

AECOMCD Scanned
PM Copy

10 Patewood Drive, Bldg. 6, Ste. 500, Greenville, SC 29615

April 12, 2024

Hand Delivered to SCDHEC

Ms. Kim Kuhn
 South Carolina Department of Health and Environmental Control
 Bureau of Land and Waste Management, State Remediation Section
 2600 Bull Street
 Columbia, South Carolina 29201

**Re: Feasibility Study Report
 Former Shakespeare Composite Structures Site, Newberry County
 Voluntary Cleanup Contract 14-6271-RP, Site ID # 51025**

Dear Ms. Kuhn:

Signify North America (Signify) and AECOM Technical Services, Inc. (AECOM) are transmitting the enclosed Feasibility Study Report (FS Report) to SCDHEC. The FS Report is formatted in general accordance with the FS Work Plan (May 2019) and in accordance with USEPA CERCLA guidance, as discussed in our March 8, 2024 meeting with the Department. We also have incorporated into the document the comments we received from SCDHEC during the March 8 meeting.

Signify and AECOM wish to pursue Alternative 5 listed in the FS Report, and this is our preferred alternative, subject to SCDHEC concurrence. As stated in Chapter 6.0 of the FS Report, Alternative 5 is composed of the following:

- In situ chemical oxidation (ISCO) for the groundwater source area beneath the east end of the main building; in situ chemical reduction (ISCR) using zero valent iron (ZVI) and in situ adsorption (ISA) using colloidal activated carbon (CAC) beneath the west end of the main building and in several outside areas; monitored natural attenuation (MNA) for groundwater; institutional controls (ICs) onsite and offsite; and containment via concrete floor remain in place as a cover for impacted soils.

A more-detailed discussion of the components of Alternative 5 is contained in Section 6.3.5 of this FS Report.

It is still the Signify and AECOM intent to try to be in the field by about October 1, 2024 with our first injection event for Alternative 5, as we discussed on March 8, in order to take advantage of suitable fall weather and for other Signify reasons. The additional remedy monitoring well installations and baseline sampling would occur in mid- to late-September 2024.

AECOM and Signify personnel are available to address SCDHEC comments on this document and ready to answer questions the Department may have. Please let us know how we can assist you throughout the document review, public input, and remedy approval process.

Should you have any questions regarding the information included in this submittal package, please contact me at 864-380-6950, Tim Renn, P.E. at 864-561-3414, or Scott Ross, P.G. at 803-201-9662, at your convenience.

Sincerely,



David R. Oliphant, CHMM
 Senior Project Manager

cc: Mr. Emil Filc - Signify North America
 Mr. Tim Renn - AECOM
 Mr. Scott Ross - AECOM

RECEIVED

APR 15 2024

SITE ASSESSMENT,
REMEDICATION, &
REVITALIZATION

144

51025

AECOM

RECEIVED

APR 15 2024

SITE ASSESSMENT,
REMEDICATION, &
REVITALIZATION

CD scanned
PM Copy

Feasibility Study Report
Shakespeare Composite
Structures Site
Newberry, SC

RP-VCC-14-6271-RP

April 2024

Project # 60721186

144

FEASIBILITY STUDY REPORT

**SHAKESPEARE COMPOSITE STRUCTURES SITE
19845 US HIGHWAY 76, NEWBERRY, SC**

VCC 14-6271-RP

**PREPARED FOR:
SIGNIFY NORTH AMERICA CORPORATION**

**PREPARED BY:
AECOM, GREENVILLE SC**

APRIL 2024

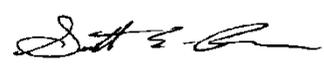
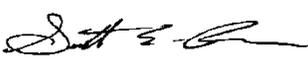
Quality Information

Prepared by

Checked by

Verified by

Approved by

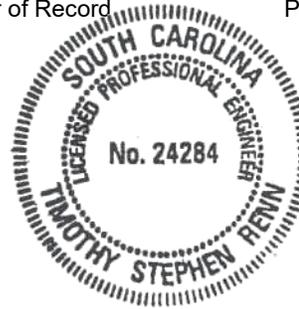


Dave Oliphant,
CHMM
Project Manager

Scott Ross, P.G.
Project Hydrogeologist

Tim Renn, P.E.
Engineer of Record

Scott Ross, P.G.
Project Manager



Prepared for:
Signify North America Corporation

Prepared by:
AECOM
10 Patewood Drive, Bldg. 6, Ste. 500
Greenville, SC 29615
USA
aecom.com

TABLE OF CONTENTS

1.0 INTRODUCTION..... 1-1

 1.1 Feasibility Study Objectives 1-1

 1.2 Site Background 1-1

 1.2.1 Facility Description and Location..... 1-1

 1.2.2 Facility Operational Background 1-2

 1.2.3 Site Investigation History/FS Activities 1-2

 1.2.3.1 Pre-Voluntary Cleanup Contract (VCC) 1-2

 1.2.3.2 Voluntary Cleanup Contract 1-3

 1.2.3.3 Remedial Investigation..... 1-3

 1.2.3.4 FS Work Plan, Bench-Scale Treatability Study, and Total Oxidant Demand
 Summary..... 1-4

 1.2.3.5 Sitewide Groundwater Monitoring Event of February and March 2022 1-5

 1.2.3.6 Pilot Study Procedures and Results Summary 1-6

 1.2.3.7 Pilot Study Conclusions..... 1-7

 1.3 Report Organization..... 1-8

2.0 ADDITIONAL ASSESSMENTS - JUNE 2023 THROUGH JANUARY 2024 2-1

 2.1 Conclusions from June 2023 Main Building Area Assessment..... 2-2

 2.2 Conclusions from the September 2023 Main Building Area Assessment 2-2

 2.3 Conclusions and Recommendations from the November 2023 Seismic Evaluations 2-2

 2.4 Conclusions from the January 2024 Groundwater Sampling Event..... 2-3

 2.5 Conclusions from the Additional Sampling of Pilot Test Wells..... 2-4

 2.6 Recommendations from the Data Gap Evaluation 2-4

3.0 CURRENT CONCEPTUAL SITE MODEL 3-1

 3.1 Site-Specific Geology..... 3-1

 3.2 Site-Specific Hydrogeology 3-2

 3.2.1 Regional Hydrogeology..... 3-2

 3.2.2 Site Hydrogeology 3-2

 3.3 Site-Specific Hydrogeology 3-3

 3.3.1 Hydraulic Conductivity 3-3

 3.3.2 Groundwater Hydraulic Gradients..... 3-3

 3.3.3 Groundwater Flow Rates 3-4

 3.4 Summary of Nature and Extent of Contamination 3-5

 3.4.1 Soil 3-5

3.4.2	SSV	3-6
3.4.3	Groundwater	3-7
3.4.4	Surface Water	3-9
3.4.5	Chemicals of Concern, Media of Concern, and Potential Receptors	3-10
3.4.5.1	Chemicals of Concern	3-10
3.4.5.2	Media of Concern for the FS	3-11
3.4.5.3	Potential Receptors	3-11
3.6	Conceptual Site Model and Fate and Transport Summary	3-11
4.0	REMEDIAL ACTION OBJECTIVES, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AND PRELIMINARY REMEDIATION GOALS	4-1
4.1	Remedial Action Objectives	4-1
4.2	Identification of Applicable or Relevant and Appropriate Requirements	4-1
4.2.1	Chemical-Specific ARARs	4-2
4.2.2	Location-Specific ARARs	4-3
4.2.3	Action-Specific ARARs	4-3
4.3	TBC Information	4-3
4.4	Preliminary Remediation Goals	4-3
4.5	Areas to be Addressed by Remedial Actions	4-3
4.6	General Response Actions	4-3
5.0	IDENTIFICATION/SCREENING OF POTENTIAL MEDIA OF CONCERN TECHNOLOGIES	5-1
5.1	Overview	5-1
5.2	Media Requiring Remedial Action	5-1
5.3	General Response Actions	5-1
5.3.1	Groundwater	5-1
5.3.2	Soil	5-2
5.3.3	SSV	5-2
5.4	Identification and Screening of Remedial Technology Type and Process Options for Groundwater	5-2
5.4.1	No Action	5-3
5.4.2	Land Use Controls/Institutional Controls	5-3
5.4.3	Monitored Natural Attenuation	5-4
5.4.4	In Situ Treatment	5-6
5.4.4.1	Chemical Oxidation (ISCO)	5-6
5.4.4.2	In Situ Anaerobic Bioremediation	5-9
	Screening Result	5-10

- 5.4.4.3 In Situ Chemical Reduction 5-10
- 5.4.4.4 In Situ Adsorption..... 5-12
- 5.4.5 Air Sparging..... 5-13
- 5.4.6 In Situ Containment with Treatment Downgradient of Area of Impact 5-15
- 5.4.7 Extraction, Ex Situ Treatment, and Discharge..... 5-17
- 5.5 Identification and Screening of Remedial Technology Type and Process Options for Soil and Subslab Vapor 5-19
- 5.5.1 No Action 5-19
- 5.5.2 Institutional Controls..... 5-20
- 5.5.3 MNA or Active Groundwater Remediation Monitoring..... 5-21
- 5.5.4 In Situ Containment..... 5-22
- 5.5.5 In Situ Treatment..... 5-23
 - 5.5.5.1 In Situ Soil Vapor Extraction 5-23
 - 5.5.5.2 In Situ Thermal Treatment 5-25
 - 5.5.5.3 In Situ Subslab Passive Ventilation 5-26
 - 5.5.5.4 In Situ Subslab Depressurization..... 5-27
- 5.5.6 Ex Situ Excavation and Off-Site Disposal..... 5-28
- 5.6 Summary of Retained Technologies 5-29
- 6.0 DEVELOPMENT AND DETAILED EVALUATION OF REMEDIAL ACTION ALTERNATIVES 6-1
- 6.1 Development of Remedial Action Alternatives..... 6-1
- 6.2 Evaluation Criteria..... 6-1
 - 6.2.1 Protection of Human Health and the Environment 6-2
 - 6.2.2 Compliance with ARARs and Other Criteria, Advisories, and Guidance..... 6-2
 - 6.2.3 Long-Term Effectiveness and Permanence 6-2
 - 6.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment 6-2
 - 6.2.5 Short-Term Effectiveness..... 6-2
 - 6.2.6 Implementability 6-3
 - 6.2.7 Cost..... 6-3
 - 6.2.8 State Acceptance..... 6-3
 - 6.2.9 Community Acceptance 6-3
- 6.3 Detailed Criteria Evaluation of Remedial Action Alternatives..... 6-4
 - 6.3.1 Alternative 1 – No Action 6-4
 - 6.3.1.1 Overall Protection of Human Health and the Environment..... 6-4
 - 6.3.1.2 Compliance with Applicable or Relevant and Appropriate Requirements..... 6-4

- 6.3.1.3 Long-term Effectiveness and Permanence 6-4
- 6.3.1.4 Reduction of Toxicity, Mobility, or Volume 6-4
- 6.3.1.5 Short-term Effectiveness 6-5
- 6.3.1.6 Implementability 6-5
- 6.3.1.7 Cost..... 6-5
- 6.3.2 Alternative 2 – MNA, ICs, and Containment via Cover 6-5
 - 6.3.2.1 Protection of Human Health and the Environment 6-5
 - 6.3.2.2 Compliance with ARARs and Other Criteria, Advisories, and Guidance 6-6
 - 6.3.2.3 Long-Term Effectiveness and Permanence..... 6-6
 - 6.3.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment 6-6
 - 6.3.2.5 Short-Term Effectiveness 6-6
 - 6.3.2.6 Implementability 6-7
 - 6.3.2.7 Cost..... 6-7
- 6.3.3 Alternative 3 – ISCO, MNA, ICs, and Containment via Cover 6-7
 - 6.3.3.1 Protection of Human Health and the Environment 6-9
 - 6.3.3.2 Compliance with ARARs and Other Criteria and Guidance 6-9
 - 6.3.3.3 Long-Term Effectiveness and Permanence..... 6-10
 - 6.3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment 6-10
 - 6.3.3.5 Short-Term Effectiveness 6-11
 - 6.3.3.6 Implementability 6-11
 - 6.3.3.7 Cost..... 6-11
- 6.3.4 Alternative 4 – ISCO, ISERD, ISA, MNA, ICs and Containment via Cover 6-12
 - 6.3.4.1 Protection of Human Health and the Environment 6-13
 - 6.3.4.2 Compliance with ARARs and Other Criteria and Guidance 6-13
 - 6.3.4.3 Long-Term Effectiveness and Permanence..... 6-14
 - 6.3.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment 6-15
 - 6.3.4.5 Short-Term Effectiveness 6-15
 - 6.3.4.6 Implementability 6-15
 - 6.3.4.7 Cost..... 6-16
- 6.3.5 Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover 6-16
 - 6.3.5.1 Protection of Human Health and the Environment 6-17
 - 6.3.5.2 Compliance with ARARs and Other Criteria and Guidance 6-18
 - 6.3.5.3 Long-Term Effectiveness and Permanence..... 6-18
 - 6.3.5.4 Reduction of Toxicity, Mobility, or Volume through Treatment 6-19
 - 6.3.5.5 Short-Term Effectiveness 6-19

