

WESTRIDGE MARINE TERMINAL IN WATER  
EXCAVATION REPORT

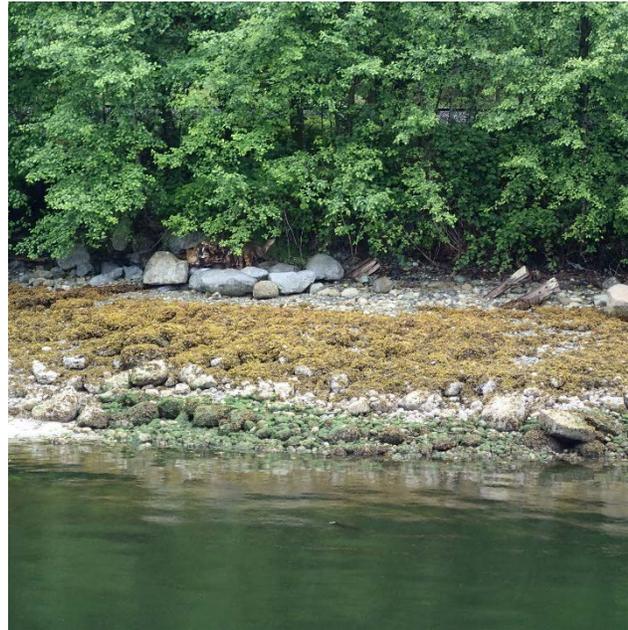
# WESTRIDGE MARINE TERMINAL UPGRADE AND EXPANSION PROJECT APPLICATION TO VANCOUVER FRASER PORT AUTHORITY



**TRANSMOUNTAIN**

Trans Mountain Pipeline ULC  
Kinder Morgan Canada Inc.  
Suite 2700, 300 – 5 Avenue S.W.  
Calgary, Alberta T2P 5J2  
Ph: 403-514-6400

May 2017



# Contents

Section	Page
<b>Acronyms and Abbreviations</b> .....	<b>v</b>
<b>1 Introduction</b> .....	<b>1-1</b>
<b>2 In-water Excavation Description</b> .....	<b>2-1</b>
<b>3 Timing</b> .....	<b>3-1</b>
<b>4 Sediment Analysis</b> .....	<b>4-1</b>
<b>5 Mitigation Measures</b> .....	<b>5-1</b>
<b>6 Conclusion</b> .....	<b>6-1</b>
<b>7 References</b> .....	<b>7-1</b>

**Figures**

2-1 Foreshore Expansion Area .....	2-1
2-2 Turbidity Curtain Installation Details .....	2-2
2-3 Example Turbidity Curtain Installation .....	2-3
2-4 Example Orange Peel Clam Bucket Operation.....	2-3
2-5 Subtidal Rock Reef Conceptual Design .....	2-4
2-6 Cross Section of Sheet Pile Circular Wall .....	2-5
5-1 2-Level Circular Sheet Pile Wall Installation Template .....	5-1
5-2 Decanting Barge Overview.....	5-2
5-3 Decanting Barge Filter Details.....	5-2
5-4 Decanting Barge in Use .....	5-3

# Acronyms and Abbreviations

BC	British Columbia
CSR	Contaminated Sites Regulation
DAS	Disposal at Sea
m	metre(s)
Stantec	Stantec Consulting Ltd.
TMEP/the Project	Trans Mountain Expansion Project
Trans Mountain	Trans Mountain Pipeline ULC
WMT	Westridge Marine Terminal

# Introduction

Trans Mountain Pipeline ULC (Trans Mountain) submitted a Facilities Application to the National Energy Board (NEB) in December 2013 for the Trans Mountain Expansion Project (the Project or TMEP). On November 29, 2016, the Government of Canada concluded that the Project was in the public interest of Canada. A Certificate of Public Convenience and Necessity and other authorizations allowing the Project to proceed, subject to 157 conditions, were issued and became effective on December 1, 2016.

As part of the Project, the Westridge Marine Terminal (WMT) will require expansion, including construction of three new loading berths within an expanded water lot and infilling along the existing shoreline to accommodate new onshore infrastructure.

