DHEC
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South Carolina Department of Health and Environmental Control

Proposed Plan for Site Remediation

Former Philip Services Corporation Site (aka ThermalKem)

Rock Hill, South Carolina

August 2014

ANNOUNCEMENT OF PROPOSED PLAN

The South Carolina Department of Health and Environmental Control (DHEC or the Department) recently completed an evaluation of cleanup alternatives to address groundwater and soil contamination at the Former Philip Services Corporation (PSC) Site (the Site) in Rock Hill, South Carolina. This Proposed Plan identifies DHEC's Preferred Alternative for cleaning up the contaminated soil and groundwater and provides the reasoning for this preference. In addition, this Plan includes summaries of other cleanup alternatives that were evaluated. These alternatives were identified based on information gathered during a Remedial Investigation conducted by DHEC.

DHEC is presenting this Proposed Plan to inform the public of our activities and to gain your input. This Proposed Plan summarizes information that can be found in greater detail in the Feasibility Study (FS) report dated July 2011 and other documents contained in the Administrative Record file. The Department encourages the public to review these documents to gain a comprehensive understanding of the Site and activities that have been conducted.

DHEC will select a final remedy after reviewing and considering comments submitted during the 30-day public comment period. The Department may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments. DHEC is the sole responding governmental party at the Site and is conducting these actions pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund) and the SC Hazardous Waste Management Act.

MARK YOUR CALENDAR

❑ **PUBLIC MEETING:**
When: August 26, 2014 at 6:30pm
Where: South Point High School Auditorium
801 Neely Rd, Rock Hill, SC

DHEC will hold a meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. After the Proposed Plan presentation, DHEC will respond to your questions. Oral and written comments will also be accepted at the meeting.

❑ **PUBLIC COMMENT PERIOD:**
DHEC will accept written comments on the Proposed Plan during the public comment period until **September 26, 2014.**

Submit your written comments to:
Lucas Berresford, Project Manager
DHEC-L&WM
2600 Bull St.
Columbia, SC 29201
berresjl@dhec.sc.gov

❑ **FOR MORE INFORMATION:**

See: DHEC's website at:

View: The Administrative Record is located at the following locations:

- DHEC's Bureau of Land & Waste Management
  8911 Farrow Road
  Columbia, SC

  Contact: Freedom of Information Office:
  (803) 898-3817

- York County Library's Main Branch
  138 East Black Street,
  Rock Hill, SC

Summary of DHEC's Preferred Remedy

Combined Alternative 3 – Hydraulic Containment, Soil Vapor Extraction (SVE), Thermal-Enhanced Multi-Phase Extraction (MPE), and In Situ Thermal Treatment

This alternative includes:

- Excavation and offsite disposal of metals contaminated soil exceeding Remedial Goals (RGs) outside of Volatile Organic Compounds (VOCs) / Thermal treatment areas,
- Hydraulic containment with onsite physical/chemical treatment for the regolith and bedrock hydraulic zones, as described (if necessary)
- SVE in the Burn Pit Area, (if necessary)
- Thermal-enhanced MPE for the Fuel Oil Area,
- In- situ thermal treatment for select areas to treat for VOCs in soil and regolith groundwater.
- Groundwater and surface water monitoring.
- Institutional controls

Site Description

The PSC Site is located at 2324 Vernsdale Road, approximately 4.5 miles southwest of the City of Rock Hill, South Carolina (Figure 1). Robertson Road borders the property to the northeast, and the Norfolk Southern Railroad forms the northwestern boundary. Wildcat and Fishing Creeks border the industrial property on the southeast and southwest, respectively. The former PSC Property (the Site) consists of approximately 44.5 acres of industrial property on the west side of Wildcat Creek and approximately 108 acres of undeveloped woodland on the east side of Wildcat Creek.

Site History

- **Operational History**

The PSC Site is a former Resource Conservation Recovery Act Site (RCRA) hazardous waste treatment, storage, and disposal facility. Beginning in 1966, Quality Drum Company and, later, Industrial Chemical Company conducted operations consisting of waste storage, treatment, and recycling. The facility received spent solvents from offsite facilities, stored the solvents on the site in drums and tanks, and recovered these solvents through distillation. Until 1981, wastes from the distillation process (e.g., still bottoms) were sent to a local landfill. In 1981, a hazardous waste incinerator was installed at the facility for still bottoms treatment and the facility began to process a broader variety of waste streams. Quality Drum and Industrial Chemical merged in December 1982.

In May 1983, Stablex South Carolina, Inc. acquired the facility. At that time, approximately 26,000 drums and 200,000 gallons of bulk liquid waste stored in tanks were present on the site. In 1986, NUKEM purchased the stock of Stablex. Stablex South Carolina, Inc. changed its name to ThermalKem, Inc. in January 1987. ThermalKem operated the Site as a hazardous waste incinerator and storage facility under RCRA interim status (EPA I.D. No. SCD 044 442 333).

PSC purchased the stock of ThermalKem through its subsidiary, Petro-Chem, and took over operation and management of the facility in November 1995. PSC ceased operation of the incinerator one month later and submitted an incinerator closure plan in 1998. PSC continued to operate the facility as a fuel blending storage and transfer facility until 1999. PSC declared bankruptcy in June 2003.

During the years of operation, the facility sustained two large structural fires. The facility also experienced a subsurface diesel fuel release, with the quantity of fuel spilled estimated to be greater than 200,000 gallons, as well as various other releases of hazardous substances.

- **Environmental Response History**

Several soil and groundwater investigations were conducted under the RCRA program during the operation of the facility. Based on these investigations a groundwater extraction and treatment system was installed in 1988 to address the petroleum contamination. Additional extraction components (groundwater extraction wells EW-2 and EW-3 and a fuel interceptor trench) were installed in the mid-1990s.

The incinerator was shut down and dismantled in the late 1990s, and soil was excavated beneath the incinerator leaving an open pit.

In 2003, PSC filed for bankruptcy and DHEC assumed the environmental management responsibilities for the site in December 2003. A Trust was formed out of the bankruptcy to provide some funding for environmental activities including a remedial investigation, feasibility study and the continued operation of the groundwater treatment system. The Trust will be inadequate to complete the preferred remedy described in this Proposed Plan.