6.3.5.6 Implementability 6-20

6.3.5.7 Cost..... 6-20

6.4 Comparative Analysis of Remedial Action Alternatives 6-20

6.4.1 Protection of Human Health and the Environment 6-21

6.4.2 Compliance with ARARs and Other Criteria, Advisories, and Guidance..... 6-21

6.4.3 Long-Term Effectiveness and Permanence 6-21

6.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment..... 6-22

6.4.5 Short-Term Effectiveness..... 6-22

6.4.6 Implementability 6-23

6.4.7 Cost 6-23

6.4.8 Comparison of Remedial Alternatives 6-24

7.0 REFERENCES..... 7-1

FIGURES

- Figure 1-1 Site Location Map
- Figure 1-2A Site Plan
- Figure 1-2B Location of Water Supply Wells
- Figure 1-3 Wells and Elevations in Shallow Zone
- Figure 1-4 Wells and Elevations in Intermediate Zone
- Figure 1-5 Wells and Elevations in Bedrock Zone
- Figure 1-6 TCE Concentrations in Shallow Zone
- Figure 1-7 TCE Concentrations in Intermediate Zone
- Figure 1-8 TCE Concentrations in Bedrock Zone
- Figure 1-9 TCE in ISCO Pilot Study Area Groundwater – Shallow Zone – Update September 2023
- Figure 1-10 TCE in ISERD Pilot Study Area Groundwater – Shallow Zone – Update January 2024
- Figure 1-11 TCE in ISERD Pilot Study Area Groundwater – Intermediate Zone – Update January 2024
- Figure 2-1 TCE in ISCO Pilot Study Area Groundwater- Shallow Zone – Updated September 2023
- Figure 2-2 TCE in Subslab Vapor – Updated September 2023
- Figure 2-3 TCE in Subsurface (2-10 Ft) Soils – Updated September 2023
- Figure 2-4 Seismic Survey Location Map – November 2023
- Figure 2-5 TCE in Shallow Zone – Updated Trends January 2024 – Selected MW-Series Wells for Mann Kendall Trend Plot Evaluations
- Figure 2-6 TCE in Shallow Zone – Updated Trends January 2024 – Selected TMW-Series Wells for Mann Kendall Trend Plot Evaluations
- Figure 2-7 TCE in Intermediate Zone – Updated Trends January 2024 – Selected Wells for Mann Kendall Trend Plot Evaluations
- Figure 2-8 TCE in Bedrock Zone – Updated Trends January 2024 – Selected Wells for Mann Kendall Trend Plot Evaluations
- Figure 3-1 Orientation of Cross Sections
- Figure 3-2 Cross Section A-A'
- Figure 3-3 Cross Section B-B'
- Figure 3-4 Cross Section C-C'
- Figure 3-5 Cross Section D-D'

FIGURES (continued)

- Figure 3-6 Surface Water Sample Locations
- Figure 3-7 Conceptual Site Model
- Figure 5-1 Targeted Groundwater Treatment Areas – Shallow Zone
- Figure 5-2 Targeted Groundwater Treatment Areas – Intermediate Zone
- Figure 6-1 Targeted Groundwater Treatment Areas – Shallow Zone – ISCO, ISERD, ISA, MNA, and ICs
- Figure 6-2 Targeted Groundwater Treatment Areas – Shallow Zone - Main Building – ISCO, ISERD, ISA, MNA, and ICs
- Figure 6-3 Targeted Groundwater Treatment Areas – Intermediate Zone - ISCO, ISERD, ISA, MNA, and ICs

TABLES

Table 2-1	Subslab Soil Vapor Data – 2018 and 2023 for Selected Compounds
Table 2-2	Phase II RI and FS Soil Data
Table 2-3	Sample Results - ISCO Pilot Study Wells
Table 2-4	Sample Results - ISERD Pilot Study Wells
Table 3-1	Permanent Monitoring Well Construction Details
Table 3-2	Groundwater Elevation Summary Table – 2017 to January 2024
Table 3-3	Vertical Gradient Calculations – February 2022
Table 3-4	Surface Water Sample Results Summary Table
Table 4-1	Areas, Media, COCs, and RAOs
Table 4-2	Evaluation of Potential Chemical-Specific ARARs
Table 4-3	Evaluation of Potential Location-Specific ARARs
Table 4-4	Evaluation of Potential Action-Specific ARARs
Table 4-5	Evaluation of Potential TBCs
Table 4-6	COCs, PRGs, and Potential GRAs by Media
Table 5-1	Screening of Groundwater Remedial Technologies and Process Options
Table 5-2	Screening of Soil and Subslab Vapor Remedial Technologies and Process Options
Table 6-1	Components of Remedial Alternatives
Table 6-2	Comparative Analysis of Remedial Alternatives
Table 6-3	Cost Estimate Summary for Alternative 1 – No Action
Table 6-4	Cost Estimate Summary for Alternative 2 – MNA, ICs, and Containment via Cover
Table 6-5	Cost Estimate Summary for Alternative 3 – ISCO, MNA, ICs, and Containment via Cover
Table 6-6	Cost Estimate Summary for Alternative 4 – ISCO, ISERD, ISA, MNA, ICs, and Containment via Cover
Table 6-7	Cost Estimate Summary for Alternative 5 – ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover

ATTACHMENTS

Attachment A Historic Groundwater Tables

Attachment B Detailed Cost Estimates for Remedial Action Alternatives

Attachment C Technical Data Sheets for Potential Chemical Injectants

Attachment D PDF Copies of Three Previous Shakespeare Reports

ACRONYMNS

µg/L	micrograms per liter
µg/m ³	micrograms per cubic meter
3-D	3 dimensional
ABC®	Anaerobic Biochem (proprietary chemical)
AC	activated carbon
ARAR	applicable or relevant and appropriate requirement
AS/SVE	Air sparging/soil vapor extraction
atm-m ³ /mol	atmospheres-meters cubed per mole
bgs	below ground surface
BRA	baseline risk assessment
BSTS	bench scale treatability study
BTEX	benzene, toluene, ethylbenzene, xylene
CAC	colloidal activated carbon
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DCE	dichloroethene
DHC	<i>dehalocoides</i>
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DPT	direct push technology
ERD	enhanced reductive dechlorination
ERH	electrical resistance heating
EVO	emulsified vegetable oil
FS	feasibility study
ft	feet or foot
ft/day	feet per day
ft/ft	feet per foot

ACRONYMNS (continued)

g/kg	grams per kilogram
GRA	general response action
HQ	hazard quotient
HSA	hollow stem auger
HW	horizontal well
IC	institutional control
IDW	investigation derived waste
ISA	in situ adsorption
ISAB	in situ anaerobic bioremediation
ISCO	in situ chemical oxidation
ISCR	in situ chemical reduction
ISERD	in situ enhanced reductive dichlorination
K	hydraulic conductivity
KMnO4	potassium permanganate
MCL	maximum contaminant level
mg/kg	milligram per kilogram
MNA	monitored natural attenuation
msl	mean sea level
MW	monitoring well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCWSA	Newberry County Water and Sewer Authority
ng	nanograms
O&M	operation and maintenance
ORP	oxidation reduction potential
PAC	powdered activated carbon
PCE	perchloroethylene or tetrachloroethene
PDB	passive diffusion bag
PENAC	Philips Electronics North America Corporation
PPE	personal protection equipment
PRB	permeable reactive barrier
PRG	preliminary remediation goal
psi	pounds per square inch

ACRONYMNS (continued)

PSWP	Pilot Study Work Plan
RAO	remedial action objective
RG	remedial goal
RI	remedial investigation
ROI	radius of influence
RSL	regional screening level
SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Control
SSL	soil screening level
SSV	subslab vapor
S.U.	standard units
SVE	soil vapor extraction
SVS	soil vapor sample
TBC	to be considered
TCE	trichloroethene
TCH	thermal conductive heating
TCL	target compound list
TMW	temporary monitoring well
TOD	total oxidant demand
UIC	underground injection control
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VCC	voluntary cleanup contract
VOC	volatile organic compound
ZVI	zero valent iron

1.0 INTRODUCTION

This is the Feasibility Study (FS) Report for the Shakespeare Composite Structures Site (the Site) located in Newberry, South Carolina. This FS Report has been formatted in general accordance with the FS Work Plan (**AECOM, 2019**). The FS Work Plan was submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) on May 15, 2019. SCDHEC approved the FS Work Plan in correspondence dated June 4, 2019. This Introduction section addresses the FS objectives, site background, and FS Report organization.

1.1 Feasibility Study Objectives

The objectives of the FS, as stated in the FS Work Plan, include the following: (1) present the current conceptual site model (CSM); (2) summarize bench-scale treatability study and pilot study results; (3) develop remedial action objectives (RAOs), applicable or relevant and appropriate requirements (ARARs), and remedial goals (RGs); (4) identify and screen potentially applicable remedial technologies and process options, and (5) develop and evaluate remedial action alternatives. The locations in this FS Report where each of these objectives are addressed is discussed in Section 1.3 below.

1.2 Site Background

The facility description and location, and the facility operational background, are summarized below, along with a summary of the pre-FS site investigation activities. More detailed descriptions of the facility background, historical operation, and site topographic setting are included in the Remedial Investigation (RI) Report (**AECOM, 2018**).

1.2.1 Facility Description and Location

The Site is located at 19845 US Highway 76, approximately 1 mile northwest of Newberry, South Carolina (**Figure 1-1**). The Site is centered on the Valmont Composite Structures facility (the "Facility," formerly known as Shakespeare Composite Structures), and includes several surrounding properties (**Figure 1-2A**). General land use surrounding the facility consists of agricultural, residential, undeveloped, and commercial/light industrial properties (**AECOM, 2018**). The topography of the Site is generally flat or slightly sloping on the Facility property. Land surface elevations generally decrease to the southwest, west, and north moving away from the Facility property. Surface elevations range from approximately 562 feet (ft) mean sea level (msl) on the east side of the Facility to less than 520 ft msl along an unnamed intermittent stream located to the north of the Facility. Uses of adjacent properties are as follows:

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

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

South: The Facility property is bordered to the south by U.S. Highway 76 and properties owned by the Newberry County Airport, Mr. Walter Shealy, and Ms. Cristal Rendon. The property owned by Mr. Shealy is primarily farmland with a few small residences (rental homes) located sporadically across more than 60 acres.

West: There are three properties located immediately to the west of the Facility property. The property that immediately bounds the facility to the west is owned by Ms. Edith and Mr. Steve Bedenbaugh. The properties to the west of the Bedenbaugh property are owned by Mr Josh Chapman and Ms. Kimberly Chapman.

Northwest: The property located to the north-northwest of the Chapman properties and west of the Dickert property is owned by Mr. Josh Chapman and Ms. Kimberly Chapman.

Some of these offsite properties have private water located on those parcels (see **Figure 1-2B**).

1.2.2 Facility Operational Background

The Facility was originally opened to produce fiberglass products, and it has continued to be used for this manufacturing process. Operations at the facility include the design and manufacture of large fiberglass utility poles and cross arms and a variety of other fiberglass outdoor products such as posts, signs, sheet piling, and signposts. Manufacturing is conducted inside two separate buildings – the Main Building (nearest to US Highway 76) and the Pole Winder Building (near the railroad tracks).

1.2.3 Site Investigation History/FS Activities

Several phases of investigative efforts have been performed at the Site, as discussed below.

1.2.3.1 Pre-Voluntary Cleanup Contract (VCC)

The pre-VCC investigative efforts that were conducted include:

- Phase II Environmental Site Assessment – Collection of initial soil and groundwater samples from the Shakespeare facility (February through April 2014);
- Site Investigation – Collection of additional soil and groundwater samples from the Shakespeare facility along with several groundwater samples from surrounding private parcels (May 2014 through August 2014); and
- Expanded Investigation - Collection of additional shallow groundwater samples and evaluation of shallow bedrock for impacted groundwater on surrounding properties (August through September 2014).

Results of these studies are included in the RI Report (**AECOM, 2018**).

1.2.3.2 Voluntary Cleanup Contract

Voluntary Cleanup Contract (VCC) RP-VCC-14-6271-RP between the SCDHEC and Philips Electronics North America Corporation (PENAC) was executed in September 2014. PENAC is the former name of Signify.

1.2.3.3 Remedial Investigation

The RI included a Baseline Risk Assessment (BRA) summary where groundwater chemicals of concern [COCs] were identified. The RI was implemented in two phases, beginning in 2014 after execution of the VCC. The RI was conducted to further evaluate the horizontal and/or vertical extent of previously identified chlorinated volatile organic compounds (CVOCs) in soil and groundwater; assess additional potential areas of interest for secondary sources of CVOCs that could be contributing to soil and/or groundwater impacts; evaluate potential vapor intrusion pathways; determine risk to potential human and ecological receptors; and provide additional data needed to develop a remedial strategy for the Site.

The locations of monitoring wells at the Site are shown in **Figure 1-3** (shallow groundwater zone), **Figure 1-4** (intermediate groundwater zone), and **Figure 1-5** (deep groundwater zone). RI efforts determined that the source areas for CVOCs present in groundwater originated from historical operational practices that impacted groundwater beneath the western portions of the Main and Pole Winder Buildings located on the facility property. CVOCs subsequently migrated both horizontally and vertically within groundwater, and away from the identified source areas, and impacted multiple aquifer depth intervals (shallow, intermediate, and bedrock) beyond the Facility property.

In general, the water table at the Site is encountered in the fine sands and silts and clays of the residuum. Groundwater is encountered at depths ranging from approximately two ft below ground surface (bgs) near the northern end of the Site and on the Dickert property to as deep as approximately 18 ft bgs on the former Shakespeare Composite Structures facility. Groundwater beneath the Site is mainly encountered under unconfined conditions.

As a result, the direction of groundwater flow beneath the Site, particularly in the shallow (water table) zone follows topography, with flow components to the west and northwest. CVOCs have migrated within the water table and saprolite zones primarily through natural dispersion. Vertical migration downgradient of the source areas within the saprolite and into underlying granitic bedrock was influenced primarily by numerous privately-operated water supply wells located to the west and southwest of the Facility.

The RI defined the extent of CVOC-impacted groundwater at multiple aquifer depth intervals. Analytical results were screened against United States Environmental Protection Agency (USEPA) maximum contaminant levels (MCLs) to identify compounds of interest in groundwater beneath the Site. Concentrations of tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC) have exceeded their respective MCLs in several groundwater samples collected from the Site. Of these, TCE was the most frequently

detected chemical in groundwater samples collected at the Site. The elevated concentrations of CVOCs are most widespread in shallow zone groundwater (upper portion of the water table aquifer). TCE and cis-1,2-DCE also exceeded their respective MCLs in one or more samples collected in the intermediate (saprolite) zone.

