TECHNICAL BRIEFING – 2012 ANNUAL MONITORING REPORT
GROUP 3 SITE 2 (PICA 08) GROUNDWATER AND SURFACE WATER – APRIL 2013

The document reviewed was an annual data report for Group 3 Site 2 (PICA 08) groundwater and surface water monitoring. The response action for groundwater at the site is In-Situ Enhanced Bioremediation. The remedy has been in effect since September 2010. The remedy consists of injection of emulsified vegetable oil (EVO) to create conditions favorable for enhanced reductive dechlorination (ERD). Prior to injection of EVO six injection wells were installed along with three monitoring wells (2MW-25, 2MW-26, and 2MW-27). A total of approximately 8,260 gallons of dilute EVO was injected in September 2010.

The sampling results contained in the annual report were collected in accordance with the Remedial Design. Groundwater sampling was performed on the following dates: 3/22/12, 6/26/12, 9/21/12, and 12/21/12; performance monitoring samples were collected on September 21, 2012 and compliance monitoring samples were collected for every quarterly event. The single surface water sample (discussed below) was collected on March 8, 2012. The sampling results are described in the report along with trend evaluation for results accumulated since remedy inception.

Monitoring Program and Schedule

The monitoring for the site consists of performance monitoring and compliance monitoring. Groundwater samples are collected for both performance and compliance monitoring whereas surface water samples are collected solely for compliance monitoring.

The goal for performance monitoring is to check that groundwater chemistry and conditions are suitable for biodegradation to occur. Analytes consist of field parameters (pH, temperature, and specific conductance), dissolved gases (methane, ethene, and ethane), and dissolved organic carbon (DOC). Other miscellaneous parameters (nitrate, dissolved iron, sulfate, and volatile fatty acids) are to be performed on an "as needed basis" but are not discussed in the report. Performance monitoring is to be conducted on a semi-annual frequency for Years 1 through 7 of the remedy.

Compliance monitoring for both groundwater and surface water is to monitor water quality to ensure that contaminant concentrations continue to decrease at a sufficient rate to achieve Site Cleanup Levels (SCLs). Compliance monitoring was to be performed on a quarterly frequency for the first year and then revert to a semi-annual frequency. However, an additional year of quarterly monitoring was added. The frequency will be semi-annual for the next two years and then change to annual frequency. Compliance monitoring for surface water was completed on an annual frequency.

Contaminants of Concern (COCs)

The following constituents are COCs at the site:

- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- 1,1-Dichloroethene (1,1-DCE)
- Carbon tetrachloride (CT)

Monitoring Locations

Ten monitoring wells are included in the program as follows: 2MW-4D, 2MW-5, 2MW-10, 2MW-14, 2MW-17, 2MW-25, 2MW-26, 2MW-27, 2MW-47-101, and 2MW47-102. Well 2MW-5 was added to the sampling lineup in the second quarter of 2012 at the request of the New Jersey Department of Environmental Protection (NJDEP). Samples from the monitoring wells were collected using passive diffusion bags (PDBs) except for DOC which was collected by bailer. There are five surface-water sampling locations where grab samples are collected as follows: 2SW-16, 2SW-20, 2SW-29, 2SW-36, and 2SW-39. However, only a single sample was collected because other locations were dry. It was reported that dense vegetation prohibited subsequent surface-water sample collection. The report notes that future surface water samples will be collected early in the first quarter of the year when vegetation is less dense and evapotranspiration has not caused locations to dry up. VOCs were analyzed by Method 8260B. Field parameters included pH, oxidation-reduction potential, and temperature (also specific conductance is referenced in Table 1).

Reductive Dechlorination

The report includes a section on the processes that are involved in the degradation of contaminants in the area. It is noted that a "strongly reducing In Situ Reactive Zone was created by the introduction of excess organic carbon." That zone favors reductive dechlorination. Two processes contribute to degradation: cometabolism and dehalorespiration. There are two primary pathways cited as follows:

CT → chloroform → dichloromethane → chloromethane → methane

And

PCE → TCE → DCE → VC→ ethene → ethane → carbon dioxide

It is noted that other reactions are also possible.

Groundwater Results

Groundwater chemistry:

- DOC is highest in wells closest to the EVO injection. Concentration decreases throughout the year demonstrate consumption by a "flourishing microbial community."
- Methane is at elevated concentrations near and downgradient of injection wells. Those concentrations are resultant from degradation of CT and methanogenesis.
- Ethane was detected in eight of ten sampled wells in September 2012.
- Ethene was detected in all ten sampling wells in March 2012 and September 2012 and was generally at the highest concentrations in wells near injection sites.

Contaminant concentrations:

- Contaminant concentrations decreased after injection of EVO in September 2010. CT showed pronounced concentration reductions downgradient of the injection. The change in CT plume configuration from 2010 (most results from July 2010) to December 2012 is remarkable in that one of the hot spots is entirely absent after remedy implementation and the other has been reduced in concentration; several wells that had been within a hot spot showed no detection of CT in December 2012.
- TCE concentrations decreased in wells both upgradient and downgradient of injection sites with the exception of one well locations where the TCE concentration rebounded.

Surface Water Results

Only one surface-water sample was collected for 2012. No COCs were detected in that sample.

Future Actions

A second round of EVO injection was planned for the second quarter of 2013. In that event a 1 percent solution of EVO was to be used instead of 2.5 percent because VOC concentrations had already decreased and reducing conditions had already been established. The second injection event is to be documented in the semi-annual monitoring report which is expected to be submitted to regulators in August 2013. Compliance groundwater monitoring frequency was scheduled to change to semi-annual in the first quarter of 2013; performance monitoring frequency will continue as semi-annual. Surface water monitoring will remain on an annual frequency.