This In-water Excavation Report has been prepared to address the following five Vancouver Fraser Port Authority (VFPA) information requests regarding in-water excavation, sediment analysis, and mitigation measures for the expansion works at the WMT for the Project and Environmental Review Application Submission Requirements:

- A diagram of the proposed dredge/excavation area and Sediment Analysis.
- A description of the proposed volume of soils and sediments to be removed, the method, and the anticipated disposal method.
- The timing of the proposed dredging/excavation in relation to the fisheries sensitive periods.
- The anticipated timeframe for the duration of works and hours of operation expected for the equipment.
- Mitigation measures proposed to reduce induced turbidity.

# In-Water Excavation Description

Trans Mountain retained Stantec Consulting Ltd. (Stantec) to conduct a sediment sampling program in the potential excavation pocket at the WMT, and preliminary marine geotechnical investigations indicated that a soft sediment layer within the infill footprint was not suitable to support the fill. As such, under the preliminary WMT design, the overlaying riprap in this area will be removed and the unsuitable material beneath may be excavated and removed from the site once the sheet pile walls are installed.

Removal of riprap in the area of the foreshore accounts for the in-water excavation construction activities at WMT. This includes removal of all existing riprap in the area of the foreshore expansion to just past the extents of the expanded foreshore area (Figure 2-1). The total volume of riprap to be removed is estimated to be 25,000 cubic metres (m<sup>3</sup>).