A more detailed discussion of the results of the investigative efforts conducted at the Site to date is included in the RI Report (**AECOM, 2018**).

1.2.3.4 FS Work Plan, Bench-Scale Treatability Study, and Total Oxidant Demand Summary

Following approval of the RI Report, SCDHEC requested that Signify develop an FS Work Plan for the Site. The purpose of the FS Work Plan was to outline the proposed information that would be included in the Site FS. The cover letter for the FS Work Plan also proposed that a bench-scale treatability study (BSTS) and subsequent pilot study should be completed prior to development of the FS. The FS Work Plan (**AECOM, 2019**) was submitted to SCDHEC on May 15, 2019. SCDHEC approved the FS Work Plan in correspondence dated June 4, 2019.

The BSTS was conducted between September 2019 and January 2020. Two potential remedies, in situ chemical oxidation (ISCO) and in situ enhanced reductive dechlorination (ISERD), were evaluated in the BSTS as possible treatment options for Site-related CVOCs. For the pilot test, reductive dechlorination via in situ anaerobic bioremediation (ISAB), was enhanced by including in situ chemical reduction (ISCR), which is an abiotic process; thus the term ISERD is used in this FS Report.

On September 19, 2019, soil was collected from two locations within an area between monitoring well (MW)-10 and MW-10I, and groundwater was collected from MW-10 and MW-10I. This area and the two monitoring wells are located just north of the Facility property on the Dickert property (**Figure 1-2A and Figure 1-3**). Soil and groundwater samples were shipped to Redox Tech, LLC (Redox Tech) in Cary, North Carolina for ISCO total oxidant demand (TOD) testing. Soil and groundwater samples were also submitted to SiREM Laboratories (SiREM) in Ontario, Canada for bench-scale evaluation of various reductive dechlorination treatments as well as ISERD treatments.

The TOD evaluation was conducted to determine if native Site groundwater and saturated aquifer material would be amenable to ISCO treatment. Aquifer materials targeted for ISCO treatment that contain high natural organic carbon, high naturally reduced inorganic minerals such as iron, and elevated CVOc concentrations require higher concentrations of oxidant to effectively treat the targeted contaminants. TOD values determined in the four microcosms used for ISCO testing indicated a limited oxidant demand exerted by Site groundwater and saturated soil. TOD values for the microcosms ranged from less than 0.3 grams per kilogram (g/kg) to 2.8 g/kg, which falls within the typical range for saprolitic soils found in the Piedmont region of South Carolina. Based on these results and a subsequent discussion with the vendor Redox Tech, a TOD value of 1 to 2 g/kg was considered adequate for ISCO design purposes. Because the Site TOD value is low,

these results indicated that ISCO may be a suitable remedial option to treat CVOC-impacted Site groundwater.

The BSTS for enhanced reductive dechlorination (ERD) evaluated the effectiveness of multiple treatment amendments for CVOC-impacted Site media including EDS-ER™ (an emulsified vegetable oil [EVO]), which promotes ISAB via reductive dechlorination, MicroEVO™ (a sulfidated zero valent iron [ZVI]), which promotes abiotic ISCR, and KB-1® Plus (a chlorinated solvent bioaugmentation microbial culture). One of the EDS-ER™ amended treatment microcosms and one of the MicroEVO™ ISCR amended treatment microcosms were also buffered using sodium bicarbonate to maintain the pH within the optimal range (i.e., 6 to 8 standard units [S.U.]) for reductive dechlorination to occur.

Based on the results of the BSTS, it was determined that the microcosm with buffered EVO that was amended approximately 40 days after initiation of testing with KB- 1® Plus was able to completely degrade the TCE in Site groundwater. The microcosms containing sulfidated ZVI saw an immediate decrease in TCE to approximately half of its initial concentration; however, bioaugmentation was required to promote further reduction in the concentration of TCE. VC remained in this sulfidated ZVI microcosm at the conclusion of the BSTS in January 2020. Based on the results of the BSTS, both ISCO and ISERD (using a combination of ISAB and ISCR) were determined to be potentially applicable remediation technologies that could be used to address CVOC contamination in Site groundwater. A field-based pilot study was recommended as the next logical step in order to evaluate effectiveness, implementability, and cost associated with full-scale implementation of one or both technologies.

The BSTS Report (**AECOM, 2020a**) was submitted to SCDHEC in May 2020. In their approval letter, SCDHEC reviewed and concurred with the BSTS results and recommendation for the completion of a pilot study at the Site.

1.2.3.5 Sitewide Groundwater Monitoring Event of February and March 2022

The sitewide groundwater monitoring event was conducted in February and March 2022. The monitoring event included sampling of 65 monitoring wells located at the Site. This includes 39 shallow zone wells, 12 intermediate zone wells, and 14 deep (bedrock) zone wells. Samples were analyzed for volatile organic compounds (VOCs) and a number of natural attenuation parameters. Field parameter data were also recorded. Wells monitored and the groundwater elevations in those wells during the sitewide event for the three groundwater zones on the site are indicated in **Figure 1-3** (shallow zone), **Figure 1-4** (intermediate zone), and **Figure 1-5** (deep zone). The Sitewide Groundwater Monitoring Report (**AECOM, 2023a**) was submitted to SCDHEC in May 2023.

Because TCE was detected most frequently and at the highest concentrations in Site groundwater, the results for this chemical constituent have been used to represent the extent of impact in the shallow, intermediate, and bedrock groundwater zones. **Figures 1-6 , 1-7, and 1-8** depict the extent of TCE in shallow zone, intermediate zone, and bedrock groundwater zone, respectively, based on analytical results from the site-wide monitoring event conducted in

February/March 2022. The Site-wide monitoring data are further discussed in Section 3.0 of this FS Report.

1.2.3.6 Pilot Study Procedures and Results Summary

SCDHEC requested that Signify submit a Pilot Study Work Plan (PSWP). The PSWP (**AECOM, 2020b**) was submitted to SCDHEC on October 1, 2020. SCDHEC approved the work plan on October 16, 2020. The field-scale, groundwater treatability pilot study was initiated in August 2021, and the final performance monitoring event was completed in December 2022. The area inside and outside of the east end of the Main Building was selected for the ISCO pilot study. That pilot study area is shown in **Figure 1-9**. An offsite area on the Dickert property to the north of the Pole Winder building was chosen for the ISERD pilot study. The ISERD pilot study areas are shown in **Figure 1-10** (shallow zone) and **Figure 1-11** (intermediate zone). Observation monitoring wells were installed in both pilot areas in August 2021. Later that month, a baseline groundwater sampling event took place, prior to initiating the in situ groundwater injections.

For the ISCO pilot test, in September 2021 a total of 827 pounds of RemOx®S chemical oxidant was mixed with water to make 2,250 gallons of potassium permanganate (KMnO₄) solution, resulting in an approximate 4% by weight RemOx®S treatment solution. This solution was subsequently injected into three temporary direct push technology (DPT) points to treat shallow zone groundwater in the vicinity of temporary monitoring well (TMW)-31 inside the east end of the Main Building. The targeted treatment area encompassed approximately 550 square ft and assumed an 8-ft radius of influence (ROI) for each DPT injection point. Each DPT injection was conducted over a 10-ft vertical interval from 10 to 20 ft bgs. The RemOx®S solution was injected, in 2-ft intervals beginning at the bottom of the desired treatment interval. This bottom-up injection method equates to 5 vertical intervals per treatment point location and 15 injection intervals overall. ISCO injections were conducted on September 20 and 21, 2021.

For the ISERD pilot test, Anaerobic Biochem (ABC®)+Olé (a proprietary injectant of the firm Redox Tech) was used for the ISERD injection portion of the pilot study. Five temporary shallow zone and five temporary intermediate zone groundwater DPT injection points were used to inject the ABC®+Olé solution in a barrier-type formation upgradient of monitoring well MW-10 on the Dickert property. The DPT injections for MW-10I had to be modified to accommodate DPT refusal at the originally proposed injection locations. A total of 10,000 pounds of ABC®+Olé in 5,000 gallons of water was injected.

At each of the ten targeted DPT locations for the ISERD pilot test, an approximate 19% by weight solution of ABC®+Olé was used. A 19% by weight solution equates to approximately 1,000 pounds of ABC®+Olé mixed with 500 gallons of water per each DPT injection location. Each injection in the shallow zone was performed over a 10-ft vertical interval from 20 ft bgs to 30 ft bgs for the targeted shallow zone groundwater. Each injection in the intermediate zone was performed over a 6-ft vertical interval and from 30 ft bgs to 36 ft bgs for the targeted intermediate zone groundwater. In addition, approximately 100 pounds of magnesium oxide were added per DPT injection location for pH buffering, and guar was used to achieve hydraulic emplacement of the ABC®+Olé mixture at each injection point.

ISERD injections were conducted during the period of September 22 through 24, 2021. Injection was conducted in a bottom-to-top approach, for a total of 2,500 gallons injected into the shallow zone. For the intermediate zone, the target depth was 36 ft bgs. However, at two of the five injection locations, geoprobe refusal occurred before the 36-ft depth was reached. As a result, the volume of injectant solution varied among the intervals and injection points.

Multiple post-injection performance monitoring events (October 2021, March 2022, July 2022, and December 2022) occurred during the pilot study. Laboratory analytical data and field parameter data were reviewed and assembled in the Pilot Study Report (**AECOM, 2023b**). The Pilot Study Report contained detailed information regarding the pilot test design, chemicals, injection procedures, sampling procedures, and analytical results.

1.2.3.7 Pilot Study Conclusions

The Pilot Study Report (**AECOM, 2023b**) was submitted to SCDHEC in May 2023. Conclusions from that report, coupled with data from June 2023 to January 2024 (see Section 2.0 of this FS Report) are summarized below:

ISCO Pilot Study

The ISCO pilot study results are shown in **Figure 1-9**. Review of field observations and measurements along with analytical results from the ISCO study area monitoring wells indicate the following ISCO pilot study conclusions:

- Treatment using the oxidant KMnO₄ was effective in decreasing TCE concentrations to non-detection levels in the area where obstructions did not limit access to the injection DPT equipment.
- The December 2022 TCE concentration of 3,600 micrograms per liter (µg/L) in groundwater at source area well TMW-31 indicated that a TCE source still exists in groundwater under the building in that area following ISCO injection activities.
- Because of overhead obstructions inside the eastern end of the building, another approach to accessing appropriate injection locations in the TMW-31 CVOC groundwater source area may need to be identified.

ISERD Pilot Study

The ISERD pilot study results are shown in **Figure 1-10** and **Figure 1-11**. Review of field observations and measurements along with analytical results from the ISERD study area monitoring wells indicate the following pilot study conclusions:

- CVOC concentrations indicate that overall conditions, with enhancement, in the treatment areas remain favorable for continued degradation to occur in the vicinity of MW-10, MW-10I, and ERD-OBSW-1I. The distance of ERD-OBSW-1S from the injection locations prevented treatment at this well due to the tight lithology associated with the shallow zone groundwater aquifer.

- An increase in parameters such as dissolved iron, total organic carbon,, and methane also support the conclusion that conditions still remain favorable for continued degradation of CVOCs in certain parts of the treatment area.
- The ISERD technology worked favorably for the intermediate zone, as evidenced by the decline in TCE concentrations and increase in cis-1,2-DCE. The pH may have been a limiting factor for success in the shallow zone.
- The bioaugmentation injection event conducted in December 2021 did not result in a significant increase in *dehalococcoides* (DHC) and associated reductase enzymes, which indicates limited effectiveness of this procedure.
- If ERD or ISERD is conducted in the future, buffering to increase the targeted groundwater pH will need to be closely controlled in order to avoid increasing the pH to above 8 S.U., which is outside the favorable range for reductive dechlorination to occur.
- An ROI of at most 10 ft was confirmed during the pilot study.

In the Pilot Study Report, it was recommended that both ISCO and ISERD should be retained as potential treatment technologies and for remedial alternatives development in the FS.

1.3 Report Organization

This FS has been prepared in general accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) in Title 40 of the Code of Federal Regulations (CFR), Part 300 as amended on March 5, 1990 (55 FR 8666). The general framework of this FS Report is based on the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988) with revisions and additions to accommodate the unique aspects of this feasibility study.

The basic steps in the FS process and, consequently, the organization of this FS Report, follow the CERCLA process. The following outline for this FS Report essentially follows what was listed in the FS Work Plan (**AECOM, 2019**), with slight modifications to the text outline to account for the additional assessments conducted at the Site between June 2023 and January 2024:

- Summarize the additional assessments conducted from June 2023 to January 2024 (Section 2.0);
- Present the current CSM, including discussions of site-specific geology and hydrogeology, nature and extent of contamination, and fate and transport (Section 3.0);

- Discuss RAOs, ARARs, and RGs (Section 4.0);
- Identify and screen potential groundwater treatment technologies, including discussion of area and volume of groundwater requiring remediation, general response actions, and process options (Section 5.0); and
- Develop and perform a detailed evaluation and comparative analysis of potential remedial action alternatives (Section 6.0).

2.0 ADDITIONAL ASSESSMENTS - JUNE 2023 THROUGH JANUARY 2024

The groundwater pilot study testing was completed in December 2022. After review of the groundwater analytical data received from the laboratory in February 2023, and additional review of the Sitewide groundwater monitoring event data of February and March 2022, Signify and AECOM determined that several data gaps existed, regarding VOC source areas and potential groundwater migration. It was agreed that these data gaps needed to be addressed prior to completion of the FS Report. These four potential data gaps were addressed through field activities from June 2023 through January 2024. In addition, during that period the groundwater pilot test monitoring wells were sampled at least once.

