Healthy People. Healthy Communities.

March 8, 2021

Mr. Mike Goldstein
Global Remediation and Transaction Manager
800 E Beaty St.
Davidson, NC 28036

Re: Record of Decision
Request for Remedial Design Work Plan
Ingersoll Rand Honea Path Plant
Anderson County
Consent Agreement: 01-045-W
BLWM ID# 400238

Dear Mr. Goldstein:

The South Carolina Department of Health and Environmental Control (the Department) has completed the Record of Decision for the former Ingersoll Rand facility. A copy is attached for your records.

Please submit a Remedial Design Work Plan to my attention on or June 30, 2021. If you have any questions, please contact me at (803) 898-0723 or email me at trentjc@dhec.sc.gov.

Sincerely,

Jan Trent

Jan Trent, Project Manager
State Voluntary Cleanup Program
Site Assessment, Remediation & Revitalization Division
Bureau of Land and Waste Management

Enc: ROD

cc: Lucas Berresford, Manager, BLWM
Chris McClusky, Area Director, Upstate BEHS- Anderson
Andy Davis, Arcadis, 10 Patewood Drive, Suite 375 Greenville, SC 29615
BLWM File #400238

S.C. Department of Health and
Environmental Control

RECORD OF DECISION

FORMER INGERSOLL RAND-HONEA PATH FACILITY

ANDERSON COUNTY, SOUTH CAROLINA

PREPARED BY:

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

BUREAU OF LAND AND WASTE MANAGEMENT

MARCH 2021

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2.0 Statement of Basis and Purpose

This Decision Document presents the Selected Remedies for the source area soil and source area groundwater at the former Ingersoll Rand Site. The remedies were chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the Former Ingersoll Rand Facility.

3.0 Assessment of the Site

The response action selected in this Record of Decision (ROD) is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment.

4.0 Description of Selected Remedy

The Department has selected soil vapor extraction (Alternative 2) for addressing the source area and optimized pump and treat (Alternative 6) to address contaminated groundwater at the site. The selected remedies will require installation of an additional pumping well within the source area and an expansion of the pilot study SVE system from the pilot study. A successful SVE pilot study was conducted in October 2018. The new pumping well will be located in the source area and tied into the current treatment system.

5.0 Statutory Determination

The Selected Remedy attains the mandates of CERCLA Section 121 and to the extent practicable the NCP. The remedy is protective of human health and the environment, complies with applicable or relevant and appropriate requirements (ARARs), is cost effective, and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The remedy also satisfies the statutory preference for treatment which permanently and significantly reduces the toxicity, mobility, and volume of hazardous substances, pollutants, or contaminants as a principal element of the remedy.

6.0 Authorizing Signature

This ROD documents the South Carolina Department of Health & Environmental Control's selected remedy for source area soils and groundwater at the Former Ingersoll Rand facility.

Henry J. Porter, Chief
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control

3-4-2021
Date

PART II - THE DECISION SUMMARY

1.0 Site Name, Location, and Description

The Former Ingersoll Rand Facility is located at 415 Brick Mill Road in Honea Path, South Carolina. The Site (Figure 1) is located on approximately 466 acres in a semi-rural area typically composed of woods and farmland. The current owner of the facility is Timken; however, Trane (formerly Ingersoll Rand) owns and operates the remediation system requirements.

2.0 Site History and Enforcement Activities

2.1 Site History

The facility consists of a main manufacturing building, a smaller storage building to the rear of the plant, and a small wastewater treatment plant located northeast of the main plant building.
Ingersoll Rand was originally owned and operated as part of Torrington. Torrington operated from 1970 to 2003. In February 2003, Ingersoll Rand sold Torrington to Timken Company, and Torrington was renamed Timken US Corporation, which was subsequently renamed Timken US LLC.

The Torrington Company manufactured steering components, universal joint assembles, and other specialty metal components at the facility from 1970 to 2003. Process wastewater was generated from metal cleaning operations. The process wastewater was treated in a pretreatment facility prior to discharge to the Town of Honea Path Chiquola Creek Treatment Plant. Prior to the construction of the pretreatment facility in 1989, process wastewaters were treated in three grit chambers and three oxidation/equalization ponds prior to discharge to Broad Mouth Creek, under National Pollutant Discharge Elimination System (NPDES) Permit. This treatment system was operated from approximately 1970 to December 1989.

2.2 Previous Investigations

In February 2001, DHEC issued Consent Agreement #01-145-W to Ingersoll Rand to regulate groundwater monitoring and corrective action activities at the Site. The monitoring program outlined in the Consent Agreement included collecting quarterly water-level measurements from the monitoring wells and collecting semiannual groundwater samples for VOC analysis from select monitoring wells. The Consent Agreement also required that the groundwater recovery and treatment system continue to be operated and that a groundwater monitoring and corrective action effectiveness report (CAER) be submitted annually.

Subsequent to the Consent Agreement being issued, additional recovery wells and monitoring wells were installed. In June 2004, the groundwater remediation system was expanded to include recovery wells RW-6 and RW-7 (Phase II). Additional system expansion occurred in March 2007, when recovery wells RW-8 and RW-9 were installed, and an additional groundwater air-stripper treatment system (Phase III) was installed along the western plume. Further system expansion occurred in October 2008, when recovery well RW-10 was installed during Phase III, RW- 11 was installed during Phase II, and RW-12 was installed during Phase I. The current groundwater recovery well network is depicted on Figure 2.

In 2007 and 2008, six additional monitoring wells were installed. Monitoring well MW 29A was installed in February 2007 to monitor the partially weathered rock (PWR) aquifer zone. Monitoring wells MW-30 through MW-34 were installed in October 2008, near the anticipated downgradient extent of the VOC plume. MW-30 and MW-31 monitor the residuum aquifer zone, MW-33 and MW-34 monitor the PWR aquifer zone, and MW-32 monitors both the residuum and PWR aquifer zones. MW-30 was installed off property to demonstrate plume containment west of the facility. MW-30 was properly abandoned in 2010, as approved by SCDHEC, because no VOCs were observed in groundwater samples collected from the well.

In October 2011, monitoring wells MW-35, MW-36, and MW-37 were completed in the PWR aquifer zone to further delineate the VOC plume downgradient of monitoring well MW-32. In order to contain the plume downgradient of MW-32, monitoring well MW-35 was converted to a recovery well in September 2013 and began operating on September 27, 2013.

In 2011 and 2012, a monitoring study was conducted to identify the source of VOCs detected in surface water along the western intermittent surface water drainage ditch (unnamed tributary of Broad Mouth Creek). The study included three surface water sampling events performed in December 2011, January 2012, and April 2012. The results of this study were submitted to SCDHEC in the report Surface Water Investigation-Western Plume Limb.

Monitoring wells MW-38 and MW-39 were installed in November 2013 along the western plume limb within the drainage feature that forms the western boundary of the Facility property. Monitoring well MW-38 monitors the PWR aquifer zone and MW-39 monitors the residuum aquifer zone

In November 2013, a VOC migration pathway study was implemented within the western intermittent surface water drainage ditch, in accordance with the SCDHEC-approved Surface Water Investigation Work Plan. This study involved the use of direct-push technology (DPT) to install shallow and deeper temporary wells along the bank of the intermittent drainage ditch to compare groundwater and surface water elevations and to collect shallow and deeper groundwater VOC samples. The results of this study indicated that groundwater discharges to surface water within the upstream section of the western intermittent surface water drainage ditch, and that surface water migrates to groundwater downstream near Broad Mouth Creek. The results of this study were submitted in the March 2014 Groundwater Migration Investigation-Western Plume Limb Report.

In October 2014, a second VOC migration pathway study was implemented to define the extent of shallow subsurface fine- to coarse-grained sand that was acting as a preferential pathway for impacted groundwater migration to surface water. The investigation was conducted in accordance with the SCDHEC-approved Residuum Investigation Work Plan. The results of the investigation were submitted as the letter report Residuum Investigation Report, dated December 19, 2014. As recommended in the report, a groundwater recovery trench and sump (TS-1) and recovery well (RW-13) were installed between August 13, 2015 and March 17, 2016, to capture VOC-impacted groundwater before it discharged to the surface water drainage ditch. The trench and recovery well were approved for operation by SCDHEC on June 17, 2016. On July 1, 2016, the groundwater recovery trench system began operating.

2.3 Recent Activities

In February 2016, the Department requested that a Feasibility Study Work Plan be submitted to address the source area and interior of the plume. In response Ingersoll Rand conducted additional soil source area investigations at the former waste storage area and the drum storage area immediately northeast of the facility building. In 2018, a Focused Feasibility Study Workplan was approved by the Department. Two Test Pilots were conducted during the FFS, one to evaluate soil vapor extraction (SVE) and one to evaluate groundwater pumping in the source area upgradient of recovery well MW-19A. Both pilot tests were successful. In July 2019 a Feasibility Study Report was submitted to the Department, the Report was approved in August 2019.

3.0 Community Participation

Due to Covid-19 restrictions a presentation of the Proposed Plan was recorded and placed on the Department's website. Postcards were sent to nearby residents and elected officials providing notice of the public comment period. The Proposed Plan and the Administrative Record were also posted online at:

WWW.SCDHEC.GOV/INGERSOLL-RAND.

This information was also made available to the public at the local DHEC office. The official public comment period ran from October 2, 2020 through November 20, 2020. One formal comment was submitted by email that was not directly related to the Remedy Selection Process. This comment is presented and discussed in the Responsiveness Summary.

4.0 Scope and Role of Response Action

This action will serve as the final remedial action at the Site. The remedy addresses the source area contamination (Figure 3) for the Former Ingersoll Rand Facility. The remedy proposed action includes installation of a SVE system to treat source area soil and the addition of a pumping well to optimize the current pump and treat system. With the additional pumping well further migration of contaminated groundwater should be prevented. The proposed remedy will permanently reduce the toxicity, mobility, and volume of contamination at the Site.

5.0 Site Characteristics

5.1 Overview of Site Characteristics

The Site, which encompasses approximately 466 acres, was originally owned and operated as part of the Torrington Company (Torrington). Torrington, formerly a division of Ingersoll Rand, manufactured steering components, universal joint assemblies, and other specialty metal components at the Site from 1970 to 2003. Process wastewater was generated from metal cleaning operations. Prior to construction of the on- Site pretreatment facility in 1989, process wastewater was treated in three grit chambers and three oxidation/equalization ponds at the plant and then discharged to Broad Mouth Creek, under National Pollutant Discharge Elimination System (NPDES) Permit No. SC0001082. This process wastewater treatment system was operated from approximately 1970 to December 1989. Since December 1989, process wastewater from the facility has been treated on Site in a pretreatment facility prior to discharge to the Town of Honea Path Chiquola Creek Treatment Plant.

