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April 18, 2017

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SITE ASSESSMENT, REMEDIATION & REVITA...

Ms. Addie Walker
Bureau of Land and Waste Management
SC Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

Regarding: Phase II Remedial Investigation Work Plan
Shakespeare Composite Structures Site
Newberry, South Carolina
SCDHEC VCC Number 14-6271-RP

Dear Ms. Walker:

Please find attached one hard copy and one electronic copy (on compact disc) of the Phase II Remedial Investigation Work Plan (Phase II RIWP) for the Shakespeare Composite Structures Site (the Site) located in Newberry, South Carolina. This work plan is being submitted at the request of the South Carolina Department of Health and Environmental Control (SCDHEC) as a result of the January 23, 2017 meeting regarding the status of the investigative efforts at this Site and in accordance with voluntary clean-up contract (VCC) number 14-6271-RP.

Should you have any questions regarding the work plan, please feel free to contact me at your convenience.

Sincerely,
AECOM Technical Services, Inc.

Scott E. Ross, P.G.
Project Manager
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cc: Ms. Dianne Murphy – Philips Lighting North America

(98)

AECOM Technical Services, Inc.

Submitted by:
AECOM Technical Services, Inc.
Columbia, S.C
April 2017

Phase II Remedial Investigation Work Plan

Shakespeare Composite Structures, LLC

Voluntary Cleanup Contract 14-6271-RP

File # 51025

19845 US Highway 76

Newberry, SC

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19845 US Highway 76

Newberry, SC

Prepared By: Scott E. Ross, P.G.
Project Manager

Reviewed by: Walter Gerald, P.G
Sr. Program Manager

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List of Acronyms

BLS	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2 DCE	cis-1,2 - dichloroethene
CVOCs	chlorinated volatile organic compounds
DI	deionized
DO	dissolved oxygen
DOT	Department of Transportation
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
FBQSTP	Field Branches Quality System and Technical Procedures
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HSA	hollow stem auger
IDW	investigation derived waste
MCL	maximum contaminant level
NGVD	National Geodetic Vertical Datum
NTu	Nephelometric Turbidity Units
µg/L	micrograms per liter
mg/L	milligrams per liter
ORP	oxidation-reduction potential
PCE	tetrachloroethene
PPE	personal protective equipment

List of Acronyms (continued)

QC	quality control
RECs	recognized environmental conditions
RI	remedial investigation
RSL	Regional Screening Level
SC	Specific Conductance
SESD	EPA Region IV Science and Ecosystems Support Division
SOPs	Standard Operating Procedures
SU	Standard Unit
TCE	trichloroethene
TCL	Target Compound List
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VCC	voluntary cleanup contract
VOCs	volatile organic compounds

1.0 INTRODUCTION

The Shakespeare Composite Structures, LLC (Shakespeare) facility has been designing and producing fiberglass products at their manufacturing facility located in Newberry, South Carolina (the facility) since the mid-1960s. In December 2013, Shakespeare retained AECOM Technical Services, Inc. (AECOM) to perform a Phase I Environmental Site Assessment (Phase I ESA) at their facility. The Phase I ESA was followed by a Phase II ESA, which investigated several potential area of environmental concern identified at the facility during the Phase I ESA. Results of the Phase II ESA led to several subsequent phases of investigative efforts at the Site and vicinity. These investigations have identified concentrations of chlorinated volatile organic compounds (CVOCs) in soil and groundwater beneath the facility and adjacent properties. As a result of the investigative findings, Philips Electronics North America (PENAC) and the South Carolina Department of Health and Environmental Control (SCDHEC) entered into a Responsible Party-Voluntary Cleanup Contract (VCC). The VCC includes plans to complete a Remedial Investigation (RI) and Risk Assessment (RA) at the Shakespeare site. Philips Lighting North America (PLNA), a division of PENAC has retained AECOM to assist with completion of RI and RA efforts at the Site. This document serves as the Phase II Remedial Investigation Work Plan (Phase II RIWP). The Work Plan Addendum outlines the rationale for performing additional investigative efforts and the technical approaches that will be used to collect additional data from the Shakespeare site.

1.1 Physical Setting

The Shakespeare facility is located on US Highway 76, approximately 1 mile northwest of the City of Newberry (**Figure 1-1**). The Shakespeare facility occupies 24.24-acres. The property includes the main production building and the pole winder building, totaling approximately 250,000 square-feet under roof. The property also has several smaller structures located at the west end of the property including a less than 90-day hazardous waste storage building, a residual resin curing building, along with other smaller storage buildings.

An asphaltic employee parking lot is located to the southwest of the main building, which is accessed from U.S. Highway 76 to the southwest of the subject property (**Figure 1-2**). The south end of the property contains another asphalt-paved area, which is the former employee overflow parking area where equipment and other materials currently are staged. There is a covered shed area at the southeast end of the property where finished products are packaged and staged for shipment. The area between the two buildings in the center of the property is mostly grassed and is used for equipment or material storage (i.e. forklifts, compressors, molds for poles and other products), and some grassed areas are present at the west and northwest sides of the property. Loading docks are located on the northwest and southeast corners of each building and are accessed via concrete-paved or asphalt-paved driveways from U.S. Highway 76. The northwest, northeast, and southeast perimeters of the subject property are fenced, and locking gates are present at the two driveways beyond the employee parking lot .

General land use surrounding the facility consists of agricultural, residential, undeveloped and commercial/light industrial properties. Uses of adjacent properties identified during the site visit are as follows:

North: The facility is bordered immediately to the north by a Norfolk Southern rail line and undeveloped land planted with pine trees. The property bounding the facility to the north beyond the rail line is owned by J.L. Dickert.

East: The facility is bordered immediately to the east by a residential parcel, beyond which is vacant land (pine trees) and vacant buildings formerly occupied by the Dickert Lumber Company. The property east of the private residence up to Lumber Road is also owned by J.L. Dickert.

South: The facility is bordered to the south by U.S. Highway 76 and properties owned by the Newberry County Airport and Walter Shealy. The property owned by Mr. Shealy is primarily farmland with a few small residences located sporadically across the more than 60 acres.

West: There are three residential properties located immediately to the west of the facility. The property that lies adjacent to the west of the facility is owned by Harriet Boazman. The properties to the west of the Boazman property are owned by Edna Ringer and Kimberly Chapman, respectively.

1.2 Site Operational Background

The facility is used for the design and manufacture of large fiberglass utility poles, cross arms, and other fiberglass outdoor products (such as signs and sign posts). According to information reviewed in previous documents and confirmed with Shakespeare personnel, the subject property was undeveloped, wooded land until 1965. The main building was constructed in the mid-1960s and used for fiberglass production. The pole winder building reportedly was constructed in the late 1970s.A more detailed summary of the facility's operational background and history are included in the Phase I ESA report (AECOM, 2014a).