The four potential data gaps and the actions performed to address the data gaps are summarized below:

- Additional groundwater assessment in the area of the foam room (TMW-31 area) and paint room inside and outside of the Main Building, to further evaluate a potential VOC source in this area – Installation and sampling of additional groundwater monitoring wells occurred in June 2023.
- Additional assessment of the subslab vapor and soil in the area upgradient of the foam room, to further evaluate a VOC source in this area – Sampling and analysis of subslab vapor (SSV) and soil, along with sampling several pilot study wells, was performed in September 2023.
- Evaluation of the bedrock surface and depth to bedrock outside the Main and Pole Winder Buildings and downgradient of the groundwater plume to the north of the Site using seismic geophysical tools, to evaluate potential preferential pathways of groundwater migration from the Site building areas – This task was conducted in November 2023.
- Evaluation of groundwater TCE concentration trends in selected monitoring wells onsite and offsite, to see if TCE concentrations are increasing, stable, or decreasing in the areas where the wells are located – Groundwater samples were collected from 21 monitoring wells in January 2024 for VOC analysis, and Mann Kendall trend plots were developed from these results.

It was originally intended that the field and laboratory results and conclusions from the activities during this time period would be included in the FS Report. However, because of the extensive volume of data generated during this time period, the document entitled Feasibility Study Technical Memorandum (**AECOM, 2024**) was developed in February 2024 and submitted to SCDHEC. This document contains summaries of the objectives, approaches and procedures, observations, data, and conclusions and recommendations for each of the data gaps and for the additional pilot study area sampling. The conclusions and recommendations stemming from the June 2023 to January 2024 additional assessments and contained in the Feasibility Study Technical Memorandum, are listed in the following subsections.

2.1 Conclusions from June 2023 Main Building Area Assessment

The following conclusions were drawn from the June 2023 assessment:

- The source area for VOCs in groundwater upgradient of well TMW-31 in the paint room was better defined in June 2023. Additional monitoring wells were installed inside and outside the building. The locations of those wells, MW-34 to MW-38, are shown in **Figure 2-1**. The 681 µg/L TCE concentration at well MW-35, which is upgradient of well TMW-31 and the foam room, is similar in magnitude to the 920 µg/L baseline concentration detected in August 2021 and 480 µg/L and 860 µg/L concentrations detected during the pilot study at well TMW-31. According to discussions with facility personnel after receipt of the data, there are no known potential TCE sources farther upgradient of the foam room in the east end of the Main Building, other than the subslab sewer line upgradient of the foam room. (Note: as a follow up to the June 2023 sampling event, assessment of SSV and soil in the area upgradient of the foam room was conducted in September 2023, as discussed in Section 2.2 of this document).
- The June 2023 data indicated that the VOC plume has not migrated appreciably beyond the area of the outside observation well. The June 2023 sampling event revealed that the maximum TCE concentration in groundwater downgradient of observation well ISCO-OBSW-1S was 21 µg/L at well MW-37, which is located outside of the building.

2.2 Conclusions from the September 2023 Main Building Area Assessment

The following conclusions were drawn from the September 2023 assessment:

- Based on the SSV data collected from ten locations inside the east end of the Main Building and upgradient of the foam room, there was no indication of a TCE source in SSV of a magnitude that would suggest a significant TCE source in soil in that area of the building.
- Based on the soil data collected from four locations inside the east end of the Main Building, along the sewer line beneath the concrete floor and upgradient of the foam room, there was no indication of a TCE source in soil media of a magnitude that would suggest a significant TCE release from the sewer into underlying soil in that area of the building.
- Since no TCE source area was found, it was recommended to proceed with the seismic study, later conducted in November 2023, to evaluate potential preferential pathways for TCE in groundwater downgradient of the Site buildings.

The SSV and soil concentrations from the September 2023 assessment and also from the RI are depicted in **Figure 2-2** and **Figure 2-3** respectively. The 2023 data have also been added to the SSV and soil tables (from 2018 RI), in **Table 2-1** and **Table 2-2**, respectively.

2.3 Conclusions and Recommendations from the November 2023 Seismic Evaluations

The following conclusions were drawn from the November 2023 seismic assessment:

- As illustrated on Figures 3-1, 3-2, and 3-3 in the FS Technical Memorandum, inspection of shallow, intermediate, and bedrock zone groundwater monitoring results suggests that there are different migration dynamics driving the direction of contaminant distribution in the monitored depth intervals. A structure contour map of the top-of-rock surface (underlying all three figures), prepared based on reported depth of competent rock in the previously installed soil borings, suggested the potential for bedrock topography to influence groundwater flow.
- The seismic assessment data coupled with the structure contour map data suggest that the bedrock surface is more of a pinnacled surface with abrupt changes in depth, instead of a smooth surface with gradual slopes between data points. These observations suggest that the potential for preferential groundwater/contaminant flow paths is present, but that further refinement of the bedrock surface is unlikely with remote sensing tools that are feasible to use at this site.

The geophysical field investigation was completed in one mobilization from November 7 to 11, 2023. Data collection occurred along nine lines as shown on **Figure 2-4**.

2.4 Conclusions from the January 2024 Groundwater Sampling Event

The following conclusions were drawn from the January 2024 sampling event:

- There was no indication of an increasing TCE source area. Of the 21 wells sampled in January 2024, only two of them showed increasing concentrations, and both of those were of relatively low magnitude: MW-14 (maximum TCE concentration of 139 µg/L) and TMW-25 (maximum TCE concentration of 51.9 µg/L). MW-14 is an off-site well to the north of the Pole Winder Building, and TMW-25 is inside the Pole Winder Building.
- There was indication of potential migration of TCE from formerly higher concentration areas on the west side of the Site. The decrease in TCE groundwater concentrations at several wells on the west side of the Site, inside and outside of the Main Building or the Pole Winder Building, indicate potential for downgradient CVOC migration. Since TCE daughter products (cis-1,2-DCE and vinyl chloride) concentrations are low, there is no indication of appreciable natural anaerobic biodegradation that is occurring; therefore, the concentration decreases likely have resulted from dilution or dispersion. From 2017 to January 2024, the following TCE concentration notable decreases were observed:
 - MW-8 from 1,100 to 412 µg/L;
 - MW-9 from 170 to 45 µg/L;
 - TMW-21 from 890 to 90 µg/L;
 - TMW-24 from 320 to 94 µg/L.

TCE concentration trends in these four and in other shallow aquifer monitoring wells are shown in **Figure 2-5** and **Figure 2-6**. Concentration trends in the intermediate and bedrock zones in selected wells are shown in **Figure 2-7** and **Figure 2-8**, respectively.

2.5 Conclusions from the Additional Sampling of Pilot Test Wells

The additional groundwater data generated during the period from June 2023 through January 2024 are included in **Figure 1-9**, **Figure 1-10** and **Figure 1-11**, for the ISCO, ISERD shallow zone, and ISERD intermediate zone pilot test areas, respectively. **Table 2-3** and **Table 2-4** depict the analytical results through January 2024 for the ISCO and ISERD pilot test areas. The following conclusions were drawn from the additional sampling of the pilot study wells:

ISCO Pilot Test Area:

- Based on the pilot test data at ISCO-OBSW-1S, ISCO is still a retained technology for detailed analysis of alternatives for the FS.

ISERD Pilot Test Area:

- Based on the pilot test data from these wells, ISERD is still a retained technology for detailed analysis of alternatives for the FS. The use of activated carbon (AC) and ZVI to enhance anaerobic biodegradation are also retained technologies for detailed analysis in this FS.

2.6 Recommendations from the Data Gap Evaluation

As a result of the conclusions above, AECOM did not recommend advancement of additional borings/monitoring wells prior to completion of the FS Report for the following reasons:

- The available data adequately demonstrated that the groundwater environment is highly variable across the site and that the heterogeneity has the potential to influence the flow of groundwater and migration of contaminants.
- Additional drilling would only refine that understanding incrementally at the selected locations. To achieve a sufficient density of data to adequately characterize the heterogeneities of the site would require drilling in poorly accessible areas of the Site such as within the operating facilities and on neighboring properties.
- The magnitude of CVOC concentrations (almost all recent concentrations less than 1 milligram per liter of TCE across the site) did not indicate the presence of dense non-aqueous liquid or other high concentrations of TCE or other CVOCs.
- Trend plots of TCE concentrations, recently completed using data from 2017 to January 2024, indicated only two isolated points with increasing TCE concentrations.
- Based on the data gap evaluation and additional pilot test sampling, it was recommended that development of the FS Report continue. Remedial technologies should be selected that can be applied at specific locations at the Site. Remedial actions should be focused on the likely source areas and known flow paths, while having a broader impact by utilizing existing groundwater flow paths to remediate downgradient residual contamination.

3.0 CURRENT CONCEPTUAL SITE MODEL

This section contains summaries of the geology and hydrogeology at the Site, based on RI and other data generated to date. From these data, the nature and extent of soil and groundwater contamination is discussed, and the CSM presented in the RI Report is further refined and addressed in this section.

3.1 Site-Specific Geology

Over 100 soil and/or well borings have been advanced during the multiple phases of investigation at the Site. Lithologic data collected from these borings has been used to develop a description of the sediments and rock formation beneath the Site. Soil/rock encountered during boring installation were visually examined by field personnel and recorded on soil boring logs. Field personnel used the Unified Soil Classification System to characterize and describe the soils encountered during field sampling activities. Lithologic data obtained from these borings has provided information to allow determination of soil and rock layers beneath the Site and correlation of Site-specific data with the geologic formations.

Four geologic cross sections were prepared during the RI phase, using well and soil boring information obtained during the various phases of investigation. The cross-sections depict the general lithology based on the major component identified in soil cores (sands, silt, clay, etc.). **Figure 3-1** is a site map depicting well boring locations and the orientation of the cross sections. **Figure 3-2** through **Figure 3-5** are the geologic cross sections depicting the lithology encountered beneath the Site.

As illustrated on the cross-sections, geologic formations encountered beneath the Site ranged from the residuum to saprolite to bedrock. The shallow soils (land surface to approximately six ft bgs) encountered directly beneath the Facility appear to be fill material placed during construction of the original plant buildings. Shallow residuum related sediments encountered beneath the fill materials on the facility and other areas generally consist of pale brown to reddish brown fine grained sands and silt to silts and silty clay with sand. The thickness of the residuum sediments vary across the Site, ranging from as little as three ft to ten ft. These soils have been severely weathered and contain little to no rock fabric texture and consist of varying percentages of sand, silt, and clay.

The residuum interval grades downward to a less weathered saprolitic zone with varying percentages of sands, silts and clay. Saprolitic soils are differentiated in this area from the residuum by color and visually evident relict rock fabric or structure. The residuum soils are more consistent in color, while the saprolitic soils contain sediments of varying color related to degradation of granitic parent rock minerals (white to pale red – feldspars, gray - quartz, dark gray to black – biotite and hornblende). The saprolitic soils range from one ft to more than ten ft in thickness across the Site.

The saprolitic soils are underlain by bedrock consisting of granite and/or granitic gneiss. Rock cores have been collected from each bedrock well bore. As indicated above, each core sample was visually examined by AECOM field personnel. Based on examination of rock core samples

collected from the Site, the majority of the study area is underlain primarily by an aphanitic (fine grained) granite (which may also be considered a granodiorite based on percentage of quartz and feldspars). The mineral content of the granite consists of a mixture quartz (gray), plagioclase feldspar (light gray to white), orthoclase feldspar (pink to pale brown), and to a lesser extent accessory minerals including hornblende and biotite (dark gray to black). This is evident in rock cores from the majority of the bedrock wells installed at the Site. Small thin zones of phaneritic (larger-coarse grain) mineral textures are present at multiple depths in cores from RDW-1 (west central portion of Site) and SDW-3 (southern portion of Site).

The bedrock content appears to change to more of granitic gneiss beneath the west-southwest portion of the Site. Cores from boring SDW-2 indicate the mineral content of the rock contains a much higher percentage of darker colored (black, dark gray) feldspars and hornblende with numerous white to light gray (likely quartz and feldspar rich) dike-like intrusions of varying thickness. This fabric was evident from the depth at which it was encountered (43 ft bgs) to the bottom of the well bore in SDW-2 (88 ft bgs). This same fabric was also encountered in the rock core for MW-19D, located north of SDW-2, but at a much greater depth than at which it was encountered in SDW-2. The gneiss-like structure was encountered beneath the aphanitic granite seen throughout other portions of the Site between depths of 95 and 120 ft bgs in MW-19D.

3.2 Site-Specific Hydrogeology

This section briefly discusses the regional and Site-specific hydrogeology.

3.2.1 Regional Hydrogeology

The Site is located in the piedmont physiographic province of South Carolina. Groundwater is typically encountered in the alluvial deposits and weathered saprolite above the bedrock within the primary porosities of the soils and within the secondary porosity (e.g. faults, joints, and/or fractures) in the bedrock. Groundwater movement occurs within each of these zones. Groundwater movement within the unconsolidated materials (residuum and saprolite) is typically controlled more horizontally by topography and discharge to surface water bodies and vertically with seepage/discharge to the underlying bedrock.

3.2.2 Site Hydrogeology

During the investigative efforts completed at the Site, drilling was conducted to as deep as 163 ft bgs. Temporary and/or permanent monitoring wells were screened in three depth zones: shallow (or water table/surficial aquifer), intermediate (typically screened in saprolite), and in bedrock.

Table 3-1 summarizes TMW and permanent well construction and depth information.

In general, the water table is encountered in the fine sands and silts to silty clays of the residuum across the Site. Total depths for shallow wells ranged from 12 ft bgs, on top of bedrock beneath the eastern end of the Main Building at the Facility property, to approximately 30 ft at several locations throughout the center portion of the Site. The variation in depth of the shallow wells across the Site is due to differences in land surface elevation and the depth to underlying bedrock. Groundwater has been encountered at depths ranging from approximately two ft bgs in shallow

wells near the northern end of the Site on the Dickert property to as deep as approximately 18 ft in wells on the Facility property.

Intermediate wells were installed in the underlying saprolite or at the saprolite-bedrock interface depending on location and the results of field screening. Intermediate well depths ranged from 23 ft bgs in MW-19I, which is at the top of bedrock to as deep as 55 ft in MW-3I, located at the southwest corner of the Facility property. Depth to groundwater in intermediate wells has ranged from 3.8 ft bgs in MW-19I to 18 ft in MW-9I.