5.2 Geology/Hydrogeology

The Site lies within the Inner Piedmont Belt of South Carolina. The dominant rocks of the Inner Piedmont Belt include mica schist, biotite gneiss, amphibolite, and granitoid gneiss, as well as younger granitic plutonic intrusions. The Site is underlain by one aquifer that can be subdivided into three hydrogeologic zones differing in depth, appearance, texture, composition, and hydraulic properties. With increasing depth, these hydrogeologic zones are the residuum aquifer zone, PWR aquifer zone, and bedrock aquifer zone.

The residuum aquifer zone is derived from extensive weathering of the parent bedrock. The residuum lithology consists predominantly of unconsolidated silt with varying proportions of clay and fine-coarse sand. Below the shallow soil horizon, the residuum is saprolite with remnant textural and structural features evident from the original parent bedrock. The predominant textural features include weathered granite and banded biotite schist/gneiss. The saprolite consists of silt, fine-coarse sand, and traces of weathered rock fragments. Groundwater movement within the residuum aquifer zone is characterized by porous-type flow, owing to its predominantly granular texture. In general, the residuum aquifer zone is characterized by low permeability and high storativity. Thus, groundwater flow rates and subsequent VOC plume migration rates within this water-bearing zone are typically very low.

Underlying the residuum is a transition zone of partially-weathered bedrock, referred to as the PWR aquifer zone. Boring logs from historical drilling activities indicate this material is not granular but is, instead, highly-fractured rock interlayered with highly-weathered saprolite. It is believed that groundwater movement on a macro scale can be roughly characterized as porous-type flow in the PWR because the fractures are numerous and densely spaced. This aquifer zone is hydraulically connected with, and recharged by, the residuum aquifer zone. The thickness of this unit is difficult to determine because of the transitional nature of the upper and lower boundaries of the PWR. In general, the PWR aquifer zone is characterized by higher permeability, compared to the residuum. Thus, groundwater flow rates and subsequent VOC plume migration rates within this water-bearing zone are typically higher.

As weathering and the number of fractures decrease with depth, the PWR aquifer zone transitions into the bedrock aquifer zone. Groundwater flow in the bedrock aquifer zone is controlled by the orientation, size, and interconnection of structural features (fractures, faults, joints, unit contacts, etc.) within the rock and is not characterized as porous-type flow at the facility, even on a macro scale. In general, this zone is poorly connected with the PWR aquifer zone. In general, the bedrock aquifer zone is characterized by higher flow rates where the secondary structural features are regionally interconnected. Thus, VOC plume migration rates within this water-bearing zone are typically higher.

5.3 Nature and Extent of Contamination

5.3.1 Soil

Two former trichloroethene (TCE) aboveground storage tanks (ASTs) have been used at the facility. The original TCE AST was located near the northern corner of the main plant building adjacent to a former methanol AST along the back-fence line within an unpaved area. The TCE and methanol ASTs were removed in 1989. The TCE AST was then moved to the current AST tank farm until TCE was no longer used at the plant in 1992.

In 2006, soil samples were collected as part of a Phase I/II assessment. During this investigation. three soil borings (SB-04, -05, and -06) were completed near the current AST tank farm. TCE was reported at 93 milligrams per kilogram (mg/kg) in the 10- to 12-foot (ft) sample collected from soil boring SB-05. This concentration exceeds both the EPA Industrial Soil Screening Level (SSL), which is 6.0 mg/kg, and the Maximum Contaminant Level (MCL) risk–based SSL, which is 0.0018 mg/kg. No VOCs were reported in soil samples collected from SB-04 and SB-06. Soil borings SH-01 through SH-04 were converted to monitoring wells. The groundwater sample collected from SH-02 during the Phase II assessment exhibited the highest concentration of TCE (39,000 µg/L). Groundwater samples have consistently been collected from SH-02 since January 2008. Concentrations were highest in 2009 (43,000 µg/L) but have fluctuated between 26,000 µg/L (January 2010) and 16,900 µg/L (January 2011). While concentrations have decreased since 2011 (to 14,100 µg/L in June 2013), the groundwater concentrations have remained stable over the last several years: 14,000 µg/L in June 2017/January 2018 and 12,000 µg/L in June 2018.

In October 2016, additional soil samples were collected to better assess soil in the upgradient plume areas near the plant. TCE was reported at concentrations ranging up to 57 mg/kg in the 10-ft sample collected from boring B-01 located 15 ft southwest of SHA boring SB-05.

5.3.2 Groundwater

The Site lies on a northeast-southwest-oriented topographic high that forms the divide between two small local hydrogeologic drainage basins; both small basins drain to the north-northeast into Broad Mouth Creek. Rainfall/recharge produces a generally circular mounding of the water table along this topographic high, with the highest water levels occurring near the main plant building. Groundwater migrates in a radial pattern from the northeastern end of this topographic high to the northwest, north, and northeast. The underlying geologic structure impacts groundwater flow at the facility, and thus groundwater migration is more pronounced to the northwest and northeast along unnamed intermittent tributaries toward Broad Mouth Creek. This is also observed in the configuration of the VOC plume at the Site, which consists of two prominent plume limbs, one migrating to the northwest (western plume) and one migrating to the northeast (eastern plume).

5.3.4 Surface Water

In 2011 and 2012, a study was conducted to identify the source of VOCs detected in surface water along the western intermittent surface water drainage ditch (unnamed tributary of Broad Mouth Creek). The study included three surface water sampling events performed in December 2011, January 2012, and April 2012.

In November 2013, a VOC migration pathway study was implemented within the western intermittent surface water drainage ditch. The results of this study indicated that groundwater discharges to surface water within the upstream section of the western intermittent surface water drainage ditch, and that surface water migrates to groundwater downstream near Broad Mouth Creek.

In October 2014, a second VOC migration pathway study was implemented to define the extent of shallow subsurface fine- to coarse-grained sand that was acting as a preferential pathway for impacted groundwater migration to surface water. A groundwater recovery trench and sump (TS-1) and recovery well (RW-13) were installed between August 13, 2015 and March 17, 2016, to capture VOC-impacted groundwater before it discharged to the surface water drainage ditch and began operation on July 1, 2016.

A groundwater trench and recovery system began operating on July 1, 2016, to control groundwater migration to surface water along a portion of the western intermittent drainage ditch. Recovery well RW-13 and the trench system (trench and recovery sump TS-1) recover shallow residuum groundwater along a 200-ft trench adjacent to the western intermittent drainage ditch, as part of the Phase III system. Near the trench, a marked improvement in VOCs detected in the surface water was observed between 2017 and 2020. Within the vicinity of the trench system, VOCs in residuum groundwater are contained, as concentrations of VOCs in the adjacent surface water locations (SS-18, SS-21, SS-22, and SS-23) remained below the SCDHEC Surface Water Standard.

Shallow VOC-impacted groundwater continues to discharge to the surface water downgradient (downstream) of the trench. VOC concentrations in surface water depict decreasing trends within the intermittent tributary prior to its confluence with Broad Mouth Creek and are not detectable within surface water samples collected farther downstream within Broad Mouth Creek.

In June 2020, surface water samples, from the eastern and northern drainage feature, were obtained from SD-3, SS-7, and SS-14. A surface water sample was not collected from SS-8, as the location was dry during the June 2020 monitoring event. All VOCs were below the laboratory reporting limits or SCDHEC surface water standard, with the exception of TCE concentrations in SD-3 (4.3 micrograms per liter [μg/L]), which exceeded the SCDHEC surface water standard of 2.5 μg/L.

Within a few years of the installation of recovery well RW-11, no groundwater recharge has been observed (since 2010) in the headwaters of the central drainage feature at sample points SS-9, SS-10, SS-11, and SS-12. RW-11, in addition to RW-6, has effectively depressed the shallow residuum water-bearing zone within this area, preventing its discharge to the surface. The effectiveness of the operation of RW-11 has contributed to the overall decreasing trend in the central drainage feature, given that the initial surface water impacts (discharged groundwater) observed in this drainage feature were approximately 600 ft downgradient of RW-11 (just upstream of SS-13).

6.0 Current and Potential Future Site and Resource Uses

The current use of the Site is commercial and the future use is most likely to remain the same. Deed restrictions will be used to assure that any future use of the site meets with the cleanup requirements.

7.0 Summary of Site Risks

As a result of the environmental investigations, volatile organic compounds, particularly TCE, were found to be present in groundwater above Maximum Contaminant Levels (MCLs). Long-term exposure to these constituents of concern can result in harmful effects to human health and to ecological systems.

Further, South Carolina has established water quality standards, which are outlined in S.C. Regulation 61-68: *Water Classifications and Standards*. This regulation establishes water quality standards that protect existing and classified uses of SC waters. Per this SC regulation, waters which meet standards, e.g., maximum contaminate levels (MCLs), shall be maintained. Waters which do not meet standards shall be improved, wherever attainable, to achieve those standards. Contaminants in soil continues to source the groundwater plume preventing an effective cleanup at the facility.

DHEC's selected remedy is necessary to reduce VOC concentrations in soil and groundwater to protect public health and the environment, and ultimately reduce contaminants in groundwater to below the MCLs.

8.0 Remedial Action Objectives

Remedial action objectives (RAOs) are developed in order to set goals for protecting human health and the environment. The goals should be as specific as possible but should not unduly limit the range of alternatives that can be developed. Accordingly, the following RAOs were developed for the Site:

1. Reduce the potential for leaching to groundwater from the vadose zone.

2. Reduce source area groundwater impacts to further mitigate/control impacts to downgradient groundwater and streams.

3. Restore groundwater to MCLs (maximum contaminant level).

Applicable groundwater criteria are the Maximum Contaminant Levels (MCLs) established by the South Carolina Primary Drinking Water Regulations. The individual MCLs for the contaminants of interest are:

Table 1: Remedial Goals

Contaminant	Media	Concentration
Tetrachloroethylene (PCE)	Groundwater	5 ug/L
Trichloroethylene (TCE)	Groundwater	5 ug/L
cis-1,2-dichloroethylene (cis-1,2-DCE)	Groundwater	70 ug/L

9.0 Remedial Alternatives

The *Source Area Focused Feasibility Study (FFS) (AEM, 2019)* was conducted to identify, develop, and evaluate options and remedial alternatives to address the groundwater contamination at the site. This evaluation considered the nature and extent of contamination and associated potential human health risks developed during the remedial investigations and associated studies to determine and evaluate potential remedial alternatives and their overall protection of human health and the environment.

Alternative 1: No Action Alternative: Evaluated for baseline comparison only, the No Action alternative is does not include any on-site or legal controls or actions for soil or groundwater at the site.