In 2004, the open pit was backfilled and the incinerator building was demolished under the direction of DHEC. DHEC also completed upgrades to the groundwater treatment system in 2005.

DHEC began a Remedial Investigation in 2004 consisting of several phases of soil and groundwater investigation to determine the nature and extent of contamination. The Remedial Investigation Report (RI) was completed in September 2008. A Feasibility Study (FS) which evaluated remedial alternatives for cleanup of the site was completed on July 22, 2011.

SITE CHARACTERISTICS

Areas of Concern

- ***Historic Areas of Concern (RCRA Part B Corrective Action Process)***

During operation of the facility, the RCRA Part B Permit Corrective Action process identified four solid waste management units (SWMUs) and seven areas of concern (AOCs). These SWMUs and AOCs are approximately shown on **Figure 2-2**. The SWMUs and AOCs, as listed in the RCRA Facility Investigation (RFI) Part 1 Report (Philip, 1999), and a brief description of the wastes managed/disposed in each area, are presented below. An additional summary of the information is also presented in the Environmental Data Review and Current Environmental Conditions Report prepared by URS Corporation (March 2006).

Incinerator Building Sump (SWMU 8) – This area contained ash and water from the incinerator water seals. The incinerator was operated from approximately 1981 to 1995.

Container Storage Area (SWMU 11) – This area was used for the storage of a large number of drums of spent halogenated and non-halogenated solvents on the ground surfaces. This location was used for container storage from pre-1983 until 1995.

Truck Washing Station and Sump (SWMU 19) – Wastes managed included wash water, residue, and soil from trucks carrying spent halogenated and non-halogenated solvents. The truck washing station/sump was operated from 1981 until 1995.

Burn Pits (SWMU 41) – This area was used for the disposal of solvent distillation still bottoms by open pit burning. The burn pits were operated approximately between 1966 and the early 1970's.

Impacted soil, drums, and waste material were excavated in this area to a depth of 8 feet in 1985 under supervision of SCDHEC.

Solvent Ditch Area of Concern – Spillage and leakage from tank trucks and the tank farm migrated to this area via stormwater runoff. This ditch existed from the 1960's until 1983. Soil excavation was performed to remove visibly impacted material in 1983.

Fuel Oil Area of Concern – This area was an area of concern due to the suspected diesel fuel leaks from underground piping associated with three underground storage tanks and from diesel fuel delivery piping to the incinerator.

Drum Repacking Area Fire Area of Concern – A building in this area housed spent halogenated and non-halogenated solvents in lab pack form and drums of solids and sludges from spent solvents. The building was destroyed by fire in 1995 and rebuilt the same year.

Blend Tank Overflow Area of Concern – This area included a tank farm where liquids containing spent halogenated and non-halogenated solvents were blended for incineration prior to 1995.

Scrubber Containment Overflow Area of Concern – Wastes managed at this location included caustic solutions of scrubber water with particulate matter from incineration.

Boiler Explosion Area of Concern – The boiler was used as a backup steam supply for the scrubber and was replaced after it exploded in March 1991. No wastes were managed here but approximately 50 gallons of diesel fuel would have exploded with this boiler.

Stormwater Outflows Areas of Concern – These areas of concern include the collection and outflow areas for stormwater runoff from the site and treatment, storage, and disposal areas.

DHEC's Remedial Investigation

The RI activities at the site included sampling of various environmental media to determine the nature and extent of contamination. Specifically, DHEC's contractor, CDM, sampled groundwater, surface water, and sediment, and soil. The sampling results for these media are summarized below.

- **Chemicals of Concern (COCs)**

Three classes of VOCs and their typical degradation products were identified as having the highest concentrations in both soil and groundwater site wide. Although other compounds were detected on site, they were generally coupled with higher concentrations of compounds from one of the three identified classes shown below.

- BTEX – Benzene, toluene, ethylbenzene, and xylene.

- Chlorinated ethenes and ethanes (CEE)– Chloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethene; cis-1,2-dichloroethene; 1,1,2,2- tetrachloroethane; tetrachloroethene; 1,1,1- trichloroethane; trichloroethene; 1,1,2- trichloroethane; and vinyl chloride.

- Chlorinated benzenes (CB)– Chlorobenzene; 1,2-dichlorobenzene; 1,3- dichlorobenzene; 1,4-dichlorobenzene; 1,2,3-trichlorobenzene; and 1,2,4- trichlorobenzene.

- ***Soil Areas of Concern***

Soil samples were compared with EPA Region 9 Preliminary Remedial Goals (PRGs) for industrial soil and/or EPA Region 9 Soil Screening Levels (SSLs) with a dilution-attenuation factor (DAF) of 20 in the RI report. Surface soil sampling results revealed concentrations that exceed the EPA Region 9 PRGs for industrial soil and/or EPA Region 9 SSLs for the VOCs. Three classes of VOCs have been identified in soil including BTEX, chlorinated ethenes (CEE), and chlorinated benzenes (CB).

The highest concentrations of these compounds were primarily confined to four areas of the site: North Drum Storage Area, Solvent Ditch Area, Incinerator/Drum Repackaging Area, and South Drum Storage Area. The four areas shown on **Figure 2-3** were estimated based on the extent of SSL exceedances with a DAF of 20, and are summarized below:

Soil Area #1 - Warehouse (Drum Storage and Management) Area. This area is located on the northern end of the warehouse and includes the former East Drum Storage, Drum Receiving, and Drum Packaging areas. Only CEE compounds were detected above SSL/PRG screening criteria in this area.

Soil Area #2 - Incinerator /Drum Repackaging Area. This area includes both the southern end of the warehouse (Drum Repackaging and Fire area) and the former incinerator area southeast of the warehouse. BTEX, CB, and CEE compounds were all detected above screening criteria in this area. Site wide, the highest concentrations were detected in this area for all three VOC classes.

Soil Area #3 - Solvent Ditch Area. This area contains the former solvent ditch area. This area is also located southeast of the former Blend Tanks Overflow area. BTEX and CEE compounds were detected above screening criteria in this area.

Soil Area #4 - South Drum Storage Area. This area is the furthest southeast on the site and although this area does not include any previously identified SWMUs, it is adjacent to the former stormwater pond and a former drum storage area. BTEX and CEE compounds were detected above screening criteria in this area.