Bedrock monitoring wells were installed either as open hole wells, allowing access to the upper most fracture zone in underlying bedrock, or screened across specific fracture zones at greater depths. Bedrock well depths ranged from 50 ft bgs in MW-17D, located on the Dickert property to as deep as 162.5 ft in MW-19D, located on the Chapman property. Groundwater levels in the bedrock wells ranged from approximately six ft bgs in RDW-1 to as deep as 69 ft bgs in SDW-2.

3.3 Site-Specific Hydrogeology

This section briefly discusses the Site-specific hydrogeology summarized following the RI activities, updated with 2022 groundwater elevation data.

3.3.1 Hydraulic Conductivity

During Phase II of the RI, hydraulic conductivity tests (slug tests) were performed on select shallow and intermediate monitoring wells. Data collected from the slug tests were used to calculate hydraulic conductivity (K), which is a two-dimensional measure of the ability of a square unit of the aquifer to allow the flow of water. The hydraulic conductivity is also used with the groundwater gradient and media porosity to determine the rate of groundwater flow. The procedures for conducting slug tests are discussed in Section 3.3.7 of the RI Report (**AECOM, 2018**).

Slug tests were conducted on seven paired shallow and intermediate wells. Data generated during the slug tests were evaluated using Aqtesolv, a commonly used, commercially available, computer software package. The results of the slug tests for the seven shallow wells showed that the K values ranged from 0.13 to 2.19 ft per day (ft/day) with an average K of 0.80 ft/day. K values in the intermediate zone wells ranged from 0.055 to 1.65 ft/day for an average of 0.72 ft/day. The results of the analysis of the slug test data for the shallow wells are included in Appendix E of the RI Report, along with the copies of the raw water level data and graphs generated using Aqtesolv software.

3.3.2 Groundwater Hydraulic Gradients

Depth to groundwater data from the February 2022 Sitewide groundwater monitoring event were used to calculate groundwater elevations and to prepare groundwater elevation contour maps for each zone. Depth to water data from 2017 through January 2024 are shown on the groundwater elevation summary table (**Table 3-2**). **Figures 1-3 through 1-5** are groundwater elevation contour maps for the shallow, intermediate, and bedrock zones, respectively, based on the most recent sitewide water level measurement event (February 2022). As shown in each of the contour maps, the general direction of groundwater flow appears to be to the west-northwest. In the

shallow zone, the groundwater flow is to the northwest with a southwest flow component, which is likely the result of a topographic low in that direction (**Figure 1-3**). Groundwater flow in the shallow zone can be interpreted to be in the direction of several small unnamed tributaries that lie to the west of the Site. The groundwater flow direction in the intermediate zone is also to the west (**Figure 1-4**). Based on elevations determined for the bedrock wells, the direction of flow within bedrock appears to be to the west. There are several private water supply wells located to the west and southwest of the Site. Historic use of these wells has likely directed flow within the bedrock fracture system to the southwest (**Figure 1-2B** and **Figure 1-5**).

The groundwater elevations and flow maps were used to calculate average horizontal and vertical groundwater gradients across the site. The triangulation method was used to calculate horizontal gradients for each zone. This method uses groundwater elevations from upgradient wells on the east side of the Site, side gradient wells, and downgradient wells located west of the Site. Based on the groundwater elevations determined during the February 2022 Sitewide measurement event, the average hydraulic gradients for each zone are as follows:

- Shallow zone – 0.016 feet per foot (ft/ft), the same as that calculated in June 2018, to the west-northwest
- Intermediate zone – 0.015 ft/ft, which is almost identical to that calculated in June 2018, to the west-northwest
- Bedrock zone – 0.02 ft/ft, compared with 0.013 ft/ft in June 2018, also to the west

These horizontal hydraulic gradients were calculated using the February 2022 data provided in **Table 3-2**.

Determination of the vertical gradients provides a basic indication of whether contaminants have the potential to migrate vertically from shallower groundwater zones to deeper zones. Vertical hydraulic gradients were also calculated using the February 2022 data from paired shallow and intermediate well clusters across the Site. The vertical gradient calculations for the February 2022 monitoring event are shown in **Table 3-3**.

Based on the calculated hydraulic gradients, it appears that there was a general downward gradient between the shallow and intermediate zones across the Site during this event. The average vertical gradient between the shallow and intermediate zones for this event was determined to be -0.044 ft/ft in the downward direction. The vertical gradients onsite ranged from -0.46 ft/ft at the MW-19 well pair to +0.20 ft/ft at the MW-21 well pair.

3.3.3 Groundwater Flow Rates

The hydrogeologic data (hydraulic conductivity and gradient) collected at the Site during the RI and updated with the February 2022 groundwater elevation data were used to calculate Site groundwater flow rates using Darcy's Law. Groundwater flow rates for the unconsolidated formation (water table/shallow zone and intermediate zone) and bedrock beneath the Site are summarized in the table below.

Hydraulic Property Summary Table Shakespeare Composite Structures Site

	Average Hydraulic Gradient (from February 2022 Monitoring Data) (ft/ft)	Assumed Effective Porosity	Average Hydraulic Conductivity (from RI Data)	Calculated Groundwater Velocity (ft/day)	Calculated Groundwater Velocity (ft/yr)
Shallow	0.016	0.25	0.81	0.051	18.9
Intermediate	0.015	0.3	0.72	0.036	13.14
Bedrock	0.020	NA*	NA*	NA*	NA*

* Not determined based on variability within screened fracture zones.

3.4 Summary of Nature and Extent of Contamination

The nature and extent of soil, SSV, groundwater, and surface water contamination is described in the subsections below.

3.4.1 Soil

Although several VOCs have been detected in soil samples, the CVOCs TCE and cis-1,2-DCE were the chemicals most frequently reported above their respective screening values in soil samples. Both TCE and cis-1,2-DCE were detected in a limited number of surface soil (0-2 ft) samples. Subsurface soil data from the RI and from September 2023 are shown in **Table 2-2**. Soil samples collected during this phase of work were selected based on field screening results. In some cases, multiple samples were collected from intervals between 2 and 10 ft bgs, based on field screening results. Soil samples collected from the six borings advanced during Phase II of the RI were collected at two-ft intervals between land surface and 15 ft bgs. TCE and cis-1,2-DCE were detected in multiple samples collected from several of the Phase II RI borings.

Based on the results presented in **Table 2-2**, the distribution of elevated TCE concentrations is primarily centered underneath the west-central portion of the Main Building, with the highest TCE concentrations detected at in the Main Building at B-27, B-30, B-47, and B-49. Based on subsurface soil sample data, there also appears to be a small area of elevated TCE concentrations beneath the Pole Winder Building between at B-45PW and B-50. No TCE was detected in soil from the additional assessment at the eastern end of the Main Building in September 2024.

As indicated in **Table 2-2**, no chemicals detected in soil exceeded regional screening levels (RSLs) for an industrial or residential scenario during any of the assessment events. The following constituents exceeded the MCL-based soil screening level (SSL): methylene chloride, styrene, and TCE. The first two compounds are currently used onsite and are not deemed to be legacy compounds. In addition, methylene chloride is a common laboratory artifact.

3.4.2 SSV

During Phase II of the RI, SSV samples were collected on two separate occasions. The initial phase of soil vapor sampling entailed collection of samples from 52 locations using a passive sampling system. Confirmatory SSV samples were collected at seven specific passive sample points that were selected based on the elevated VOC concentrations reported as a result of the passive sampling effort (**Figure 2-1**).

Passive SSV Screening Results: The passive sampling effort detected several VOCs in soil vapor. As shown in Table 5-7 of the RI Report, one of at least 20 different VOCs were detected in at least one passive sample. Review of these results indicated multiple areas of elevated VOC concentrations in soil vapor. The aromatic hydrocarbons benzene, toluene, ethylbenzene and xylenes (BTEX) were detected most frequently in the passive vapor samples. Other aromatic compounds detected frequently included isopropylbenzene and 1,2,4-trimethylbenzene. The CVOCs cis-1,2-DCE, PCE, and TCE were also detected in multiple passive sample locations. The passive sample results were not used for comparison to any regulatory screening values since the results were reported as mass only [nanograms (ng)]. This task served as a screening process. The results of which were used to identify areas where VOCs were present at elevated concentrations and allowed focusing of additional soil vapor and soil sampling efforts that could be used to identify potential source areas. **Figure 2-1** depicts the distribution of TCE in soil gas based on the results of the passive survey.

Confirmatory Soil Vapor Sample Results: As a result of the passive sampling effort, SCDHEC requested collection of additional soil gas data using an active sample collection method at five of the passive sample locations in the Main Building and two locations in the Pole Winder Building. These locations were identified for confirmatory sampling by SCDHEC based on the concentrations of chlorinated compounds in each of the corresponding passive samples. Confirmatory soil vapor samples (SVS) were collected using a vapor pin and 1 liter summa canister at passive sample locations SV-31, SV-45, SV-46, SV-49, and SV-54 in the Main Building and locations SV-20 and SV-23 in the Pole Winder Building. The seven samples were analyzed for the nine VOCs most commonly detected during the passive survey along with the CVOCs trans-1,2 DCE and VC using USEPA Method TO-15.

As indicated above, SVS sampling results were screened against the USEPA Industrial Air RSL [based on a hazard quotient (HQ) of 1]. The industrial air RSLs were used because this is an active manufacturing facility, and Facility personnel have stated that operations will continue for the foreseeable future. The remedies being considered incorporate institutional controls that would limit use of the Site to industrial use. The results are summarized on **Table 2-1**.

As presented on **Table 2-1**, benzene, cis-1,2-DCE, ethylbenzene, cis-1,2-DCE, and TCE were detected above their respective industrial RSLs in one or more samples. Meta- and para-xylene and PCE were detected above their respective RSLs in multiple samples. The samples from SVS-31 and SVS-49 contained the highest number of detections above screening values with five compounds each. The highest VOC concentration detected in the samples was TCE at 1,020 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) in SVS-31. TCE was detected above its Industrial RSL in

five of the seven SVS samples. TCE was also detected above its residential RSL but not above its industrial RSL in one of the seven SVS samples.

For the ten vapor point sampling points collected near the Foam Room in September 2023, benzene, ethylbenzene, and TCE were detected above their industrial RSLs.

It should be noted that the benzene, ethylbenzene, and meta- and para-xylenes detected are likely to have originated from current operations and not from historical Site operation. Therefore, only the two CVOCs (cis-1,2-DCE and TCE) detected above their industrial RSLs are determined to be COCs for this FS.

Soil Vapor Summary: The areas of highest CVOC concentrations in the passive soil vapor samples are located within the central western portion of the Main Building and beneath a portion of the Pole Winder Building, which correlate directly with the areas of soil impact and elevated groundwater concentrations. TCE results for the confirmatory soil vapor samples, also depicted on **Figure 2-1**, confirm the areas of the higher TCE concentrations in sub-slab soil vapor. It is important to note that soil vapor data collected from the downgradient (western and northern) Facility property boundaries have detected a very limited number of VOCs. This indicates that the potential for migration of volatile vapors from the likely onsite Facility source areas to offsite areas is minimal.

3.4.3 Groundwater

Groundwater data have been collected during multiple phases of work beginning with the Phase II Environmental Site Assessment, then the Phase I and Phase II RI, the 2022 sitewide comprehensive sampling event, and the additional assessments of June 2023 to January 2024. This includes sampling from temporary well borings, permanent monitoring wells, and private water supply wells. This section summarizes the results of the historic, RI, and post-RI groundwater investigative efforts. This section of the report focuses primarily on the most recent RI and post-RI data.

The majority of the groundwater samples collected from the Site have been analyzed for target compound list (TCL) VOCs. A limited number of samples were also analyzed for specific biogeochemical parameters used to evaluate natural attenuation potential. **Tables C-1 through C-3 in Attachment A** summarize analytical results and field parameter readings for groundwater samples collected from the site through January 2024. Analytical results are compared with the MCLs.

The following summary appears in the Sitewide Groundwater Monitoring Report (**AECOM, 2023a**), with the exception of a change of figure and table numbers to reflect this FS Report:

“The highest TCE concentrations found in shallow wells in 2022 are beneath the Main Building: MW-8 at 530 µg/L (600 µg/L from detected in the passive diffusion bag [PDB] sample); and TMW-31 at 480 µg/L (down from 1,400 µg/L in 2017 but increased to 1,810 µg/L in September 2023 after completion of the ISCO pilot study). Another high TCE concentration is also found outside and hydraulically downgradient of the Pole Winder Building: (MW-10 at 590 µg/L, which is the location of the shallow zone ISERD pilot study). These concentrations are shown in **Figures 1-**

6, 2-8, and 2-9. The area of TCE impacted groundwater in the shallow zone extends radially from the Main Building to the west and from the Pole Winder Building to the north-northwest. This distribution of TCE in the shallow zone appears to be consistent with groundwater flow direction, which is generally to the west of the Main Building and to the northwest or north-northwest downgradient from the Pole Winder Building.”

As shown in **Figure 1-7**, the distribution of TCE in the intermediate zone is similar to that depicted beneath the facility property. The extent of TCE impacts to the west-southwest is slightly more widespread than in the shallow zone, but less than that to the northwest. The highest TCE concentrations in the intermediate zone in 2022 occurred at wells MW-9I (850 µg/L), located west of the Main Building, and MW-5I (610 µg/L), located on the north side of the Pole Winder Building. The previous high concentration at MW-10I in 2017 (1,000 µg/L) was reduced to 50 µg/L in 2022, as a result of the ISERD pilot study initiated in fall 2021. This concentration has since increased up to 617 µg/L during the most recent sampling event (**Figure 2-10**).

TCE impacts in the bedrock zone extends farther to the southwest than either the shallow or intermediate zones, as shown in **Figure 1-8**. This is thought to be due to the historic use of private water supply wells, screened in the bedrock, located to the south and west of the facility. The highest TCE concentration in the bedrock during the 2022 Sitewide monitoring event occurred at well MW-6D (160 µg/L), located on the north side of the Main Building. The second highest concentrations occurred at off-Site well MW-12D (53 µg/L and 70 µg/L in the PDB sample); MW-12D is located on the tract of land (Dickert property) to the north of the Pole Winder Building and railroad tracks.