- Alternative 2: Soil Vapor Extraction: This is an *in situ* unsaturated (vadose) zone soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air to remove volatile and some semi-volatile contaminants from soil.
- Alternative 3: Excavation: Contaminated material is excavated and transported to a permitted off-site treatment and/or disposal facility.
- Alternative 4: *In Situ* Chemical Oxidation/Blending (ISCO): Oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and or inert by blending or injecting chemicals into the source area.
- Alternative 5: Continued Pump and Treat (CP&T): This is the current operations at the Site. This alternative provides for continued plume containment at the site interior and boundary utilizing the current remediation infrastructure. Currently, groundwater is extracted using submersible pumps and treated via an air stripper prior to being collected into a central sump and then discharged to Broad Mouth Creek under a national Pollutant Discharge Elimination System (NPDES) permit.
- Alternative 6: Optimized Pump and Treat (OP&T): The groundwater capture and extraction rate in the source area is improved with the addition of extraction wells and improved pump and treat remedial infrastructure. Groundwater is extracted using submersible pumps and treated via an air stripper prior to being collected into a central sump and then discharged to Broad Mouth Creek under a national Pollutant Discharge Elimination System (NPDES) permit.
- Alternative 7: Vacuum Enhanced Extraction (VEP&T): A vacuum enhancement is added to the Optimized Pump and Treat alternative. A vacuum is placed on the source-area pumping wells(s) to increase the radius of capture for the pumping well.

All of the alternatives include groundwater monitoring and institutional controls (groundwater use restriction,) on the property. It is assumed that institutional controls will remain in place until the groundwater remedial goals (RGs) are met.

9.1 Description of Remedial Alternatives

9.1.1 Alternative 1: No Action Alternative

The regulations governing the Superfund program require the Department to consider a No Action alternative. The No Action alternative serves as a baseline against which the other remedial alternatives can be compared. Under this alternative, land use controls would be required to prevent groundwater use on the former Ingersoll Rand Site.

The estimated 30-year present value cost for this alternative is **$0.**

9.1.2 Alternative 2: Soil Vapor Extraction

Alternative 2 is soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semi-volatile contaminants from soil.

This Alternative was further developed for detailed analysis from the installation and field pilot testing of new SVE wells near the source area. The pilot study concluded that the vadose zone within the study area appears to have a highly transmissive layer that connects the observation wells and the pilot test well.

The cost represents installation, maintenance, monthly inspections, and effluent sampling as part of discharge permit requirements for site-related constituents found in groundwater. Electric usage and repair work have also been included. Operation and maintenance (O&M) and monitoring will continue for four years.

The estimated 4-year present value cost for Alternative 2 is **$280,400.**

9.1.3 Alternative 3: Excavation

Alternative 3 consists of excavation of contaminated material and transport to a permitted off-site treatment and/or disposal facility.

The estimated present value cost for this alternative is **$3,070,600.**

9.1.4 Alternative 4: *In Situ* Chemical Oxidation/Blending (ISCO)

Alternative 4 will include *in situ* blending and/or injections of chemicals into the source area. Oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.

The estimated present value cost for this alternative is **$2,578,400**.

9.1.5 Alternative 5: Continued Pump and Treat

Alternative 5 represents the current operations at the Site. It consists of implementing no action to specifically target the source material except for treating the source by containing contaminants that are in groundwater. This alternative provides for continued plume containment at the site interior and boundary utilizing the current remediation infrastructure. Currently, groundwater is extracted using submersible pumps and treated via an air stripper prior to being collected into a central sump and then discharged to Broad Mouth Creek under a National Pollutant Discharge Elimination System (NPDES) permit.

The estimated present value cost for this alternative is **$125,000 to $200,000** per year.

9.1.6 Alternative 6: Optimized Pump and Treat (OP&T)

Alternative 6 improves the existing groundwater capture and extraction rate in the source area with added extraction wells in the source area and improved pump and treat remedial infrastructure. This alternative utilizes submersible pumps and existing treatment via an air stripper prior to being discharged to a central sump and then to Broad Mouth Creek via an NPDES permit. The cost includes $50,000 for the installation of a new pumping well.

The estimated present value cost for this alternative is **$250,000** per year.

9.1.7 Alternative 7: Vacuum Enhanced Extraction (VEP&T)

Alternative 7 provides the addition of vacuum enhancement to the Optimized Pump and Treat (VEP&T) alternative. A vacuum is placed on the source-area pumping well(s) to increase the radius of capture for the pumping well. The cost includes $156,000 to install the required vacuum equipment.

The estimated present value cost for this alternative is **$366,800** per year.

10.0 Comparative Analysis of Alternatives

The National Contingency Plan requires the Department use specific criteria to evaluate the different remediation alternatives individually and against each other in order to select a remedy. Two of these criteria, overall protection of human health and the environment and compliance with State and Federal regulations, are threshold criteria. If an alternative does not meet these two criteria, it cannot be considered as the Site remedy. Five of the criteria are balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume of contaminants through treatment; short-term effectiveness; implementability; and cost. These criteria are used to weigh the strengths and weaknesses of the alternatives. Community response to the preferred alternative and the other considered alternatives is a modifying criterion that was carefully considered by the Department prior to the final remedy selection.

The following section of the ROD profiles the relative performance of each alternative against the criteria, noting how it compares to the other options under consideration.

Although Alternative 1 (No Action) does not meet the threshold criteria, it is retained for discussion because it provides a baseline for comparing the other alternatives to the criteria outlined above.

10.1 Overall Protection of Human Health and the Environment

When evaluating alternatives in terms of overall protection of human health and the environment, consideration is given to the manner in which Site-related risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Alternative 1: The No Action does not provide for overall protection of human health and the environment on site as there will be no decrease in contaminants in the source areas. The potential for off-site impacts to protect human health and the environment are uncontrolled.

Alternative 2: SVE is protective of human health and the environment because it reduces the concentrations of contaminants of concern in soil and thus groundwater source areas and eliminates potential vapor exposure pathways.

Alternative 3: Excavation is protective of human health and the environment because it removes the contaminants of concern in soil and thus groundwater and eliminates exposure pathways. There are short term potential exposures to site workers and local community with truck traffic.

Alternative 4: *In-situ* Chemical Oxidation is protective of human health and the environment because it removes the contaminants of concern in soil and thus groundwater and eliminates exposure pathways. There are short term potential exposures to site workers and local community with truck traffic.

Alternative 5: Continued Pump and Treat provides for overall protection of human health and the environment as there is complete containment of the groundwater plume. However, this alternative does not mitigate potential environmental or human exposure to source area soil. There is limited possibility of human exposure given the depth of impacted source soil. The continued operation of the pump and treat system limits the potential for off-site exposure but is minimal in its treatment capabilities.

Alternative 6: Optimized Pump and Treat-(OP&T) provides protection of human health by improving site groundwater that poses unacceptable risk. OP&T will prevent human contact with, or consumption of, contaminated groundwater and restore groundwater quality to meet state and federal standards. This Alternative increases protection of human health and environment by enhancing the rate of reduction of the concentrations of VOCs in groundwater source areas and accelerates the elimination of exposure pathways.

Alternative 7: Vacuum-Enhanced Extraction (VEP&T) provides protection of human health by improving site groundwater that poses unacceptable risk. OP&T will prevent human contact with, or consumption of, contaminated groundwater and restore groundwater quality to meet state and federal standards.

Alternatives 2 and 3 are the best choices for meeting the Protective of Human Health and the Environment criteria by addressing the source area soils.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This criterion evaluates whether an alternative meets state and federal environmental statutes and regulations that pertain to the Site. Each alternative is evaluated with respect to its ability to comply with such requirements. ARARs are used to determine the extent of cleanup, to formulate the remedial action alternatives, and to govern the implementation and operation of the selected remedy.

Applicable requirements are those legally enforceable standards that specifically address a hazardous substance, pollutant, contaminant, remedial action, or other circumstance encountered at a site. Relevant and appropriate requirements are federal or state standards, criteria, or limitations that, while not legally applicable to a site, address problems sufficiently similar to those found so their use is well-suited to a particular site.

Alternative 1 would not restore groundwater to applicable South Carolina groundwater quality standards within a reasonable amount of time.

Alternative 2 would potentially bring source soil into compliance with ARARs. Alternative 3 upon excavation the soil would be in compliance. Alternatives 4 and 5 are effective in meeting ARARs provided site constraints allow access to impacted soil.

Alternatives 5, 6, and 7 are groundwater alternatives focused on TMV reduction and complies with potential ARARs as contaminants are leached from soil and contained by the pump and treat systems. Alternative 7 is not likely to realize significant improvement in ARAR compliance when compared to Alternative 6.

Each of these alternatives would require compliance with Underground Injection Control requirements, and Alternative 3 would also require compliance with regulations governing operation of the treatment system and discharge of treated water.

Alternatives 2 and 4 best meet compliance with ARARS because they do not require operation of a wastewater treatment system or discharge of treated water.

10.3 Long-Term Effectiveness and Permanence

This criterion evaluates the magnitude of risk remaining from untreated media or treatment residuals and the adequacy and reliability of containment systems and institutional controls.

The No Action alternative includes no controls for exposure and no long-term management measures. All current and potential future risks would remain under this alternative.

Alternative 1 does not provide long-term effectiveness or permanent remedy for the soil contamination or provide long-term protection to prevent human exposure.

Alternative 2 will achieve long-term effectiveness by treating soil contaminants with no waste products or residuals and continually remove source area mass.

Alternatives 3 and 4 are effective as long as all impacted media is removed via excavation or treated via in-situ soil blending. If impacted soil is not treated, then potentially clean backfill or treated soil can be impacted by the surrounding soil outside of the excavation or soil blending limits.

Alternative 5 does not provide long-term effectiveness or permanent remedy for the groundwater contamination under the assumption that source material half-life concentrations could be on the order of decades.

Alternatives 6 and 7 both significantly improve long-term effectiveness by more directly removing groundwater contaminants at the presumed source area and accelerates TMV reduction.

Alternative 3 would provide permanent removal of contaminants. Extraction and above-ground treatment is a reliable and proven technology for removal of VOCs. This technology was previously used at the RBSA and was shown to be effective. Repair and maintenance of wells, pumps, and equipment would likely be required over time. Fencing, signage and surveillance would be required to ensure the system remained functional. Injection of vegetable oil-based substrate would likely need to be repeated. One additional injection event is anticipated ten years after the initial event.

Alternatives 2 and 6 best meet the long-term effectiveness criterion. Alternative 2 will permanently remove source are contaminants and Alternative 6 will prevent further migration of impacted groundwater.

10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion evaluates the degree to which an alternative employs treatment to reduce the harmful effects of contaminants, limit the ability of contaminants to move in the environment, and reduce the amount of contamination present.