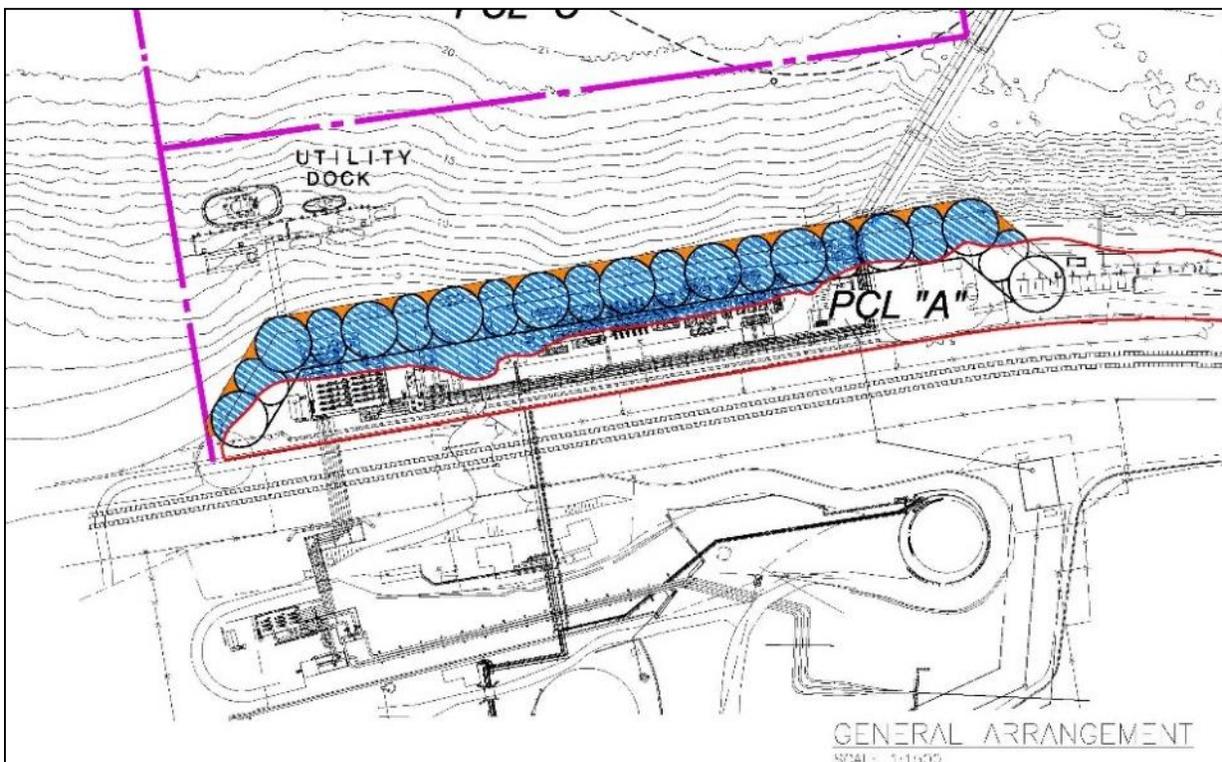


Figure 2-1. Foreshore Expansion Area

Prior to commencing removal of riprap, a turbidity curtain will be installed surrounding the area. The turbidity curtain will be engineered and installed to trap sediment created via the riprap removal process within the area where the riprap is being removed. Figure 2-2 provides the Turbidity Curtain installation details (as provided in the Construction Environmental Management Plan [TR-14]) and Figure 2-3 provides an example of a turbidity curtain installation.