1.3 Summary of Previous Investigative Efforts

As mentioned above, Shakespeare retained AECOM to assist with multiple ESAs to determine if the facility had any environmental issues or concerns. The ESAs were followed by multiple phases of more in-depth subsurface investigations both at the facility and on properties adjacent to the facility. The previously completed activities are briefly summarized below.

Phase I ESA. Completed in January 2014: Identified several recognized environmental conditions (RECs) at the site that led to the Phase II ESA.

Phase II ESA. Implemented in late January 2014: Included the collection of soil samples from several of the RECs identified in the Phase I ESA along with the collection of groundwater samples from beneath several portions of the facility. The Phase II ESA indicated that several chlorinated volatile organic compounds (CVOCs) including trichloroethene (TCE), and degradation compounds cis-1,2 dichloroethene (cis-1,2 DCE) and vinyl chloride (VC) are present above their respective drinking water standards (US Environmental Protection Agency [USEPA] maximum contaminant levels – MCLs) in groundwater beneath the facility. Results of the Phase II ESA are discussed in more detail in the Site Investigation Summary (AECOM, 2014b).

Site Investigation. A broader site investigation was implemented at the request of PENAC in April 2014. This work included the installation and sampling of several temporary and permanent monitoring wells as well as the collection of additional soil samples at the facility. Results further verified the presence of CVOCs in groundwater beneath the facility.

In May 2014, the investigation efforts expanded to include a more elaborate soil sampling program designed to delineate the source areas within the main and pole winder buildings, installation and sampling of additional monitoring wells, and collection of samples from several private water wells surrounding the facility. This phase of the investigation detected CVOCs in soil beneath both buildings, and indicated a more expansive area of CVOC impact in groundwater beneath the Site. Sampling of groundwater from private wells also indicated that several wells located downgradient (west and southwest of the facility) contained elevated CVOC concentrations.

Expanded Investigation. In July 2014, PENAC implemented an Expanded Investigation at the site. This included multiple phases of groundwater investigation activities on properties to the north, west, and southwest via installation of temporary wells, and installation of permanent shallow wells on these properties. This phase of investigation also included installation of several additional permanent shallow, several intermediate and bedrock monitoring wells, and collection of surface water samples (AECOM, 2014b).

The results of the Expanded Investigation efforts indicate that the lateral extent of CVOC impact to groundwater in multiple depth zones had been defined in most directions, with a limited number of data gaps that remain to be addressed.

Expanded Investigation Addendum. From December 2015 through February 2016: PENAC conducted additional groundwater investigations to fill data gaps for the shallow zone, intermediate zone, and in bedrock beneath the Site. 14 wells were installed in the shallow, nine(9) intermediate, and two (2) bedrock wells were installed during this phase of the investigation.

However, due to data gaps in not bounding the impacts, at the request of SCDHEC, a three-dimensional model was requested to be completed and submitted to SCDHEC (submitted in September 2016) to support the assessment of the locations of the next set of wells to be installed to bound the impacts in the three zones of impacted groundwater (shallow, intermediate, and bedrock).

Based upon a meeting with SCDHEC (January 2017), the locations of the next set of wells to be installed to bound the impacts in the three zones of impacted groundwater was agreed upon for next steps and that is below further discussed.

1.4 Phase II Remedial Investigation Objectives

SCDHEC has reviewed the results of the investigative efforts performed to date and has requested Shakespeare submit a plan to complete the delineation of the vertical and horizontal extent of CVOC impacts to groundwater both on- and off-Site, and to evaluate the potential risks these compounds pose to human health and the environment. The investigation and risk evaluation information will be used to determine if a remedy for the CVOC impacted groundwater is necessary.

This Phase II RIWP presents the scope of the investigative efforts and the procedures to be used during the completion of the RI. Based on the information collected to date from the Site, the objectives of the Site Investigation are as follows:

- Verify the horizontal extent of CVOCs off-Site in the shallow groundwater with the installation of one additional permanent monitoring well off-site (proposed northwest of MW12 west of the Dickert property, subject to field conditions).
- Conduct further evaluation of groundwater quality in the intermediate zone off-Site to determine the distribution of elevated CVOC concentrations at greater depths above bedrock (estimated that four intermediate wells be installed one west of MW20I; one north of MW-12, near MW-14, and one near MW-17, subject to field conditions) Conduct further evaluation of groundwater quality in the shallow bedrock on properties surrounding the former Shakespeare facility (it is proposed that one will be located southeast of water well PW-2; one will be located west of RDW-2, one will be located between MW-11 and MW-12, and one will be located southeast of MW17, subject to field conditions)
- Implementation of a semi-annual groundwater sampling program using the permanent monitoring well network to be established at the Site; and
- Provide data to be used in evaluation of the potential risks the CVOCs may pose to possible human and or ecological receptors.

The following sections of the Phase II RIWP present the rationale for the investigation and describe, in detail, the sampling methods to be used during Phase II RI field activities.

2.0 RATIONALE FOR SITE INVESTIGATION

Previous rounds of investigation have included the collection of soil and groundwater samples from numerous locations across the Site and off-Site. The results of the previous investigative efforts have indicated the presence of CVOCs TCE, cis-1,2 DCE and VC in groundwater above their respective drinking water standards in multiple groundwater samples from beneath the Site as well as locations on private property to the north and west of the Site. In accordance with the RP-VCC, PLNA has developed this work plan presenting investigative efforts to be used to determine the extent of impact to environmental media at the Site. This section discusses the rationale and objectives for the implementation of the Phase II RI.

2.1 Soil

During the Phase II ESA and initial phase of the Site Investigation, numerous surface and subsurface soil samples were collected from beneath the Shakespeare facility. The results of the soil investigation efforts to date have identified limited areas of CVOC impacts in soil. None of the reported concentrations exceeded USEPA Regional Screening Levels (RSLs) nor was an obvious source area(s) defined.

2.1.1 Soil Source Area Determination

In order to verify that definitive source areas are not present beneath the main building and pole winder building, PLNA is performing an additional soil investigation in these areas. This will include a two stage process briefly discussed below:

Sub-slab Soil Vapor Sampling

The first stage entails collection of sub-slab soil gas samples on a grid system established for each building. Soil gas samples will be collected from approximately 24 locations beneath the west end of the main building and 15 locations beneath the west end of the pole-winder building using passive soil gas sampling devices, spaced on a 20-foot grid system **(Figure 2-1**). The soil-gas sampling effort will take approximately two weeks to complete. The first portion includes installation of the passive samplers, followed by sample collection and then shipment of the samplers approximately two (2) weeks after they are installed to the laboratory for analysis. Sub-slab soil vapor samples will be submitted to Beacon Environmental Services, Inc. (Beacon) and analyzed for Target Compound List -Volatile Organic Compounds (TCL-VOCs) using SW-846 Method 8260c.

