Project Brief: Savage Municipal Water Supply Superfund Site

STONE ENVIRONMENTAL

Services / Expertise
CERLA Site
Remedial Investigation/Feasibility Study
Remedial System O&M
Remedial System Optimization
In Situ Oxidation
Bedrock Investigations
Pumping Tests
Tracer Dye Testing
Long Term Monitoring
Vertical Profiling
3-D Visualization

Markets
State Government

Project Location
Milford, New Hampshire

Date Completed
2011 - Present

Project Owner
New Hampshire Department of Environmental Services (NH DES)

Project ID#
14-129

Bedrock Drilling in Support of Savage Municipal Water Supply Superfund Site – Operable Unit 3

As project manager at Weston Solutions, Bette Nowack was integrally involved in all activities for this project from 2007 until 2014, with continued involvement in the project through to completion of the Initial Screening of Alternatives Report under a subcontract to Weston Solutions after joining Stone Environmental. Team member Seth Pitkin of Cascade performed vertical profiling at the site in 2001.

Historical use of chlorinated hydrocarbons at the Savage Municipal Water Supply Superfund Site (the Site) in Milford, NH has resulted in impacts to the overburden and bedrock aquifers underlying the Site and the nearby municipal water supply well. The primary contaminant of concern at the site is tetrachloroethene (PCE), although breakdown products of the solvent are present as well. From the 1940s through 1987 the OK Tool Company produced metal cutting tools and tool hardware at the Site. The initial discovery of volatile organic compounds (VOCs) at the Site occurred in February 1983, when an inspection of the OK Tool Company building revealed potential releases to the floor drains, the ground surface, and the nearby river. The remedy for the OK Tool area, also identified as Operable Unit 1 (OU1), included the construction of a treatment building with a hydraulic barrier wall, to surround the area where the highest concentrations of contaminants were identified, to be used in conjunction with a combination of air sparge (AS), soil vapor extraction (SVE), and groundwater extraction/injection.

A second operable unit (OU2) was developed to address the plume of contamination present downgradient from the former OK Tool area and has been managed by the remaining responsible parties. An evaluation of the remedy performed in 2007 indicated that, while concentrations beyond the slurry wall were decreasing,

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groundwater present within the confines of the wall would not reach the Record of Decision specified cleanup goals within a reasonable time frame. In an effort to aggressively treat areas of elevated PCE concentrations, an in-situ chemical oxidation (ISCO) program was implemented in 2008 and the former facility leach field was excavated and treated on-site to remove a potential on-going source of shallow groundwater contamination at the site.

Based on increasing concentrations of Site contaminants in shallow bedrock monitoring wells and a stark increase in residential development to the north and northwest, where the bedrock aquifer is the sole source of drinking water, a deep bedrock investigation was implemented. The investigation led to the discovery of suspected dense non-aqueous phase liquid (DNAPL) in the deep bedrock aquifer in the area of the former OK Tool building and the subsequent development of OU3 by the United States Environmental Protection Agency (EPA) to address impacts to the bedrock aquifer throughout the entire Site. A Remedial Investigation of OU3 was completed in 2014 and a Feasibility Study is currently being performed to evaluate remedial alternatives for the impacted bedrock aquifer.

View of Sodium Permanganate Distribution within Till Unit at Site

Project team members have led and/or supported the following tasks at this site between 2001 and 2014:

- Stone was retained to investigate the source area at the Site using our modified WaterlooAPS groundwater profiling technology. The objective of the investigation was to assess whether DNAPL contaminants had been released outside the slurry wall containment system. A concern arose as to whether DNAPL and/or contaminated water might have been released through the downgradient recharge system prior to treatment, resulting in a new source of groundwater contamination. Increased levels of PCE at a downgradient monitoring well suggested this was the case. The investigation found no effects of a release from the recharge gallery and determined that residual contamination outside the slurry wall was causing the increased PCE levels at the downgradient monitoring well.
- Completed the 2007 Evaluation of the Remedy, consisting of a detailed hydrogeological review of Site conditions and the treatment system to optimize remedial progress and identify potential efficiency improvements for the groundwater treatment plant.
- Assumed responsibility for Operations and Maintenance (O&M) at the Site including all treatment plant O&M, groundwater monitoring events, and all remedial activities completed in conjunction with the NHDES and USEPA.
- Implemented several efficiency upgrades at the groundwater treatment plant including the removal of the AS/SVE compressor and vacuum blower and replacement of the older, oversized boilers with compact, high efficiency boilers resulting in a significant reduction in energy consumption.
- Designed and implemented an aggressive ISCO program in conjunction with NHDES and EPA to treat high concentrations of PCE in groundwater present within the confines of the slurry wall and reduce the timeframe required to reach cleanup goals. The ISCO program was designed to blanket the deep overburden aquifer within the confines of the slurry wall, providing a passive barrier between the overburden and bedrock, before reducing the groundwater extraction rate within the wall and targeting areas of elevated PCE identified during previous vertical profiling events.

