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**Information provided to Vancouver Fraser Port Authority regarding the proposed marine construction safety boom at Westridge Marine Terminal**

## 1. Background

In February 2017, Trans Mountain Pipeline ULC (Trans Mountain) submitted a Project Permit Application to the Vancouver Fraser Port Authority (VFPA) to upgrade and expand a portion of its existing Westridge Marine Terminal (WMT). The proposed terminal upgrade and expansion is part of the Trans Mountain Expansion Project (TMEP). During construction, Trans Mountain plans to deploy a temporary approximately 915 metre marine construction safety boom around the perimeter of the marine terminal. The purpose of the marine construction safety boom is 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 boom layout has been designed to remain within the overall confines of the proposed construction safety zone and the boom's layout will be adjusted in keeping with changes to construction footprint over the different construction phases. The boom will be tethered to the shore at both ends in a manner that allows it to rise and fall with the tide. Figure 1 below shows the conceptual layout for the boom as well as locations for the ship gates.

A description of the proposed marine construction safety boom was included in Trans Mountain's May 2017 Addendum to the Project Permit Application. This memo provides additional information regarding the tethering for the boom toward the shore per the VFPA request. The design changes described herein almost eliminates the intertidal grounding of the boom structures.

**Figure 1: Proposed marine construction safety boom showing ship gate (concept only, actual layout might be different)**


The purple line in this illustration depicts the maximum extent to which the marine construction safety boom will be deployed during construction. At the start of construction the boom deployment will cover a slightly smaller area. This floating boom provides about 100 meters of work space around the area where construction is being undertaken. . It will be held in place offshore by a series of 9 anchored buoys as shown and it will be attached to fixed points where it comes ashore on both ends. The installation of this safety boom could take up to 3 weeks from the time equipment mobilization commences at the work site.

## 2. Marine Construction Safety Boom Description

The marine construction safety boom consists of a number of transversely mounted HDPE floats under vertical panels. It is held in place by 9 steel buoys each 3.3 m in diameter. Each buoy will have 2 or 3 anchors and chains to hold the buoy in proper position. Solar powered navigation lights (up to 2 NM range) and informational signs will be mounted approximately 30 m apart. Radar reflectors will also be mounted at the corners of the boom which, together with the nature of its metal components, will ensure that the construction safety boom shows up easily on vessel radars.

**Figure 2: Marine Construction Safety Boom Schematic**

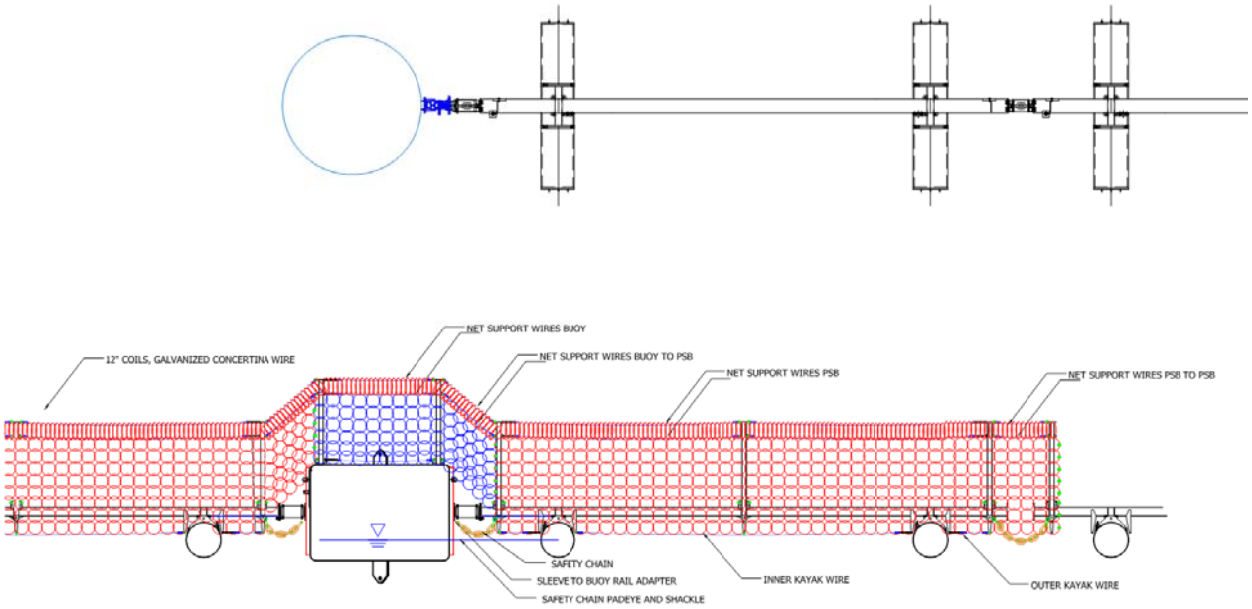

**Figure 3: Example of a Similar Boom from an Alternate Installation**

Similar to the boom shown above, the planned safety boom has two transverse HDPE floats for each 12.5 m section, along with a horizontal rectangular galvanized spar and saddle connectors to the floats. However, the fence posts and the fence fabric material will be different. Signage is provided on every other unit as shown and there will be lights approximately every other panel which is more than shown on this example. The boom deployed at WMT will be kept more taut (with less catenary) than the system shown in the photograph above.