Confirmation Soil Sampling

Upon receipt of the sub-slab vapor results, PLNA and AECOM will collect confirmation soil samples from three (3) locations beneath the floor within each building for laboratory analysis. The locations of the soil borings will be determined based on the results of the soil vapor sampling effort. Soil samples designated for laboratory analysis will be collected at two foot intervals from land surface to the water table. It is estimated that eight (8) soil samples will be collected from each of the confirmatory borings for analysis. The results of the sub-slab soil vapor and confirmatory analyses will be used to determine if CVOC hot spot areas are present in the subsurface soils beneath the plant buildings.

2.1.2 Soil Vapor Migration

AECOM is also proposing to use the passive soil-vapor samplers to determine if COVCs are present in soil vapor at property boundaries to the north and west. AECOM will install six (6) passive diffusion samplers along a transect that borders the agricultural property to the north of the plant, and six samplers along a transect that borders the property to the west of the plant. Soil vapor sampling devices collected from these areas will also be submitted to Beacon for TCL VOC analysis. The proposed soil vapor sample locations are also depicted on **Figure 2-1**. The results of this sampling effort will be used to determine if additional soil vapor sampling may be required on the private parcels.

2.2 Groundwater

Investigative efforts to date have determined that elevated concentrations of CVOCs in groundwater extend to multiple depths from beneath the facility to the north and west. The intent of the additional groundwater investigative efforts presented in this work plan is to fill-in data gaps in each groundwater zone identified by PLNA and SCDHEC. This will be accomplished using a variety of methods including the installation and sampling of permanent wells and vertical profiling of groundwater quality. This section briefly discusses the rationale for the investigative efforts in groundwater.

2.2.1 Shallow Zone

As shown on **Figure 2-2**, the lateral extent of elevated impacts to shallow groundwater has been generally delineated in all directions. However, the TCE concentration in shallow well MW-12, located on the Dickert property, has slightly higher concentrations than many of the other shallow wells in this area. As a result, based on the general north to northwest groundwater flow direction in this area, an additional well (MW26) located down gradient of MW-12 has been recommended by SCDHEC.

2.2.2 Intermediate Zone

During the previous phase of work, PLNA utilized vertical profiling of groundwater quality to determine the impact to groundwater between the shallow zone (water table) and the underlying bedrock in several portions of the Site. However, the lateral extent of impact in this depth interval has not been fully delineated to the north and west of the plant area; therefore, based on a meeting with SCDHEC in January 2017, it has been requested that additional intermediate wells be installed to more fully delineate the horizontal extent of CVOCs. As a result, PLNA and AECOM will again utilize the vertical profiling process to delineate the vertical and lateral extent of impact in the intermediate zone at a total of four locations; including one on the Chapman property to the west of the plant (MW19I), and three locations on the Dickert property (MW12I, MW14I, and MW17I) (**Figure 2-3)**.

The depths at which the vertical profiling efforts will be initiated in each well boring will depend on the depth of the nearest shallow well. The anticipated depths at which the profiling will be initiated at a particular location are presented in **Table 2-1**.

Historically the profiling process utilized on-site analysis with the Color-Tec® screening methodology; however, due to the anticipated lower CVOC concentrations to bound the impacts this technology is not as accurate as desired. Therefore, the vertical profiling process during this phase of work will include analysis of groundwater samples by Shealy Environmental Services, Inc. (Shealy) located in West Columbia, South Carolina. PLNA and AECOM will coordinate with Shealy regarding delivery of samples to the laboratory as soon as possible after collection with rapid reporting of analytical results. Results of the vertical profiling analyses will be used to determine the ultimate location and depth at which intermediate zone monitoring wells will be installed.

2.2.3 Bedrock Groundwater Investigation

The bedrock well installation program completed to date determined the horizontal extent of CVOCs in several directions. However, SCDHEC has requested that additional bedrock wells be installed to more fully delineate the horizontal extent of CVOCs. As a result, four additional bedrock wells will be installed at locations requested by the SCDHEC. This includes two to the north of the plant on Dickert property (MW12D and MW17D), one to the west on Chapman property (MW19D), and one to the southwest of the plant on Shealy property (SDW3).

PLNA and AECOM will also use vertical profiling to determine the vertical extent of impact in bedrock fracture zones in each new well. The intent of this effort is to locate the shallowest, productive fracture zone that is not impacted by CVOCs. An inflatable packer system will be used to isolate fracture zones and allow collection of groundwater samples from discrete intervals. Groundwater samples from the bedrock wells will also be forwarded to Shealy for rapid turnaround analysis. Each bedrock well will be screened within the fracture zone interval(that is found to not be impacted by CVOCs.

2.2.4 Monitoring Well Sampling

Groundwater from each of the existing and new monitoring wells installed during this phase of work will be sampled as part of a semi-annual site-wide sampling effort. Groundwater samples collected from each well, at a minimum, will be analyzed for TCL VOCs. Several wells will also be tested for additional parameters as discussed in Section 2.5, below. The wells to be sampled as part of this synoptic event will include the following:

- Nine (9) shallow wells(MW-1 through MW-9), six intermediate wells (MW2I, MW3I, MW5I, MW6I, MW7I), and five bedrock wells (MW2D, MW3D, MW6D, MW&D, and MW9D) on the plant site;
- Ten (10) shallow wells located within the plant buildings (TMW-21, TMW-22, TMW-23, TMW-24, TMW-25, TMW-29, TMW-30, TMW-31, TMW-32, and TMW-33);
- Nine (9) shallow wells (MW10 through MW18), one intermediate well (MW10I), and one bedrock well (MW18D) located on Dickert property;
- One shallow well (MW19) on the Chapman property;
- Two shallow wells (MW20 and MW21), and two intermediate wells (MW20I and MW21I) on the Boazman property;
- Two bedrock wells (RDW1 and RDW2) on the Ringer property;

- Three shallow wells (MW23, MW24, and MW25), one intermediate well (MW24I) and two bedrock wells (SDW1 and SDW2) on the Shealy property;
- One (1) newly proposed shallow well (MW26);
- Four (4)) newly proposed intermediate wells; and
- Four (4) newly proposed bedrock wells (MW12D, MW17D, MW19D and SDW3).

Table 2-2 lists the wells to be sampled during this phase of work and the proposed analytical parameters for each well. Monitoring wells will be purged and sampled in accordance with protocols referenced in section 3.2.4 below.

