Memorandum For: **Ms. Lee Ann Smith, Chair, POWER Action Group**
Protecting Our Water and Environmental Resources

From: FSA **Frank Anastasi, P.G., Community Technical Advisor**
(NC LG-2459; PA PG-2605; WY PG-2001)

Date: **June 20, 2018**

Subject: **Trip Report: May 17, 2018 Site Inspection**
Electrical Resistance Heating Remediation System
On-site PCE and Petroleum Hydrocarbon Source Area
CTS of Asheville Superfund Site
235 Mills Gap Rd., Asheville, Buncombe County, NC

I traveled to Asheville, North Carolina (NC) May 17, 2018 to inspect the electrical resistance heating (ERH) remediation system being installed at the source area of the CTS of Asheville Superfund Site along with you and other members of the community. We were given a tour of the area and briefed on the ERH equipment and treatment facilities by EPA's Remedial Project Manager Mr. Craig Zeller. Ms. Angela Miller, EPA's Community Involvement Coordinator for the site, and CTS Corporation's Remediation Manager George Lytwynyshyn, were also present.

Representatives from CTS contractors provided additional information about the installation and function of ERH System components, and plans for activating the system to begin the remediation process. Photographs of the site and ERH facilities taken during the inspection appear in the attached Photograph Log.

Background

The ERH remediation will attack the residual mass of contamination that is present beneath the former manufacturing plant and nearby. This work is focused on the non-aqueous phase liquid (NAPL) petroleum hydrocarbon and trichloroethylene (TCE) in the subsurface soil and ground water above the bedrock.

The March 7, 2017 Consent Decree between EPA and CTS Corporation, Mills Gap Road Associates, and Northrup Grumman Systems Corporation set in motion the design and construction of the equipment and facilities for the interim remedial action. Soil and ground water sampling to obtain final design data commenced in May 2017; field work to prepare the site and install facilities and equipment for one remedial system began in October 2017 and was almost complete at the time of the inspection (installation is now complete, and the system began operating June 8). A treatability study is underway for another technology planned to be used at the adjacent Northern Area of the site.

ERH System at Source Area

Mr. Zeller first showed us the electrode and vapor-recovery well installations over the 1.2-acre Source Area where extremely high levels of TCE exist (e.g., 42,000 ug/L in ground water and 830,000 ug/kg in soil). The ERH system will induce an electric current into the ground. The moisture in the ground conducts electricity throughout the area, which heats up the ground and actually boils the water in the subsurface. TCE and other volatile compounds and petroleum hydrocarbons present in the soil and ground water will transition into the vapor phase and be collected by recovery wells. An estimated 20,000 lbs. of VOCs are expected to be removed from the subsurface treatment zone (having an estimated volume of 47,250 cubic yards) over 90 to 120 days of full-heating operations.

227 electrodes were placed into the ground over the source area, including some angled installations to extend the reach of the remediation beneath adjacent private property located east of the CTS site. The surface of the site is covered by an impermeable membrane to prevent vapors escaping into the ambient air. Hundreds of electrical cables run along the ground surface and are connected to the top of each heating electrode just above the ground surface. The cables run to one of several control modules, which are conducted to alternating-current transformers, which get power from a step-down transformer connected to Duke Power lines.

Vapor recovery wells were installed at each electrode, and in a few additional locations along the outer perimeter of the area to be heated. Plastic piping runs along the ground surface between each recovery well and the treatment equipment located to the north of the source area. The recovered vapors will be treated by the regenerative thermal oxidizer to destroy TCE and other VOCs. Liquid NAPL will be separated and collected for off-site disposal. The treated airstream will then be discharged into the air through the tall exhaust stack. Liquid condensate collected with the vapors will be treated also, and the treated water recycled back into the ground at the electrodes to enhance performance of the ERH process.

The system is designed to segregate any NAPL that potentially may be collected with the vapors so it can be stored and transported off-site for proper treatment/disposal. Contingent plans are included for treatment of the recovered vapors by granular activated carbon if VOC concentrations become low enough as the projects nears completion (instead of the thermal oxidizer). Temperature monitoring points (TPMs) were installed in the ground at 18 locations throughout the treatment area to monitor the earth's response to the ERH. Twenty-two monitor wells were installed to enable collection of shallow and deep ground water samples to establish baseline conditions and monitor progress as contaminant concentrations decrease to the goal of 95% reduction in key contaminants.

Ambient air monitors were installed at four locations along the perimeter fenceline. Air samples were collected before heating commenced to establish baseline, and continuous air monitoring is being performed at these locations during heating. The airstream discharged from the thermal oxidizer is being monitored continuously during operation, and discreet air samples will be collected at frequent intervals during the heating process to document compliance with air-discharge limitations.

The attached Photo Log shows these system components with specific information noted in photo captions.

