ISCO Eliminates NAPL and Site Disruptions to Expedite Site Closure

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Background/Objectives. Former underground storage tanks (USTs) were the source of petroleum contamination at a confidential industrial site located in Lakewood, New Jersey. Previous operations at the site utilized two USTs: a 7,500 gallon and a 2,000 gallon, which were removed with limited excavation. The geology consists primarily of sands, and depth to groundwater is approximately 15 to 18 feet below ground surface (ft bgs). Following removal of the USTs, soil analytical data revealed contamination above the New Jersey Department of Environmental Protection (NJDEP) remedial standards. The primary contaminants of concern consisted of extractable petroleum hydrocarbons (EPH), naphthalene and 2-methylnaphthalene with concentrations up to 25,000 mg/kg and the potential presence of non-aqueous phase liquids (NAPL). The treatment area was located immediately adjacent to the primary loading docks for the facility presenting a site operations issue for the onsite manufacturing business.

Approach/Activities. Due to the depth of impacts and the proximity to the adjacent building foundation, excavation and shoring activities were not considered a cost effective or safe remedial alternative. A chemical oxidation treatment program was design to target an approximate 5,500 ft^2 area with a vertical treatment interval from approximately 15 to 20 ft bgs. A total of 14 permanent injection wells and 10 vent wells, installed with direct push technology, were utilized for the treatment program. The vent wells ensured that offgases did not build within the subsurface and nearby structures, and also provided additional monitoring points to confirm appropriate ISCO conditions. Based upon the analytical results and oxidant demand calculations, approximately 125,000 lbs. of 34% hydrogen peroxide and catalysts were utilized, diluted to a concentration between 6 and 9% prior to injection. Process monitoring, which consisted of field analysis of vent well offgases and groundwater and post-injection groundwater sampling, was conducted throughout the treatment program. The process monitoring results were utilized continuously to optimize the injection process by making calculated, real-time adjustments to the injection formulation and targeted wells. The treatment program consisted of 30 field days into the 14 injection locations, which included mobilization, site setup, active injection, and demobilization.

Results/Lessons Learned. In situ chemical oxidation utilizing hydrogen peroxide based chemistry achieved the remedial goals and provided an effective and efficient treatment solution without significant interruption to the existing facility operations. Routine process monitoring and sampling ensured a safe and efficient treatment program was occurring while delivering the oxidants to appropriate treatment intervals. By utilizing permanent injection and vent wells, the injection design was adjusted in real-time and effectively eliminate residual NAPL that migrated into vent and injection wells, and target treatment intervals above standards. Following two limited reinjection events, a soil boring program and four quarters of groundwater monitoring confirmed the site could be closed meeting all applicable NJDEP soil and groundwater residential remediation standards. The project was completed in approximately 6 months, including follow-up injections at approximately 50% of the cost of excavation, sheeting and shoring with no interruptions to the active manufacturing operations.