2.3 Water Well Sampling

In addition to the monitoring well network, groundwater samples will also be collected from a select number of water wells located to the west of the Site. The wells to be sampled include the Boazman well and the Chapman well (PW-4). Each sample will also be analyzed for TCL VOCs. **Table 2-2** also lists the water wells to be sampled during this phase of work.

Water wells will be purged and sampled in accordance with protocols referenced in Section 3.2.4 below.

2.4 Surface Water

Based on field observations during previous phases of work at the Site, it appears that shallow groundwater may discharge to shallow creeks that bound the northern and western portions of the impacted area (**Figure 2-5**). During the previous phases of work, three surface water samples (SW-1 though SW-3) were collected from a shallow creek that bounds the northern impacts on the Dickert property.

As part of this investigative effort, Shakespeare will collect additional surface water samples from three locations on the Dickert property and from approximately two (2) locations in the creek west of the Site, on the Shealy Property. The proposed sample locations are depicted on **Figure 2-5**. Procedures to be used for surface water sample collection are discussed in Section 3.2.4.

2.5 Sample Analysis

Groundwater, soil, soil vapor and surface water samples will be collected for laboratory analysis during this investigation. Soil vapor samples will be analyzed for TCL VOCs using EPA SW-846 analytical method 8260c. Groundwater, soil, and surface water samples collected during this investigation will also be analyzed for the TCL VOC suite of parameters.

In addition groundwater samples collected from ten (10) monitoring wells will also be analyzed for a specific list of biological and additional geochemical parameters to assess for potential remedial parameters. The wells to be used for the biogeochemical analyses have been selected based on their locations within the TCE plume:

Shallow wells – MW1, MW6, MW8, MW10, MW20

Intermediate wells – MW6I, MW9I, MW10I, MW20I

Bedrock wells – MW6D

The additional parameters include the following:

- Electron acceptors - ferric iron, manganese, sulfate
- Degradation/end products - ferrous iron, dissolved manganese, sulfide, carbon dioxide, ethene, ethane, methane
- Biological Parameters – *dehalobacter*, *dehalococcoides,* and functional genes

As indicated above, **Table 2-2**lists the samples to be collected during this investigation and the parameters for which samples will be analyzed during this round of investigation.

3.0 INVESTIGATION PROCEDURES

This section of the Phase II RI Work Plan discusses the methods to be used in preparation for and when performing the investigative efforts. Procedures detailed in the USEPA Region 4 Science and Ecosystem Support Division (SESD) Field Branches Quality System and Technical Procedures (FBQSTP) will be used during the execution of the investigative efforts. Where the SESD Technical documents do not specify procedures for activities described in this work plan, AECOM Standard Operating Procedures (SOPs) or other appropriate procedures are referenced. Copies of the referenced procedures are included in Appendix A.

A site-specific Health and Safety Plan (HASP) has also been prepared by AECOM for this project and will be made available upon request, under separate cover.

3.1 Investigation Preparation Activities

Preparation for field work will include: resolution of Site access issues; selection and procurement of qualified subcontractors; procurement of necessary field and sampling equipment; designation of an investigative derived waste (IDW) storage area; and designation and construction of a temporary equipment decontamination area.

3.1.1 Resolution of Access Issues and Permits

Property access agreements for various private parcels to the north, west, and south had been negotiated and executed in 2014 and 2015. An access agreement for the property located west of the Dickert property has yet to be negotiated. Prior to any field related effort on this property, written permission for access to this property will be obtained.

Additionally, the accessibility of all proposed sampling locations will be confirmed (i.e., potential obstacles to drilling such as underground water, sewer, gas, electric and telephone lines or above-ground cables, buildings or other above-ground structures will be identified). Should the relocation of any of the proposed sampling locations be deemed necessary, minor adjustments in sampling locations of 50 feet or less will be considered to be in conformance with the work plan and will not require regulatory approval. Significant changes in sampling locations of greater than 50 feet will be proposed for the client/SCDHEC's approval during the sampling activities. Sampling relocations, regardless of their magnitude, will be documented in the field log including the reason for the change and summarized in the Phase II RI report.

In accordance with the South Carolina Well Standards [R.61-71(H)(1)(a)], a permit for well installation is required prior to initiation of drilling activities. AECOM will acquire the well permits on behalf of PLNA as part of this effort. Submittal of this Work Plan will serve as the written request for the permit to perform the drilling activities referenced herein.

3.1.2 Selection of Qualified Subcontractors

AECOM will procure qualified subcontracting firms that have experience in South Carolina with a detailed understanding of state regulations, and if possible, past experience at the project site. The contractors include an environmental drilling contractor, laboratory contractors, a waste management contractor, and an underground utility survey specialist. The drilling contractor will be selected based on proven experience, cost, and proof of appropriate OSHA related training requirements and availability.

AECOM will contract a SCDHEC-certified laboratory to perform the primary sample analysis required for this project. The laboratory will be National Environmental Laboratory Accreditation Conference (NELAC) certificated and will also be certified by the SCDHEC. As previously indicated, Shealy has been selected to perform the primary chemical analyses and a limited number of geochemical parameters. In addition, Pace Analytical Services, Inc. (PACE) will analyze a specific set of samples for dissolved gases. Microbial Insights, Inc. will perform biological analysis on a specific set of samples. The Phase II RI sample analytical program is discussed in more detail in Section 2.4, above.

3.2 Field Procedures

As discussed in Section 2, the investigative efforts will consist of an additional phase of groundwater investigation, a limited investigation of surface water quality, evaluation of soil vapor and soil quality. AECOM will utilize the USEPA Region 4 Science and Ecological Services Division (SESD) Field Branches Quality System and Technical Procedures Manual (FBQSTPM) as guidance for various investigative processes. These include several standard operating procedures (SESDPROCs). These procedures are referenced throughout this portion of the work plan. Copies of the SOPs are also included in **Appendix A** of this work plan.

This section of the Work Plan details the procedures that will be used to investigate each media and other project related efforts to be performed.

3.2.1 Soil Vapor and Soil Investigation

Soil Source Area Determination

As previously indicated, the sub-slab soil vapor program will be performed in multiple stages. This effort will include collection of soil gas samples on a grid system established within each building. Soil gas samples will be collected from approximately 24 locations within the main building and 15 locations within the pole-winder building using passive soil-gas sampling devices, spaced on a 20-foot grid system. Field personnel will follow USEPA Region 4 Soil Vapor Sampling Procedure (SESDPROC-307-R3) when collecting soil vapor samples (USEPA, 2014a). Field personnel will advance small (approximately 1 inch diameter) core holes through the building floors at the locations identified on the attached map (**Figure 2-1**) using a rotary hammer drill. A shallow boring (approximately 3 feet deep) will then be advanced with the rotary drill at each core hole location. A passive soil gas sampling device provided by Beacon Environmental Services, Inc. (Beacon) will then be placed in the small diameter borehole with a cork or other device intended to seal each core hole attached to at land surface. The passive soil gas sampling devices will be left in-place for approximately two weeks. Field personnel will then retrieve the collected passive gas samples and submit them to Beacon for analysis.