Of these areas, the Incinerator Area had the highest concentrations of all three classes of compounds. The South Drum Storage Area had the lowest average concentrations in surface soil. Soil sampling results revealed that concentrations also exceed industrial soil PRGs and/or SSLs in the subsurface of the four identified areas. The detected concentrations in subsurface soils were generally higher than surface soil in all four areas, and in some cases, exceeded surface soil detections by a factor of ten. Subsurface samples also contained detections of the three VOC classes below the water table in each area.

- ***Groundwater Areas of Concern***

Based on information derived from the hydrogeology and concentration contour maps prepared during the RI, four (4) groundwater areas (GW Areas) of concern were identified. These areas of concern are shown on **Figure 2-4** and include the following:

GW Area #1 - Incinerator / Drum Repackaging Area. The incinerator area was chosen as an Area of Concern because this is the area in regolith (shallow) groundwater and soil with the highest concentrations of CB. This area also includes the southern end of the warehouse where soil concentrations of BTEX exceed 1,000 mg/kg and total CEE soil concentrations are close to 300 mg/kg.

GW Area #2 - Solvent Ditch Area. Groundwater in the solvent ditch area contains the highest concentrations of chlorinated ethenes in regolith, and the highest concentrations of all three VOC classes were detected in bedrock in this area. This area extends into the North Drum Storage location because detected compounds in groundwater there are consistent with concentrations in the solvent area, possibly indicating a source.

GW Area #3 - Burn Pits. Although a removal action previously occurred in this area in 1983, groundwater concentrations in this area do not suggest that VOCs in this area are a result of migration from other areas. Stable concentrations in this area suggest there may be a source remaining.

GW Area #4 - Fuel Oil Area – The fuel oil area remains an area of concern because free product is still present in this location.

The groundwater sampling results for the RI were consistent with the observed soil sampling results. In the areas with the highest concentrations of VOCs in soil, groundwater concentrations were comparably high. Soil concentrations in the burn pit and fuel oil area may not be as high in these areas because soil excavation was previously performed in the burn pit area and because the fuel oil product is in the subsurface. The fuel oil product is associated with a former underground leak, meaning that the oil did not have to migrate through a large depth of soil to reach the groundwater.

Groundwater contamination is likely to be from the primary areas of concern identified for soil, and it is believed that there are plumes originating from the Solvent Ditch Area, Drum Management Area, Incinerator Area, North Drum Storage Area (although co-mingled with the Solvent Ditch area), Burn Pit Area, and Fuel Oil Area. The only soil area of concern that does not correspond to higher concentrations in groundwater is the South Drum Storage Area.

- ***Sediment***

To the extent compounds were detected in sediment samples from Wildcat and Fishing Creek and surface soil samples collected east of Wildcat Creek above laboratory quantitation limits, the results were either below regulatory criteria or were consistent with the concentrations detected in the background samples.

- ***Surface Water***

An extensive surface water investigation completed in 2004 revealed minimal surface water impacts. The investigation included installing vapor diffusion modules in Fishing and Wildcat Creeks and performing onsite screening using a gas chromatograph. The investigation also included collection of surface water samples for laboratory analysis. Limited impacts were observed in the onsite screening and no organics were detected in the laboratory surface water samples. Additional details can be found in the Summary Report – Initial Site Investigation (CDM October 2004).

SUMMARY OF SITE RISKS

A detailed risk assessment was conducted during the remedial investigation to quantify potential and current and future risks to human health and the environment posed by contaminated media at the site in the absence of remedial actions. Additional information can be found in the Remedial Investigation Report, dated September 2008.

The conclusions indicated that environmental contamination may pose potential cancer and non-cancer hazards above acceptable standards for hypothetical **future** users of the facility. No cancer or non-cancer hazards above acceptable standards to off-site receptors were identified. The pathways of principal concern are the exposure to chlorinated VOCs in groundwater through drinking water ingestion, and inhalation of VOCs through indoor air originating from groundwater.

COCs in surface soil based on calculated risk levels are primarily the metals thallium, and vanadium, with chlorinated VOCs limited to subsurface soil. Nineteen (19) additional chemicals were identified as COCs in soil based on exceedances of Soil Screening Levels (SSLs). Sixteen (16) VOCs, along with Manganese were identified as COCs in groundwater based on exceedances of drinking water standards (Maximum Contaminant Levels, "MCLs"). (Table XX)

SCOPE AND ROLE OF THE ACTION

The selected remedial alternative is anticipated to be the final remedy for the site. The selected alternative will include both soil and groundwater treatment. The remedy will be evaluated annually after completion to assure that the remedial action objectives have been met following completion of the remediation.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are designed to meet regulatory requirements and to protect human health and the environment. The RAOs are established to protect human health and the environment by considering the nature and extent of contamination, the potential exposure pathways, and the location and sensitivity of potential receptors. Based on the results of the RI (CDM, September 2008), the following RAOs have been developed for the site:

- Minimize potential for human contact with COCs in soil.
- Minimize future releases of COCs from soil to groundwater and from groundwater to surface water.
- Maintain surface water quality at regulatory criteria.
- Prevent human exposure to groundwater having concentrations in excess of remedial goals established for the site.
- Meet groundwater remedial goals at monitoring wells (to be established during remedial design) located immediately upgradient of Wildcat Creek.
- Restore groundwater at the site to drinking water standards.
- Prevent future releases of COCs from soil and groundwater to indoor air.

These RAOs specifically address the highest observed concentrations and calculated risks for the media sampled during the RI.

Feasibility Study

Based on information collected during the RI, DHEC conducted a Feasibility Study (FS), dated July 22, 2011, to identify, develop, and evaluate various cleanup technologies and remedial alternatives. Six (6) alternatives were evaluated to address groundwater contamination across all areas of concern and six (6) alternatives were also evaluated to address soil contamination across all areas of concern. The evaluation of these alternatives assumed that only one technology would be used to treat all areas of concern for groundwater and only one technology would be used to treat all areas of concern for soil. In addition, the FS evaluated (3) "combined" alternatives that applied multiple technologies to treat different areas of soil and groundwater contamination.

Summary of Remedial Alternatives for Groundwater

SCDHEC evaluated remedial alternatives for cleanup of the site in the FS. This section evaluates the groundwater remedies for the site. A detailed comparison is found in Table 6-1.