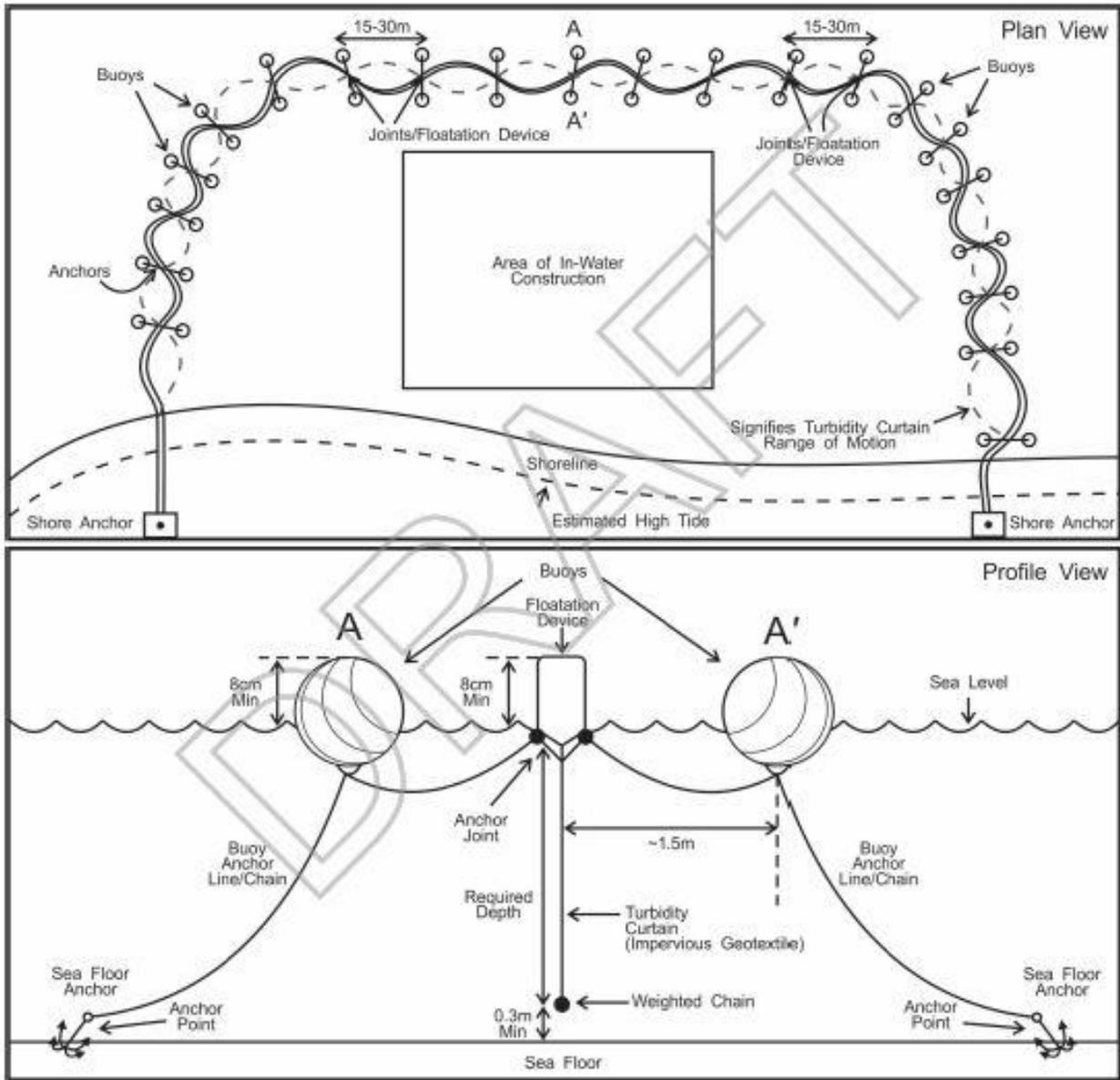


Figure 2-2. Turbidity Curtain Installation Details



Figure 2-3. Example Turbidity Curtain Installation

After the turbidity curtain is installed, and the area is prepared for construction activities, removal of the riprap will commence. Riprap will be removed via both marine and land-based operations. Marine removal of the riprap will be via an orange peel clam bucket (Figure 2-4) or a similar removal method. Land removal of riprap will be via excavator.



Figure 2-4. Example Orange Peel Clam Bucket Operation

Riprap material that is removed will be placed on a barge and moved to a marine yard. At the marine yard, the materials will be transferred to land transport equipment and transported to an approved disposal site on land. Alternatively, if the material is determined to be acceptable for the offsetting subtidal rock reef (Figure 2-5), the material will remain onsite with the suitable material placed in the rock reef design locations. Materials that are unsuitable, or which are not efficient to sort for the rock reefs, may be used as fill in the sheet pile cell construction if it meets the engineering requirements. Otherwise, unused material will be disposed of on land at approved landfill sites.



### Legend

- Bathymetry (m CD)
- Proposed Expansion
- Adult Reef (3,243 m<sup>2</sup>)
- Integrated Reef (2,441 m<sup>2</sup>)
- Nursery Reef (3,812 m<sup>2</sup>)
- Nursery Reef (Not Considered Offset Habitat) (390 m<sup>2</sup>)

Figure 2-5. Subtidal Rock Reef Conceptual Design

The design of the circular sheet pile wall only requires the removal of the riprap on the foreshore prior to the installation of the sheet piles. Dredging or levelling of sediment below the riprap is not required behind the turbidity curtain.

Once a circular cell of the sheet pile wall has been completed, the sediment and granular materials inside the cell will be removed using an orange peel clam bucket. The sheet pile cells will not be dewatered during the interior soil excavation and rock fill. The water level in the sheet pile cell will remain the same as the sea level as the sheet pile cell walls are not water tight. Once the excavation is complete to the till layer, the cells will be filled with rock ranging in size from 20 to 150 millimetres (mm) in size. The rock will displace the water inside of the sheet pile cell (Figure 2-6).

