

Remedial Investigation at a Superfund Site

Multilevel Sampling and Monitoring Using the Westbay System

CHALLENGE

Volatile Organic Compound (VOC) contaminated groundwater posed a risk to nearby private water supply wells. Traditional approaches of drilling and sampling multiple boreholes did not provide adequate data to characterize flow and contaminant migration in the complex fractured bedrock.

SOLUTION

The Westbay System was installed in the bedrock formation and provided the ability to collect discrete samples from multiple levels in each borehole in order to quantify water quality and vertical hydraulic head distribution at the site.

RESULTS

The Westbay System provided a highly effective and less costly distribution of hydraulic head while also providing high quality data to delineate the boundary of the contaminant plume.

Detailed Groundwater Data Required for Superfund Site Remedial Investigation Between 1962 and 1988 Galaxy Chemicals/ Spectron, Inc., recycled chemical solvents and blended fuels at a site located six miles off the busy Interstate 95, located in Elkton, Maryland, USA. In 1988, after nearby residents complained of careless practices at the plant, the State of Maryland shut Spectron down. The company declared bankruptcy and abandoned the site. Soon afterward, the U.S. Environmental Protection Agency (US EPA) placed the site on its National Priorities List. Remedial investigation work has been taking place at the present-day Spectron Superfund site ever since.

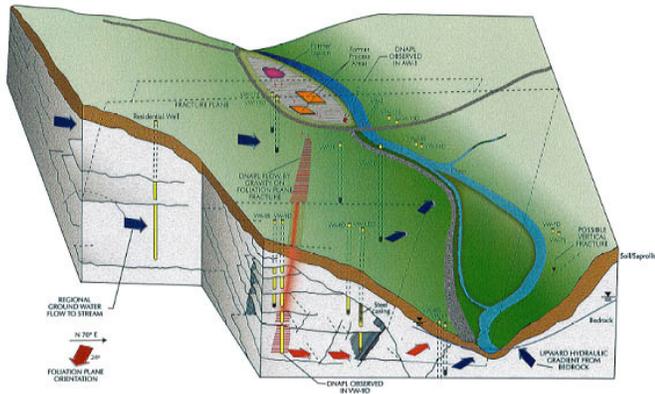
During the time Galaxy Chemicals occupied the site, volatile organic compounds such as trichloroethene (TCE), perchloroethene (PCE), and 1,1,1-trichloroethane (TCA) contaminated the groundwater in the area. For the purposes of the remedial investigation, the Spectron site was divided into two operable units: OU-1 (overburden soil) and OU-2 (bedrock, groundwater). Of the two, OU-2 was more difficult to characterize because of the site's complex fractured-rock hydrogeology and the dense and non-aqueous nature of the site contaminants. A larger than usual amount of data was required in order to assess the extent of the site contamination and develop a Conceptual Site Model (CSM).



Above: Drilling operations at the Galaxy Spectron Site.

Remedial Investigations

The Spectron site, which is located along Little Elk Creek between two ridges, is characterized by a thin overburden of soil with fractured crystalline bedrock beneath. Nearby residences all have private water wells. Characterization of groundwater quality and flow in the bedrock was required to develop a detailed Conceptual Site Model (CSM) to be used to evaluate the potential impacts to human health or the environment.



Above: Conceptual Site Model of the Galaxy Spectron site.

During the early stages of the remedial investigation, when basic information on the nature and extent of the contamination in the bedrock was being gathered, consultants used a traditional approach which involved the drilling and sampling of multiple monitoring boreholes to different depths. When it became clear that more detailed, discrete groundwater data was needed, the consultants reviewed various multi-level monitoring system options. In the end the Westbay System was chosen. The proposed alternative approach was approved by the US EPA and work on the OU-2 remedial investigation has continued using the Westbay Monitoring System since 2006. Remedial investigation work continues at the site to this day.

The Results

Using the Westbay System, the following findings have been developed for the OU-2 remedial investigation:

- Bedrock fractures had formed primarily along the regional foliation plane
- Fracture frequency and aperture decrease with depth
- Yield and specific capacity of water-bearing fractures decrease with depth
- Significant hydraulic gradient, indicating groundwater flows upward toward the creek
- Potentiometric levels in the deeper bedrock do not respond to precipitation
- Bedrock groundwater elevations correlate to changes in barometric pressure
- Low-yield fractures had high concentrations of contamination due to limited dilution
- High-yield fracture zones had lower concentrations, due to greater groundwater movement through the fracture zones

Westbay System

The Westbay System offered an effective and less costly way to detail the distribution of hydraulic head in the bedrock and confirm the direction of groundwater flow, while also providing accurate water quality data to delineate the boundary of the contaminant plume. Further, the system was capable of gathering both types of data successfully and accurately over a long period of time.



Above: Little Elk Creek after restoration.