Alternative 1 - No Action

Under this alternative, no action would be taken to remediate any affected media at the site. Reassessments of conditions would occur at 5- year intervals in accordance with CERCLA.

Alternative 2:- Institutional Controls and Long-Term Monitoring

Deed restrictions would be implemented to prevent prolonged exposure to COCs, control future development, prevent installation of new potable wells, and prevent potable use of groundwater and surface water within the affected area.

A monitoring plan would be implemented for groundwater and surface water monitoring across the site to evaluate COC concentrations in these media on a routine basis. This monitoring plan would cover 30 years and reassessments of the conditions would be conducted at the site every five years.

Alternative 3 – Hydraulic Containment and Onsite Physical / Chemical Treatment

This alternative would consist of collecting groundwater through extraction wells and trenches, and pumping the impacted water to an onsite wastewater treatment system with subsequent discharge to the municipal publicly owned treatment works (POTW) through an existing industrial discharge permit. Institutional Controls would be established to restrict site use. This alternative could also have a component of phytoremediation, where trees would be planted near the creek to treat groundwater before it discharges to the creek.

Under this alternative and as described in this FS, containment would be set up in both regolith and bedrock hydraulic zones. Extracted groundwater from both zones would be transferred to the existing groundwater treatment system. It is assumed that six additional extraction wells would be installed in the regolith to the top of bedrock and six other extraction wells would be installed into bedrock.

Alternative 4 – In Situ Chemical Oxidation, Dual-Phase Extraction, and Bedrock Extraction

This alternative includes several process options. In situ chemical oxidation would be performed to treat dissolved-phase COCs in the regolith zone. Dual phase extraction (DPE) would be used to treat free product fuel oil in GW Area #4. Finally, bedrock COCs would be contained and treated using extraction wells, and water would be transferred to the existing groundwater treatment system. Institutional controls would also be established.

Under this alternative, an oxidizing agent would be injected into the groundwater plumes in the regolith hydraulic zone to destroy organic COCs. The in situ chemical oxidation alternative relies on injection of a powerful oxidizing agent to destroy the organic COCs. Because sodium persulfate is known to effectively oxidize all three COC types (CEE, CB, and BTEX), this oxidizer is used in the FS analysis. Ferrous iron may also be used to enhance the effectiveness.

Alternative 5 – Air Sparging, Dual-Phase Extraction, and Bedrock Extraction

This alternative involves an air sparging system in regolith groundwater to treat the majority of the plume area. As with Alternative 4, this treatment process would be combined with DPE in the fuel oil GW Area #4 to treat free product, which would be completed prior to starting the air sparging system in this area. Additionally, bedrock COCs would be contained and treated using extraction wells. Institutional controls would also be established.

Air sparging is an in situ treatment technology that uses injected air to remove volatile contaminants from groundwater. As the injected air rises through the groundwater plume, contaminants are stripped from the water and carried towards the surface and removed from the vadose zone through a soil vapor extraction (SVE) system.

Because air sparging in bedrock zones is generally ineffective, bedrock COCs would be contained by installing extraction wells.

Alternative 6 – Permeable Reactive Barrier Wall, Dual-Phase Extraction, and Bedrock Extraction

This alternative involves constructing a subsurface permeable reactive barrier (PRB) wall to treat affected groundwater before it migrates off site. Treatment walls involve constructing permanent, semi-permanent, or replaceable units across the flow path of a contaminant plume. As groundwater flows though the treatment wall, contaminants are removed by physical, chemical, and/or biological processes.

It is assumed that the barrier wall would be a funnel-and-gate reactive wall with impermeable sections of the wall being used as a funnel to direct groundwater into the permeable gate sections of the wall. The permeable reactive section would consist of granular zero-valent iron and pea gravel. The reactive wall would be constructed by excavating a trench to approximately 60 feet below land surface perpendicular to groundwater flow.

PRB systems are not designed to treat free product areas. Thus, the PRB would not likely be used in the fuel oil GW Area #4 where free product is present. DPE would be performed in this area prior to installing the PRB to remove any free product from the subsurface. Finally, institutional controls would also be established.

Remedial Alternatives Soil

This section evaluates the soil remedies for the site. A detailed comparison is found in Table 6-2.

Alternative 1 : No Action

Under this alternative, no action would be taken to remediate any affected media at the site. Reassessments of conditions would occur at 5- year intervals in accordance with CERCLA.

Alternative 2 : Institutional Controls

This alternative includes implementation of deed restrictions that prevent prolonged exposure to COCs and control future use of the property. Fencing would be constructed around the soil areas of concern as an additional control. Reassessments of the site would be conducted every 5 years.

Alternative 3: Soil Excavation and Offsite Disposal

This alternative consists of excavating impacted material and then transporting this material off site to an appropriate regulated landfill. Soil would be excavated and then loaded onto trucks. The excavated material would then be landfilled in either a regulated solid waste landfill or, if the waste is determined to be hazardous, in a regulated hazardous waste landfill.

The existing buildings and structures within the areas of concern would be removed. Soils would be excavated in the VOC soil locations. One foot of soil would be excavated from the areas where PRGs are exceeded for metals. Material would be disposed of off-site at an appropriate regulated landfill. The excavations would be backfilled with clean soil. Institutional controls would be established to control future site use.

Alternative 4: Source Containment

This alternative includes installing a cap, or cover, over the soil areas of concern. The cap would be either a hydraulic barrier such as clay and/or a synthetic membrane liner. This alternative includes demolishing existing building structures in covered areas. Soil would be excavated to a depth of one foot in locations where metals exceed PRGs. Excavated soils for metals exceedances would be relocated to defined VOC location areas for capping. Soil areas of concern would be capped. The estimated combined surface area of the affected soil areas is approximately 300,000 square feet (approximately 7 acres). Surface water controls would be established to capture water and direct it around the perimeter of the cap. Institutional controls would be established to control site use.

Alternative 5: Soil Excavation and Onsite Ex-Situ Treatment

This alternative is similar to Alternative 3 except that excavated materials would be treated on site and returned to the excavation locations. Soils would be excavated and stored in a central area for staging and treatment. Excavation would include removal of soil to the impacted depth above the water table. The material would then be treated and returned to its original location as fill material. This alternative also includes additional institutional controls consisting of fugitive dust controls during excavation, transport, handling, and replacement; covering stockpiles with tarps or plastic sheeting; and surface water runoff controls.

