SECTION 4

Early Works

4.1 Temporary Workspaces

Figure 4-1 shows the temporary workspaces associated with construction of the Project. Temporary barge ramps or rail spur tracks during construction are not currently considered necessary.

4.2 Temporary Piles

In total, the Project will add 373 temporary piles: six temporary piles for the marine construction safety boom, 235 temporary piles for templates, and 132 addition piles for other works (such as, foreshore and the temporary office trestle). Table 4-1 provides more details on these temporary piles. Figures 4-1 and 4-2 provide a sketch of the temporary piles.

<table>
<thead>
<tr>
<th>Table 4-1. Temporary Piles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>Marine Construction Safety Boom</td>
</tr>
<tr>
<td>Template Piles</td>
</tr>
<tr>
<td>Berth 1-2 Dolphins</td>
</tr>
<tr>
<td>Loading Platform 1-2</td>
</tr>
<tr>
<td>Berth 3 Dolphins</td>
</tr>
<tr>
<td>Loading Platform 3</td>
</tr>
<tr>
<td>Access Trestle</td>
</tr>
<tr>
<td>Junction Platform 1</td>
</tr>
<tr>
<td>Junction Platform 2</td>
</tr>
<tr>
<td>Foreshore Circular Cells – Within Sheet Pile Cells, no additional area</td>
</tr>
<tr>
<td>Foreshore Circular Cells – Within Sheet Pile Cells, no additional area</td>
</tr>
<tr>
<td>Temporary Working Piles</td>
</tr>
<tr>
<td>Proposed Trestle (office laydown) – West of foreshore</td>
</tr>
<tr>
<td>Miscellaneous Piles</td>
</tr>
<tr>
<td>Miscellaneous anchor points, construction piling</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Notes:

ft = foot
m = metre
m² = square metre
4.3 Diversion of Existing Outfalls

There are no natural watercourses located in the Project site. The current WMT drainage captures surface runoff and directs it to a number of catch basins, with direct discharge points into Burrard Inlet (Figure 4-3). From an erosion control perspective, the existing drains will be managed to reduce inputs of sediment. Trans Mountain has an understanding of the drainage paths and all sediment laden contact water will be treated prior to discharge.

The Erosion and Sediment Control Plan can be found in Appendix A.

4.3.1 Water Treatment Plant and Temporary Discharge

There will be three new temporary storm water retention/treatment areas created:

1. One will be located near the tunnel portal to capture construction water related to tunnel excavation activities.
2. A small weir tank to capture storm water and construction water on the west end of the foreshore construction area.
3. One will be located in the onshore northwest corner of the site (south of the railway) to capture the remainder of the site construction contact water.

All of these storm water retention areas will also be capable of capturing storm water events.

Figure 4-4 details the storm water retention/treatment areas and drainage paths in the foreshore area.
4.3.2 Existing Outfalls around the Foreshore Expansion

To expand the foreshore, the existing drainage from the site (which directs upslope surface water from the site into Burrard Inlet under the railway) will require diversion during construction. The new diversion will run east-west on the north side of the railway, tying into the existing drainage and directing drainage around the construction area (east or west) into Burrard Inlet.

4.3.2.1 Storm water Outfalls

There are currently five storm water outfalls on site that service the drainage needs in the uplands areas south of the rail line draining into Burrard Inlet.

An interceptor pipe will be installed along the inner portion of the foreshore to collect water from these five storm outfalls and will drain east-west, around the extents of the bulkhead wall into Burrard Inlet. While the plan/profile details have not yet been developed, Figure 4-5 illustrates the proposed alignment and outfall locations. The existing outfalls will be used until the backside of the circular sheet pile walls are filled with granular fill. The new interceptor pipe will be installed concurrently with the circular sheet pile installation and completed prior to blocking of the existing outlets.
4.4 Removal of Existing Marine Structures

To facilitate the expansion of the WMT facilities, removal of existing marine structures is necessary. Existing berth infrastructure will not be demolished as part of the Project and the in-water training wall, adjacent to Barnet Marine Park, will also remain.

These marine structures (Figure 4-6) include legacy piles/wooden fenders, a spill barrier, and Pier 59.

Removal of existing marine structures will be performed using a derrick barge with a supporting materials barge and vibratory pile hammer. Prior to removal of the marine structures, a boom will be placed around the removal area to contain incidental debris.

4.4.1 Pier 59 Removal Methodology

The access to Pier 59 (Figures 4-7 and 4-8) is located in line with the WMT railway crossing. The pier is approximately 70 m in length and is constructed on wooden timber piles, with a wooden superstructure.
The Pier 59 superstructure will be dismantled in large sections and placed on the material barge. Pier 59 piles will be removed by wrapping a choker around the pile and dead pulling the pile out of the water. In the event that this does not work, the vibratory hammer will be used to remove the piles.
4.4.2 Spill Barrier Removal Methodology

The spill barrier (Figure 4-9) is located approximately 23 m (Figure 4-10) west of the westernmost mooring dolphin (Dolphin 1 in Figure 4-10) of the existing berth. The spill barrier is approximately 20 m long. Its construction includes an access platform and vertical wooden planks supported from timber wales and 12 piles (Figure 4-11).