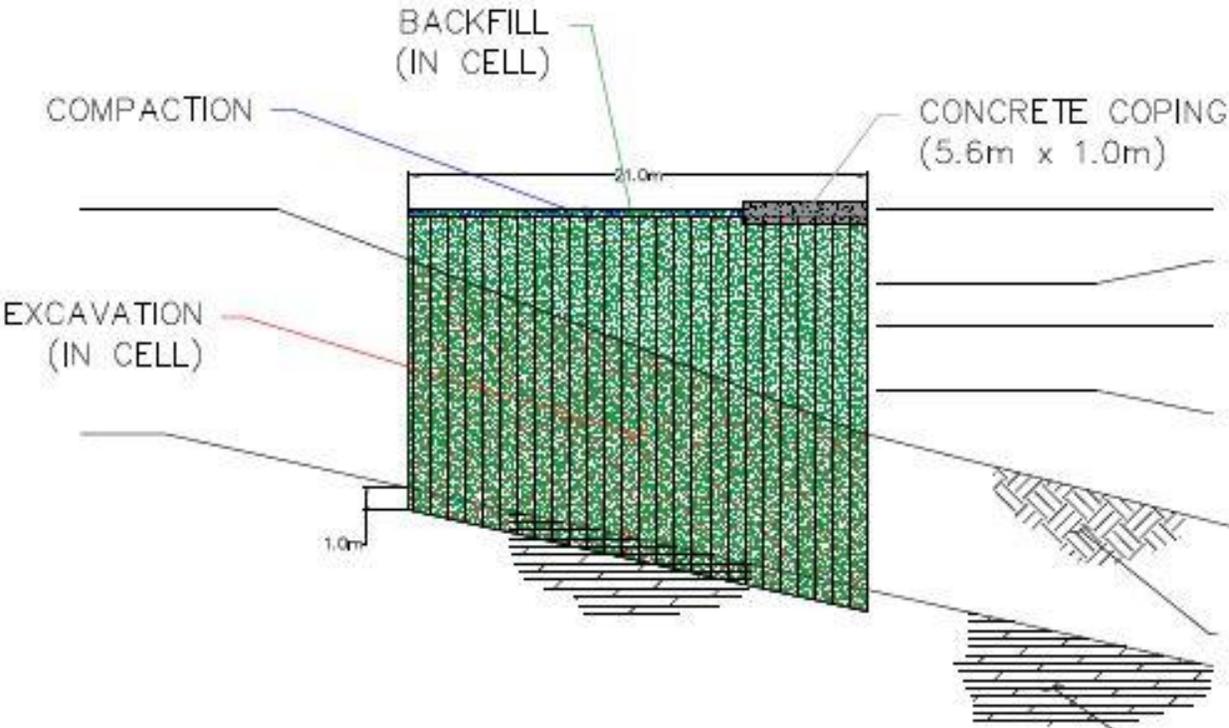


Figure 2-6. Cross Section of Sheet Pile Circular Wall

The sediment and granular materials that are removed from the interior of the sheet pile cell will be removed from the site on barges, taken to a dock for off-loading into trucks, and taken to a landfill for disposal. The materials will be tested for contaminants so that they are handled correctly and taken to land fill sites that can take contaminated soils, if so required.

# Timing

In keeping with the direction of the Department of Fisheries and Oceans Canada and in an effort to protect fish and fish habitat during work associated with in-water excavation, in-water excavation work will be completed during the least risk window of August 16 to February 28. The preliminary schedule for riprap removal from land and water is planned between August 16 and September 29, 2017, over the course of 30 work days; however, this is subject to change.

Activities are planned to take place in accordance with the hours established within the City of Burnaby noise bylaw. Construction activities will take place Monday to Friday, 7:00 a.m. to 8:00 p.m. and Saturday, 9:00 a.m. to 8:00 p.m.

# Sediment Analysis

Stantec was retained by Trans Mountain to conduct a sediment sampling program in the potential dredge pocket at the WMT.

The objectives of this program were to:

1. Characterize the chemical and physical properties of sediments that may be excavated at the WMT
2. Compare the sediment results to Disposal at Sea (DAS) screening criteria, federal sediment quality guidelines for the protection of marine life, and standards of the British Columbia (BC) Contaminated Sites Regulation (CSR).

The 2016 sediment sampling program took place on November 10 and 11, 2016. A total of 22 samples were collected (one sample per site and two field duplicates). Sampling was conducted within the potential excavation pocket at the WMT. Samples collected outside of the excavation pocket are reference sites for comparison post excavation to determine if contaminant levels increase due to sediment dispersion from the excavation site.

The 2016 sampling program demonstrated that some contaminant levels are above the DAS screening criteria in surface sediment at the proposed excavation site.

Results from the surface and core samples collected in December 2014 from the proposed dredge pocket indicate that the majority of contaminants are contained within the upper 0.5 metres (m) of sediment. The approximate penetration depth of a clamshell or backhoe dredge is 0.5 m, which would allow removal of this layer as a single excavation unit. The 2014 program also found isolated patches of elevated copper levels extending to 1.5 m.

The anthropogenic source of copper in sediment within the proposed excavation site is unknown; however, it is not associated with activities at the WMT itself.

Sediment that has concentrations higher than the DAS screening criteria can be further tested for acute and chronic toxicity to identify whether the sediment can be disposed of at sea. Sediment that is not suitable for DAS can be disposed of on land, and would be considered soil under the BC CSR. At this time, Trans Mountain has no plans for DAS.