Alternative 6: Soil Vapor Extraction

This alternative involves the in-situ treatment of affected soils. Organic COCs within the affected soil would be collected by SVE or, as a contingency, thermal enhanced SVE. This alternative also includes institutional controls and focused metals excavation.

An in situ SVE treatment system would be developed by installing a series of wells above the water table and applying a vacuum to the unsaturated soil. The soil vapor recovered by the wells would then be treated ex situ. Impermeable (geomembrane) covers are often placed on top of the soil to increase the radius of influence of the SVE wells and reduce short-circuiting of air in the subsurface. Existing concrete slabs might serve the same purpose as the geomembrane covers. This analysis assumes that the SVE wells will have a 20-foot radius of influence, and each well will be operated at a vapor flow rate of 20 cubic feet per minute. Approximately 600 SVE wells would be required.

Thermal enhancements include installing a series of electrodes to the subsurface above the water table. The electrodes heat the soil by electrical resistance, which increases the vadose zone permeability by reducing moisture and mobilizes VOCs from soil. Thermal enhancement can be applied as a contingency should the vapor extraction rates be limited by the geologic formation and prolonged SVE operation. As SVE removes the vapors, water condensed from the vapor stream and the extracted vapors require ex situ treatment.

Summary of Combined Soil and Groundwater Remedial Alternatives

This section presents combination alternatives for both soil and groundwater. Whereas the alternatives presented in the previous subsections were focused on applying technologies across all areas of concern, the alternatives in this section are more focused on applying different technologies, as appropriate, to different areas and on applying those technologies that treat groundwater and soil simultaneously. Treatment areas will be refined during remedial design.

Alternative 0 – No Action

Under this alternative no remedial action will be conducted and conditions will remain as they are currently except that the groundwater treatment system will no longer be operated. This alternative is used for a baseline of comparison of all other alternatives.

Alternative 1 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced Multi- Phase Extraction, and Deep Soil Mixing

This alternative involves hydraulic containment for groundwater and soil remediation consisting of hot spot removal, SVE in the Burn Pit Area, thermal-enhanced multi-phase extraction (MPE) in the Fuel Oil Area, and deep soil mixing with an oxidant. Specifically, this alternative includes the following components:

- Institutional controls.
- Excavation and offsite disposal of VOC Principal Threat Source Material (PTSM). This is calculated as any VOC whose concentration exceeds 1,000 times the corresponding SSL (covered or uncovered) for that location.
- Excavation and offsite disposal of metals in soil exceeding RGs outside of VOC treatment areas.
- SVE in the Burn Pit Area (if necessary).
- MPE with thermal enhancements in the Fuel Oil Area.
- Deep soil mixing with oxidant in VOC impacted areas in soil and regolith groundwater outside of the Burn Pit and Fuel Oil areas.
- Hydraulic containment with onsite physical/chemical treatment for both the regolith and bedrock hydraulic zones if necessary to limit the migration of COCs
- Groundwater and surface water monitoring.

Excavation of PTSM soil would be performed in areas where any VOC whose concentration exceeds 1,000 times the corresponding SSL. The excavated soil disposal would be at an offsite permitted facility.

The soil surrounding the PTSM locations and other soil exceeding the RGs for VOCs would be addressed using deep soil mixing with an oxidant to destroy the VOCs. In areas where the soil exceedances are above shallow groundwater having VOC concentrations in groundwater in excess of approximately 1,000 ug/L, the soil mixing depth would be extended through the vadose zone to the depth of auger refusal, estimated to range from 15 to 30 feet. In other areas with RG exceedances, identified by the shallow zones areas on **Figure 5-4**, soil mixing would extend to the depth of the water table, approximately 17 to 18 feet.

The oxidant selected for this analysis is potassium permanganate. The soil mixing is assumed to use mixing columns consisting of a system of overlapping augers or blade mixers.

This alternative also includes applying SVE to the Burn Pit Area soil. However, because of the limited amount of soil data currently available in the Burn Pit Area, additional assessment would be performed during the Remedial Design to confirm the need for SVE in this area.

The Fuel Oil Area under this alternative would be remediated using thermal-enhanced MPE. The thermal enhancements would be applied using electrical resistance heating (ERH) to volatize and mobilize the fuel oil for recovery as vapors using SVE and as free product liquid using total fluids extraction. MPE wells will be co-located with the ERH electrodes. Vapors and total fluids would be collected from the MPE wells. The treatment for this process would include condensate collection from the vapor, vapor treatment by thermal oxidation, disposal of fuel oil, and water treatment.

Thermal treatment using ERH would permanently destroy wells and other equipment located within the treatment area. As such, operation of the existing groundwater extraction and treatment system would cease during thermal treatment. For costing purposes, a new hydraulic containment system is assumed to be required under this alternative. If this alternative is selected, a more detailed analysis involving groundwater modeling and monitoring would be necessary to support decisions regarding the need for the hydraulic containment system following thermal treatment and the associated design of any such containment system. This alternative could also have a component of phytoremediation, where trees would be planted near the creek to treat groundwater before it discharges to the creek.

For scoping purposes ERH has been assumed as the thermal treatment technology. However, if this alternative is selected, other technologies, such as thermal conductive heating, will be evaluated during pre-design activities to determine the most effective approach for this site.

Following certain components of this remedial alternative, Monitored Natural Attenuation (MNA) may be warranted to assess further attenuation from areas that did not reach RGs and to ensure that COC concentrations in all treated areas remain below regulatory criteria. If MNA is not demonstrated as effective in this period, more active remediation may be warranted. MNA and associated monitoring are assumed to last for 10 years in regolith groundwater.

Alternative 2 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Air Sparging

This alternative involves hydraulic containment, thermal-enhanced MPE, and air sparging for groundwater, and soil remediation by hot spot removal and SVE. Specifically, this alternative includes the following components:

- Institutional controls (see Alternative 1).
- Excavation and offsite disposal of VOC PTSM (see Alternative 1).
- Excavation and offsite disposal of soil with metals exceeding RGs outside VOC treatment areas (see Alternative 1).
- SVE and air sparging for VOC impacted areas above the water table that exceed regulatory standards (see Alternative 1).
- Thermal-enhanced MPE for the Fuel Oil Area (see Alternative 1).
- Air sparging for VOC impacted areas in regolith groundwater following excavation of PTSM.
- Hydraulic containment with onsite physical/chemical treatment for the bedrock hydraulic zone if necessary to limit the migration of COCs(see Alternative 1).
- Groundwater and surface water monitoring.

