Preliminary Close Out Report

For

Ravenswood PCE Superfund Site

Ravenswood, West Virginia

May, 2018

PREPARED BY:

United States Environmental Protection Agency

Region III

Philadelphia, Pennsylvania

I. Introduction

This Preliminary Close Out Report documents that the U.S. Environmental Protection Agency ("EPA") completed construction activities at the Ravenswood PCE Site ("Site") in accordance with *Close Out Procedures for National Priorities List Sites* (OSWER Directive 9320.2-22, May 27, 2011). EPA and the West Virginia Department of Environmental Protection ("WVDEP") conducted a pre-final inspection on February 3, 2016 and determined that the contractors have constructed the remedy in accordance with the remedial design ("RD") plans and specifications, and no further response is anticipated. EPA and the WVDEP have initiated the activities necessary to achieve performance standards and Site completion.

EPA is the lead agency for the Site and the WVDEP is the support agency. There are no viable potential responsible parties at the Site, therefore the Site is Fund-financed.

The Site was originally comprised of two operable units ("OUs"). OU 1 referred to groundwater contamination while OU 2 addressed vapor intrusion. However, the constructed remedy for OU 1 was effective in alleviating the vapor intrusion issue and thus addressed both OUs.

II. Summary of Site Conditions

A. Site Location

The Site (CERCLIS Identification No. WVSFN0305428) is located in the City of Ravenswood, Jackson County, West Virginia ("City"). The Site generally includes the downtown area of Ravenswood, which is underlain by groundwater contaminated with tetrachloroethene, which is also known as perchloroethylene or PCE.

The PCE plume extends from the intersection of Broadway Street and Walnut Street approximately 1,400 feet northeast to the City of Ravenswood water supply well field located adjacent to Virginia Street (See Figure-1). This well field currently includes seven production wells ("PW") known as PW-1 to PW-7, which supply water to approximately 7,100 people.

B. Site History

In September 1989, during routine health department water analysis, PCE contamination was detected in the City's production wells PW-2, PW-3 and PW-5 at levels exceeding the Maximum Contaminant Level ("MCL") for PCE in drinking water which is 5 micrograms per liter ("5 µg/L") as set forth at 40 C.F.R. § 141.61. MCLs are the standards for drinking water established by the Safe Drinking Water Act, 42 U.S.C. § 300g-l. PCE concentrations that exceeded the MCL were detected five times from 1989-1998 in the finished water that was distributed to the public. Following the identification of PCE in the drinking water supply, the City of Ravenswood independently added a Venturi air stripper to provide wellhead treatment

for the production wells in 2000. Various EPA Site investigations took place during the period between 1998 and 2010.

EPA added the Site to the final National Priorities List ("NPL") on September 23, 2004 (69 FR 56919).

C. History of Previous Environmental Investigations and Response Actions

In November 2008, as part of the Remedial Investigation ("RI"), EPA initiated a Treatability Study at the Site to provide engineering data to support a final remedy decision for OU1 of the Site. Air sparging with soil vapor extraction ("AS/SVE") was evaluated due to its effectiveness at similar sites. In November 2008, fifteen wells were installed as part of the AS/SVE system study. The system included: nine air sparging wells, three soil vapor extraction wells, two groundwater monitoring wells and one vapor monitoring well. An AS/SVE system was moved from the Vienna PCE Superfund Site in Vienna, West Virginia and was installed at the Ravenswood PCE Site in June 2009.

The air sparging wells inject air into the water table which volatilizes the PCE (changes PCE from an aqueous phase to a vapor phase). The volatilized PCE then moves upward into the vadose zone (the area extending from the top of the groundwater to the land surface). The PCE is then captured by the soil vapor extraction wells. The soil vapor extraction wells work by creating a vacuum in the vadose zone. The PCE vapors captured by these wells are transported via piping to a vapor-phase granular activated carbon ("GAC") unit which is in the Treatment System ("TS") building. The GAC works as a filter to remove the PCE from the air. The treated air is then discharged to the atmosphere.

D. 2011 Record of Decision

The decision by EPA on the remedial actions to be implemented at the Site is presented in the 2011 Record of Decision ("ROD"). The remedial action objectives of the selected remedy are:

- Prevent human exposure, including ingestion, inhalation, and dermal contact, by current and future residents and industrial workers to contaminated groundwater that exceeds EPA's acceptable level of risk of $1x10^{-4}$;
- Prevent down-gradient and offsite migration of contaminants in the groundwater to the Ohio River and Sandy Creek; and
- Restore contaminated groundwater to meet the ARAR [Applicable or Relevant and Appropriate Requirement] which is the MCL.

The major components of the selected remedy as outlined in the 2011 ROD are:

- In-Situ AS/SVE, including the continued operation of the AS/SVE system put in place for the TS, monitoring of vapors, and an expansion of AS and SVE wells in areas that would effectively treat all contamination;
- Groundwater monitoring throughout the contaminated groundwater plume and near the Ohio River, which may require the installation and monitoring of additional wells;
- Continued well-head treatment (stripping system)[1] on the City's contaminated production wells prior to distribution, as needed;
- A Pre-Remedial Design Investigation ("PRDI") to ensure the proper placement of the air sparging and soil vapor extraction wells; and
- Institutional Controls ("ICs") to prevent the installation of new production wells in the contaminated portion of the aquifer.