## 3. Marine Construction Safety Boom Shore Connection Description

Figures 4 and 5 below show images of the locations where the eastern and western end of the floating construction safety boom would be terminated.

**Figure 4: Western End of Marine Construction Safety Boom**

**Figure 5: Eastern End of Marine Construction Safety Boom**

The original design developed for Trans Mountain involved a typical floating section of safety boom that connected on both ends to a 44 ton 2.2 m by 2.2 m by 3.7 m concrete anchor block with the interface at approximately +3.1 m to +4.1 m Chart Datum. This design created potential challenges because of the effect of the weight of the concrete block on the ground and the potential for impact to the intertidal zone from grounding of up to 12 HDPE floats at low tide.

Recognizing the drawbacks of the original design, Trans Mountain has developed an alternate option for anchoring the marine construction safety boom to lessen effects on the intertidal zone. The alternate design will not require the concrete anchor blocks and will also significantly reduce grounding of the boom. The design to tether at each end to shore entails the following:

- On the east-end, the connection point will be made outside the intertidal zone at approximately -0.9 m Chart Datum and will run adjacent to an existing timber lagging and pile wall thereby completely eliminating the need for boom grounding.

- On the west-end there is no similar solution practically available. As a result, the boom will be anchored to a HP 14 x 117 pile set at approximately +3.1 m to +4.1 m Chart Datum. This pile would have only a 7.6 square centimetre contact area. Under this design, it is anticipated that only 5 or 6 – 3.5 m HPDE pipe floats will ground in the west-end of the intertidal zone during low tide. A qualitative assessment of potential effects on intertidal habitat associated with the grounding of 5 to 6 floats is included in Section 4 below.

## 4. Summary of Potential Environmental Effects caused by the Grounding of the Marine Construction Safety Boom in the Intertidal Zone

The following environmental assessment looks at the potential effects arising from boom grounding in the intertidal zone. This assessment is based on the understanding that, due to its design, the weight of the boom is spread out over a large shore contact area, which reduces the pressure on underlying habitats where it grounds out. The pressure on the intertidal zone arising from the boom grounding is anticipated to be similar to that of a small group of people walking on beach. The evaluation below considers potential effects arising from that level of pressure occurring approximately twice per day over a period of 40 months.

| Shore Connection | Depth at Shore Connection | Physical Characteristics (along boom alignment) | Biological Characteristics (along boom alignment) | Potential Effects of Boom Grounding |
|---|---|---|---|---|
| Western End | Approx. +4.1 m Chart Datum (0.3 m below mean higher high water level) | • Predominantly sand, with some cobble, gravel and the occasional boulder.<br>• See Figure 4. | • Low abundance of barnacles (*Balanus glandula*, *Chthamalus dalli*), shore crabs (*Hemigrapsus* spp.), Gammarid amphipods, periwinkles (*Littorina* spp.), and limpets (*Lottia* spp.) relative to abundance of species on nearby rocky intertidal habitats.<br>• Low abundance of rockweed (*Fucus gardneri*) and Turkish washcloth (*Mastocarpus* sp.) relative to abundance of species on nearby rocky intertidal habitats. | • Potential effects on intertidal habitat and species will be limited to the contact point between the pontoon floats (3.5 m long, oriented perpendicular to shore) and the intertidal substrate.<br>• Potential for localized disturbance to soft-sediment habitat.<br>• Potential for scraping of intertidal algae, and crushing or scraping of invertebrates; however, coverage of these species is low in the area, and the same species are abundant across rocky and mixed-substrate intertidal habitats in the Central Harbour of Burrard Inlet. |
| Eastern End | Approx. -0.9 m Chart Datum | • Predominantly sand, with some gravel, cobble and the occasional boulder.<br>• See Figure 5. | • Low abundance of barnacles (*Balanus glandula*, *Chthamalus dalli*), periwinkles (*Littorina* spp.), and limpets (*Lottia* spp.) relative to abundance of species on nearby rocky intertidal habitats.<br>• Low abundance of sea lettuce (*Ulva* spp.), rockweed (*Fucus gardneri*), and Turkish washcloth (*Mastocarpus* sp.) relative to abundance of species on nearby rocky intertidal habitats. | • No effects anticipated as floats are not expected to ground during low tide conditions. |

## 5. Conclusion

Subject to agreement of the VFPA Trans Mountain intends to proceed with the alternate design option thus reducing impact of boom grounding in the intertidal zone. Trans Mountain is open to discussing any residual questions or concerns VFPA may have with regard to the proposed marine construction safety boom during the weekly permit review meetings.