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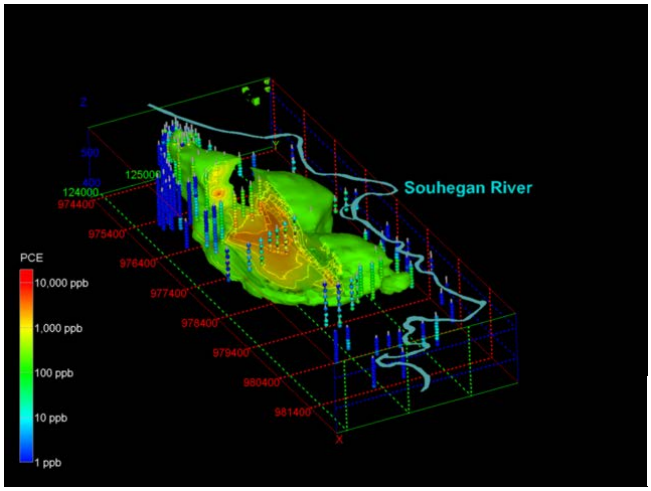
- Designed and implemented the excavation of approximately 2,500 cubic yards of VOC impacted soil in the area of the leach field for the former OK Tool building and in the proximity of a leaking discharge drain to the Souhegan River. Both areas of soil were inferred to represent an ongoing source of shallow overburden groundwater contamination. Soils were excavated and treated onsite utilizing ex situ chemical oxidation with ozone and peroxide via two above ground treatment cells. Additional treatment of excavated soils was provided via SVE with treatment of vapors using granular activated carbon.
- Completed the first Five-Year Review for the entire Savage Municipal Water Supply Superfund Site under CERCLA in conjunction with NHDES and EPA, documenting the status of remedial progress within both OU1 and OU2.
- Developed and implemented a deep bedrock investigation in conjunction with NHDES, EPA, and the United States Geological Survey (USGS) to evaluate the potential for Site contamination to impact nearby residential wells. Investigation included the installation/deepening of 18 deep bedrock monitoring wells, borehole geophysical surveys, packer testing, pumping tests, and a tracer dye study to evaluate contaminant migration rates.
- Completed the Remedial Investigation Report documenting the findings from the deep bedrock investigation, including identifying the nature and extent of impact to the bedrock aquifer, an evaluation of contaminant migration pathways, and development of a conceptual site model.
- Based on the conclusions of the Remedial Investigation, completed an Initial Screening of Alternatives Report that formed the basis of the Feasibility Study and remedy selection.



3-Dimensional Model of PCE concentrations in groundwater.

Results

- Additional improvements were made to increase safety in the plant and increase efficiency of plant operation.
- Annual fuel costs have been reduced by 75% due to the efficiency improvements implemented at the treatment plant.
- Conducted on-site treatment of excavated soils eliminating the costs associated with shipping and disposal of soil and the cost of clean backfill.

- Worked in conjunction with NHDES and EPA to generate a more aggressive in-situ and ex-situ chemical oxidation remediation plan to reduce the remedial time frame at the site and minimize long-term O&M costs. Remedial plan for ISCO resulted in excellent distribution of the oxidant throughout the overburden aquifer within the confines of the slurry wall.
- The findings of the investigation conducted in support of the OU3 RI suggest that the residential properties located to the north and northwest did not appear to be at risk of becoming impacted with Site related contamination under the current hydrogeological conditions.
- Received excellent feedback on the RI Report for OU3 from both NHDES and USEPA including the thoroughness of the document and the analysis of technical information.
- Coordinated with the consultants for the OU2 Potentially Responsible Parties to implement bedrock investigations beyond the limits of OU1, including access to monitoring locations and the sharing of data.
- Worked with NHDES and EPA to develop remedial alternatives for the bedrock aquifer that can be instituted in conjunction with the existing infrastructure and/or will also result in concomitant reductions in concentrations of overburden contaminants.
- Completed tasks on-time and under the allocated budget for NHDES. Excess funding was allowed to be re-distributed to conduct additional tasks at the Site not initially accounted for including additional investigatory work performed by the USGS at the Site to evaluate the extremely low flow rates of ambient flow present within the fractured bedrock aquifer.