Alternative 1 would not provide any reduction of toxicity, mobility, or volume of contaminated media. The No Action alternative could allow the volume of impacted groundwater to increase over time through diffusion.

Alternative 2 accelerates contaminant removal and irreversibly reduces the toxicity and volume of contaminated soil by destroying the contaminant via treatment (i.e., volatilization).

Alternatives 3 and 4 are very effective at reducing TMV of contaminated soil via excavation and off-site removal or soil blending. The contaminants of concern are removed or oxidized in place. These two technologies are effective provided site constraints allow access to impacted soil.

Alternative 5 only reduces TMV of contaminated groundwater by intercepting contaminants outside the source area.

Alternatives 6 and 7 are expected to accelerate contaminant removal and reduce the toxicity and volume of contaminated groundwater by treatment (i.e., air stripping)

Alternative 3 best meets the RTMV through treatment criterion by removing the source area soil.

10.5 Short-Term Effectiveness

Short-term effectiveness takes into consideration any risk the alternative poses to on-Site workers, the surrounding community, or the environment during implementation, as well as the time needed to implement the alternative.

Alternative 1 does not provide short-term effectiveness as the source area soil will continue to contribute to groundwater contamination and provides no protection for potential human exposure.

Alternative 2 will immediately reduce the contaminant TMV, thereby reducing the impacts to groundwater. Additional considerations for Alternative 2 include the reduction or elimination of vapor intrusion concerns.

Alternatives 3 and 4 are very effective in the short term provided the site constraints allow access to the impacted soil media.

While Alternative 5 does provide control of plume migration through TMV reduction, this alternative does not provide short-term effectiveness as the source area aquifer matrix contributes to groundwater contamination.

Both Alternatives 6 and 7 will accelerate the reduction of the contaminant TMV by direct extraction, thereby reducing impacts to groundwater.

Alternatives 2 and 6 best meet the short-term effectiveness criterion as both alternatives use the current infrastructure. Alternative 6 will require the installation of an additional pumping well.

10.6 Implementability

Implementability considers the technical and administrative challenges of construction and start-up, as well as the availability of required materials and services.

No technical or administrative feasibility concerns are associated with implementing Alternative 1 because no actions are being taken.

Implementation of Alternative 2 is considered technically feasible and could be accomplished through conventional construction methods. The infrastructure is currently in place.

The implementation of alternatives 3 and 4 are considered technically feasible, however, due to site constraints it would be difficult to implement and would impact facility operations.

No technical or administrative feasibility concerns are associated with implementing Alternatives 5 or 6 since both are either existing or straightforward enhancement of the current system, and both will be based primarily on existing infrastructure.

Alternative 7 is a significant expansion and may include installation of additional extraction wells with a mechanical vacuum system.

Alternative 2 and 6 would be easier to implement as the infrastructure is already in place.

10.7 Cost

The cost criterion includes estimated initial capital costs and annual O&M costs, as well as a 30-year present value cost estimate. Present value cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of -30% to +50%.

Remedial Alternative	30-Year Net Present Value
Alternative 1: **No-Action, Monitoring, Closure of Existing System**	**$0**
Alternative 2: **SVE**	**$280,400**
Alternative 3:	

Excavation	**$3,070,600**
Alternative 4: ***In-Situ* Chemical Oxidation/Blending**	**$2,578,400**
Alternative 5: **Continued Pump and Treat**	**$200,000 per year** **$6,000,000**
Alternative 6 **Optimized Pump & Treat**	**$50,000 Capital Investment/$200.000 per year** **$6,050,000**
Alternative 7 **Vacuum Enhanced Extraction**	**$156,000 Capital Investment/$210,000 per year** **$6,456,000**

10.8 Community Acceptance

Due to COVID-19 a presentation was recorded and placed on the Department's webpage. The presentation of the proposed plan was made available online on October 2, 2020, and maintained online throughout the comment period. Notice of the public comment period was sent to nearby residents by postcard and published in the October 3, 2020 edition of the Anderson Independent. One emailed comment was received concerning the discharge from the former wastewater ponds to the outfall, however, this did not directly affect the proposed remedies.

11.0 Selected Remedy

The Department has selected soil vapor extraction (Alternative 2) and optimized pump and treat (Alternative 6). Soil vapor extraction will address the source area soils and optimized pump and treat will capture groundwater flow from the source area. Figures 4 and 6.

11.1 Description of Selected Remedy

The selected remedies will require installation of an additional pumping well within the source area and an expansion of the pilot study SVE system. Monitoring will be conducted to evaluate the effectiveness of the remedy. A comprehensive review of remedy effectiveness will be conducted at five-year intervals until groundwater is restored to Class GB standards.

12.0 Statutory Determinations

The Department expects the Preferred Remedy to satisfy the following statutory requirements: 1) be protective of human health and the environment; 2) comply with applicable or relevant and appropriate requirements; 3) be cost-effective; 4) utilize permanent solutions to the maximum extent practicable; and 5) satisfy the preference for treatment as a principle element of the remedy.

13.0 5 Year Review Requirement

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels allowed for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after the initiation of the remedial action to insure the remedy remains protective of human health and the environment. This review will include a comprehensive evaluation of the treatment system to determine the effectiveness and if modifications are required to facilitate meeting remedial goals.

PART III - RESPONSIVENESS SUMMARY

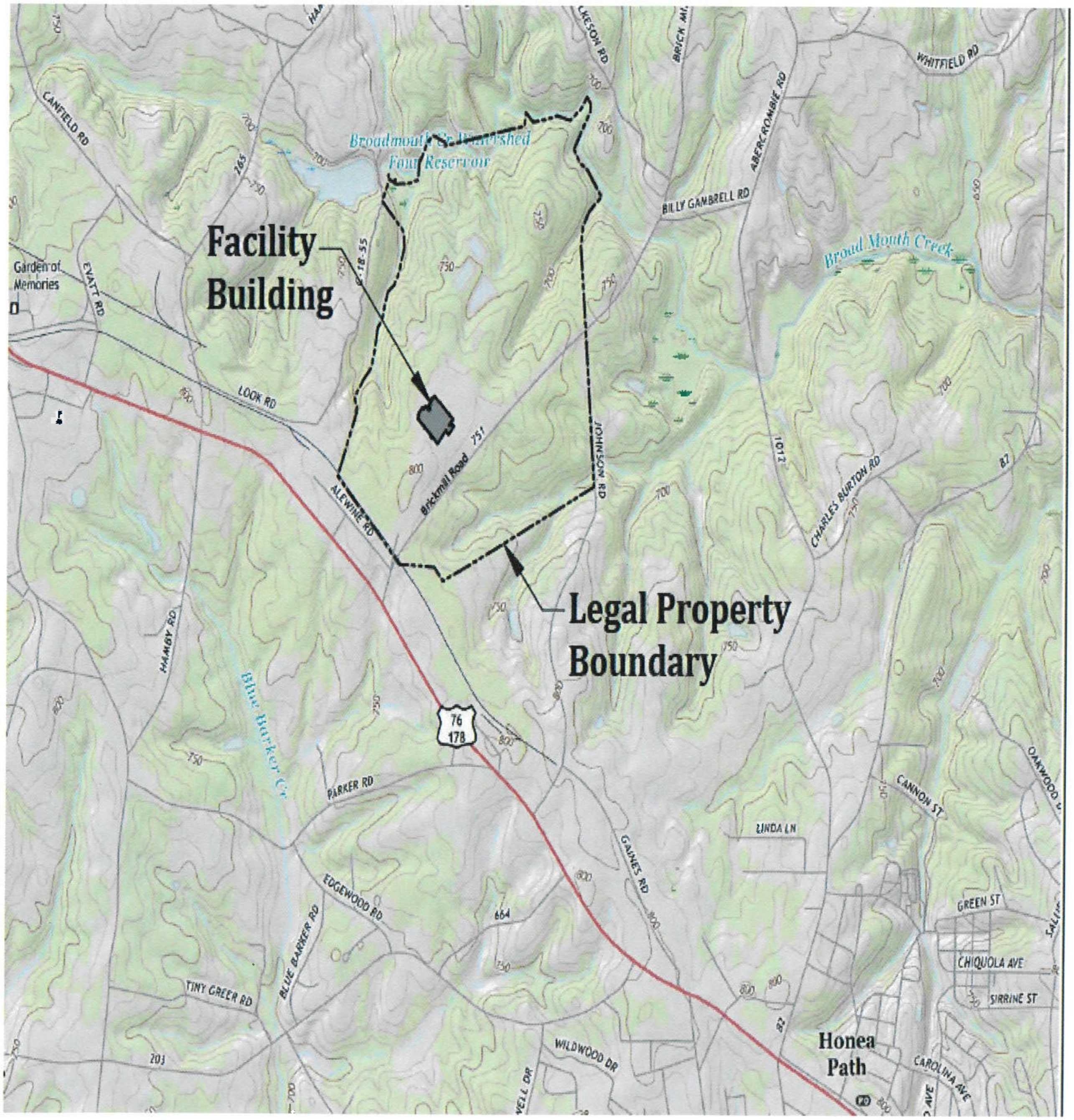
The Proposed Plan was made available on the Department's website from October 2, 2020 and posted in the Anderson Independent. Post cards were mailed to 108 property owners identified by property records announcing the web address for the online presentation. No requests for an extension of the comment period were received and therefore the comment period ended on November 20, 2020.

Mr. Brad Ricketts sent the following email on October 12, 2020. *I worked for ingersoll rand we had a pond that was supposed to take care of all waste but all they did was pipe it in the creek on back side of the property dam pipe stuck out in the creek seen this first hand all the run off went in it so they done away with the waste water treatment fired every one that new about it then they drilled wells to ck on water quality then it went to timken it still was happening but Torrington ingersoll rand WS a good place to work they just fired everyone that new this*

The Department thanked Mr. Ricketts for the information. It was determined that this was most likely an outfall pipe. This information did not change the remedy selection.

