

RPM News

▲ Remedial Project Manager News ▲

“COMMUNICATING NAVY INSTALLATION RESTORATION PROGRAM NEWS AND INFORMATION AMONG ALL PARTICIPANTS”

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Commanding Officer:
Captain Mark B. Samuels

Environmental Department Head:
Mr. Rick Gardner

Environmental Restoration
Division Director:
Mr. Tom Flor

Consultation/Information
Management Branch Head:
Mr. Robert Kratzke

Environmental Engineering
Consultant:
Ms. Barbara A. Johnson
(805) 982-4858

Editor:
Ms. Anita W. Ortiz
(805) 982-5462

In Situ Electric Resistance Heating at Former Dry Cleaning Facility

NS Great Lakes, Illinois

A successful application of Electric Resistance Heating (ERH) treatment technology at Site 22, Naval Station (NS) Great Lakes, Illinois was recently completed. The ERH system reduced chlorinated volatile organic compound (cVOC) concentrations in the low permeability soil by more than 99 percent.

ERH utilizes current passed into the subsurface via steel electrodes with graphite and steel shot to heat the soil and groundwater. As the temperature of the subsurface reaches the boiling point of the cVOC/water mixture, steam is created. This steam is laden with cVOC vapors, and is recovered by a vapor recovery system. At the surface, water is condensed from the stream, and the vapor is treated via conventional treatment technologies and discharged to the atmosphere under permit.

Project Background

Building 105 at Site 22 was constructed in 1939 and was utilized as a dry cleaning facility until 1993/94. It is postulated that the soil and groundwater cVOC contamination is from the dry cleaner operations.

The Great Lakes Project Team decided after the Feasibility Study that ERH was the most effective way to treat the cVOC contamination in the low permeability soil at the site. Supplemental soil samples were collected throughout the site to determine the location and depth required for the ERH treatment. The goal of the treatment approach was to reduce the average cVOC concentration of tetrachloroethene (PCE) in soil to below the Illinois Tiered Approach to Corrective Action Objectives criteria for industrial use sites of 20 milligrams per kilogram (mg/kg).

To accomplish the remediation goals, Tetra Tech NUS, Inc. (TtNUS) worked with ERH subcontractor Thermal Remediation Systems, Inc. (TRS) to design and operate the ERH system. The system consisted of 16 wells that functioned as electrodes, vapor recovery, and drip irrigation; a power control unit; and associated vapor treatment equipment. The ERH treatment was conducted in a 2,400 square foot area near the southeast corner of the site. Inside this area, three distinct treatment zones were planned to depths of 25 feet, 18 feet, and 8 feet (Figure 1).

The system was installed by TtNUS and TRS in April and May 2006 (Figure 2) with testing and system start-up occurring on 24 May 2006. Four rounds of performance/confirmatory soil sampling were conducted between July and September 2006. Demobilization of the ERH equipment was completed in October 2006.

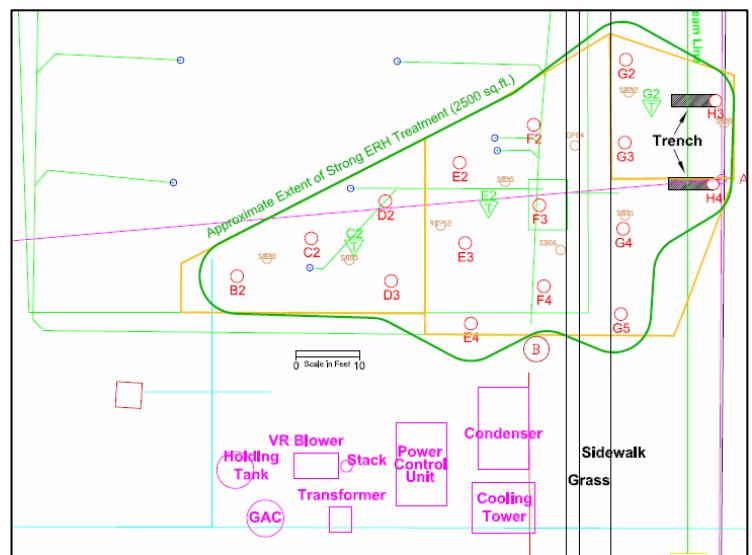


Figure 1. Treatment Area and Layout for the In Situ Electric Resistance Heating System.



Figure 2. ERH system and related components during operation.

