a deck on pile structure, was extended 75m to the west, as part of the project. This included the slip forming and transport of two 37m long concrete caissons with cover slabs and a cope wall. This was to facilitate two 8,500 TEU vessels being serviced along berth 5 and 6, at the same time.

Landside Elements
The landside works included a major upgrade to the terminal access, electrical infrastructure, reefer capacity, increased workable RTG bays and a full re-orientation of the existing yard, so that the container ground slots were all facing east west, rather than on north south angles. This promotes higher efficiency and allows the RTGs to traverse the full width of the terminal.

A major aspect of this project was the expansion of the intermodal yard. This included doubling the rail capacity and transitioning from Rubber Tire Gantries (RTG), to the more productive, Rail Mounted Gantry (RMG), all while the terminal continued to run at a certain level of service. This upgrade included the construction of new concrete beams, cable trailing system, rail, safety fencing and commissioning the new RMGs, prior to them being put into full service. This was an extremely challenging transition. Which included considerable planning and adaptive management to ensure the terminal's productivity was maintained, while the project could still move forward.

The construction staging and existing infrastructure, posed a significant challenge during construction. The terminal was required to continue to operate at an agreed level of service and works were required to be completed in and around this busy operation. The terminal setting was over 100years old and had experienced over five terminal expansions in that time. Existing infrastructure, utilities and contamination were a large contributor to these challenges.

Envision Certification
The Institute of Sustainable Infrastructure, defines Envision® as a sustainability framework and rating system that enables a thorough examination of the sustainability and resiliency of all types of civil infrastructure.

As part of the Port Authority's sustainability initiatives and its role being a steward for the environment, the project had an aim of Gold. In the end, the Project was awarded Platinum, which is the highest award.

The project partners were required to meet a number of strict requirements, under a number of categories in order to achieve this award. A few examples were, reducing greenhouse gas (GHG) and air pollutant emissions achieved through; Installation of ship to shore power connection and electrified rail mounted gantry cranes, sustainable siting and innovative marine restoration, prioritizing the needs and goals of the local communities through meaningful investments etc.

Community Engagement
Community engagement and First Nations consultation has been a strong focus in the planning and delivery of the project. Monthly project newsletters updating progress of the work, changes to port access and environmental matters were issued to stakeholders and interested parties.

The Centerm Community Fund was created as a part of the Project to show appreciation to the community for their patience during construction of the terminal expansion and construction on the south shore. It was part of a larger $2 million donation to community initiatives in East Vancouver from the Port Authority and the container terminal's operator, DP World.

Delivery during the COVID pandemic
A major challenge to the project was delivery of most elements of the construction during the COVID pandemic. All members of the project team worked diligently to ensure the success of the project during this challenging time.

Discussion and Conclusion
Elements of the works for the Centerm Terminal expansion have been presented.

The project has involved dredging and offshore disposal, reclamation, berth extension using precast concrete caissons and reclamation. Major reconfiguration of the working terminal was carried out. This required close liaison with the terminal operator to enable successful delivery.

Essential to the success of the project has been the program of community consultation and engagement and the Port Authority's commitment to habitat enhancement.