Figures

Figure 1 – Site Location Map



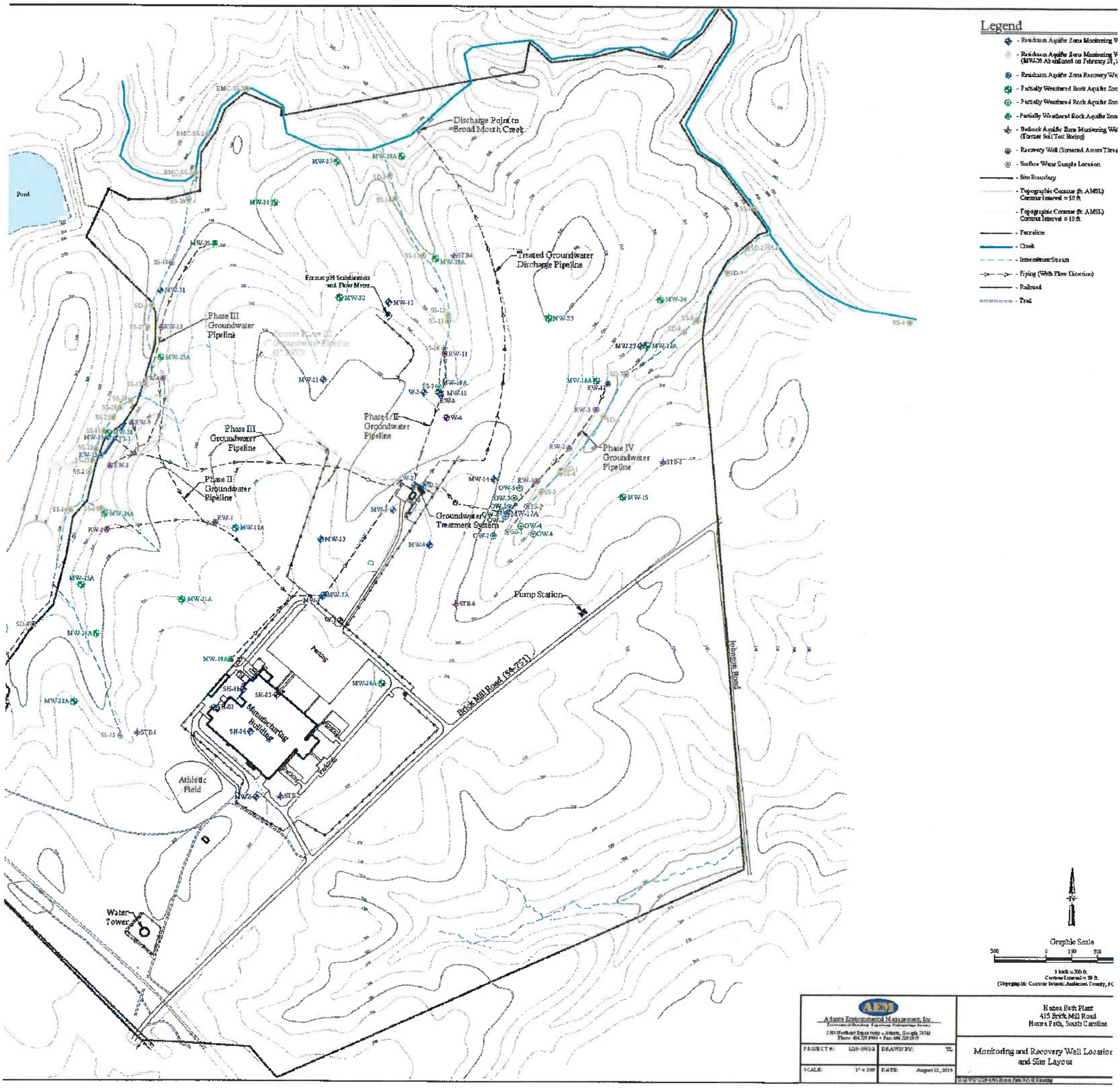
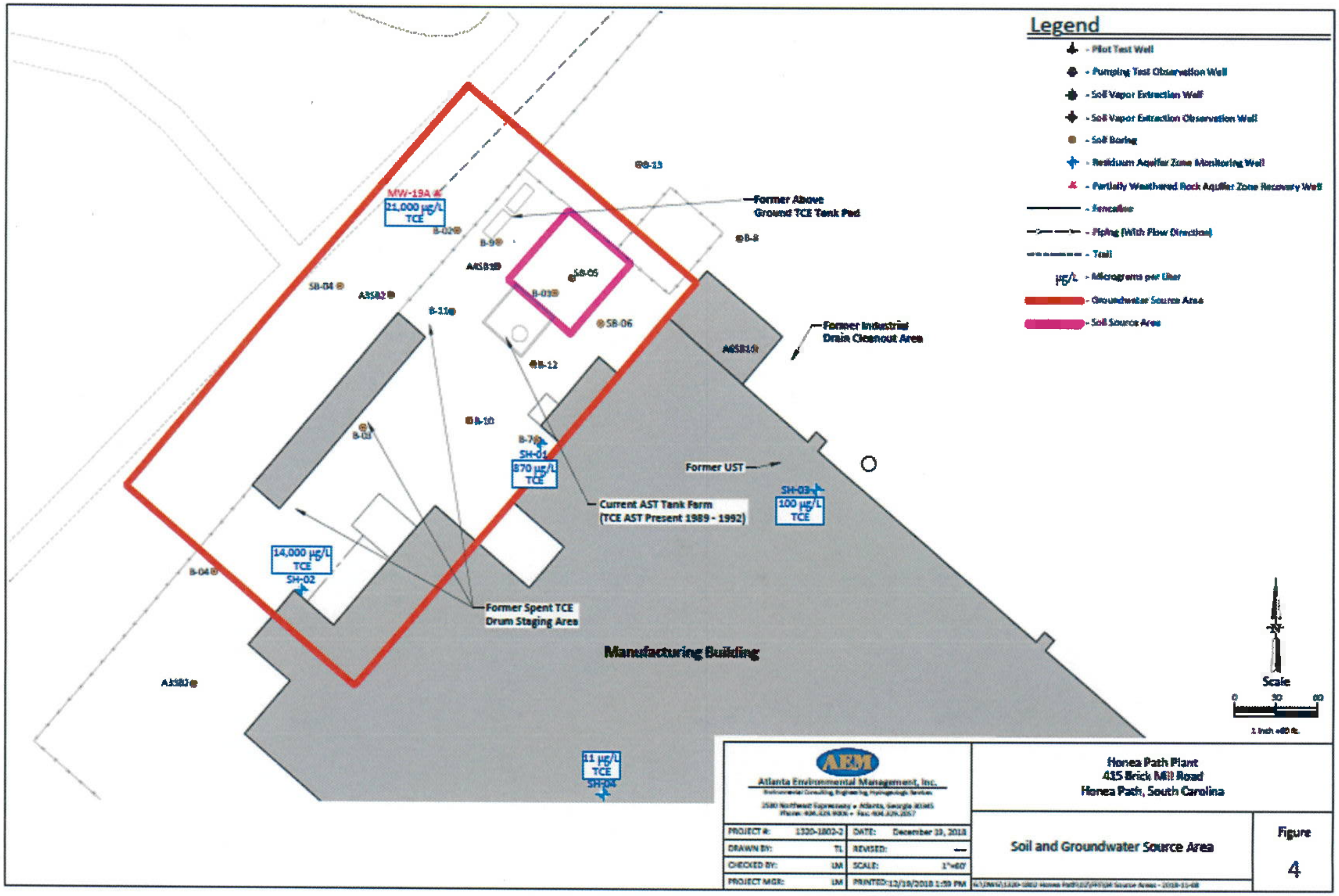

Legend
- Site Boundary
- Fenceline
- Creek
- Intermittent Stream
- Piping (With Flow Direction)
- Railroad
- Trail
Pond
Discharge Point to Broad Mouth Creek
Treated Groundwater Discharge Pipeline
Phase III Groundwater Pipeline
Phase I/II Groundwater Pipeline
Phase II Groundwater Pipeline
Phase IV Groundwater Pipeline
Groundwater Treatment System
Pump Station
Manufacturing Building
Parking
Athletic Field
Water Tower
Brick Mill Road (S4-751)
Johnson Road
MW-33
MW-34
MW-15
MW-13
MW-14
MW-17A
MW-11
MW-12
MW-32
MW-31
MW-21A
MW-25A
MW-26A
MW-22A
MW-19A
MW-16A
MW-18A
Graphic Scale
300 0 150 300
Atlanta Environmental Management, Inc.
PROJECT #: 1320-1901-2
DRAWN BY: TL
SCALE: 1" = 300'
DATE: August 12, 2019
Honea Path Plant
415 Brick Mill Road
Honea Path, South Carolina
Monitoring and Recovery Well Location and Site Layout