Following certain components of this remedial alternative, MNA may be warranted to assess further attenuation from areas that did not reach RGs and to ensure that COC concentrations in all treated areas remain below regulatory criteria. If MNA is not demonstrated as effective, more active remediation may be warranted. For the purposes of the FS, MNA and associated monitoring are assumed to last for 10 years in regolith groundwater.

Alternative 3 – Hydraulic Containment, SVE, Thermal-Enhanced MPE, and In Situ Thermal Treatment

This alternative involves hydraulic containment in the regolith and bedrock zones, SVE in the Burn Pit Area, thermal-enhanced MPE in the Fuel Oil Area, and in situ thermal treatment for both soil and groundwater. Specifically, this alternative includes the following components:

- Institutional controls.
- Excavation and offsite disposal of metals exceeding RGs outside of VOC treatment areas (see Alternative 1).
- SVE in the Burn Pit Area, if necessary (see Alternative 1).
- Thermal-enhanced MPE for the Fuel Oil Area (see Alternative 1).
- In situ thermal treatment for select areas to treat for VOCs in soil and regolith groundwater (see Alternative 1).
- Hydraulic containment with onsite physical/chemical treatment for the regolith and bedrock hydraulic zones if necessary to limit the migration of COCs, except that the two most southern proposed regolith extraction wells are not included under this alternative (see Alternative 1).
- Groundwater and surface water monitoring.

Under this combination alternative, soil and regolith groundwater treatment using in situ thermal methods such as ERH would be applied to the areas of higher VOC concentrations to quickly reduce the COC mass to relatively low concentrations that will be protective of human health via direct contact. In general, these are the areas exceeding 1,000 mg/kg total VOCs in soil and 1,000 ug/L total VOCs in groundwater. If this alternative is selected, these areas will be refined during remedial design.

This technology would not be used to treat all areas of VOC contamination. However, it would have a remedial effect beyond the direct treatment zone through enhanced degradation and volatilization. For the purposes of this analysis, the indirect treatment zone for in situ thermal treatment is assumed to be a 50-foot perimeter surrounding each treatment zone.

Because this technology will not immediately treat all areas of VOC contamination, but is anticipated to accelerate attenuation outside of the immediate treatment zone, groundwater containment may be necessary for both the regolith and bedrock zones. If this alternative is selected, a more detailed analysis involving groundwater modeling and monitoring would be necessary to support decisions regarding the need for the hydraulic containment system following thermal treatment and the associated design of any such containment system. This alternative could also have a component of phytoremediation, where trees would be planted near the creek to treat groundwater before it discharges to the creek.

MNA may be warranted to assess further attenuation from areas that did not reach RGs and to ensure that COC concentrations in all treated areas remain below regulatory criteria. If MNA is not demonstrated as effective in this period, more active remediation may be warranted. MNA and associated monitoring are assumed to last for 10 years in regolith groundwater.

COMPARATIVE EVALUATION OF ALTERNATIVES

The National Contingency Plan requires DHEC to use specific criteria to evaluate 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. Because of the complex geology / hydrogeology of the site and the wide variety of COC types (fuel oil, chlorinated solvents, metals, etc.), there is no specific technology that is feasible for addressing all contaminated areas in a particular media.

Therefore, DHEC is only performing a comparative evaluation of the No Action and Combined Alternatives 1 through 3, which use multiple technologies to treat various areas of soil and groundwater contamination. The FS includes evaluation of all remedial alternatives and is summarized in FS Tables 6-4 and 6-5. The criteria for this evaluation are listed below:

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 degree to which site-related risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Alternative 0 - No Further Action

This alternative would not be protective of human health and the environment. The shutdown of the groundwater treatment system could allow contaminated groundwater to discharge into the creek and migrate offsite. There would be no increased protection of human health and the environment.

Because the "No Action" alternative is not protective of human health and the environment, it was eliminated from consideration under the remaining criteria.

Alternative 1 - Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Deep Soil Mixing

Performing thermal-enhanced MPE in the Fuel Oil Area, and using deep soil mixing with an oxidant in other VOC impacted areas is expected to be protective of human health and the environment because it removes the areas with the highest concentrations of COCs and treats source material while using different techniques in the remaining soil impacted areas. Future releases of COCs to groundwater and surface water would be reduced, and hydraulic containment of groundwater (to the extent necessary) would limit the migration of COCs. However, limited groundwater treatment is proposed under this alternative. The deep soil mixing would be applied to regolith groundwater with VOCs generally exceeding 1,000 ug/L. Monitoring proposed under this alternative would be annual and would allow evaluation of whether additional actions need to be taken.

Alternative 2 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Air Sparging

This alternative would be expected to be protective of human health and the environment. PTSM excavation and SVE would significantly reduce COC concentrations in soil, and thermal-enhanced MPE and air sparging with hydraulic containment of groundwater would significantly reduce COC concentrations in groundwater. Monitoring proposed under this alternative would allow for evaluation of whether additional actions need to be taken.

Alternative 3 – Hydraulic Containment, SVE, Thermal-Enhanced MPE, and In Situ Thermal Treatment

Thermal treatment would destroy the largest mass of COCs in soil and groundwater. SVE and enhanced thermal MPE would reduce the product in the soil and groundwater in the fuel oil areas.

Alternative 3 is expected to be the most protective of human health and the environment when compared to the other alternatives and applied to the same areas of concern. In situ thermal treatment is a demonstrated technology for multiple chemical types and for substantial contaminant concentration reductions. Monitoring proposed under this alternative would allow for evaluation of whether additional actions need to be taken.

2. Compliance with State and Federal Regulations (ARARs – Applicable or Relevant and Appropriate Requirements)

Each of the alternatives is evaluated with respect to its ability to comply with applicable state and federal regulations.

Alternative 1 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Deep Soil Mixing

This alternative would likely achieve chemical-specific ARARs for a majority of the impacted soil since much or all of the source material would be excavated and disposed off-site or treated to below RGs. Chemical-specific ARARs may not be met for several years in regolith and bedrock zone groundwater though concentrations would be expected to decline with the treatment of source material in soil and the areas of higher regolith zone VOCs. All location- and action-specific ARARs would be expected to be met.