E. Pre-Remedial Design Investigation

In 2012 EPA conducted a PRDI to support development of Remedial Design ("RD") for the Site. The purpose of the investigation was to further refine the location of the PCE plume and locate any contaminant source(s). The investigation included the installation of 30 borings to depths of 30 feet below ground surface ("bgs"), collection of 60 soil samples from these borings, installation of 4 groundwater monitoring wells, collection and analysis of 16 groundwater samples from all new and existing groundwater wells, as well as exploratory vapor intrusion sampling.

During the PRDI, two potential PCE source areas were identified near the former dry cleaning facility at 120 Washington Street ("the building"). Soil contamination was found in the grassy area behind the building and along the alley adjacent to the building, as well as along the City sanitary sewer system along Walnut Street between Washington and Race streets. PCE was detected in all soil samples collected from behind the building at depths from surface to 26 feet bgs. PCE was also detected in the soil samples collected near the manholes of the sanitary sewer exiting the facility. It is likely releases occurred to surface and subsurface soils and to the sanitary sewer system as a result of dry cleaning equipment maintenance practices (filter and solvent changes) during facility operation. Soil samples were also collected at a former dry cleaning facility at 220 Washington Street. PCE was detected in one of the eight subsurface soil samples collected at this address. The area behind this building is paved; therefore, it is assumed that surface releases likely would have been transported off site by storm water and surface water discharges. However, since PCE was detected beneath the pavement, it is possible that a release occurred at this facility.

[1] The well head treatment was installed prior to EPA involvement by the City.

Groundwater sample results from the PRDI indicated that the groundwater plume extends from the source area (south of the intersection of Walnut and Washington streets) to PW-3 (Figure 1.2). A second, lower concentration "lobe" of the plume extends southwestward toward Broadway Street. The secondary lobe of the plume is consistent with the presumed contaminant release points and the groundwater model developed in the RI. That model indicates that a small portion of the contaminant mass from the source area could migrate westward to a hydraulic stagnation point between the influence of the City production well field and the Ohio River.

F. Removal Action

A removal action was initiated to address the contaminated soils at 220 Washington St. identified in the PRDI. Since the ROD did not specifically address soils, EPA utilized a Removal Action to address this new source of contamination. The Removal Action was initiated on April 2, 2015 when the OSC first mobilized to the Site. On April 13, 2015 the OSC mobilized the Emergency and Rapid Response Services ("ERRS") contractors to the Site. Between April 13 and April 24, 2015, the ERRS contractor removed contaminated soil and staged this soil for disposal. Ultimately, 437.25 tons of contaminated soil was disposed at Republic Service's Green Valley Landfill in Ashland, Kentucky. The Removal Action demobilized on April 25, 2015 to allow the Remedial Action detailed below to proceed. After completion of Remedial activities in the area, Removal remobilized from July 20 to 24, 2015 to perform site restoration activities.

G. Remedial Action Construction

The RD for the Site included an expansion of the former AS/SVE system put in place during the TS (hereafter referred to as "Treatment System 1" or "TS1") and the installation of a second treatment system ("TS2"). These two RD components are described below

- TS1 was expanded and modified to treat the northern portion of the PCE plume in the area of the production well field. The RD specified modifications to the programming of the TS1 programmable logic controller ("PLC") that enable it to operate wells AS-1, AS-10, and AS-11 continuously, and wells AS-2, AS-3, AS-4, AS-5, AS-6, and AS-12 on a pulsed schedule. The RD also required the addition of three new AS wells, with conveyance piping, to improve the removal effectiveness of TS1.

- TS2 was designed to treat the southern portion of the plume, particularly the source areas behind the two former dry cleaners. The RD specified that the following components be included in TS2:

    - Five new SVE wells manifolded to a blower that pulls the recommended vacuum;
    - Ten new AS wells with a compressor to supply air to the wells at the appropriate pressure;
    - Subsurface conveyance piping;

- A subsurface liner/vapor seal to improve recovery in the source area behind 220 Washington Street;
- Off-gas treatment using GAC;
- Condensate removal;
- A PLC to control the operation and allow remote monitoring of the system; and
- A treatment building to house the compressor, blower, GAC, PLC, and other treatment system components.

The TS2 well construction methods and locations were based on data collected from the RI, treatability study, and the PRDI. The operational strategy for TS2 described in the RD was based on field observations and data collected from the operation of TS1.

Soil sample data collected during the PRDI was used to estimate contaminant concentrations in the system off-gas and evaluate vapor treatment requirements. Based on the maximum detected concentrations and the expected flow rate, the maximum expected discharge from TU2 is 0.012 pounds per hour ("lbs/hr"). Based on State air quality standards, off-gas treatment was not required.