Figure 3 Soil and Groundwater Source Area



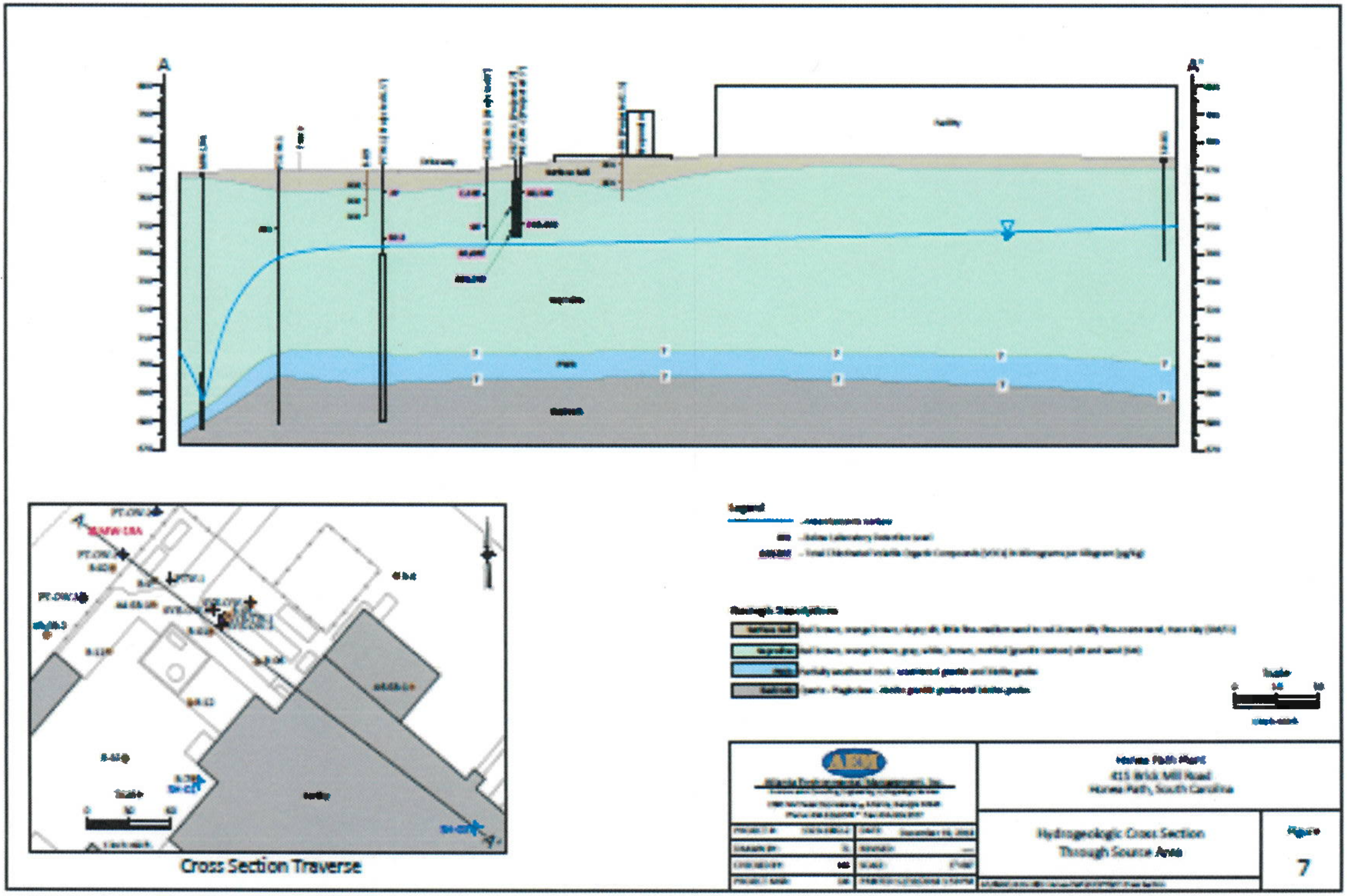


Figure 4- Geologic Cross Section

Figure 5 Proposed SVE System Layout

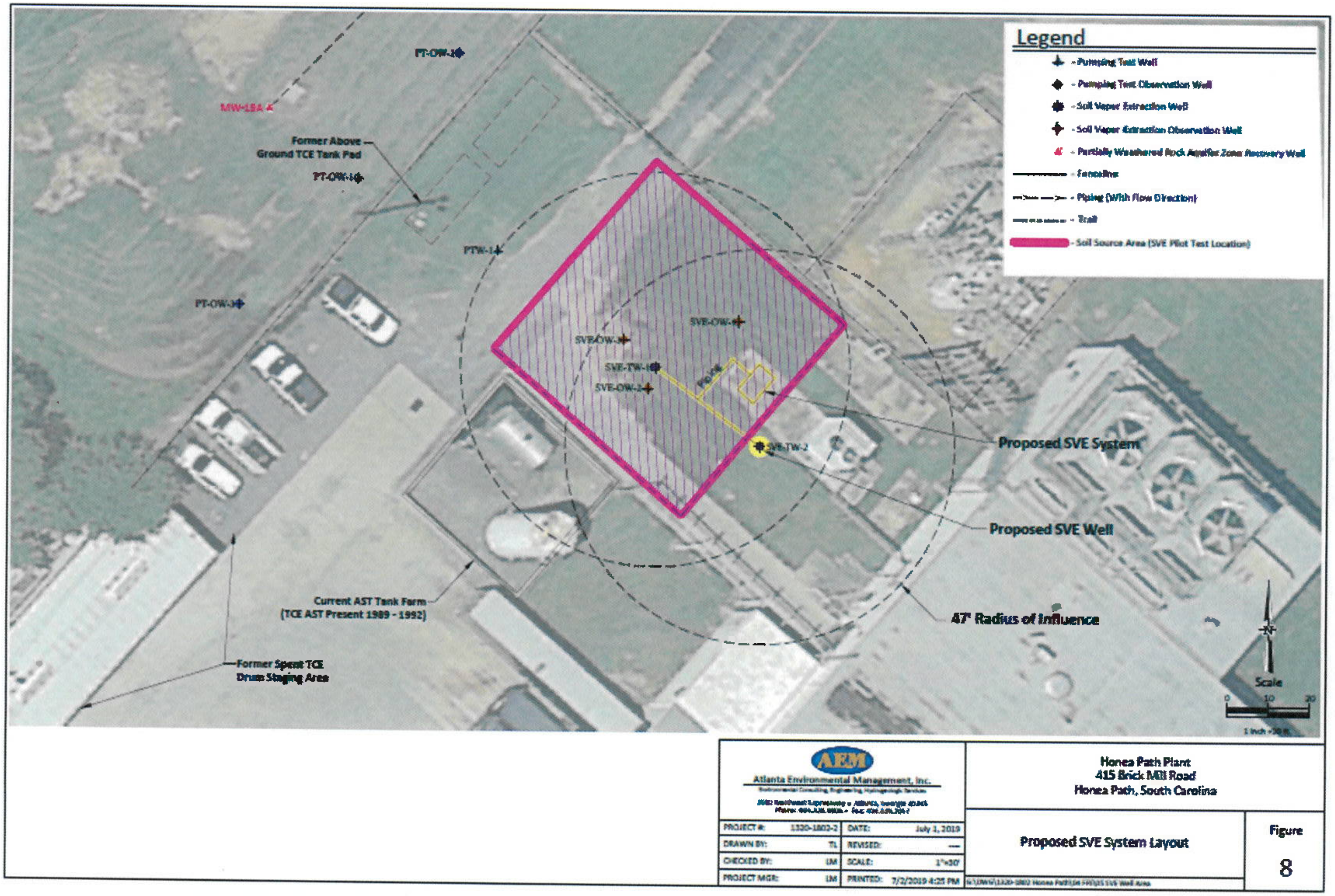
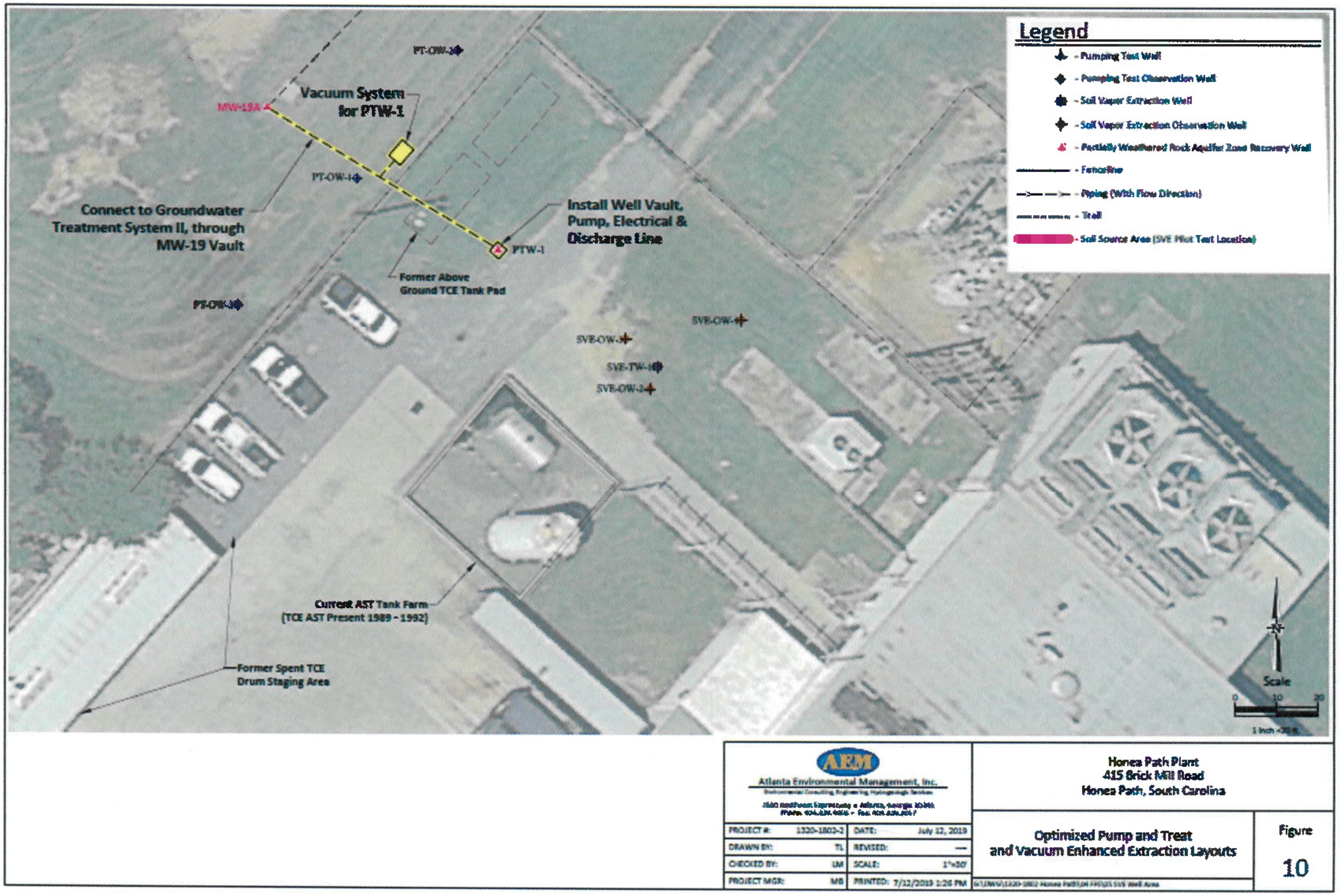


Figure 6 Proposed Optimized Pump and Treat and Vacuum Enhanced Extraction Layout



Appendix A

Proposed Plan

S.C. Department of Health and Environmental Control

Proposed Plan for Site Remediation Former Ingersoll Rand Honea Path Plant (HPP)

415 Brick Mill Road Honea Path, South Carolina

October 2020

ANNOUNCEMENT OF PROPOSED PLAN

The South Carolina Department of Health and Environmental Control (DHEC or the Department) has completed an evaluation of cleanup alternatives to address source area contamination at the former Ingersoll Rand facility (the Site) and optimizing the active groundwater pump and treat system. This Proposed Plan identifies DHEC's Preferred Alternative for cleaning up the contaminated area and provides the reasoning for this preference. In addition, this Proposed Plan includes summaries of the other cleanup alternatives evaluated. These alternatives were identified based on information gathered during environmental investigations conducted at the Site since 1990.

The Department is presenting this Proposed Plan to inform the public of our activities conducted at the Site, gain public input, and fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP). This Proposed Plan summarizes information that can be found in greater detail in the Source Area Focused Feasibility Study (July 2019) and other documents contained in the Administrative Record file. The Department encourages the public to review these documents to gain an understanding of the Site and the activities that have been completed.

The Department will select a final cleanup remedy after reviewing and considering comments submitted during the public comment period. The Department may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

DHEC's Preferred Cleanup Summary
Alternative 3: Release for Unrestricted Use

DHEC's preferred remedial option includes:

- Soil Vapor Extraction in the soil source area;
- Optimized Pump and Treat for groundwater

❑ PUBLIC PARTICIPATION:

DHEC has provided a presentation online of the Proposed Plan online at:

http://www.dhec.sc.gov/IngersollRand

If requested by the public, DHEC will hold a meeting to explain the Proposed Plan and all the alternatives presented in the Remedial Alternatives Evaluation.