ISCO at the Northern Area

We also were briefed on the status of the testing for in-situ chemical oxidation (ISCO) that will be used to reduce dissolved-phase TCE concentrations in ground water above the bedrock just beyond the source area, at the adjacent 1.9-acre Northern Area. Potassium permanganate will be injected into the subsurface to provide a source of oxygen that will promote chemical breakdown of TCE in the ground water. The RAO is to reduce TCE concentrations in groundwater in the Northern Area by 95 percent.

The ISCO remediation will be a two-stage TCE-destruction process -- early treatment of TCE in the zones where permanganate slurry has been injected, and longer-term treatment throughout the aquifer, beyond the slurry injection zones, where the dissolved permanganate becomes distributed in the ground water. CTS contractors began the treatability study (TS) in late January 2018. Three new injection wells and eight new monitoring wells were installed in and around the area.

VOC concentrations in ground water samples and geochemical parameters of the subsurface materials were determined in pre-treatment baseline sampling. Monitoring wells were installed in pairs, with one shallow and one deep well at each location. Based on the baseline sampling data that was collected, the treatment zone will extend from approximately 30 feet below ground surface (bgs) to the top of bedrock. At MW-7A, the top of bedrock was encountered at 72 feet bgs.

Seven emplacement zones were constructed in each injection well, in the saturated soil and highly-weathered bedrock. The potassium permanganate slurry was injected through these perforations and into the voids. The injected slurry is expected to have penetrated about 15 to 20 feet radially out from the well into the surrounding soil. Ground water and soil samples have been collected and analyzed to determine how well the permanganate was distributed in the subsurface, and how effective it has been in reducing TCE. A report of the testing will be prepared after the final sampling data is evaluated (by around the end of 2018).

Current Status

As of the date of this writing, the complete ERH system has been installed and is now operating. System start-up and testing began on May 29; the system reached full operating power on June 8th. Preliminary testing has confirmed system components are operating as intended and designed. CTS' website indicates it expects the system to reach full heating of the subsurface to about 87 degrees Celsius after about 40 days of operation, or by around July 20 (see http://www.ctsofasheville.com/2018/06/15/site-activities-week-of-june-18-2018).

According to the most recent status update on the CTS remediation website, as of June 15 the ERH System had applied 411,000 kilowatt-hours (kWhr) of the estimated 8,255,000 kWhr that the remediation will require, and the average underground temperature had risen three degrees to 17-degrees Celsius.

CTS will be reporting perimeter air monitoring and thermal oxidizer discharge monitoring data to EPA; air data will be available to be viewed at EPA's website for the CTS site https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0402598.

The following pages present photographs taken during the May 17 inspection. I will continue to track the ERH-remediation and ISCO-testing progress over the coming months. If you have any questions, feel free to contact me at (301) 309-0061.

CTS of Asheville Superfund Site – May 17, 2018 Site Inspection
On-site Source Area Electrical Resistance Heating Remediation System Installation

EPA's Mr. Zeller at the Source Area of CTS Superfund Site, south side of Mills Gap Road. Note impermeable cover over treatment area.

Close-up detail at electrode and vapor recovery well head. Note electric cable and vapor recovery piping.

Surface installations including cables, piping, vapor recovery and electrical control units across the 1.2-acre Source Area.

Close-up of recovery piping

Close-up of electrical cable connection fittings for attachment to electrodes.

Electrical transformer (one of several as the system is zoned to enable optimization of remedial action).

CTS of Asheville Superfund Site – May 17, 2018 Site Inspection
On-site Source Area Electrical Resistance Heating Remediation System Installation

Electrical transformer – one of several -- and incoming cables from electrodes.

Additional cables and other electrical transformers and control units across source area.

Vapor recovery piping looking toward eastern property boundary.

System installations along the eastern property boundary.

Vapor recovery and electrode installations angled beneath adjacent private property to the east of CTS site.

Close-up of vapor recovery and temperature monitoring point installation along eastern property boundary

CTS of Asheville Superfund Site – May 17, 2018 Site Inspection
On-site Source Area Electrical Resistance Heating Remediation System Installation

Monitoring wells completed with dedicated in-well “hot” sampling apparatus for collecting ground water samples during remediation.

View of treatment system components (note thermal oxidizer exhaust stack in center of photo)

Vapor recovery system manifold at treatment system for metering vapors into thermal oxidizer where TCE and VOCs will be destroyed.

Thermal oxidizer unit and influent piping.

Emergency shut off control at thermal oxidizer. System has integrated monitoring with auto-shut off in case of higher-than allowed VOC exhausts.

Water sampling/treatment/monitoring equipment.

CTS of Asheville Superfund Site – May 17, 2018 Site Inspection
On-site Source Area Electrical Resistance Heating Remediation System Installation

Carbon treatment units.

Additional carbon treatment units and water holding tank.

Monitoring well at Northern Area where ISCO testing is in process

Injection and monitoring wells where ISCO potassium permanganate was injected.