Analysis of an estimated 40 soil gas samples collected from beneath the two plant buildings will allow AECOM to focus a confirmatory soil sampling program that will be performed as part of the second phase of this process.

Confirmation Soil Sampling

AECOM will select three (3) locations in each building, based on the results of the soil gas sampling, for the collection of soil samples to be submitted for laboratory analysis. Soil samples will be obtained from continuous soil cores collected at each of the three confirmatory borings using a Geoprobe™ or equivalent style drill rig. Soil samples will be collected in accordance with procedures referenced in USEPA Region 4 SESDPROC-300-R3 (USEPA, 2014a). Soil samples designated for laboratory analysis will be collected at two foot intervals from land surface to the water table. It is estimated that the depth of soil sample collection in these confirmatory borings will be approximately16 feet below land surface.

Based on these assumptions eight (8) soil samples will be collected from each of the confirmatory borings advanced in each building. AECOM estimates that a total of 48 soil samples (24 from the main building and 24 from the pole winder building) will be collected for confirmatory analysis. Soil samples collected from the borings will be forwarded to Shealy and analyzed for TCL VOCs. Results of this sampling will be used to determine if the passive sampling efforts have identified a source area and possibly allow quantification of an impacted soil volume.

As part of this task, TCL VOC results for the soil samples will be reviewed and validated in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA, 2008a) and the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (October, 2008b) modified for method specific requirements. Results for the biogeochemical parameters will not undergo detailed validation. The results of the validation effort will be summarized in the RI Report.

Soil-Vapor Migration

Passive soil-vapor samplers will be used to determine if CVOCs are present in soil vapor at property boundaries to the north and west. AECOM will install six (6) passive diffusion samplers along transects that border the Dickert property, to the north of the plant, and the Boazman property, to the west of the plant. The proposed sample locations are also depicted on **Figure 2-1**. The results of this sampling effort will be used to determine if additional soil vapor sampling may be required on the private parcels.

3.2.2 Groundwater Investigation

As indicated in Section 2.2 above, the groundwater investigation will include the following:

- Installation of one (1) shallow permanent monitoring well;
- Vertical profiling of intermediate groundwater quality at four locations to the north and west of the plant and; Installation of four (4) intermediate monitoring wells;
- Vertical profiling of groundwater quality in bedrock fractures and installation of four additional bedrock wells;

- Development and sampling of the newly installed permanent wells; collection of groundwater elevation data from the expanded well network;
- Collection of groundwater samples from the Site monitoring well network; and
- Collection of groundwater samples from two (2) water wells (Boazman/Ringer Well and Chapman Well).

The proposed locations for the additional permanent wells are shown in **Figures 2-2 through 2-4**. The permanent wells will be installed in accordance with procedures described in the USEPA Region 4 SESD protocol (USEPA 2013a) for Design and Installation of Monitoring Wells (SESD GUID-101-R1; (**Appendix A**) with a drill rig capable of utilizing direct push technology (DPT) and/or hollow stem augers (HSAs) as well as roto-sonic technology. Well boring advancement and well installation procedures are discussed below.

3.2.2.1 Well Boring Advancement

Shallow Wells

Soil borings advanced during this phase of work for shallow monitoring well installation will be advanced using a DPT/Geoprobe™, roto-sonic or HSA style drilling rigs. The well borings will be advanced to depths determined appropriate by information collected in the field and as determined by the AECOM field hydrogeologist.

During well boring advancement, soil cores/samples will be obtained for geologic characterization and soil classification. Soil core collection will entail the use of a variety of tools depending on the drill technology. Depending on the drilling technology that will be used, these sampling tools may include two-inch diameter by two foot stainless steel split spoons utilized during HSA drilling or a 2-1/4-inch diameter by 5 foot length Geoprobe™ soil core barrel with acetate liner. Soil cores will be collected continuously from land surface to the target depth for a boring in order to identify potential confining layers, if present, and to accurately determine the water table depth. Soil recovery and soil type will be determined and logged.

Soils collected during the well boring process will be visually classified and described on boring logs using the Unified Soil Classification System (USCS). Copies of the boring logs will be included in the Phase II RI Report to be prepared following completion of this investigation.

In the event that it becomes necessary to terminate a boring short of its intended completion depth (i.e., a boulder or other obstacle is encountered), the boring will be abandoned in accordance with the SC Well Standards [R.61-71(H)(2)(e)]. Borehole abandonment will include backfilling of the borehole with a cement and bentonite grout (at a mixture of approximately nine to one) via tremie pipe from the bottom up. A new boring will be advanced as close as possible, within 10 feet from the abandoned boring. Soil coring will be resumed below the abandoned boring termination depth.

Intermediate Wells

As indicated above, the intermediate zone vertical profiling borings will be advanced using direct push drilling technology. Proposed intermediate well locations are depicted on **Figure 2-3**.Borings advanced as part of the intermediate zone vertical profiling will also be advanced using direct push drilling techniques. The direct push drilling techniques will also utilize a 2-1/4-inch diameter by 5 foot length Geoprobe™ soil core barrel with acetate liner. Once the core barrel is advanced its maximum length, a three (3) inch inside diameter outer casing will be advanced over the core barrel to the same depth. The core barrel is then removed from inside the casing allowing extraction of a soil core. The intermediate zone vertical profiling borings will be advanced at locations and depths specified in **Table 2-1**. The methods to be used to collect groundwater samples for screening from these borings are discussed in Section 3.2.3.1, below.

Bedrock Wells

As indicated in Section 2.2.3 above, some fracture zones within the underlying granitic bedrock contain elevated concentrations of CVOCs. The distribution of the CVOCs within fracture zones has not been fully determined; therefore, during this phase of work four (4) additional bedrock well borings are proposed to determine the lateral extent of impact to shallow fracture zones. The proposed locations for these bedrock wells are depicted on **Figure 2-4**.

The proposed bedrock well borings will be advanced using a combination of mud-rotary and wireline coring techniques. Mud-rotary drilling will be used to drill through overburden and saprolitic soils into the top of bedrock. Once bedrock is encountered, a 6-inch diameter SCH-40 PVC surface casing will be installed in the well bore. The surface casing will be grouted in place and allowed to cure for up to 48 hours before drilling into bedrock will commence.

