

QUALITY CONTROL AND PERFORMANCE OF A CUTOFF WALL FOR CONTAINMENT OF DNAPL PLUME

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Abstract

This paper describes the quality control and performance of a soil-bentonite cutoff wall at the Taylor Lumber Superfund Site (site) in Sheridan, Oregon. The cutoff wall was constructed under an EPA Emergency and Rapid Response prime contract. The site is used for the wood treatment of telephone poles, pilings, and railroad ties. The cutoff wall was constructed to contain a dense nonaqueous phase liquid (DNAPL) plume, which threatened to contaminate the nearby Yahmill River. The cutoff wall with a length of 2030 ft. and a maximum depth of 26 ft. completely surrounds the wood treatment facility. The wood treatment facility remained active, and care was taken to limit the impacts of construction on the facility's operations. Difficulties included achieving a maximum permeability of 1×10^{-7} cm/sec with materials containing minimal fines, excavating around utilities including live gas and sewer lines, and meeting the fast tracked mobilization and construction schedule. The project included construction of a cap over the cutoff wall, which consisted of geosynthetic clay liner (GCL), geotextile, and aggregate base. This project represents the first full closure slurry cutoff wall constructed for EPA Region 10.

1.0 Introduction:

The site is located at the Taylor Lumber Wood Treatment Facility in Sheridan, Oregon, approximately 50 miles southwest for Portland. This facility is used for the chemical treatment of wood for use as telephone poles, pilings, and railroad ties. This site was listed as a superfund site after a spill released chemicals into the underlying aquifer. This spill released a dense nonaqueous phase liquid (DNALP) plume, which required mitigation prior to reaching the adjacent Yahmill River. Several alternatives were evaluated for the mitigation of this site, including treatment by steam injection. However, the method chosen for this site was the construction of a soil-bentonite cutoff wall, which created a subsurface barrier to contain the plume. The United States Environmental Protection Agency (USEPA), Region 10, enacted an Emergency and Rapid Response contract to construct a soil-bentonite cutoff wall at this site.

Construction of the soil-bentonite cutoff wall was completed in September of 2000. The construction schedule required mobilization and submittals within one week of award of the contract. Also, the completion date was governed by the Oregon Department of Transportation, which did not allow the placement of asphalt concrete paving after September 30. Since the asphalt concrete paving was the last phase of the site restoration, it was essential that the cutoff wall be completed in time to allow the paving

prior to September 30. Another factor was the upcoming weather, which could inhibit cutoff wall construction and stop any paving activities. Daily meetings were held with the EPA, the contractor, and Taylor Lumber to discuss scheduling and coordination issues that may impact the project.

A mix design was developed for this project to determine the necessary proportions to achieve the maximum specified permeability of 1.0×10^{-7} cm/sec. To achieve this, soils were imported from an offsite borrow area, and mixed with dry bentonite at a rate of 8% by dry unit weight of soil. The permeability was later verified by testing of both batch samples taken during the construction activities, and through core samples taken after cutoff wall completion.

The soil-bentonite cutoff wall was constructed using the slurry trench method. This method allows excavation without the use of other lateral support. Slurry walls are constructed by excavating a narrow trench which is 3 feet wide for this project, while pumping in the slurry and maintaining its level at or near the top of the trench during the excavation process. Usually, the trench is keyed into an underlying aquiclude which for this project is a 2 feet key into a siltstone layer. The aquiclude forms the bottom and the slurry wall the sides of the containment. The trench is filled with a bentonite slurry, which hydraulically shores the sides of the trench. The slurry is a mixture of water and bentonite which is heavier and thicker than water. The trench is backfilled with a mixture of soil-bentonite which is impervious (10^{-7} cm/sec) to form a permanent cutoff.

The cutoff wall at the Taylor Lumber site completely surrounds the wood treatment facility. The length of the cutoff wall is 2030 linear feet with a maximum depth of 26 feet, and average depth of 22 feet, and a width of three feet. The wood treatment facility remained active at all times, and accommodations had to be made to minimize disturbance to the facility's operation. This included continuous coordination with the facility managers, and construction of ramps over the cutoff wall at key access points. Construction of the cutoff wall instituted three distinct phases of operation: