Effectiveness of In Situ Chemical Oxidation at an LNAPL Solvent Site in New Jersey

Gary A. Angyal, ***Joelle M. Freeman*** (joelle.freeman@obg.com), and
Jacob A. Surowiecki (OBG)
Kassidy Klink (PEAK Environmental), and Robert Connell (Geo-Cleanse)

Background/Objectives. In September 1990, four 8,000-gallon solvent USTs and two No. 2 heating oil USTs were excavated and removed from a Site in Newark, New Jersey which has been utilized for paint manufacturing operations since 1953. The USTs were discovered to have leaked, however, post-excavation soil samples were not collected. A dual-phase extraction (DPE) system served as source control beginning in 2002, but was shut down in November 2014 due to reduced effectiveness. Beginning in 2014, PEAK Environmental completed horizontal and vertical delineation of the remaining contamination in soils and groundwater, with OBG serving as third party Licensed Site Remediation Professional (LSRP). Xylene and other contaminants of concern (COCs) with concentrations above the Class II-A Ground Water Quality Standards (GWQS), as well as residual light non-aqueous phase liquid (LNAPL), existed within the shallow water table zone. Based on the results of the investigation, it was concluded that active remediation should be conducted, with the goals of reducing COCs in soils to below free product thresholds and reducing COC concentrations in groundwater to levels amenable to monitored natural attenuation (MNA) and the establishment of a site-wide Classification Exception Area (CEA).

Approach/Activities. In situ chemical oxidation (ISCO) utilizing catalyzed hydrogen peroxide (CHP) was applied to address contaminated soil, groundwater, and LNAPL at the Site. Following a pilot test, Geo-Cleanse conducted the CHP injection implementation. The injections were conducted through 87 injection wells distributed within a 6 m by 6 m grid comprising a total of 2670 square meters. Injection wells were located in both external and internal area within the production building. A ratio of 9.5 kg of 34% hydrogen peroxide per kg of estimated contaminant mass was utilized. In order to estimate contaminant mass, all of the soil and groundwater analytical data in the treatment depth intervals for each individual block were compiled and average COC concentrations were calculated. The COC and LNAPL data, along with assumptions regarding pore volume and soil density, were then utilized to estimate the contaminant mass in each treatment block and the corresponding peroxide requirement.

Results/Lessons Learned. During the process of injections, “daylighting” of the injected solution was observed through preferential pathways such as well collars and cracks in paved areas, and via previous boring locations, but this was managed pro-actively by Geo-Cleanse and resulted in minimal fluid loss. Also of note was that carbon monoxide was occasionally detected inside the building during the injections, but was successfully managed by passive and active ventilation. The recurring, intermittent presence of LNAPL in monitoring locations suggested that the original contaminant mass was underestimated or that the peroxide was consumed by organic matter found in a thin peat layer present at the site. Additional hydrogen peroxide injections were completed and eliminated most observances of LNAPL, although the area is still being monitored for recurrence. However, post-injection groundwater quality results indicate that dissolved concentrations of COCs remain elevated above the GWQS. Therefore, further monitoring and evaluation is necessary before the Site can be proposed to enter MNA.