Wire-line coring techniques will be used to advance a bedrock well bore below the surface casing. Core samples will be visually examined by an AECOM field hydrogeologist to identify separate fracture zones. Core samples will be collected continuously on five foot intervals from the top of the bedrock to a depth determined by field personnel. Bedrock well bores will be advanced until the vertical groundwater quality profiling process indicates CVOCs are not present in a fracture zone. Vertical profiling sampling procedures in bedrock are discussed in Section 3.2.3.2 below.

3.2.2.2 Permanent Monitoring Well Installation Procedures

During this phase of the RI, one shallow, four intermediate, and four bedrock zone monitoring wells will be installed at the Site to allow monitoring of groundwater elevations and water quality (**Figures 2-2 through 2-4**).

Shallow and intermediate monitoring wells will be installed in accordance with SESD GUID-101-R1 protocol and SC Well Standards and Regulations (S.C.R61-71) using HSA or mud rotary drilling techniques. Shallow and intermediate permanent monitoring wells will be constructed using two-inch diameter, flush-threaded, schedule 40 PVC casing and 10 foot long, 0.010-inch slotted PVC screens. Total well depth and placement of the screen interval will be based on location-specific data needs and local geology as determined by the field geologist.

As discussed in Section 3.2.2.1 above, soil and/or rock cores will be collected during well bore advancement to allow examination and classification of soils/location of fractures and to help determine the depths at which to install the wells. Once shallow and/or intermediate well boring advancement is completed, the well materials will be installed through the 4 ¼-inch inside diameter auger annulus or within a 6-inch diameter mud rotary borehole. Shallow and intermediate permanent monitoring wells will be centered within a borehole while appropriately graded clean silica sand is placed in the annular space surrounding the well screen to a depth of approximately two feet above the top of the screen. The filter pack will be directly overlain by a layer of bentonite chips no less than two feet thick. The bentonite chips will be hydrated to create a seal prior to installation of a cement/bentonite grout. The grout seal, containing a mixture of approximately nine pounds of cement to one pound bentonite, will extend from the top of the bentonite seal to a depth of two to three feet below ground surface.

Each bedrock well will have a 6-inch diameter SCH-40 PVC surface casing that fully penetrates the weathered residuum and saprolite overlying the bedrock. The surface casing will be grouted in place and allowed to cure for up to 48 hours before drilling into bedrock will commence.

As indicated above, field personnel will utilize a rock coring system to obtain samples of the bedrock. Information obtained from the rock cores and vertical profiling efforts will be used to determine the depth at which the bedrock wells will be completed. Ideally, wells will be set to capture groundwater from obvious fracture zones encountered in the bedrock. Once the well boring has been sampled to a desired depth, the borehole will be flushed with fresh water to remove any drilling fluid and/or debris generated during drilling.

Bedrock well screen placement will be set across a fracture zone that is found to not contain CVOCs during the field screening. Bedrock wells will be constructed using five-foot long pre-packed, two inch diameter well screens, surrounded by additional sand filter pack, as needed to fill the annular space. A bentonite clay well seal and cement grout will be installed to ensure impacted groundwater encountered in overlying fracture zones does not migrate downward into an un-impacted fracture zone.

Each monitoring well will be completed flush with the ground surface using an 8-inch diameter cast iron bolt-down well cover set into a 2 ft x 2 ft x 6 inch concrete pad. Each permanent monitoring well will also be secured with a cap and lock.

All well construction details and/or boring information will be noted on monitoring well construction logs to be completed during the field investigation.

3.2.2.3 Well Development

Following their installation, each permanent well will be developed in accordance with the USEPA Region 4 SESD GUID-101-R1. Well development will be performed to remove fine-grained materials from the monitoring wells and to enhance the hydraulic connection between the screened interval and the surrounding aquifer. The permanent monitoring wells will be developed no sooner than 24 hours following installation, to allow the well construction materials to set. Water quality parameters will be measured using a YSI 556 water quality meter and an HF Scientific turbidity meter or equivalents. During well development the following water quality parameters will be monitored:

- pH;
- Temperature;
- Specific Conductance; and
- Turbidity.

Adequate well development is achieved when the pH, specific conductance, and temperature of the groundwater have stabilized and the turbidity has either stabilized or is below 10 Nephelometric Turbidity Units (NTUs). Stabilization shall be generally defined as pH constant within 0.2 Standard Units (SU), temperature and specific conductance constant within 10%.

A minimum of three well volumes will be removed before a well may be considered developed. If, after removal of three well volumes, the development criteria have not been achieved, the process will continue until either the criteria have been met, or ten well volumes have been removed. It is then at the discretion of the project manager to consider if a well is adequately developed or whether development activities should continue.

Water generated by well development activities will be stored in 55-gallon drums, polyethylene totes or comparable containers. The development water containers will be labeled as such with the date of generation and applicable source information. The containers will be transported to a designated on-Site storage area and characterized for off-Site disposal at the conclusion of the RI field activities.

3.2.3 Groundwater Sampling

As indicated above, groundwater sampling efforts will include collection of samples during the vertical profiling process and collection of samples from existing and newly installed permanent wells. Groundwater samples will be collected in accordance with procedures detailed in the USEPA Region IV SESD protocol for Groundwater Sampling (SESDPROC-301-R3**)** (USEPA, 2013b).

3.2.3.1 Intermediate Vertical Profile Borings

As indicated above, the intermediate zone vertical profiling borings will be advanced using direct-push drilling technology. Proposed intermediate well locations are depicted on **Figure 2-3**. Once a boring has been advanced to the top of a desired target depth, a 1.25 inch diameter, four-foot long, stainless steel retractable sampler will be advanced into the undisturbed subsurface. The outer casing surrounding the sampler will be back-pulled exposing a four- foot long stainless steel, 0.01 inch slot screen. A peristaltic pump will then be used to purge water from this interval for collection of a groundwater sample for confirmatory analysis. Field personnel will measure and record field parameters including pH, specific conductance, temperature, and turbidity during the purge effort. Samples for rapid laboratory analysis will be collected when the field parameters have stabilized.

This process will be repeated at two additional depth intervals, if possible depending on lithology, to allow collection of multiple groundwater samples from a boring. Field personnel will attempt to collect up to three samples from an intermediate well boring, with depths of collection varying between 5 and 10 feet below the previously sampled interval. Groundwater samples collected using this methodology will be forwarded to the laboratory the same day of collection. The laboratory will perform rush analysis for TCL VOCs on the samples, returning results within 24 hours of sample receipt, if possible.

Results of the vertical profiling efforts will be used to determine the depth at which to construct a permanent monitoring well for the intermediate depth interval.

