Remediation of Fuel Oil No. 6 LNAPL at a Challenging Site in New Jersey

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Background/Objectives. In situ stabilization (ISS) was selected as the remedial approach for a small-scale site contaminated with No. 6 Fuel Oil present as a light non-aqueous phase liquid (LNAPL) in the subsurface at a Site in New Jersey.

The 2.1-acre Site contains a circa 1899 manufacturing building with a “courtyard” area used for access and parking. The building is currently occupied and it encompasses most of the Site. Groundwater was found to be approximately 8 feet below ground surface (bgs) with the LNAPL thickness measured at up to 0.75 feet with impacts extending to the top of the underlying silt layer at 14 feet bgs. The impacted area (approx.12,000 square feet) exists beneath the buildings and the parking area, with 55% located in the study parking area.

New Jersey regulations require free and residual product be remediated unless technically impracticable to do so. The objective was to complete remediation cost efficiently to non-residential standards. In addition, the small size of the work area and tenants access requirements during construction further complicated remedial selection.

Approach/Activities. To meet the regulatory requirements and client objectives, while working within the physical constraints of the Site, in situ stabilization/solidification beneath the parking area utilizing an innovative dual-axis remediation blender and Portland cement was selected. The remediation program consisted of removing 4 feet of overburden and then treating approximately 3,000 cubic yards of impacted soil by mixing a slurry cement from 4 to 14 feet bgs. The initial treatment cells were installed in a single checker board row 5 feet away from the building with untreated cells providing structural stability. The treated cells were allowed to cure for 24 hours to provide structural stability. After this curing period, the previously untreated cells were mixed and stabilized. This approach mitigated the need for a costly sheet pile wall and allowed for more efficient project implementation.

Results/Lessons Learned. The remainder of the Site was divided into 10 x 15 x 10 foot treatment cells that were mixed using the dual-axis blender equipped with an on-board GPS system. Excavation preceded mixing and overburden was utilized as cover material on previously treated cells. All areas achieved hydraulic conductivity and leachability criteria using a short-term unconfined compressive strength proxy determined during correlated pre-project bench testing. Long-term results confirmed the efficacy of the semi real-time proxy to enable project decision criteria.

In a project defined by significant area and time constraints, it is critical to ensure that all partners work as a streamlined team. An additional lesson learned is that unexpected field conditions may be encountered, requiring formulation of contingency plans in real time. However, this approach demonstrated an effective remedy for the site.