Alternative 2 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Air Sparging

This alternative would likely achieve chemical-specific ARARs for a majority of the site in both soil and groundwater. RGs may not initially be met for bedrock groundwater, but the significant reductions in regolith and vadose zone concentrations should yield reductions in bedrock groundwater concentrations over time. All location- and action-specific ARARs should be met.

Alternative 3 – Hydraulic Containment, SVE, Thermal-Enhanced MPE, and In Situ Thermal Treatment

This alternative would likely achieve chemical-specific ARARs for a majority of the site in both soil and groundwater. RGs may not initially be met for bedrock groundwater, but the significant reductions in regolith and vadose zone concentrations should yield reductions in bedrock groundwater concentrations over time. All location- and action-specific ARARs should be met.

Alternative 3 would treat the largest portion of the site to remedial goals in the fastest time and would meet the ARARs faster than the other active remedial alternatives.

3. Long-Term Effectiveness and Permanence

This factor considers the ability of an alternative to maintain protection of human health and the environment over time.

Alternative 1 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Deep Soil Mixing

With the removal of COCs from soil via excavation and onsite treatment, long-term public health threats would be minimal. Hydraulic containment is included to the extent necessary to limit migration of COCs to surface water and potential offsite receptors. Deed restrictions and institutional controls would still be required to limit access to any COCs that remain on site, particularly in groundwater.

Alternative 2 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Air Sparging

With the removal of COCs from soil via excavation and onsite treatment, long-term public health threats would be minimal. Hydraulic containment is included to the extent necessary to limit migration of COCs to surface water and potential offsite receptors. Deed restrictions and institutional controls would still be required to limit access to any COCs that remain on site, particularly in groundwater.

Alternative 3 – Hydraulic Containment, SVE, Thermal-Enhanced MPE, and In Situ Thermal Treatment

This alternative is expected to be effective in meeting the RAOs established for the site. With the removal of COCs from both soil and regolith groundwater, long-term public health threats would be minimal. Long-term monitoring (of media and institutional controls) would identify any ongoing risks that the site poses to human health and the environment.

Alternative 3 would treat the largest portion of the site to remedial goals faster than the other active remedial alternatives.

4. Reduction of Toxicity, Mobility or Volume through Treatment (T/M/V)

This factor evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Alternative 1 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Deep Soil Mixing

Excavation and onsite treatment would effectively reduce the T/M/V of COCs in soil. This alternative would also be effective in reducing the mobility of COCs in groundwater where deep soil mixing is applied. However, groundwater extraction for COCs will only partially reduce the toxicity and volume of COCs in groundwater, particularly in the bedrock zone.

Alternative 2 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Air Sparging

Alternative 2 would be effective in reducing the T/M/V of COCs in both soil and shallow groundwater. The mobility of COCs in bedrock groundwater would also be reduced, and toxicity and volume of COCs should decline in bedrock after removing COC concentrations in the regolith and vadose zones.

Alternative 3 – Hydraulic Containment, SVE, Thermal-Enhanced MPE, and In Situ Thermal

Alternative 3 would be effective in reducing the T/M/V of COCs in both soil and shallow groundwater. The mobility of COCs in bedrock groundwater would also be reduced, and toxicity and volume of COCs should decline in bedrock after thermal treatment in the regolith and vadose zones.

Overall Alternatives 1-3 all give reductions in mobility, toxicity and volume by treatment in soil and groundwater. Alternative 3 would treat the largest area and therefore be more effective than the other active alternatives.

5. Short-Term Effectiveness

The short-term effectiveness evaluation considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

Alternative 1 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Deep Soil Mixing

The construction and treatment phase of this alternative would likely be accomplished within approximately five years. Short-term impacts associated with this alternative include disturbance and mobilization of soils during excavation, well installation, and backfilling activities; exposure to soil gas during SVE and MPE activities; and the potential of worker exposure to oxidant during deep soil mixing. Additionally, demolition of existing buildings may include worker risks for potential asbestos exposure. Thermal treatment also uses high voltage, but operation is relatively straightforward after installation. Risks associated with construction and treatment should be considered moderate.

Onsite workers would be adequately protected from short-term risks by using appropriate personal protective equipment and by following proper operating and safety procedures. Short-term air quality impacts to the surrounding environment may occur during soil grading and SVE activities. Air monitoring would be performed at the property boundaries, and fugitive dust emissions would be controlled by applying water as needed to surfaces receiving heavy vehicular traffic. Other potential short-term impacts to the surrounding area could include increased vehicular traffic and associated safety hazards, and noise.

Alternative 2 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Air Sparging

The construction and treatment phase of this alternative would likely be accomplished within 10 years. Short-term impacts associated with this alternative include disturbance and mobilization of soils during excavation, well installation, and backfilling activities; and worker exposure to soil gas during air sparging and SVE activities. Additionally, thermal treatment uses high voltage, but operation is relatively straightforward after installation. Risks associated with construction and treatment should be considered moderate.

Onsite workers would be adequately protected from short-term risks by using appropriate personal protective equipment and by following proper operating and safety procedures. Short-term air quality impacts to the surrounding environment may occur during soil grading and SVE activities. Air monitoring would be performed at the property boundaries, and fugitive dust emissions would be controlled by applying water as needed to surfaces receiving heavy vehicular traffic. Other potential short-term impacts to the surrounding area could include increased vehicular traffic and associated safety hazards, and noise.

Alternative 3 – Hydraulic Containment, SVE, Thermal-Enhanced MPE, and In Situ Thermal Treatment

The construction and treatment phases of this alternative would likely be accomplished within five years. Minimal contact with soil or groundwater is anticipated following well construction. However, if not properly monitored and if necessary controlled, vapors from thermal treatment could be a risk to workers. Thermal treatment also uses high voltage, but operation is relatively straightforward after installation. Risks associated with construction and treatment should be considered moderate.

Onsite workers would be adequately protected from short-term risks by using appropriate personal protective equipment and by following proper operating and safety procedures. Short-term air quality impacts to the surrounding environment may occur during thermal treatment. Other potential short-term impacts to the surrounding area could include increased vehicular traffic and associated safety hazards, potential dust generation, and noise.

