



Geo-Cleanse® Remediation Summary Savannah, GA Former MGP Plant Coal Tar

Overview:

Geo-Cleanse International, Inc. (GCI) performed a full-scale in-situ chemical oxidation (ISCO) treatment program to treat by-product like material (BPLM), which is a manufactured gas plant (MGP) specific constituent. BPLM is identified as “free phase” coal tar residuals measured as BTEX (benzene, toluene, ethylbenzene, and xylenes) and PAH (polycyclic aromatic hydrocarbons). Results from the pilot ISCO treatment program indicated these constituents were amenable to chemical oxidation using Fenton’s reagent.

Site Background Characteristics:

This site was a former MGP located in Savannah, Georgia. From the early 1800s until the 1950s, the MGP site was used to produce gas from coal, coke, or oil. During the gas production process, various residuals such as tars, liquors, sludges, coal fragments and gas purifying wastes were produced, some of which were released into the soil and groundwater.

Program Goals:

The goal of the treatment program was to reduce the BPLM contamination in the groundwater and soil within the targeted depth intervals of the treatment site to the extent practicable. Treatment to the extent practicable is defined as the point where no significant BPLM reduction will occur with further treatment. Activities at the site consisted of four main phases of implementation: injector installation; mass calculations and hydrogen peroxide proportioning; injection; and post-treatment sampling. Each phase of the treatment program was specifically designed to attain the overall goal of meeting the criteria for closure at this site.

Injector Installation:

The injector installation for the full-scale treatment program at the site began on January 6, 2005 and was complete on April 30, 2005. This phase consisted of approximately 95 days of active installation. Over this time period, 1,238 injectors were installed on an approximate 15-foot by 15-foot grid pattern, across a maximum of five vertical treatment intervals, labeled A through E. In addition, the 45 injectors installed for the pilot treatment program at this site were utilized as active injection points for the full-scale. The injectors were placed on an approximate 15-foot by 15-foot grid pattern. 74 vent wells were also installed at this site.

The depths and amounts of injector layers varied based on the presence of BPLM. Injectors were installed and screened where BPLM was observed. Once an injector was installed, four adjacent injectors were installed in the same screened interval to ensure sufficient oxidant solution contact with the contaminated area. The entire treatment area was subdivided into 28 blocks, with each consisting of 91 injectors or less. These divisions were implemented to simplify the sampling, injection, and data management activities for the site.

Baseline Sampling and Mass Calculations :

During the injector installation, several injectors were continuously cored and sampled. Soil samples were obtained in 5-foot increments from approximately 20% of the injectors across the site, in order to define the lateral and vertical extent of the contaminant mass present at the site.

The samples were analyzed for BTEX using EPA Method 8260B and PAHs using EPA Method 8270C.

Using the analytical data from these samples, injectors were assigned a contaminant mass and a target volume of hydrogen peroxide for each injector was calculated. The volume of hydrogen peroxide required was based on a 22:1 ratio of hydrogen peroxide to contaminant mass. This ratio was proven to be effective during the pilot ISCO treatment program. If the mass volume calculation was less than the minimum amount of hydrogen peroxide required to be injected to establish the radius of influence, a minimum volume of 120 gallons of 50% hydrogen peroxide was used for that injector.

Once mass volume calculations were achieved, the injection activities were implemented and the full-scale treatment program took place in the following stages:

- 22:1 Ratio/Minimum Injection (Target Volumes)
- PID Headspace Chasing
- Peroxide Stability
- 21-Day Post-Treatment Monitoring
- Long Term Monitoring

These stages of injection were developed to demonstrate that the performance criteria for treating BPLM to the extent practicable were achieved.

Remediation Operations:

Each day prior to oxidant injection, groundwater samples were obtained from all of the injectors within an active treatment block and analyzed for pH, alkalinity, iron and hydrogen peroxide concentrations, temperature, and PID headspace. This process continued throughout the program on a daily basis to monitor the changes in groundwater chemistry and volatile constituents.

Once the delivery of target volume to each injector was complete in an active block, treatment focused on the injector locations with PID headspace readings in groundwater greater than 50 ppm. Results from the pilot ISCO treatment demonstrated that PID headspace in groundwater was directly proportional to remaining VOC concentrations. Treatment to the extent practicable was achieved when every injector within an active block had headspace reading below 50 ppm, thus oxidant delivery refocused on the locations that did not meet this criteria. Once all injectors within an active treatment block were all below 50 ppm, GCI conducted a hydrogen peroxide stability test. This test involved injecting hydrogen peroxide over the course of one day to obtain a concentration of peroxide equal to or greater than 250 ppm at each injector for 8 hours. The following day groundwater samples verified that sufficient hydrogen peroxide concentrations existed in each injector within the treatment block.

After the concentration of hydrogen peroxide decreased to 2.5 ppm or below in every injector block, volatile constituents in groundwater were still monitored for a period of 21-days. If headspaces remained below 50 ppm during this 21-day period, the final treatment criterion was effectively met and the block was considered closed, however select locations within each treatment block were still monitored weekly until active treatment in all the blocks across the site was complete. The long-term monitoring served as an assessment of BPLM rebound and as a final check that the block was treated to the extent practicable.

Summary and Treatment Results :

Injection at the site began on February 6, 2004 and injection activities were completed on January 17, 2005. A total of 7 injection rigs were used throughout the duration of the injection program. The entire treatment program from start to finish included the injection of approximately 4,880,490 pounds (488,049 gallons) of 50% hydrogen peroxide and a proportional quantity of site-specific catalyst solution totaling 2,676,800 gallons, which equated to an 8% peroxide solution being injected into the subsurface. The treatment criteria for treating BPLM mass to the extent practicable was achieved and maintained for the length of the treatment program across the entire site. Based on the injection activities and groundwater quality data, the full-scale treatment program conducted by GCI obtained closure in each of the 28 blocks on the site. The full-scale treatment program at the former MGP site in Savannah, Georgia was completed on February 17, 2005.

This summary sheet is intended to provide a general overview of the referenced site. For more detailed information, please contact us at 908-206-1250.