3.2.3.2 Bedrock Vertical Profile Borings

When a separate fracture zone is encountered, field personnel will direct the purging of the fracture zone to allow collection of a groundwater sample for laboratory analysis. As the boring is advanced deeper into the bedrock, and separate fracture zones are identified an inflatable packer system will be used to isolate the deepest fracture zone from influence of groundwater from overlying fractures. The packer system will be inflated, sealing the borehole above the deepest fracture zone. Groundwater will then be purged from an isolated fracture zone using a submersible pump.

Sampling of groundwater in the bedrock vertical profile boring will be performed using a stainless steel submersible pump. During profiling interval purging efforts, field parameters will be monitored to ensure representative groundwater is being sampled. Field personnel will measure and record field parameters including pH, specific conductance, temperature, and turbidity during the purge effort. Samples for rapid laboratory analysis will be collected when the field parameters have stabilized.

Once laboratory analyses confirm that CVOCs are not present in a fracture zone, the bedrock boring will be converted to a monitoring well in accordance with procedures discussed in Section 3.2.2.4.

3.2.3.3 Permanent Monitoring Wells

Permanent monitoring wells will be purged and sampled using the low flow-low volume sampling procedures with either a peristaltic pump or submersible pump. The primary choice of equipment for sampling a well using this method is the peristaltic pump; however, should the water column be deeper than the depth from which a peristaltic pump can lift water, a submersible pump will then be used to purge a deep well. Disposable Teflon™ lined tubing will be used with either the peristaltic pump or submersible pump during the purging and/or sampling process.

Prior to purging a well, clean polyethylene sheeting will be placed on the ground around the well to provide a clean working surface. Total depth and depth to water from the top of the PVC casing will be measured with an electronic water-level indicator and recorded in the field log and groundwater collection record. The volume of the standing water column will then be calculated in order to determine the required purge volume. The volume of the standing water column in a well is calculated using the following general equation:

$$V = 0.041(D^2)(H)$$

Where: H = length of water column in feet

D = diameter of well in inches

V = volume of water in gallons

The volume, per linear foot for a 2-inch well, equals 0.163 gallons per foot. The length of the water column (total depth minus depth to water) may be multiplied by 0.163 to obtain the volume of standing water within a 2-inch diameter well.

When purging with a peristaltic pump, a section of ¼-inch diameter, disposable Teflon™ lined polyethylene, or dedicated Teflon™ extraction tubing will be inserted into the middle portion of the water column in a well. The extraction tubing will be connected to a disposable section of 3/8-inch diameter silicon tubing that runs through the pump device. This tubing is connected to another section of ¼-inch diameter tubing that is used for discharge tubing. Purging of a well will be performed from within the screened interval.

Water quality parameters (pH, specific conductance, temperature, turbidity, dissolved oxygen (DO), and oxidation reduction potential (ORP) will be measured using a water quality meter equipped with a flow-through cell (YSI or equivalent). Turbidity may also be measured with a HF Scientific, LaMotte, or equivalent turbidity meter. The water quality meter(s) will be calibrated twice per day, prior to field use each morning and once during mid-day.

As a general rule, water quality readings will be taken periodically to determine when purging is completed. An adequate well purge is achieved when the specific conductance and temperature of the groundwater have stabilized within 10%, pH as stabilized within 0.2 SU, and the turbidity has either stabilized or is below 10 NTU. Should the low flow-low volume sampling procedure not be appropriate for sampling wells due to lack of stabilization, field personnel will utilize alternative methods specified in the USEPA Region 4 SOP SESDPROC-301-R3 (**Appendix A**). There are no criteria establishing the number of readings required to determine stability. However, if the parameters have not stabilized within five purge volumes, it is the discretion of the project manager whether to collect a sample or to continue purging.

As indicated in Section 2.4, all groundwater samples collected during this investigation will be analyzed for TCL VOCs using SW-846 Method 8260C. A subset of wells will also be sampled for a broader list of biogeochemical parameters (**Table 2-2**).

3.2.4 Surface Water Sampling

As indicated in Section 2.3, surface water samples will be collected from three locations on the Dickert Property and two locations on the Shealy Property (**Figure 2-5**).

Surface water samples will be collected in accordance with procedures described in the USEPA Region 4 SOP SESDPROC-201-R3 (USEPA, 2013c). Samples will be collected by submerging bottles directly into the water column where the water column is sufficiently deep enough to allow, without inadvertently elevating turbidity. A sample bottle will be lowered into the water column with the cap in-place and facing upstream. Once the mouth of the bottle is at the desired sampling depth, the cap will be removed allowing water to fill the container. For bottles containing preservative, the bottle will be submerged enough to allow surface water to slowly fill the bottle preventing the preservative from washing out of the sample container.

When possible, water quality parameters will also be measured in the field at the time of sample collection using a water quality meter. The field parameters measured during surface water sampling will be pH, specific conductance, temperature, DO and ORP. Field parameters will be measured by submerging the water quality instrument probe into flowing surface water. Field measurements and visual observations including color and a description of the general conditions at each surface water sampling location will be recorded on surface water sampling logs.

At each surface water body, sampling will be conducted in order from the most down-stream location to the most up-stream location to preclude disturbing sediments that could then become suspended and wash downstream potentially biasing the other samples.

3.2.5 Hydraulic Testing

Once well sampling efforts have been completed, field personnel will perform testing in 12 wells located at the Site to estimate the horizontal hydraulic conductivity (K) of the aquifer zones. Six shallow and six intermediate wells will be used for this testing.

Shallow: MW2, MW3, MW5, MW6, MW10, MW20

Intermediate: MW2I, MW3I, MW5I, MW6I, MW10I, MW20I

Rising and falling head permeability tests will be conducted to measure the aquifer response to the instantaneous addition or removal of a cylinder (or slug) of known volume. Results of the tests will be used to determine an average K for the shallow and intermediate zones. K values will be used to determine groundwater flow velocities for each zone. K and groundwater velocity values will be used during the Feasibility Study and future remediation planning efforts. This information is critical to the assessment of potential constituent migration via groundwater and preliminary evaluation of remedial alternatives.

3.2.6 Well and Sample Location and Elevation Survey

At the completion of drilling activities, all borings, new monitoring wells and surface water sample points will be located using standard global positioning system (GPS) and/or conventional survey methodology by a registered land surveyor.

Wells, borings and sample points will be surveyed for elevation referenced to the National Geodetic Vertical Datum (NGVD-88) and horizontal location referenced to the SC State Plane Coordinate System North American Datum (NAD-83) by a qualified professional land surveyor in accordance with the USEPA Region 4 protocol for Global Positioning Systems (SESDPROC-110-R4) (USEPA, 2015a). Surveying of monitoring well locations will provide horizontal control and vertical data for the ground surface, the top of the outer protective casing, and the top of the PVC well casing at each location. The top of PVC casing elevation will be surveyed at a permanently designated point marked into the top of the well casing. The designated point will be exposed only when the protective cap is removed and be the point from which all future water level measurements are taken. Vertical elevation data will be surveyed to an accuracy of 0.01 feet and horizontal position data to an accuracy of 0.1 feet.