❑ PUBLIC COMMENT PERIOD:

October 2, 2020 through November 20, 2020

DHEC will accept written comments on the Proposed Plan during the public comment period. Please submit your written comments to:

Jan Trent, Project Manager
SC DHEC Bureau of Land & Waste Management
2600 Bull Street
Columbia, SC 29201
trentjc@dhec.sc.gov

❑ FOR MORE INFORMATION:

Call: Jan Trent, Project Manager, 803-898-0723

See: DHEC's website at:
http://www.dhec.sc.gov/IngersollRand

View: The Administrative Record is available online on the DHEC website above or through the DHEC Freedom of Information Office:

DHEC Freedom of Information Office
2600 Bull Street, Columbia, SC
(803) 898-3817
Monday - Friday: 8:30 am - 5:00 pm

The Honea Path Plant (HPP) is located on approximately 466 acres in a semi-rural area typically composed of woods and farm land at 415 Brick Mill Road, Honea Path, South Carolina.

The facility consists of a main manufacturing building, a smaller storage building to the rear of the plant, and a small wastewater treatment plant located northeast of the main plant building. Topographic features include the gullies and intermittent drainage features located on the northeastern, northern, and northwestern property boundaries.

HPP was originally owned and operated as part of Torrington. Torrington operated from 1970 to 2003. In February 2003, Ingersoll Rand sold Torrington to Timken Company, and Torrington was renamed Timken US Corporation, which was subsequently renamed Timken US LLC.

The Torrington Company manufactured steering components, universal joint assembles, and other specialty metal components at the facility from 1970 to 2003. Process wastewater was generated from metal cleaning operations. The process wastewater was treated in a pretreatment facility prior to discharge to the Town of Honea Path Chiquola Creek Treatment Plant. Prior to the construction of the pretreatment facility in 1989, process wastewaters were treated in three grit chambers and three oxidation/equalization ponds at the facility prior to discharge to Broad Mouth Creek, under National Pollutant Discharge Elimination System (NPDES) Permit. This treatment system was operated from approximately 1970 to December 1989.

Two former trichloroethene (TCE) aboveground storage tanks (ASTs) were used at the facility. The original TCE AST was located near the northern corner of the main plant building adjacent to a former methanol AST along the back-fence line. The TCE and methanol ASTs were removed in 1989. The TCE AST was then moved to the current AST tank farm until TCE was no longer used at the plant in 1992.

In 1990, HPP installed five groundwater monitoring wells in the vicinity of the pretreatment facility and treatment lagoons. Analytical results from the groundwater collected from these wells indicated the presence of trichloroethene (TCE) above drinking water standards. Additional monitoring well installation and sampling was conducted between 1992 and 2000 to define the extent of groundwater impacts.

In 1995, HPP installed recovery wells in an effort to contain groundwater at the facility. This corrective measure was implemented to prevent the movement of contaminated from the plant property by removing impacted groundwater in the vicinity of the known source areas. The impacted groundwater is then sent for treatment prior to discharge. The current system consists of fifteen (15) recovery wells.

In February 2001, DHEC issued Consent Agreement #01-145-W to HPP.

SUMMARY OF SITE RISKS

As a result of the environmental investigations, volatile organic compounds, particularly TCE, were found to be present in groundwater above Maximum Contaminant Levels (MCLs). Long-term exposure to these constituents of concern can result in harmful effects to human health and to ecological systems. This contamination is located on the facility and has not migrated off site.

Further, South Carolina has established water quality standards, which are outlined in S.C. Regulation 61-68: *Water Classifications and Standards.* This regulation establishes water quality standards that protect existing and classified uses of SC waters. Per this SC regulation, waters which meet standards, e.g., MCLs, shall be maintained. Waters which do not meet standards shall be improved, wherever attainable, to achieve those standards

Contaminants in soil continues to source the groundwater plume preventing the effective cleanup of groundwater at the facility.

CLEANUP GOALS

Remedial action objectives (RAOs) are developed in order to set goals for protecting human health and the environment. The goals should be as specific as possible, but should not unduly limit the range of remedial alternatives that can be developed. Accordingly, the following RAOs were developed for the Site:

Reducing the potential for leaching to groundwater from the vadose zone.

Reducing source area groundwater impacts to further mitigate/control impacts to downgradient groundwater and streams.

Restore groundwater to MCLs (maximum contaminant level).

SCOPE AND ROLE OF THE ACTION

The proposed action in this Proposed Plan will be the final cleanup action for the Site. The remedial action objectives for this proposed action include reducing the potential for soil leaching contamination to groundwater and to further mitigate and control the migration of contaminants through groundwater and into surface water. As contamination will remain onsite a 5-year review will be required once the remedial action is conducted.

SUMMARY OF REMEDIAL ALTERNATIVES

Based on information collected during previous investigations, *a Revised Source Area Focused Feasibility Study* (AEM, July 2019) was conducted to identify, develop, and evaluate options and remedial alternatives to address the contamination at the Site. This evaluation considered the nature and extent of contamination and associated potential human health risks developed during the remedial investigations and associated studies to determine and evaluate potential remedial alternatives and their overall protection of human health and the environment. Each remedial alternative evaluated by the Department is described briefly below. Note: A final Remedial Design will be developed prior to implementation of any alternative.

DESCRIPTION OF ALTERNATIVES

Alternative 1 - No Action

The No Action alternative is required by the National Contingency Plan to be carried through the screening process, as it serves as a baseline for comparison of the other remedial action alternatives.

The no action alternative does not include any on-site or legal controls or actions for soil or groundwater at the site. There is no cost associated with implementing this alternative.

Alternative 2 – Soil Vapor Extraction (SVE)

Soil vapor extraction (SVE) is soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semi-volatile contaminants from soil.

This Alternative was further developed for detailed analysis from the installation and field pilot testing of new SVE wells near the source area. The pilot study concluded that the vadose zone within the study area appears to have a highly transmissive layer that connects the observation wells and the pilot test well.

The estimated present value capital cost to implement SVE moving forward is $280,400. These costs represent installation, maintenance, monthly inspections, and effluent sampling as part of discharge permit requirements for site-related constituents found in groundwater. Electric usage and repair work have also been included. Operation and maintenance (O&M) and monitoring will continue for four years.

Alternative 3 – Excavation

This alternative consists of excavation of contaminated material and transport to a permitted off-site treatment and/or disposal facility.

The costs are roughly estimated to be $3,070,600 to implement. This remedy would require an extended shut-down of the plant due to the extended infrastructure located in the area. Excavation activities will take approximately 12 months to complete.

Alternative 4 - *In Situ* Chemical Oxidation/Blending (ISCO)

This remedial alternative will include *in situ* blending and/or injections of chemicals into the source area. Oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.

The estimated capital cost to implement ISCO moving forward is $2,578,400. This cost includes setting up injection points and purchase/mixing of chemical oxidants as well as estimates for shoring, utilities relocation, and the disruption to facility operations. Remedial objects with ISCO will be achieved in approximately 12 months.

Alternative 5- Continued Pump and Treat (CP&T)

This alternative represents the current operations at the Site. It consists of implementing no action to specifically target the source material except for treating the source by containing contaminants that are in groundwater. This alternative provides for continued plume containment at the site interior and boundary utilizing the current remediation infrastructure. Currently, groundwater is extracted using submersible pumps and treated via an air stripper prior to being collected into a central sump and then discharged to Broad Mouth Creek under a National Pollutant Discharge Elimination System (NPDES) permit.

CP&T would require no additional capital costs. Typical pump and treat system will operate for 30 or more years and current annual costs are between $125,000 and $200,000 per year.

Alternative 6- Optimized Pump and Treat (OP&T)

This alternative improves the existing groundwater capture and extraction rate in the source area with added extraction wells in the source area and improved pump and treat remedial infrastructure. This alternative utilizes submersible pumps and existing treatment via an air stripper prior to being discharged to a central sump and then to Broad Mouth Creek via an NPDES permit.

The cost to implement the OP&T is approximately $50,000 to connect the pilot study test well (PTW-1) to the existing groundwater treatment system. OP&T costs would then be consistent with CP&T and would be expected to operate for 30 or more years with the current annual costs up to $200,000 per year.

Alternative 7- Vacuum Enhanced Extraction (VEP&T)

This option provides the addition of vacuum enhancement to the Optimized Pump and Treat (VEP&T) alternative. A vacuum is placed on the source-area pumping well(s) to increase the radius of capture for the pumping well.

The cost to implement the VEP&T is approximately $156,600 to install the required vacuum equipment to the existing groundwater treatment system plus an estimated $850 per month for power. VEP&T costs would then be consistent with CP&T with additional power costs and would be expected to operate for 30 or more years with annual costs up to $210,200 per year.

EVALUATION OF ALTERNATIVES

The National Contingency Plan requires the Department use specific criteria to evaluate and compare the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative against the criteria, noting how it compares to the other options under consideration. The criteria are:

1. Overall protection of human health and the environment;
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs);
3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness;
6. Implementability;
7. Cost; and
8. Community acceptance

The main objectives for the preferred remedial action are to be protective of human health and the environment and to comply with State and Federal regulations. These two objectives are considered *threshold criteria*. Threshold criteria are requirements each alternative must meet in order to be eligible for selection.

The following measures are considered *balancing criteria*: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. These criteria are used to weigh the technical feasibility, strengths and weaknesses, and cost advantages and disadvantages of each alternative.

Community acceptance of the cleanup alternative and the other considered alternatives is a *modifying criterion* that will be carefully considered by the Department prior to final remedy selection.

COMPARATIVE ANALYSIS OF ALTERNATIVES

A comparative analysis of each alternative was performed. The alternatives were evaluated in relation to one another for each of the evaluation criteria. The purpose of the analysis is to identify the relative advantages and disadvantages of each alternative.

Alternatives 1-4 are compared against each other for soil cleanup and Alternatives 5-7 are compared against each other for groundwater cleanup. The final remedy will be a combination of remedies to address both medias. The tables below rank the alternatives from 0-4 based off their effectiveness for each category. The remedy with the highest total score is considered the best alternative for each media.