The salt content would prohibit disposal on agricultural land, and the sediment exceeds Schedule 7 of the CSR, Column II, chloride and sodium standards for relocation to non-agricultural land. However, if the sediment meets all standards except sodium and chloride, soil relocation under Column II may still be possible, depending on the receiving environment characteristics (BC MoE, 2013). Sediment that is unsuitable for relocation under Schedule 7 may be disposed of at a licensed landfill facility.

# Mitigation Measures

The following mitigation measures will be taken to minimize disturbance to water and sediment from the riprap removal:

- The riprap removal from the foreshore will take place behind a turbidity curtain.
- All of the riprap along the slope will be removed to avoid obstructions during the installation of the sheet piles.
- To reduce the disturbance to the existing sediments, only the larger riprap required to be removed for the sheet pile circular wall installation will be removed prior to the sheet pile installation. In addition, a two-level circular sheet pile driving template will be used to drive the sheets in the correct location (Figure 5-1). The template will be secured in place by spud piles driven through pockets in the template. As the template will guide and hold the sheet piles in the correct locations, the sheet pile installation will not require any “levelling disturbance” of the sediment to ensure that the sheets are placed in the correct location prior to the start of their installation with a vibratory hammer.



Figure 5-1. 2-Level Circular Sheet Pile Wall Installation Template

- If, during the removal of the riprap the turbidity level of the water is higher than expected, the turbidity curtain could be moved towards the foreshore so that it would be placed between the area of riprap removal and the crane barges and storage barges. The crane barge would reach over the turbidity curtain with the orange peel clam bucket to remove the riprap. This would reduce the area where sediments would settle out from behind the turbidity curtain. The turbidity curtain will only be removed once the water quality levels behind it meet the specified water quality requirements.
- Once a complete sheet pile circular cell is installed, fish salvage will take place within the closed cell. A seine fish net will be lowered and pulled across the bottom of the cell, and then pulled up to salvage mature fish. Some mortality of small fish may occur if they are not salvaged in the seine net once the cells are filled up with granular material.

- As the material that is removed from the interior of the cell will be wet, the soil material will be placed on a "decanting barge". The barge will allow the soil material to drain and hay bale filters on the barge will filter the water. The water will flow back into the sea at the end of the barge. Once the material has drained, the material will be moved onto another barge for disposal (refer to Figures 5-2, 5-3, and 5-4).
- If the water quality testing indicates that additional mitigation measures are required, a turbidity curtain will be installed around the area where the water is discharged from the decanting barge into the sea, or alternatively, the water will be pumped directly from the decanting barge back into a completed circular sheet pile wall cell to contain the water in the cell.