Isoconcentration maps were not developed in this report for cis-1,2-DCE or any other VOC, since there were very few additional MCL exceedances other than for TCE. As previously mentioned above, cis-1,2-DCE was detected above its MCL (70 µg/L) in only three samples of the 2022 Sitewide monitoring event: MW-6 (220 µg/L), MW-8 (76 µg/L), and TMW-21 (130 µg/L). The area of cis-1,2-DCE-impacted groundwater generally mimics the TCE plume but is much less widespread. The highest cis-1,2-DCE concentrations are also found in wells located on the Facility property near the Main Building and towards the northwest corner of the Facility property.

Additional discussion of the nature and extent of VOCs in groundwater occurred in the RI Report (**AECOM, 2018**) and the Pilot Study Report (**AECOM, 2023b**). Discussions of geochemical indicator, biological indicator, and natural attenuation evaluation also are addressed in those two documents. Review of the geochemical and biological indicator parameter and degradation by-product information supports a conclusion that natural attenuation via biodegradation is evident beneath portions of the Site. Based on these parameters, there is evidence of the presence of electron acceptors (sulfate, iron, manganese, etc.). Reduced species of these acceptors (sulfide, ferrous iron, soluble manganese, etc.) are present, which indicate reducing conditions. Additionally, the dissolved oxygen (DO) and oxidation reduction potential (ORP) are low, indicating anaerobic groundwater conditions, which also supports reductive dechlorination. The results of the screening protocol are presented in Table 5-15 of the RI Report. As shown in that table, four of the wells (MW-6, MW-6D, MW-8, and MW-9I) exhibit adequate evidence of reductive dechlorination. Five wells (MW-7I, MW-10, MW-10I, MW-20 and MW-20I) exhibited limited evidence of anaerobic biodegradation. The products of TCE degradation observed at the Site

include cis-1,2-DCE and VC, which were present at relatively low concentrations in some of the monitoring wells. The ratio of parent compounds (PCE and TCE) to the degradation products in several wells was also analyzed. Reviewing the ratio of parent to daughter products showed that wells MW-6 and MW-7I have significant concentrations of daughter products (greater than 25 percent). Of the DCE isomers, cis-1,2-DCE is predominant and indicative of reductive dechlorination of TCE. This evidence suggests that natural attenuation is occurring beneath a portion of the Facility property; however, it does not appear to be widespread.

A groundwater sample was collected in June 2014 from the private water supply well located on the Boazman property that bounds the west side of the facility. The initial water well sample collected from the Boazman well contained TCE at a concentration of 270 µg/L, which is above the MCL of 5 µg/L. As a result of the detection of TCE in the initial sample from this well, SCDHEC requested collection of groundwater samples from private water wells surrounding the facility (**Figure 1-2B**). Eight private water wells were sampled to determine if VOCs were present. The tables in **Attachment A** lists the water well samples collected during investigative efforts and the associated analytical results.

TCE was detected in the initial sample from the Boazman well (270 µg/L) and PW-2 (64 µg/L). Because both concentrations exceed the MCL for TCE of 5 µg/L, Philips (now Signify) installed carbon filter systems and/or municipal water lines to the affected homes utilizing these wells.

During the sampling and analysis of groundwater from private water wells, TCE was the only compound detected above its MCL. As indicated, TCE was detected in the initial sample from PW-2 at 64 µg/L, and it was also detected in PW-5 (livestock well on the Shealy property) at 15 µg/L. The degradation compound cis-1,2-DCE has also been detected at low concentrations in the initial sample from the Boazman well (7.7 µg/L) and the initial samples from PW-2 (6.9 µg/L) and PW-5 (0.94 µg/L); all detected cis-1,2-DCE concentrations were below the MCL of 70 µg/L.

A dual packer system was used to collect samples from multiple depth intervals in wells PW-2 and PW-8. As shown in the tables in **Attachment A**, TCE was detected in each depth interval in both wells above its MCL. TCE concentrations in the PW-2 samples ranged from 16 µg/L at 140 ft to 79 µg/L at 84 ft. TCE concentrations ranged from 9.8 µg/L at 182 ft to 150 µg/L at 155 ft in PW-8. PW-4 (Chapman well) has been sampled on multiple occasions with only trace concentrations of TCE reported in these samples. No VOCs were detected in the samples collected from PW-1, PW-6, and PW-7.

Based on the results of the water well sampling efforts surrounding the Site, Signify coordinated the connection of several properties west of the Site to the Newberry County Water and Sewer Authority (NCWSA). This included the homes connected to the Boazman well (Boazman and Ringer homes), PW-2 (Shealy property rental), and PW-3 (Shealy property rental). In addition, a water line was installed to supply water for cattle formerly supplied by the livestock well (PW-5) on the Shealy property.

3.4.4 Surface Water

A total of eight surface water samples were collected from the Site by the end of the RI phase. This includes multiple samples collected from locations SW-1 through SW-3, which are located

on the Dickert property, and one round of samples from locations SW-4 and SW-5, which are located on the Shealy property. Each sample was analyzed for TCL VOCs. **Figure 3-6** depicts the surface water sample locations.

Table 3-4 lists the surface water data for samples collected from the Site. As shown, a limited number of VOCs were detected in the surface water samples. The primary CVOC (TCE) and its daughter compound cis-1,2-DCE were detected in samples collected from location SW-2 on multiple occasions, but at low to trace concentrations. TCE was also detected at a trace concentration in the sample collected from SW-5, located on the Shealy property. The reported concentrations do not exceed their respective surface water screening criteria. Based on the intermittent detection of Site-related constituents in each of the tributaries, it appears that groundwater will periodically discharge to the tributaries to the north (on the Dickert property) and to the southwest (on the Shealy property). The interaction between groundwater and surface water in these tributaries is based on rainfall and groundwater elevations, with discharge of groundwater occurring during periods of normal to above average rainfall.

3.4.5 Chemicals of Concern, Media of Concern, and Potential Receptors

Analytical data collected from 2014 to 2024 have been evaluated in previous documents and in the FS Report. The following is a summary of the COCs, media of concern, and potential human receptors at the Site:

3.4.5.1 Chemicals of Concern

Soil COCs: TCE. As indicated in **Table 2-2**, no constituents exceeded industrial or residential RSLs for soil during any of the assessment events. The following constituents exceeded the MCL-based SSL: methylene chloride, styrene, and TCE. The first two compounds are currently used onsite and are not deemed to be legacy compounds associated with historical facility operations. Also, methylene chloride is a common laboratory artifact. As a result, only TCE has been determined to be a soil COC for this FS.

SSV COCs: PCE, TCE and cis-1,2-DCE. As indicated in **Table 2-1**, the only constituents exceeding industrial RSLs for air were these two compounds, plus benzene and ethylbenzene. BTEX compounds are byproducts of the existing manufacturing process and are not legacy compounds. Therefore, TCE and cis-1,2-DCE are the only SSV COCs for the FS. As previously discussed, industrial RSLs were used because the Site use in the foreseeable future is industrial.

Groundwater COCs: PCE, TCE, cis-1,2-DCE, and VC. As indicated in the tables contained in **Attachment A**, the following CVOCs exceeded their MCLs in at least one groundwater sample during the 2014 to 2024 period: PCE, TCE, cis-1,2-DCE, and VC. These constituents were determined to be COCs in the RI Report. Only two of these constituents, TCE and cis-1,2-DCE, exhibited exceedances of the MCL in the 2022 samples. One non-CVOC, styrene, had one MCL exceedance in one Site well, occurring only in March 2022. However, styrene is a compound associated with the current manufacturing process and is not a legacy chemical that was used.

As a result, no new COCs were identified during the 2022 Sitewide monitoring event or during the additional assessments of June 2023 to January 2024.

Surface water COCs: None. As indicated in **Table 3-4**, there were no exceedances of the surface water screening criteria. As a result, there are no surface water COCs for this FS.

3.4.5.2 Media of Concern for the FS

Based on the nature and extent of contamination and on the current CSM, the following are media of concern to be addressed in the FS:

- Soil,
- SSV, and
- Groundwater.

3.4.5.3 Potential Receptors

Based on the BRA previously conducted as part of the RI phase for the Site, on the nature and extent of contamination evaluation, and on the current CSM, the following receptors or potential receptors have been identified:

- on-Site and off-Site groundwater
- on-Site soil,
- on-Site SSV

Note that no ecological receptors were identified in the Screening-Ecological Risk Assessment.

3.6 Conceptual Site Model and Fate and Transport Summary

The data and other information from the RI and pre-RI phases were used to develop a pictorial CSM and a more detailed 3-dimensional (3-D) model for the Site. Both versions of the CSM depict the extent of TCE since it is the chemical most commonly detected above screening values at the Site. **Figure 3-7** represents the pictorial CSM for the Site. This version of the CSM provides a cross-sectional view of the Site from the south-southwest.

As shown on the figure, the source for the TCE related impacts appears to be via the historic release(s) of chlorinated solvents and other site-related materials through the former floor drain system beneath the Main Building (and to a lesser extent the Pole Winder Building). The solvent and other process-related components emanating from the floor drain system migrated vertically through subsurface soils into underlying groundwater. As shown in **Figure 3-7**, once in the groundwater, the chlorinated solvents continued to migrate downward through the unconsolidated soil intervals (residuum and saprolite) to underlying granitic bedrock. In addition to the vertical migration in groundwater, the compounds moved horizontally with the groundwater flow direction to the northwest. Pumping from water wells to the west of the Facility property pulled impacted groundwater in this direction. **Figure 3-7** primarily focuses on the migration pattern from the

Facility to the west-southwest, however it also indicates there is a groundwater flow component to the northwest towards an unnamed tributary on the Dickert property.

As shown on the CSM figure, the chlorinated solvents have also migrated into the fractured intervals within the underlying granitic bedrock. Horizontal and vertical migration in groundwater particularly to the west was enhanced by historic pumping in several privately-owned water supply wells. The approximate locations of the water wells west of the Site, including the Boazman and Chapman (PW-4) wells, are illustrated on **Figure 1-2B**.

An electronic copy of the 3-D version of a CSM is included on compact disc (CD) in the RI Report **AECOM, 2018**) and the Sitewide Groundwater Monitoring Report (**AECOM, 2023a**). This model can be manipulated to allow views from multiple directions and angles. The 3-D model provides a more detailed depiction of the extent of TCE impact to groundwater both horizontally and vertically. It also allows viewing of the extent of concentration ranges including values just above the MCL for TCE of 5 µg/L, values above 50 µg/L, and values above 500 µg/L.

The 3-D model illustrates the dimensions of the TCE plume indicating that it has migrated vertically, below shallow zone monitoring wells to the west, likely as a result of historic pumping from water supply wells located to the west and southwest. The model also illustrates the shallow zone of impact to the north beneath the Dickert property.

4.0 REMEDIAL ACTION OBJECTIVES, APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AND PRELIMINARY REMEDIATION GOALS

4.1 Remedial Action Objectives

RAOs are developed based on chemical-specific, location-specific, and action-specific ARARs and based on the CSM. The identified RAOs for this Site consist of the following:

- Control, reduce, or eliminate incidental ingestion and direct contact of groundwater with VOCs at concentrations exceeding MCLs by human receptors.
- Control, reduce, or eliminate leaching of VOCs from soil to groundwater which would result in exceedance of groundwater MCLs.
- Control, reduce, or eliminate inhalation of soil vapor containing VOCs at concentrations exceeding the USEPA Industrial RSLs by human receptors.

Table 4-1 presents impacted Site areas/media and RAOs for this FS.

4.2 Identification of Applicable or Relevant and Appropriate Requirements

Section 121(d) of the CERCLA of 1980, as amended SARA of 1986, requires that remedial actions comply with requirements or standards set forth under Federal and State environmental laws. Types of ARARs include chemical-specific, location-specific, and action-specific.

As mandated by CERCLA 121(d)(2)(A), remedies must consider "any promulgated standard, requirements, criteria, or limitation under a State environmental or facility citing law that is more stringent than any Federal standard, requirement, criteria, or limitation" if the former is applicable or relevant and appropriate to the Site and associated remedial activities. SARA requires that the remedial action for a site meet all ARARs unless one of the following conditions is satisfied:

- The remedial action is an interim measure where the final remedy will attain the ARAR upon completion;
- Compliance will result in greater risk to human health and the environment than other options;
- Compliance is technically impracticable;
- An alternative remedial action will attain the equivalent of the ARAR; or
- For State requirements, the State has not consistently applied the requirement in similar circumstances.

In addition to ARARs, many Federal and State environmental and public health programs also develop criteria, guidance, and proposed standards that are not legally binding, but that may provide useful information or recommended procedures. These "To be Considered" (TBCs) are

not potential ARARs but are reviewed along with ARARs and considered when setting remediation objectives (e.g., media cleanup goals). Potential ARARs may be classified as either applicable or relevant and appropriate. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site.

The determination that a requirement is relevant and appropriate is a two-step process: (1) determination if a requirement is relevant and, if relevant, (2) determination if a requirement is appropriate. In general, this involves a comparison of a number of site-specific factors, including the characteristics of the remedial action, the hazardous substances present at the Site, or the physical circumstances of the Site, with those addressed in the statutory or regulatory requirement. In some cases, a requirement may be relevant but not appropriate based on site-specific circumstances; such a requirement would not be an ARAR for the site. In addition, there is more discretion in the determination of relevant and appropriate; it is possible for only part of a requirement to be relevant and appropriate in a given case. When the analysis results in a determination that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable.

Three types of ARARs were developed to further clarify how to identify and comply with environmental requirements. These types are described in the following subsections.

4.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are concentration limits in the environment promulgated by government agencies. These requirements generally set health-based or risk-based concentration limits or discharge limits for specific hazardous substances. If a chemical is subject to more than one discharge or exposure limit, the more stringent of the requirements may apply.