Comparative analysis of Alternatives Table for Soil:

Remedial Options Soil	Alternative 1 No Action	Alternative 2 Soil Vapor Extraction	Alternative 3 Removal	Alternative 4 In-Situ Chemical Oxidation
Protection Human Health and the Environment	0	3	4	4
Compliance with ARARs	0	2	4	3
Short-Term Effectiveness	0	3	2	3
Long-Term Effectiveness	0	3	2	2
Reduction of toxicity, mobility, & volume through Treatment	0	3	4	3
Implementability	4	4	0	0
Costs	4	4	1	1
Total Score	8	22	17	16

Comparative analysis of Alternatives Table for Groundwater:

Remedial Options Groundwater	Alternative 5 Groundwater Pump and Treat	Alternative 6 Optimized Groundwater Pump and Treat	Alternative 7 Vacuum Enhanced Extraction with Pump and Treat
Protection Human Health and the Environment	3	3	3
Compliance with ARARs	3	3	3
Short-Term Effectiveness	3	3	3
Long-Term Effectiveness	2	3	3
Reduction of toxicity, mobility, & volume through Treatment	3	3	3
Implementability	4	4	3
Costs	4	4	1
Total Score	22	23	19

Overall Protection of Human Health and the Environment

When evaluating alternatives in terms of overall protection of human health and the environment, consideration is given to the manner in which Site-related risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

The No Action does not provide for overall protection of human health and the environment on site as there will be no decrease in contaminants in the source areas. The potential for off-site impacts to protect human health and the environment are uncontrolled.

Alternative 2 - SVE is protective of human health and the environment because it reduces the concentrations of contaminants of concern in soil and thus groundwater source areas and eliminates potential vapor exposure pathways.

Alternative 3- Excavation is protective of human health and the environment because it removes the contaminants of concern in soil and thus groundwater and eliminates exposure pathways.

Alternative 4 -In-situ Chemical Oxidation is protective of human health and the environment because it removes the contaminants of concern in soil and thus groundwater and eliminates exposure pathways.

Alternative 5 -Continued Pump and Treat provides for overall protection of human health and the environment as there is containment of the groundwater plume. The continued operation of the pump and treat system limits the potential for off-site exposure.

Alternative 6-Optimized Pump and Treat-(OP&T) provides protection of human health by improving site groundwater that poses unacceptable risk. OP&T will prevent human contact with, or consumption of, contaminated groundwater and restore groundwater quality to meet state and federal standards.

Alternative 7- Vacuum-Enhanced Extraction (VEP&T) provides protection of human health by improving site groundwater quality. VEP&T will prevent human contact with, or consumption of, contaminated groundwater and restore groundwater quality to meet state and federal standards.

Compliance with ARARs (Applicable or Relevant and Appropriate Requirements)

This evaluation criterion evaluates whether an alternative meets federal and state environmental statutes and regulations that pertain to the Site. Each alternative is evaluated with respect to its ability to comply with such requirements.

The No Action alternative does not meet applicable South Carolina regulations.

Alternative 2 would potentially bring source soil into compliance with ARARs. Alternatives 3 and 4 are effective in meeting ARARs provided site constraints allow access to impacted soil.

Alternatives 5 and 6 are focused on TMV reduction and complies with potential ARARs as contaminants are leached from soil and contained by the pump and treat systems. Alternative 7 is not likely to realize significant improvement in ARAR compliance when compared to Alternative 6.

Long-Term Effectiveness and Permanence

Long Term Effectiveness measures the magnitude of residual risk remaining from untreated impacted media or treatment residuals and the adequacy and reliability of containment systems and institutional controls are evaluated under this criterion. It also factors the time to reach remedial goals.

The No Action alternative includes no controls for exposure and no long-term management measures. All current and potential future risks would remain under this alternative.

Alternative 1 does not provide long-term effectiveness or permanent remedy for the soil contamination or provide long-term protection to prevent human exposure.

Alternative 2 will achieve long-term effectiveness by treating soil contaminants with no waste products or residuals and continually remove source area mass.

Alternatives 3 and 4 are effective as long as all impacted media is removed via excavation or treated via in-situ soil blending. If impacted soil is not treated, then potentially clean backfill or treated soil can be impacted by the surrounding soil outside of the excavation or soil blending limits.

Alternative 5 does not provide long-term effectiveness or permanent remedy for the groundwater contamination under the assumption that source material half-life concentrations could be on the order of decades. Alternatives 6 and 7 both significantly improve long-term effectiveness by more directly removing groundwater contaminants at the presumed source area and accelerates TMV reduction.

Reduction of Toxicity, Mobility, or Volume through Treatment (TMV)

This evaluation criteria measures the degree to which an alternative employs treatment to reduce the harmful effects of contaminants, their ability to move in the environment, and the amount of contamination present is evaluated by this criterion.

Alternative 1 does not reduce TMV of contaminated soil at the site. Alternative 2 accelerates contaminant removal and irreversibly reduces the toxicity and volume of contaminated soil by destroying the contaminant via treatment (i.e., volatilization).

Alternatives 3 and 4 are very effective at reducing TMV of contaminated soil via excavation and off-site removal or soil blending. The contaminants of concern are removed or oxidized in place. These two technologies are effective provided site constraints allow access to impacted soil.

Alternative 5 only reduces TMV of contaminated groundwater by intercepting contaminants outside the source area. Alternatives 6 and 7 are expected to accelerate contaminant removal and reduce the toxicity and volume of contaminated groundwater by treatment (i.e., air stripping)

Short-Term Effectiveness

The short-term effectiveness evaluation takes into consideration any risk the alternative poses to on-Site workers, the surrounding community, or the environment during implementation, as well as the length of time needed to implement the alternative.

Alternative 1 does not provide short-term effectiveness as the source area soil will continue to contribute to groundwater contamination and provides no protection for potential human exposure. Alternative 2 will immediately reduce the contaminant TMV, thereby reducing the impacts to groundwater. Additional considerations for Alternative 2 include the reduction or elimination of vapor intrusion concerns.

Alternatives 3 and 4 are very effective in the short term provided the site constraints allow access to the impacted soil media.

While Alternative 5 does provide control of plume migration through TMV reduction, this alternative does not provide short-term effectiveness as the source area aquifer matrix contributes to groundwater contamination. Both Alternatives 6 and 7 will accelerate the reduction of the contaminant TMV by direct extraction, thereby reducing impacts to groundwater.

Implementability

The analysis of implementability considers the technical and administrative feasibility of remedy implementation, as well as the availability of required materials and services.

No technical or administrative feasibility concerns are associated with implementing Alternative 1 because no actions are being taken.

Implementation of Alternative 2 is considered technically feasible and could be accomplished through conventional construction methods.

The implementation of alternatives 3 and 4 are considered technically feasible, however, due to site constraints it would be difficult to implement and would impact facility operations.

No technical or administrative feasibility concerns are associated with implementing Alternatives 5 or 6 since both are either existing or straightforward enhancement of the current system, and both will be based primarily on existing infrastructure.

Alternative 7 is a significant expansion and may include installation of additional extraction wells with a mechanical vacuum system.

Cost

The cost criterion includes estimated initial capital costs and annual O&M costs, as well as a present worth cost evaluation. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of -30% to +50%.

The cost to implement Alternative 1 is negligible as there will be no active remediation.

The estimated present value capital cost to implement Alternative 2-SVE moving forward is $280,400. These costs represent installation, maintenance, monthly inspections, and effluent sampling as part of discharge permit requirements for site-related constituents found in groundwater. Electric usage and repair work have also been included. O&M and monitoring will continue for four years.

The cost for off gas treatment has not been included since it is assumed that the system will not remove more than 1,000 pounds a month.

The estimated cost to complete Alternative 3 moving forward is $3,070,600. The costs are exceptionally high when including facility down time, relocation of utilities, shoring to protect existing infrastructure, off-site disposal fees, and impacts to local community due to truck traffic. Treatment of soil would extend as deep as 25 ft bls in the vicinity of the facility building and power substation. This cost also assumes that the impacted soil requiring treatment is not under existing infrastructure that cannot be moved such as the power substation or building.

The estimated cost to complete Alternative 4 moving forward is $2,578,400. The costs are exceptionally high when including facility down time, relocation of utilities, and shoring to protect existing infrastructure. Treatment of soil would extend as deep as 25 ft bls in the vicinity of the facility building and power substation. This cost also assumes that the impacted soil requiring treatment is not under existing infrastructure that cannot be moved such as the power substation or building.

The costs to implement Alternative 5 are the current annual costs to operate, maintain, and monitor the ongoing activities, with no incremental cost incurred. The cost of this Alternative is assumed to be $125,000 to $200,000 per year projected over the next 30 years in present-value dollars. These costs represent monthly inspections, maintenance, and effluent sampling as part of discharge permit requirements and annual sampling and analysis of groundwater for site-related constituents found in groundwater. Electric usage and repair work have also been included. O&M and monitoring will continue for the duration of the project.

The cost to implement Alternative 6 is essentially the same as 5 but adds a one-time $50K cost to install and plumb new wells.

The cost to implement Alternative 7 is approximately $156,600 to install the required vacuum equipment to the existing groundwater treatment system plus an estimated $850 per month for power. Alternative 7 costs would then be consistent with CP&T with additional power costs and would be expected to operate for 30 or more years with annual costs of between $135,200 and $210,200 per year.

Community Acceptance

Community acceptance of the preferred remedy will be evaluated after the public comment period. Public comments will be summarized and responses provided in the Responsiveness Summary Section of the Record of Decision document that will present the Department's final alternative selection. The Department may choose to modify the preferred alternative or select another remedy based on public comments or new information.

SUMMARY OF THE DEPARTMENT'S PREFERRED ALTERNATIVE

The Department has identified a preferred alternative to address the contamination in both the soil and groundwater at the Site. The preferred remedial alternatives, are a combination of Alternative 2, Soil Vapor Extraction within the soil source area and Alternative 6 optimization pump and treat system for the groundwater plume.

Alternative 2, Soil vapor extraction (SVE) is soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semi-volatile contaminants from soil.

This Alternative was further developed for detailed analysis from the installation and field pilot testing of new SVE wells near the source area. The pilot study concluded that the vadose zone within the study area appears to have a highly transmissive layer that connects the observation wells and the pilot test well. The system will be operated for approximately 4 years or until the soil contamination has been adequately treated.

Alternative 6, Optimized Pump and Treat improves the existing groundwater capture and extraction rate in the source area with added extraction wells in the source area and improved pump and treatment remedial infrastructure. This alternative utilizes submersible pumps and existing treatment via an air stripper prior to being discharged to a central sump and then to Broad Mouth Creek via an NPDES permit.

The total estimated net present worth of this alternative combination is approximately $6M. It is the Department's judgment that the Preferred Alternative identified in this Proposed Plan is necessary to protect public health and the environment.

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for the Ingersoll Rand Honea Path Facility Site is important. Comments provided by the public are valuable in helping DHEC select a final cleanup remedy.

You may use the space below to write your comments, then fold and mail. Comments must be postmarked by November 20, 2020. If you have any questions, please contact Jan Trent at 803-898-0723. You may also submit your questions and/or comments electronically to: trentjc@dhec.sc.gov

Name ______________________ Telephone ______________________

Address ______________________ Email ______________________

City ______________________

State ____________ Zip ____________