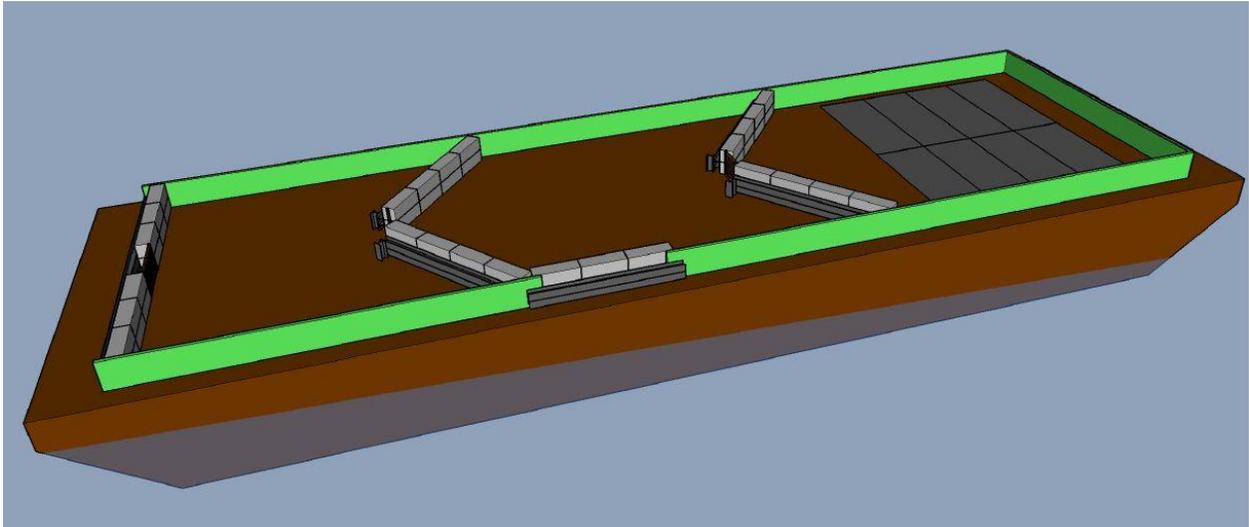


Figure 5-2. Decanting Barge Overview

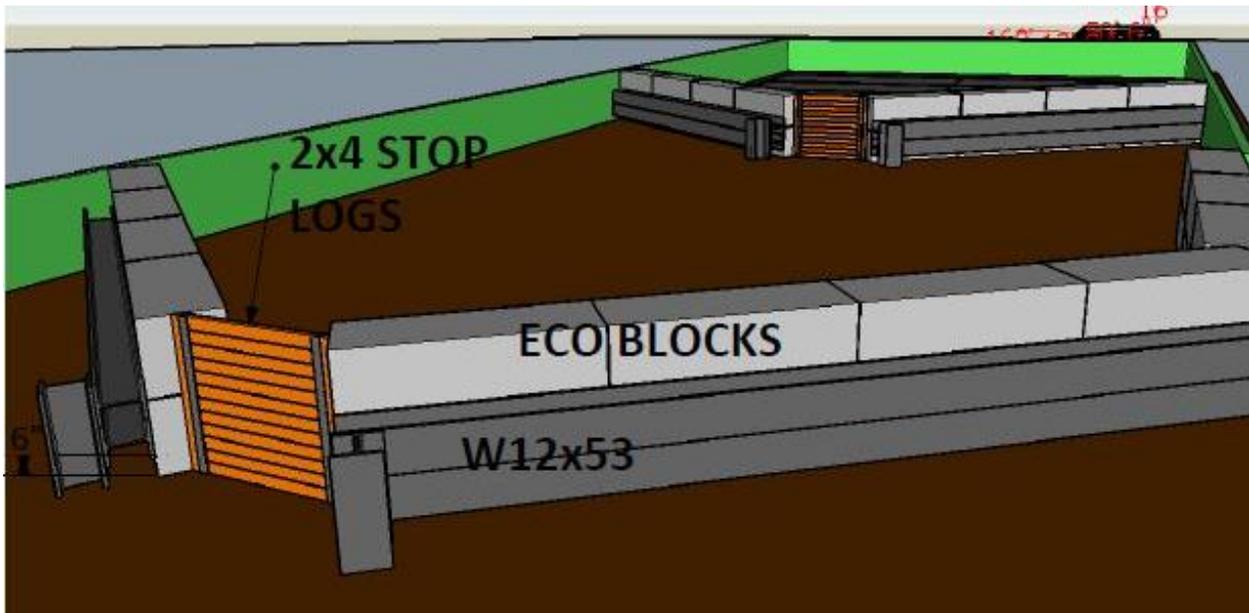


Figure 5-3. Decanting Barge Filter Details



Figure 5-4. Decanting Barge in Use

# Conclusion

Measures to reduce the residual effects of in-water excavation on the marine environment have been implemented during Project planning and will continue through the remaining phases of the Project with guidance from relevant government policies and consultation.

Trans Mountain has established mitigation that will reduce the amount of sediment that will be disturbed during riprap removal and prior to completing each circular sheet pile wall cell. This report demonstrates how, if the sediments are deemed to be problematic, Trans Mountain will move the turbidity curtain closer to the shore, reducing the area between the shore and the turbidity curtain, ultimately reducing the area of seabed that would have sediment deposited on it after the sediment settles out of the water column.

# References

British Columbia Ministry of Environment (BC MOE). 2013. *Technical Guidance 20: Applicability of Sodium and Chloride Ion Soil Relocation Standards to Dredged Marine and Estuarine Materials* (Version 2.1, August 2013). Accessed December 2016.

<http://www.env.gov.bc.ca/epd/remediation/guidance/technical/pdf/tg20.pdf>.