

Muscle Wall Case Study

Performance as a multi-use Best Management Practice

INTRODUCTION

ENGEO performed a case study into the use of Muscle Wall as a multi-use best management practice (BMP) for a shoreline development project site in Northern California. Muscle Wall is a low density polyethylene portable barrier product used for flood control, sediment control, stormwater control, and liquid containment (see right). In July 2019, 2000 linear feet (LF) of 4-ft tall Muscle Wall was installed along the project's shoreline. Through May 2020, ENGEO evaluated Muscle Wall's performance as a sediment perimeter control, temporary retaining wall, and liquid waste containment barrier.



4-ft tall Muscle Wall

SEDIMENT PERIMETER CONTROL

Prior to installing the Muscle Wall, the perimeter control along the project's shoreline consisted of silt fence anchored with wooden stakes (see below). Due to high winds and construction traffic, the silt fence required continual maintenance and replacement. In addition, extensive geotechnical mitigation activities including direct power compaction, vibratory tamping, surcharge placement, and deep soil mixing along the shoreline necessitated a more robust perimeter control BMP. The 2000-ft of Muscle Wall was installed in approximately 5-days, including the time to grade a level placement surface. Once installed, the Muscle Wall did not need to be maintained due to its sturdy design, and could be quickly reconfigured as needed by quickly draining the applicable segments filled with water. The Muscle Wall prevented sediment from spilling into the rip rap and water, and its appearance alone proved to regulatory inspectors that the project owner was implementing appropriately robust BMPs for the setting.



Silt fence (left) versus Muscle Wall (right)

TEMPORARY RETAINING WALL

While Muscle Wall is typically used to retain water, Muscle Wall was used as a temporary retaining wall for soil during surcharge and deep soil mixing construction activities. ENGEO performed a retaining wall analysis for 4-ft tall Muscle Wall placed on soil, and calculated the product to have overturning and sliding factors of safety of approximately 4 and 2, respectively. As shown in the photos below, Muscle Wall held back 4-ft of surcharge soil without sliding or overturning. This allowed the contractor to conduct deep soil mixing while simultaneously surcharging the site. This included four 5-ft diameter augers boring into the soil adjacent to the Muscle Wall, greatly increasing the active soil pressure against the wall. As a result of this relatively extreme construction loading condition, the product only experienced minor sliding and rotation.



Muscle Wall as a temporary retaining wall for soil

LIQUID WASTE CONTAINMENT BARRIER

Deep soil mixing is an inherently messy construction activity – liquid grout and oil spray from the augers during drilling and pool around the boring location. The Muscle Wall acted as both a splatter guard and containment barrier for the liquid waste (see right). Without Muscle Wall along the perimeter of the shoreline, the liquid waste would have flowed through the rip rap and into the water.



Muscle Wall as a liquid waste containment barrier

CONCLUSION

Muscle Wall proved to be an agile, resilient, and sustainable BMP product for not only its use as a sediment perimeter control, but also as a temporary retaining wall and liquid waste containment barrier. It is expected that a majority of the Muscle Wall segments will be recoverable, and reused in other areas onsite throughout the project's 10+ year life.



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