In order to track the effectiveness of the ERH treatment, a baseline sample set of 15 soil samples within the treatment area was chosen. The baseline samples ranged with cVOC concentrations from 16.9 mg/kg to 1,500 mg/kg, with an average concentration of 445 mg/kg. The performance/confirmatory samples were collected from the same approximate location and depths as the baseline samples. A steady decline in the average cVOC concentration in the soil throughout this monitoring period (Figure 3) was observed culminating in a greater than 99 percent reduction in the final sampling event. Following treatment, the average cVOC concentration in the site soil was less than 5 mg/kg.

Regulatory Requirements/Community Involvement

Meetings were held with the Illinois EPA (IEPA) during project planning and implementation to determine and assess the project goals and chart a path toward site closure. The IEPA was brought in to review decisions made at critical junctures throughout the remediation to confirm decisions and progress.

Visitors to Site 22 included Alex Beehler (Figure 4), the Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), and the newly installed Commanding Officer of NAVFAC Midwest. These dignitaries were given tours of the system, a brief description of the technology, and the overall project goals.

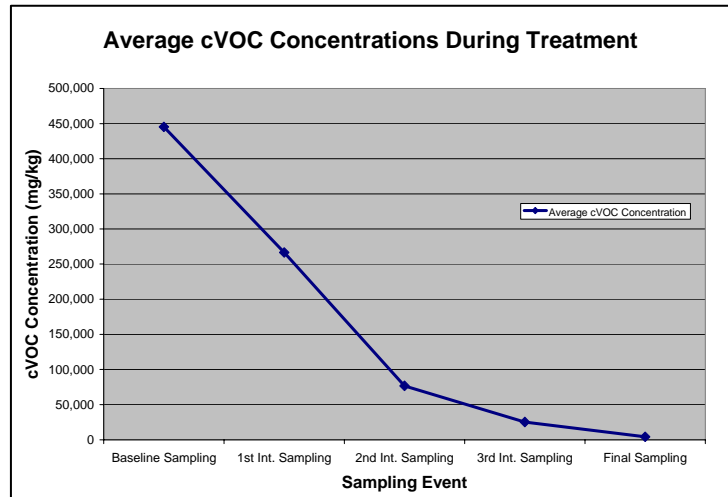


Figure 3. Graphical representation of cVOC concentration decrease and overall effectiveness from the baseline sampling event to end of treatment.

Challenges

The low permeability soil matrix at the site posed the greatest technical challenge for most remedial alternatives. ERH is a proven treatment technology that has effectively removed cVOCs from clay soil. Additionally, the safety of the pedestrians passing by or through the area was a significant concern. Safety was addressed by routine voltage checks throughout the area, most importantly near the two electrodes in the street. The use of wooden fencing and di-electric coating on certain electrode coverings eliminated voltage and safety concerns. Noise concerns were also addressed prior to system operation with the strategic placement of equipment, use of sound-proof barriers, and significant noise monitoring during system start-up.

Cost Avoidance Measures

The original remediation plan called for excavation of three isolated historical soil hot spots in addition to the ERH treatment system. The hot spots were eliminated by optimization of the treatment area and follow-up sampling. These reductions in remediation area and volume resulted in substantial cost avoidance to the project.

As interim data indicated that cVOC concentrations in certain areas of the site had been reduced to below the project goals, electrodes were disconnected in those areas, thereby reducing energy costs. This system was further optimized following each new set of interim data.

Project Successes

The most significant project success was the removal of over 1,200 pounds of cVOCs from the subsurface and reducing average concentrations by over 99 percent, surpassing the project goal of 95.5 percent reduction.



Figure 4. Alex Beehler and Executive Officer of NAVFAC Midwest Tony Edmonds visit Site 22 for technology presentation.

Communication and coordination were also critical to the project success. Regulatory, Navy, and TtNUS/TRS personnel worked together to design and execute a remedial action that satisfied the regulatory agencies yet did not adversely affect the mission of NS Great Lakes.

Lessons Learned

The remediation of a low permeability soil matrix, similar to the subsurface conditions present at Site 22, poses a significant challenge to most technologies. When implementing the ERH technology, the installation of additional vapor recovery points should be considered to provide faster, more effective removal of the vapors created through the soil heating effort, and possibly decrease the overall remediation time.

Points of Contact

*Anthony Robinson
Naval Facilities Engineering Command, Southeast
2155 Eagle Drive
North Charleston, SC 29406
(843) 820-7339*

*Howard Hickey
Naval Facilities Engineering Command, Midwest
Building 1A, Floor B
Room 25
201 Decatur Ave.
Great Lakes, IL 60088-2801
(847) 688-5999, Ext. 148*

*Robert Davis
Tetra Tech NUS, Inc.
661 Andersen Drive
Pittsburgh, PA 15220
(412) 921-7251*