Chemical-specific ARARs are affected by the current and anticipated future land use of the site. Land use scenarios can be used to establish appropriate cleanup levels for the site. However, the USEPA recognizes that cleanup to levels appropriate for either the reasonably anticipated land use or the land use preferred by the community may not be practicable or may be practicable for only portions of a site. A list of chemical-specific ARARs for this Site is provided in **Table 4-2**, and an evaluation of the ARARs is also included in the table.

4.2.2 Location-Specific ARARs

Location-specific ARARs must consider Federal, State, and local requirements that reflect the physiographical and environmental characteristics of the site or the immediate area. Remedial actions may be restricted or precluded depending on the location or characteristics of the site and the resulting requirements. A list of potential location-specific ARARs, along with the screening of each one, is provided in **Table 4-3**. As indicated in this table, no location-specific ARARs were identified. No wetlands, floodplains, critical habitats, endangered or threatened species, wilderness areas, or any historical preservation sites have been identified at the Site.

4.2.3 Action-Specific ARARs

Action-specific ARARs are activity-based or technology-based requirements, and typically affect performance, design, or other similar action-specific controls or restrictions on certain activities related to remediation. Action-specific requirements set controls or restrictions on the design, performance and other aspects of implementation of specific remedial activities. A list of potential action-specific ARARs is provided in **Table 4-4**, and an evaluation of these potential ARARs is also included in that table. Some of the potential action-specific ARARs are applicable to this Site.

4.3 TBC Information

TBC criteria are non-promulgated advisories or guidance issued by Federal or State government that are not legally binding and do not have the status of potential ARARs. TBC criteria may be considered along with ARARs as part of the risk assessment and may be used in determining the necessary level of cleanup for protection of health or the environment. TBC information identified for impacted Site media is provided in **Table 4-5**.

4.4 Preliminary Remediation Goals

Preliminary remediation goals (PRGs) for the protection of human health are identified for the COCs identified in Site media. PRGs for groundwater COCs (TCE, cis-1,2-DCE, and VC), soil COCs (TCE), and SSV COCs (TCE and cis-1,2-DCE) are identified in **Table 4-6**. USEPA MCLs for groundwater, MCL-based SSLs for soil, and industrial air RSLs for SSV are used as PRGs at this time. Remediation goals for the Site may change in the future pending SCDHEC development of a risk-based closure process.

4.5 Areas to be Addressed by Remedial Actions

The areas (locations and depths) to be addressed by remedial actions are summarized in **Table 4-6** and discussed further in **Section 5.2** of this FS.

4.6 General Response Actions

General response actions (GRAs) for this FS to address the RAOs and RGs are summarized in **Table 4-6** and further discussed in **Section 5.3** of this FS.

5.0 IDENTIFICATION/SCREENING OF POTENTIAL MEDIA OF CONCERN TECHNOLOGIES

5.1 Overview

The purpose of Section 5.0 is to identify and screen remediation technologies that may be appropriate for achieving the RAOs presented in Section 4.0. Selected technologies will be screened based on site-specific effectiveness, technical implementability, and relative life-cycle cost. Those technologies deemed favorable (i.e., passed the screening) will be used to develop remedial alternatives which will be further evaluated in detailed and comparison analyses in Section 6.0. Those technologies that are not effective, have implementability concerns, and/or are excessively expensive in comparison to other technologies are rejected from further evaluation. Criteria also necessary to conduct the screening include areas that require remediation action (Section 5.2) and GRAs (Section 5.3 below).

5.2 Media Requiring Remedial Action

Table 4-6 contains a summary of the areas (locations and depths) being targeted for treatment. For groundwater, those areas are designated as Area 1, Areas 2A through 2H, Area 3, Area 4, and Area 5; these areas are shown in **Figure 5-1** for the shallow groundwater zone and **Figure 5-2** for the intermediate groundwater zone. The areas were selected based on TCE concentrations in groundwater in nearby wells or based on TCE and SSV concentrations in soils beneath the Main Building.

Areas of the Site with impacted soil above the MCL-based SSL for TCE and the industrial air RSL for TCE and cis-1,2-DCE coincide with areas of groundwater impact identified beneath the Main Building and Pole Winder Building.

5.3 General Response Actions

This section identifies and screens process options that are potentially suitable for addressing COCs at the Site. GRAs applicable to remediating COCs within the media of concern are summarized in **Table 4-6**. The GRAs that are retained for further evaluation are listed below for groundwater, soil, and soil (subslab) vapor.

5.3.1 Groundwater

The objective of this subsection is to identify GRAs that aid in identifying technologies to remediate Site groundwater based on the identified COCs, ARARs, and the proposed PRGs. The GRAs for groundwater for this FS are listed below:

- No Action,
- Natural Attenuation,

- Land Use Controls,
- In situ Treatment, and
- Extraction, Ex situ Treatment, and Discharge.

5.3.2 Soil

The objective of this subsection is to identify GRAs that aid in identifying technologies to remediate Site soil based on the identified COCs, ARARs, and the proposed PRGs. The focused GRAs for soil for this FS are:

No Action,

Natural Attenuation,

Land Use Controls,

In situ Containment,

In situ Treatment, and

Excavation and Disposal.

5.3.3 SSV

The objective of this subsection is to identify GRAs that aid in identifying technologies to remediate Site SSV based on the identified COCs, ARARs, and the proposed PRGs. The focused GRAs for soil for this FS are:

No Action,

Natural Attenuation,

Land Use Controls,

In situ Containment, and

In situ Treatment.

5.4 Identification and Screening of Remedial Technology Type and Process Options for Groundwater

The technologies and process options addressed in this section are screened against the criteria of effectiveness, implementability, and cost. The screening process is summarized in **Table 5-1**.

5.4.1 No Action

The No Action alternative is a stand-alone remediation response for groundwater at the Site that would not provide any engineered treatment of associated COCs. This technology relies solely on natural attenuation mechanisms to reduce constituent concentrations; however, there are no sampling events to quantify constituent reduction or to monitor constituent migration. Under the No Action, constituents are left in place without implementing any containment, removal, treatment, or other mitigating actions. This action can serve as a baseline for comparison with other response actions for groundwater.

Effectiveness

For No Action, reductions in groundwater constituent concentrations would not be expected other than those resulting from natural nondestructive (e.g., dilution, dispersion, leaching, precipitation, sorption, and volatilization) and natural destructive (e.g., aerobic and anaerobic biodegradation and abiotic degradation) attenuation processes. The persistence of TCE (and some PCE) and their degradation products in groundwater located beneath the floor of the Main Building and beneath the Pole Winder Building indicates that achieving Site groundwater PRGs would not occur in a short time period, if ever. No Action is used as a stand-alone technology; however, under current exposure scenarios, the risk to human health and the environment is considered low due to the concrete floor remaining in place. No Action does not include groundwater monitoring, and it does not provide institutional controls to reduce the risk of future potential COC exposure. This technology is not considered to be effective.

Implementability

No Action would not involve any design, equipment, construction activities, or permitting; therefore, it is considered to be readily implementable.

Cost

Costs associated with No Action would be associated with a periodic Site remedy review. This remedy review would include a Site visit and follow-up written summary every five years for thirty years. A meeting with SCDHEC in Columbia, South Carolina every five years is also included. The relative life-cycle cost for No Action process would be low.

Screening Result

No Action is considered not to be effective. However, No Action will be retained in this FS, as a comparison with other remedial technologies and process options.

5.4.2 Land Use Controls/Institutional Controls

Types of institutional controls (ICs) include groundwater use restrictions and deed restrictions, which limit human exposure by restricting activity, use, and access to properties with residual contamination. Groundwater use restrictions are a type of IC, which are non-engineered, legally

binding, administrative controls designed to protect human health and the environment. Groundwater use and/or deed restrictions limit human exposure by restricting activity, use, and access to properties with residual contamination. Deed restrictions could prohibit the removal of the concrete floor to prevent exposure to impacted soil and groundwater and also could prohibit future residential or commercial development on this part of the Site. In this case, a groundwater use restriction and/or deed restriction would be placed on the use of on-Site groundwater, to protect the current and future owner/operators of the property from exposure to groundwater potentially containing COCs in concentrations exceeding the PRGs.

Effectiveness

Groundwater use and/or deed restrictions can be achieved by notifying the site owners and future landowners of the potential presence of impacted soil and groundwater, requiring the concrete floor to be maintained, and restricting the use of the groundwater.

Under this option, reductions in groundwater constituent concentrations would not be expected except through natural attenuation processes. Groundwater monitoring to verify reductions in VOC constituent concentrations and mobility would not be performed if groundwater use and/or deed restrictions were used as a stand-alone technology or process option. As a result, this technology, as a stand-alone groundwater remedy, is considered to be not effective.

Implementability

There are no major technical implementation issues to obtaining a groundwater use and/or deed restriction for on-Site soils, and this technology is considered implementable.

Cost

The capital costs associated with obtaining a groundwater use and/or deed restriction for groundwater is considered low when compared to active groundwater remediation options.

Screening Result

ICs, including a use restriction for groundwater and deed restriction for future residential development, are retained for inclusion as a component of comprehensive remediation alternatives developed in Section 6.0.

5.4.3 Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) refers to the reliance on natural attenuation processes to achieve Site-specific remedial objectives within a time frame that is reasonable when compared to other methods. Natural attenuation processes that are at work in an MNA approach include a variety of physical, chemical, and/or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, and/or concentration of VOCs in an environmental media such as groundwater. These in situ processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological

stabilization, transformation, or destruction of contaminants. Under favorable subsurface conditions, the combined effect of nondestructive and destructive attenuation may result in the reduction of groundwater VOC constituent concentrations to near or less than MCLs in some, but not all, areas of the Site, at significantly less cost than a more active remediation method. However, the time frame to accomplish the remediation goals is often much greater than when active treatment technologies are used.

MNA is a USEPA-approved groundwater remediation approach that has been successfully implemented in South Carolina. MNA typically does not require conventional remediation applications such as excavation, construction, disposal, and consequential disturbance to the surrounding environment. During MNA, groundwater VOC constituent concentration and distribution are monitored to confirm the effectiveness of natural attenuation. Therefore, MNA may require the installation of additional monitoring points to better gauge VOC constituent concentration reductions.

Effectiveness

Chlorinated ethenes will aerobically biodegrade, but typically at slow rates. The chlorinated compounds PCE and TCE present at the Site do not aerobically biodegrade in the environment to any appreciable extent. DO and ORP measurements collected during the RI and other investigation events, from monitoring wells located inside and immediately downgradient of the buildings, indicated that anaerobic conditions are only marginally present in Site groundwater. Also, only very low concentrations of the TCE degradation product (cis-1,2-DCE and VC) have been detected in Site groundwater. The January 2024 sampling event, coupled with the Mann-Kendall trend plots, confirmed that TCE concentrations are decreasing in many locations, due to other natural attenuation processes. Therefore, this technology, as a stand-alone remedy, is considered to be only marginally effective in achieving the PRGs but could be effective in conjunction with other active treatment technologies.

Implementability

MNA could be easily implemented in a relatively short time period. Conventional, readily available equipment and standard laboratory analytical methods are used to monitor existing monitoring wells. This technology is considered to be implementable.

Cost

The capital costs associated with MNA are relatively low when compared to the other more aggressive technologies evaluated, and it is due mainly to the lack of design, construction, and implementation costs. Capital costs include any additional monitoring wells that may be required to supplement the existing site monitoring well network. Operation and maintenance (O&M) costs are associated with periodic sampling and laboratory analysis and can be significant, should monitoring be conducted for an extensive time period. Overall, the costs associated with MNA are low.

Screening Result

MNA is retained for further evaluation in Section 6.0.

5.4.4 In Situ Treatment

In situ groundwater treatment involves biological, chemical, and/or physical treatment. The effectiveness of any in situ treatment technology depends on the ambient conditions of the targeted groundwater aquifer and adequate distribution of the injected substrate into the targeted groundwater plume or alternatively as a series of injection points installed in a barrier wall-type application near the downgradient edge of a source area or other parts of the plume and perpendicular to the direction of groundwater flow. For injection technologies, the targeted site aquifer geology (i.e., sandy clays, clayey sands, silty clays) would require the injection points to be placed close together to achieve adequate contact with the targeted groundwater COCs. A robust groundwater monitoring program would be required to assess the effectiveness of in situ treatment.

Screening of the following in situ treatment technologies are included in this sub-section: ISCO, ISERD, ISCR, and in situ adsorption (ISA).

5.4.4.1 Chemical Oxidation (ISCO)

The remediation of groundwater contamination using ISCO involves injecting strong chemical oxidants and in some cases catalysts directly into the source zone and/or downgradient plume. The oxidant chemicals react with the VOC chemicals, producing innocuous substances such as carbon dioxide and water. In the case of chlorinated compounds, inorganic chloride is also produced. Chemicals amenable to treatment by ISCO include, but are not limited to, benzene, toluene, ethylbenzene, and xylenes, methyl tert-butyl ether, total petroleum hydrocarbons, chlorinated ethenes, chlorinated ethanes, chlorinated methanes, chlorinated benzenes, and 1,4-dioxane. However, chemical oxidants are not selective; they will not only oxidize the targeted chemicals but will also oxidize natural organic compounds found in the subsurface.

Various chemical oxidants exist and include permanganate, persulfate, percarbonate, hydrogen peroxide in the presence of iron (Fenton's reagent), and ozone. The appropriateness of a particular oxidant depends on matching the oxidant and delivery system to the Site chemicals and Site conditions. Because of their relative ease of use and application to a broad range of organic chemicals, the most commonly employed oxidants for the remediation of groundwater are permanganate and persulfate. For this FS, ISCO using sodium permanganate (which does not require a catalyst) has been selected for screening.