Of the active treatment the most protective in the short term would be Alternative 3 with Alternative 1 being the least effective in the short term.

6. Implementability

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

Alternative 1 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Deep Soil Mixing

Excavation, SVE, and extraction well installation utilize standard construction practices. More specialized construction is required for the thermal-enhanced MPE and deep soil mixing, but no significant construction issues would be expected to be encountered. Treatability testing would be required prior to full-scale implementation. Associated permits would be obtained from SCDHEC prior to implementation of this alternative.

Alternative 2 – Hydraulic Containment, Select Excavation, SVE, Thermal-Enhanced MPE, and Air Sparging

All technologies proposed for this alternative utilize standard construction practices. More specialized construction is required for the thermal-enhanced MPE, but no significant construction issues would be expected to be encountered. Treatability testing would be required prior to full-scale implementation. Associated permits would be obtained from DHEC prior to implementation of this alternative.

Alternative 3 – Hydraulic Containment, SVE, Thermal-Enhanced MPE, and In Situ Thermal Treatment

In situ thermal treatment utilizes standard construction practices combined with more specialized equipment. However, the number of vendors for each thermal technology type is limited. No significant construction issues are expected to be encountered. Associated permits would be obtained from SCDHEC prior to implementation of this alternative.

Alternative 3 would be the easiest alternative to implement of the active alternatives, with both Alternative 1 and 2 being more difficult.

7. Cost

The cost analysis evaluated capital costs and annual operation and maintenance (O&M) costs. The net present value of an alternative is the sum of initial capital costs and the discounted value of O&M costs over the lifespan of the remedy.

Alternative 0 – $0
Alternative 1 – $43.2 million.
Alternative 2 – $29 Million
Alternative 3 – $35.9 million.

Community Response

Community acceptance of the preferred remedy will be evaluated after the public comment period ends. 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 based on public comments or new information provided during the public comment period.

SUMMARY OF THE DEPARTMENT'S PREFERRED ALTERNATIVE

The Department has identified Combined Alternative 3 - Hydraulic Containment, SVE, Thermal Enhanced MPE and In Situ Thermal Treatment as its preferred remedy for the site.

This alternative involves hydraulic containment in the regolith and bedrock zones (if necessary), SVE in the Burn Pit Area (if necessary), thermal-enhanced MPE in the Fuel Oil Area, and in situ thermal treatment for both soil and groundwater. Specifically, this alternative includes the following components:

- Excavation and offsite disposal of metals exceeding RGs outside of VOC treatment areas.
- SVE in the Burn Pit Area, if necessary.
- Thermal-enhanced MPE for the Fuel Oil Area.
- In situ thermal treatment for select areas to treat for VOCs in soil and regolith groundwater.
- Hydraulic containment with onsite physical/chemical treatment for the regolith and bedrock hydraulic zones, as described, if necessary to limit the migration of COCs.
- Groundwater and surface water monitoring.
- Institutional controls.

Figure 5-6 outlines the approximate treatment areas for this alternative and the associated technologies. These areas will be refined during remedial design. The implementation of this alternative would include sequencing of various elements so that the anticipated benefits associated with one element can be evaluated and taken into account in the implementation of subsequent stages. The precise sequencing will be described and justified during the design process conducted prior to remedy implementation.

Based on the total mass removal and proven ability of in situ thermal remediation by ERH (or a similar technology) to remediate high concentration VOCs in soil and groundwater quickly, this alternative is expected to be the most protective of human health and the environment when compared to the other remedial alternatives. Thermal remediation would significantly reduce the Toxicity, Mobility and Volume (T/M/V) of COCs in both soil and groundwater in a short timeframe. While thermal remediation is typically not used to treat groundwater in bedrock, bedrock groundwater concentrations would be expected to decline significantly in the immediate vicinity of the treatment zone and then continue to decline once thermal treatment in the regolith and vadose zones is complete. The hydraulic containment system, to the extent necessary, would limit the mobility of COCs that remain in regolith and bedrock groundwater.

Implementation of this alternative is considered technically feasible and would require specialty construction methods. The number of vendors providing thermal remediation services is limited but sufficient to promote competition. Those vendors that do exist have demonstrated a high level of success on several projects.

The cost for this alternative falls between the other two combination alternatives. The costs are also moderate when comparing to combinations of individual groundwater and soil alternatives. In general, in situ thermal treatment costs are high compared to other remedial alternatives. However, the treatment area proposed for this alternative is slightly smaller than for some of the other alternatives. This reduces overall costs. The identified treatment area still provides a high level of COC reduction. Additionally, the actual completion costs for in situ thermal treatment tend to be closer to initial estimates than for other alternatives because the technology is less susceptible to unpredictably variable field conditions.

Capital costs for this alternative include extraction well installation; thermal well, SVE well, and thermal treatment system installation; groundwater treatment system upgrades; institutional controls; and limited excavation. Although relatively short term, O&M costs also exist and include media monitoring and O&M for the thermal remediation system. Electrical power is one of the primary factors affecting in-situ thermal treatment costs, and power costs are driven by system operation duration. Careful planning, design, and understanding of existing conditions are needed to minimize the cost and the duration of thermal treatment.

COMMUNITY PARTICIPATION

The Department will evaluate comments from the public before selecting a final alternative. A comment period has been established to allow the public an opportunity to submit written comments to the Department. The community is also invited to a public meeting where the Department will discuss the Feasibility Study results, present the preferred alternative, and accept comments on the remedial alternatives.

The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files, are provided on the first page of this Proposed Plan.

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Technical Reports

- ♦ **Remedial Investigation (RI)** identifies the potential sources of contamination; and determines what contaminants are at the site, and the extent of the contamination.
- ♦ **Feasibility Study (FS)** considers various cleanup alternatives for the soil and groundwater.
- ♦ **Proposed Plan (PP)** describes cleanup alternatives to address contamination.
- ♦ **Record of Decision (ROD)** identifies the selected cleanup method.
- ♦ **Remedial Design (RD)** is the development of specifications and drawings necessary for the construction and implementation of the ROD.

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for the Former Philip Service 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 September 26, 2014. If you have any questions, please contact Lucas Berresford at 803-898-0747. You may also submit your questions and/or comments electronically to berresjl@dhec.sc.gov.