The Remedial Action began on April 13, 2015 when HydroGeoLogic ("HGL") mobilized on site to begin work under EPA Region IIIs Remedial Action Contract. The pre-final inspection was conducted by HGL August 10, 2015 in which a few minor start up issues were identified. The final inspection was conducted by Anthony Iacobone, EPA, Jake McDougal, WVDEP and J. Peterson, HGL on February 3, 2016. No outstanding issues were identified during this inspection. The Remedial Action was determined to be Operational and Functional on September 6, 2016.

H. 2017 Explanation of Significant Differences

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As indicated above, the Site was originally comprised of two OUs. OU 1 referred to groundwater contamination while OU 2 addressed vapor intrusion. However, results of vapor intrusion sampling from 2012 to 2017 have shown significant reduction in the vapor intrusion concentrations of PCE. Results from sub-slab sampling at the suspected source areas have shown a decrease of PCE from 16,000 µg/m3 to 6.5 µg/m3 in one location and 7700 $\mu g/m^3$ to 18.0 $\mu g/m^3$ in another location. In addition, there have been no exceedances of EPA risk-based numbers for indoor air over this sampling period.

The operation of the AS/SVE system is clearly influencing vapor intrusion at the Site and has reduced the levels of PCE below that which would trigger EPA to take a response action. As a result, EPA issued an Explanation of Significant Differences ("ESD") on September 27, 2017 that eliminated OU 2 and modified the OU 1 selected remedy by adding the following requirement concerning vapor intrusion:

Monitoring for Vapor Intrusion: Sampling of sub-slab and indoor air in several commercial buildings and residences at the Site will be performed twice per year to ensure the

effectiveness of the current remedy. EPA, in consultation with the West Virginia Department of Environmental Protection ("WVDEP"), will modify the frequency and number of samples in the future as sampling results warrant. Sampling modifications will be made utilizing the June 2015 *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air.*

I. Institutional Control Implementation

The requirement to implement Institutional Controls to prevent the installation of new production wells in the contaminated portion of the aquifer was satisfied on June 6, 2017, when the City of Ravenswood amended a city ordinance (§ 52.07 of the City of Ravenswood Code of Ordinances) prohibiting the digging or drilling of groundwater wells within City limits. This ordinance is maintained and enforced by the city of Ravenswood.

III. Demonstration of Construction Quality Assurance and Quality Control

Construction of the Remedial Action selected in the 2011 ROD was implemented in accordance with the approved Remedial Design, Site Management Plan ("SMP") and Construction Quality Assurance Plan ("CQAP"). EPA and the WVDEP provided field oversight during construction. Sampling and analysis during construction and during Operation and Maintenance monitoring was performed in accordance with the approved Sampling and Analysis Plan ("SAP").

If a modification in RD specified materials, methods or equipment was deemed necessary and appropriate it was reviewed with the design engineer and EPA to obtain concurrence that the modification met the intent of the specifications. Records of all work activities, samples collected, test results, health and safety issues and site visitors were maintained on-Site throughout the project and have been placed in the permanent project file to document all CQAP activities have been met.

The EPA RPM and the WVDEP RPM periodically visited the Site to review the construction progress and review and evaluate results of quality assurance/quality control ("QA/QC") activities.

EPA analytical methods or pre-approved alternative methods were used for all validation and monitoring samples during RA activities. All procedures and protocols followed for soil, water and air samples analysis during the RA are documented in the RA work plans and samples were analyzed by qualified laboratories. The QA/QC program used throughout the RA was appropriately rigorous and conformed to EPA and WVDEP standards; therefore, EPA and the WVDEP have determined that all analytical results are accurate to the degree needed to assure satisfactory execution of the RA, and consistent with the ROD and ESD plans and specifications.

IV. Schedule of Activities for Site Completion

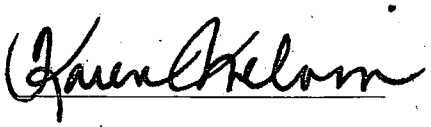
Task	**Responsible Party**	**Estimated Completion Date**
Superfund State Contract Modification	EPA and WVDEP	June 2018
Five Year Review	EPA	April 2023
Continued operation of the Air Sparging/Soil Vapor Extraction remedy	EPA	September 2026
State Takeover of Operation and Maintenance of AS/SVE System	EPA and WVDEP	September 2026
Achievement of Groundwater Cleanup Goals	EPA and WVDEP	2030
Deletion from the NPL	EPA	2030

The first Policy Five-Year Review is due five years from the signature of this report. The Five-Year Review is required due to the continued presence of hazardous substances, pollutants, or contaminants at the Site above levels that allow for unlimited use and unrestricted exposure.

V. Signature

This Preliminary Close Out Report ("PCOR") documents that construction has been completed for all Remedial Actions at the Ravenswood PCE Superfund Site.

Approved by:



MAY 4 2018

Karen Melvin, Director
Hazardous Site Cleanup Division

Date