Figure 4-9. Spill Barrier
SECTION 4 – EARLY WORKS

Figure 4-10. Spill Barrier Location
Kiewit Ledcor Trans Mountain Partnership (KLTP), 2017

Figure 4-11. Spill Barrier Construction
Kiewit Ledcor Trans Mountain Partnership (KLTP), 2017
The above water sections of the spill barrier will be dismantled in large sections and placed on the material barge. The spill barrier piles will be removed by wrapping a choker around the pile and dead pulling the pile out of the water. In the event that this does not work, the vibratory hammer will be used to remove the piles.

4.4.3 Pile Group Removal Methodology

Two groups of steel piles with wooden fenders are located approximately 65 m northeast (Figure 4-12), and 35 m west (Figure 4-13) from the end of Pier 59. Two additional steel piles (Figure 4-14) are located approximately 10 m west from the midpoint of Pier 59.

Figure 4-12. Existing Pile Group
The marine piles will be removed by wrapping a choker around the pile and dead pulling the pile out of the water. In the event that this does not work, the vibratory hammer will be used to remove the piles.
4.5 Marine Construction Safety Boom

A marine construction safety boom will be installed around the construction site and will be designed to protect the safety of commercial and recreational users of the local marine area, and the safety of workers working within a clearly demarcated working zone. The Phase 1 layout of the marine construction safety boom will be used when Berth 1 and Berth 2 are under construction. The Phase 2 layout of the marine construction safety boom will be used when the west side of Berth 3 is under construction.

The marine safety boom layout will be phased to align with the construction footprint. There is the potential that a third phase barrier footprint will be required when the east side of Berth 3 is under construction. However, this layout has not yet been finalized. The gate opening for when tankers enter the existing berth is shown on the safety boom layout figure. The marine construction safety boom will connect to the onshore fence on the beach with a block/riser post at the connection point. This will enable it to rise and fall with the tide. The marine construction safety boom will be anchored to the shore through the use of two concrete anchor blocks.

Figure 4-15 shows the extent of the safety boom layout. A navigation study was completed to demonstrate that tankers can enter through the marine construction safety boom gate. The Navigation and Navigation Safety Plan is attached as Appendix B.
Figure 1: Proposed marine construction safety boom showing shipgate (concept only, actual layout might be different)
4.6 Modifications to Existing Fire Loop

A short loop is required to tie the foreshore and dock fire mains together (Figure 4-16 and Figure 4-17). This loop will provide fire supply for the duration of the Project.

The work sequence for the modifications to the existing fire loop includes locating tie-in points 7 and 10 with tie-in 7 being located before the foam vault. Trans Mountain will install a temporary fence on Canadian Pacific (CP) Rail property to allow room to install the fire main beside the foam building. The pipe will be routed south of the foam building and then across the yard to near the above ground tee. The line is in a carrier pipe that travels along the underside of the railway. Trans Mountain will shut the foreshore down during the tie-in at tie-in point 10. This will be conducted during a period in which there are no ships scheduled at the dock. The line will then be drained and Trans Mountain will cut the pipe and install a tee.

4.7 Sanitary Force Main

Trans Mountain currently assumes that the sanitary main will be supported in place when the carrier pipes are installed under the tracks. Figure 4-18 has been provided to show the sanitary support.
4.8 Railway Interactions

Construction traffic will use the existing railway crossings to access the foreshore area. These include the primary crossing through the WMT as well as the secondary crossing accessed through North Cliff Avenue.

While it is planned to maximize bulk material deliveries via marine equipment (barge shipments), there will be an increase in equipment crossing the railway to perform the work as not all materials can be logistically or feasibly transported to the site via marine equipment.

Sections of three new 762 millimetre (mm) diameter crude oil delivery pipelines will be constructed under the existing CP Rail tracks via horizontal directional drilling. Figure 4-18 provides a drawing of the Project site plan with receiving and launch pit details on Canadian National (CN) Rail right-of-way (ROW).

Trans Mountain has reviewed the trenchless concept with CP Rail on March 3 and April 5, 2017 during site visit meetings. Trans Mountain is in the process of drafting crossing drawings with the geotechnical report that will be sent to CP Rail for Crossing Agreement execution. Trans Mountain can confirm that aerial and underground crossings of the existing rail tracks, which connect to VFPA jurisdiction, meet railway requirements.

Trans Mountain does not have any information regarding buried rail tracks. If unknown subsurface items are discovered during construction, they will be dealt with at that time according to the terms of agreement.

Figure 4-19 provides the derailment protection barrier plan and cross sections. Note that only the North barrier resides on VFPA land, and although the South barrier is not on VFPA land, it has been included to provide context.

See Appendix C for Canadian Pacific Rail License of Entry document.
SECTION 5

Engineering Clarifications

5.1 Property Boundary

Figures 5-1 to 5-3 have been provided to show the VFPA property line on the land side adjacent to the railway ROW (southern boundary) shown in bold and labelled on the site plan drawing and other engineering drawings. The CP Rail property line will be established by legal survey prior to start of construction.

5.2 Renderings

Updated renderings of the WMT have been provided in Figures 5-4 to 5-11.