3.2.7 Investigation-Derived Waste (IDW)

IDW generated during the field program will be managed in accordance with the USEPA Region 4 protocol for Management of Investigation Derived Waste (SESDPROC-301-R3)(USEPA, 2014).

Materials which may become IDW include: personal protective equipment (PPE), disposable equipment, soil cuttings from drilling or hand auguring, sediments, groundwater obtained through well development or well purging, and cleaning and decontamination fluids. All soil cuttings, residual sample materials, groundwater, cleaning and decontamination fluids will be containerized in Department of Transportation (DOT) approved 55-gallon drums or a roll-off container and temporarily staged at a central Site location pending results of laboratory analyses and selection of final disposal method(s). IDW materials such as non-hazardous PPE, disposable equipment, and general refuse will also be placed into a separate drum, roll-off container, or existing refuse bin, and disposed in accordance with applicable guidance.

Based on the results of previous investigative phases at the Site, it is anticipated that solid and liquid IDW will be handled and disposed of as non-hazardous waste. Final disposal options will be determined following completion of field activities and after review of validated analytical data for samples collected from the Site. Representative samples of soil IDW will be collected and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) VOCs to determine if the wastes are characteristically hazardous. Analytical results for groundwater samples will be used to determine hazard classification. The TCLP results for IDW soils and groundwater quality data will be compared to the TCLP maximum concentrations listed in Table 1 of 40CFR 261.24. If groundwater sample results do not exceed the TCLP concentrations, then liquid IDW can be disposed of as non-hazardous.

3.2.8 Quality Control (QC) and Handling Procedures

The QC and handling procedures for equipment and samples collected at the site are briefly described below.

3.2.8.1 Sample Containment, Handling and Shipping

To minimize sample leakage and breakage, sample containers will be sealed and placed in shipping containers surrounded by bubble wrap or equivalent packing material. Ice will be included for those samples that require refrigeration to maintain a 4^{o}C temperature. Chain-of-custody forms, identifying each sample contained in a shipping container, will be completed. One copy of the chain-of-custody form will be retained for the field records; the remaining copies will be placed inside a Ziploc™-type bag, and the bag sealed and taped to the inside cover of the shipping container.

Samples will be delivered daily to the Shealy Environmental Services, Inc. facility by AECOM field personnel. All samples will be handled and shipped in accordance with the procedures included in the USEPA Region 4 protocol for Packaging, Marking, Labeling and Shipping of Environmental and Waste Samples (SESDPROC-209-R3)(USEPA, 2015a).

3.2.8.2 Collection of QA/QC Samples

QA/QC samples will be collected during all sampling and will include trip blanks, equipment blanks, duplicate samples, matrix spike samples, and matrix spike duplicate samples. QA/QC sample frequency is summarized below.

- trip blank samples – 1 per shipping cooler,
- equipment blank samples 1 for every 20 environmental samples,
- duplicate samples – 1 for every 20 environmental samples,
- matrix spike – 1 for every 20 environmental samples, and
- matrix spike duplicate samples – 1 for every 20 environmental samples.

3.2.8.3 Field Equipment Calibration

Sampling activities detailed in this work plan call for the use of field equipment including a photoionization detector (PID), water quality meter, turbidity meter, electronic water level indicator, and a GPS. The water quality meter will be capable of measuring pH, specific conductance, temperature, DO, and ORP. All field equipment will be calibrated prior to each use (at the beginning of each day) and a calibration check during the middle of the day. All instruments will be calibrated, maintained, and operated in accordance of the manufacturer's specifications.

3.2.9 Field Equipment Decontamination

Reusable equipment used in the field investigations at the site will be cleaned between sample collection efforts. Cleaning of equipment is performed to prevent cross-contamination between samples and to maintain a clean working environment for all personnel. Cleaning of sampling equipment will be performed in accordance with the USEPA Region 4 protocol for Field Equipment Cleaning and Decontamination (SESDPROC-205-R3)(USEPA, 2015b).

For all sampling equipment used for the collection of samples for trace organic compounds and/or metals analyses:

- clean equipment with tap water and a laboratory grade non-phosphate detergent,
- rinse thoroughly with tap water,
- rinse thoroughly with deionized (DI) water,
- double rinse with organic free water
- wrap with aluminum foil, place in a plastic bag, and seal to prevent contamination if equipment is going to be stored or transported.

Cleaning and decontamination of all downhole drilling equipment will also be conducted in accordance with Section 3.7 of the Region 4 SESDPROC-105-R3.

Solvents, detergents, and rinse waters used to clean field equipment will not be reused during field decontamination. Procedures for handling and disposition of IDW, including used wash water, rinse water, and spent solvents will be conducted in accordance with Section 3.2.7

4.0 Remedial Investigation Report

It is anticipated that upon completion of the efforts summarized in this work plan, PLNA will move forward with preparation of the RI Report for this site. The RI Report will be a comprehensive report including data generated from the Phase II ESA through the most recent round of investigation. The report will discuss the results for soil, groundwater and surface water samples collected from the Site during this investigative process. The RI Report will include figures depicting sample locations and the distribution of any CVOC constituents of concern; data summary tables, data validation details, trend analysis figures, conclusions regarding the information collected to date and possible recommendations for future efforts. Appendices will contain all lithologic logs, individual monitoring well construction details, well development logs, groundwater sampling logs, laboratory reports (original data sheets), and laboratory validation notes.

An anticipated general outline for the report is as follows:

- Introduction – this section will be used to discuss site history and the purpose of the report.
- Investigation Procedures – this section will summarize the investigative history and briefly describe the investigative activities and procedures utilized during each phase of assessment.
- Physical Characteristics of the Site – this section will discuss the site setting, geology and hydrogeology of the site and surrounding area.
- Nature and Extent of Soil & Groundwater Impacts – this section will summarize compounds detected and the extent of their presence in the study area.
- Risk Assessment – this section will discuss the chemistry data from groundwater, soil, soil vapor, and surface water samples. These data will be screened in a preliminary evaluation to identify chemicals of potential concern (COPCs) to be carried through the Risk Assessment process. The Risk Assessment will consist of two components: a Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA);
- Conclusions – will summarize the pertinent information from each section and present general conclusions regarding a path forward for the site within the RP-VCC process.

A draft version of the RI Report will be submitted in electronic format to PLNA for review. The RI Report will be finalized for submittal to SCDHEC after receipt of comments from PLNA. A schedule for submittal of the RI Report will be developed after SCDHEC's approval of the Phase II RI Work Plan.

5.0 REFERENCES

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