Effectiveness

ISCO is useful for source area mass reduction and intercepting plumes to remove mobile organic chemicals. Under site conditions, the treatment of the targeted chemicals in groundwater to low or non-detect levels (i.e., MCLs) would likely be relatively rapid in the areas where the oxidant contacts the VOCs. However, the rapidness and effectiveness of ISCO is highly dependent on

achieving adequate contact between the oxidant and the targeted contaminants. Failure to account for subsurface heterogeneities or preferential flow paths may result in extensive pockets of untreated chemicals resulting in a subsequent rebound in groundwater chemical concentrations following treatment by ISCO. At the site, the targeted water table aquifer is characterized by relatively low permeability, which may limit the extent of contact between the oxidant and contaminants. Therefore, injection points will need to be placed closer together (i.e., small ROI), and multiple injection events may be necessary. Additionally, Geoprobe® refusal at this Site has occurred consistently beneath the concrete floor on the east side of the Main Building at depths higher than the seasonally-high water table. Geoprobe® refusal also has occurred consistently in the area outside of the north central side of the Main Building at depths ranging from less than five ft to approximately 8 ft bgs. The inconsistent rock surfaces may reduce the capability to place injection points in ideal patterns.

In addition, the average depth to the top of the underlying saprolite (intermediate aquifer) ranges between 19 and 31 ft bgs across much of the Site. Difficult subsurface conditions including stiff saprolitic soils will also reduce application of treatment solutions outside of a certain radius. Therefore, oxidant contact with chemicals would not be effective below 35 to 50 ft bgs unless more intensive delivery techniques (e.g., using a hollow stem auger [HSA] drill rig or rotonic drill rig) are considered.

The pilot study conducted at the Site in 2021 and 2022 demonstrated that ISCO is effective if contact between the oxidant and the targeted VOCs can be achieved. At observation well ISCO-OBSW-1S, TCE was detected at 960 µg/L in August 2021 prior to initiation of the pilot study and ISCO injections. TCE concentrations were treated to non-detect concentrations by March 2022 and continued at non-detect concentrations through December 2022 (**Figure 2-8**). In January 2024, the TCE, presumably migrating from an upgradient source, had increased or rebounded to 909 µg/L (**Table 2-3**).

Treatment of groundwater inside the Main Building and beneath the foam room floor was not successful. TCE concentrations went from 930 µg/L in August 2021 to 3,600 µg/L in December 2022. The chemical oxidant likely mobilized TCE upgradient of the well and did not contact pockets of TCE enough to accomplish widespread treatment in that area. In September 2023, concentrations had decreased to 1,810 µg/L. However, based on the success at well ISCO-OBSW-1S, this technology is deemed to be effective and may require a longer lasting chemical oxidant to be used.

Implementability

The use of ISCO for this site is administratively feasible, but technically has some challenges. Implementation of ISCO at this site requires the delivery of the chemical oxidant and catalyst, a mixing vessel, and the means for injection of the oxidant. In general, injection points are installed using a Geoprobe® rig, and they are utilized to deliver the oxidant and catalyst to the subsurface. Due to the average depth of the aquifer (approximately 40 to 50 ft thick on-Site), a Geoprobe® rig could not be utilized to treat deeper portions of the aquifer. During the RI, Geoprobe® refusal was affected by the presence of very stiff saprolitic soils and weathered rock, occurring at various

depths (from as shallow as 1 ft to greater than 30 ft bgs). Therefore, a more intensive installation procedure using an HSA drill rig or a roto sonic drill rig would be required in order to treat the entire depth of shallow (water table) and intermediate (saprolite) aquifer intervals. The use of an HSA drill rig significantly increases the complexity of utilizing ISCO because injection piping must be installed within the auger flights at every injection point. Rotosonic® drilling technology would be the most effective method for advancement of borings through the water table and intermediate aquifer zones to be used for in situ treatment.

Another implementability concern is active operations currently occurring within the Main Building and Pole Winder Building. This is an active manufacturing facility, and working around the daily operations will require significant coordination. However, during the various assessment stages and events, the Facility has been very cooperative with AECOM and Signify.

There are several other implementability issues. An underground injection control (UIC) permit would be required for ISCO implementation, but this should be relatively easy to acquire from SCDHEC. Subsequent groundwater monitoring at select locations following the pilot study could assist in determining the amount of COC rebound, if any, which then could be used to estimate the number of additional applications of chemical oxidant that would be required. This technology is considered implementable.

Cost

The primary cost associated with ISCO is for the chemical oxidant; approximately half of the total cost of this technology is related to the quantity of oxidant that is required. Other costs for ISCO are associated with the delivery of the oxidant to the subsurface and laboratory analytical costs to verify treatment. There are no O&M costs associated with ISCO beyond that of continued groundwater monitoring, and no permanent treatment facilities are required.

The cost of ISCO for this site will likely be moderate to high and is dependent primarily on the effectiveness in getting contact between the oxidant and the targeted CVOCs as well as the total number of injection points and number of injection events.

Screening Result

The groundwater treatment pilot study indicated that conditions within the aquifer to be treated are amenable to ISCO for the groundwater source area and for the VOC area outside the east side of the building; however, based on the current estimated areal extent of the TCE plume, the use of ISCO to treat the entire plume may not be cost effective. In addition, the thickness of the aquifer to be treated presents implementation issues related to the installation of injection points. However, there are enough benefits for this technology that ISCO was retained for further evaluation. ISCO was deemed to be potentially applicable at a minimum for the VOC source area at the foam room and paint room area beneath the east side of the Main Building.

5.4.4.2 In Situ Anaerobic Bioremediation

ISAB entails the addition of an electron donor (i.e., carbon source) within the subsurface to stimulate indigenous anaerobic microorganisms to biodegrade contaminants. During reductive dechlorination, carbon is used as an energy source by the anaerobic microbes, and the chlorinated aliphatic hydrocarbons are used as respiratory substrates, or electron acceptors, during metabolism. Chlorine atoms are sequentially removed from the chlorinated compounds and replaced with hydrogen atoms. PCE, TCE, cis-1,2-DCE, and VC can ultimately be degraded to the innocuous end product ethene. Under circumstances where geochemical conditions are unfavorable for complete reductive dechlorination, incomplete conversion of the parent compounds can occur, resulting in an accumulation of the daughter products of TCE (i.e., cis-1,2-DCE and/or VC).

Because chlorinated organics are used as electron acceptors during reductive dechlorination, there must be an appropriate source of carbon for microbial growth in order for this process to occur.

Potential anthropogenic carbon substrate sources include fuel hydrocarbons, lactate, or molasses. The injection of an anthropogenic carbon source such as Redox Tech's product Anaerobic Biochem® (ABC®), the Regenesys' product hydrogen release compound (HRC®), Terra System's product SRS®-SD, sodium lactate, or molasses are several carbon substrates that can produce the necessary conditions to stimulate anaerobic biodegradation. In nutrient deficient environments, ammonia and orthophosphate addition may be required to sustain the biodegradation process. The injection of a carbon source is generally performed through vertical injection points

Effectiveness

Subsurface heterogeneities or preferential flow paths may result in pockets of untreated COCs, as discussed in Section 5.4.4.1 for ISCO. "Stall out" at cis-1,2-DCE and/or VC may occur unless sufficient *DHC* bacteria are present. The injected organic carbon may be amended with *DHC* to overcome this issue. The effects of the injection of organic carbon in combination with *DHC* may last from 6 to 18 months depending on the type of organic carbon selected and the groundwater velocity in the vicinity of the injection.

The field-scale pilot study conducted in 2021 and 2022 indicated that ISAB (coupled with ZVI addition) was effective at reducing TCE concentrations around well MW-10I. Recall that reductive dechlorination via ISAB was enhanced by using ZVI (chemical reductant), which is an abiotic process. Taken together, this is referred to as ISERD in this FS. ISCR is discussed in Section 5.4.2.3. The baseline TCE concentration of 870 µg/L detected prior to injection of the ISERD amendments (ABC® and ZVI) initially increased to 1,100 µg/L in March 2022 but was subsequently reduced to between 50 and 57 µg/L during the remainder of 2022. TCE has since rebounded to 617 µg/L in January 2024, approximately 28 months after injections. Similar concentration decreases occurred at observation well ERD-OBSW-1I. The 1,000 µg/L TCE concentration in August 2021 was reduced to 83 µg/L in December 2022 (**Figure 2-10**).

“Stall out” from TCE to any of the TCE degradation products did not seem to be a problem. Buffering (pH adjustment) of the aquifer likely is necessary because the pH is below the optimum pH of between 6 and 7, which is required for optimal reductive dechlorination to occur. The pH had to be adjusted during the pilot study. The lack of appropriate pH adjustment occurred in the shallow zone, resulting in a lack of TCE concentration reductions in groundwater at wells MW-10 and ERD-OBSW-1S (**Figure 2-9**). The difficulty in buffering the targeted groundwater noted during the pilot study has the potential to impact the effectiveness of the ISAB component of ISERD. However, because of the effectiveness observed during the pilot study in the intermediate zone, in conjunction with careful pH adjustment in the field during implementation, this technology is determined to be effective with careful buffering.

Implementability

Equipment/materials required include the chemical amendment(s), *DHC*, mixing equipment, and the means for injection. At this site, a DPT rig could be used for injection down to a depth of approximately 30 ft bgs; an auger rig or roto sonic rig would be required to conduct injection at greater depths. There would be no ongoing O&M costs associated with this technology except for groundwater monitoring, and no permanent aboveground equipment would be required, unless a permanent carbon substrate feed system is installed. A UIC permit would be required before treatment could commence, which can be acquired within approximately two months. More than one injection event may be necessary. Operations downgradient and outside of the building would have to be shut down on and off for several weeks during completion of the injections or during installation of a permanent feed system, but inside operations could continue. Despite these challenges, this technology is deemed to be implementable.

Cost

The primary cost associated with ISAB is for the carbon substrate injectant. Other costs for ISAB are associated with the delivery of the injectant to the subsurface, the quantity of buffer and *DHC* required, and laboratory analytical costs to verify treatment. There are no O&M costs associated with ISAB beyond that of continued groundwater monitoring, and no permanent treatment facilities are required.

The cost of ERD for this site will likely be moderate to high and is dependent primarily on the ability to deliver the injected amendments to the necessary locations to treat the targeted TCE and on the total number of injection points and events required.

Screening Result

ISAB used in conjunction with ISCR (i.e., ISERD) is retained for further evaluation due to its effectiveness and implementability.

5.4.4.3 In Situ Chemical Reduction

ISCR involves the placement of a sufficient quantity of reductant or reductant generating material into the subsurface with the purpose of chemically converting the targeted contaminants in the

impacted groundwater to innocuous end products. Similar to other in situ injection process options, effective treatment by ISCR requires adequate contact between the reductant and the targeted contaminant so injection points to treat the Site groundwater plume will need to be relatively closely spaced. One of the most commonly used reductants is ZVI. In this case, ZVI would create strongly reducing conditions that promote the abiotic degradation of the targeted chlorinated VOCs in groundwater via abiotic reductive dehalogenation and dichloroelimination (beta-elimination). Hydrogenolysis occurs when a halogen such as a chlorine atom is substituted by a hydrogen atom along with the simultaneous addition of two electrons. Beta-elimination occurs when two chlorine atoms are removed from two different carbon atoms along with the simultaneous addition of two electrons. Of these two reaction mechanisms, beta-elimination is the more dominant pathway (approximately 90%) for abiotic degradation via ZVI.

An advantage of beta-elimination is that it produces chloroacetylene, acetylene, ethane/ethene, and chloride ions without the accumulation of cis-1,2-DCE, which eliminates the potential for “DCE stall” that can occur under anaerobic conditions using ERD. ZVI corrodes as it comes into contact with water. The products of corrosion include ferrous iron, hydrogen gas, and hydroxyl ion. The hydrogen produced can be used by certain microorganisms to target chlorinated VOCs to dehalogenate them. As the hydroxyl ions are released, the pH of the surrounding groundwater is increased, which is more conducive for the ERD of chlorinated solvents to occur. The reactive life of ZVI has been reported to be 3 to 5 years or greater, which is much longer than chemical oxidants or many electron donors (carbon substrates) used for ISAB. This longevity may potentially limit the number of future injection events needed due to the effect of matrix back diffusion. Potential ZVI projects that are used in ISCR applications include Regenesi's S-Micro ZVI[®], Hepure's Feroxsm Flow, and Rio Tinto's ATOMET 86. Similar to other in situ injectants, ZVI is typically injected via vertical injection points.

Effectiveness

ISCR using ZVI was used with ISAB during the pilot test. In the intermediate zone around wells MW-10I and ERD-OBSW-11, ISCR using ZVI coupled with ISAB was effective in reducing TCE concentrations (see **Section 5.4.4.2** above).

Implementability

The use of ISCR/ZVI during the pilot study was as implementable as ISCO, using a Geoprobe[®] rig for DPT injection within the shallow zone. Refusal was encountered during the injections for the intermediate zone using the same Geoprobe[®] rig, which required the movement of the injection points to different locations to complete the work. A rotosonic rig will likely be needed to successfully implement injections into the intermediate zone.

Cost

The primary cost associated with ISCR is for the selected chemical reductant. Other costs for ISCR include the method of delivery of the chemical reductant into the subsurface and laboratory analytical costs to verify post-injection treatment. There are no O&M costs associated with ISCR

beyond that of continued groundwater monitoring, and no permanent treatment facilities are required.

The cost of ISCR for this site will likely be moderate to high and is dependent primarily on the ability to deliver the injected amendments to the necessary locations to treat the targeted TCE, the total number of injection points and the number of events required.

Screening Result

Because ZVI can create deeply reducing conditions, has a long reactive life, and can avoid “DCE stall”, ISCR is often combined with ERD and/or with some type of AC for an enhanced in situ degradative approach. Based on this initial screening process, ISCR will be retained for additional evaluation.

5.4.4.4 In Situ Adsorption

To further promote degradation of the targeted COCs associated with the Site groundwater plume, the injected substrate could also include AC in the form of colloidal activated carbon (CAC) or powdered activated carbon (PAC). CAC or PAC would be injected to provide a medium to adsorb the targeted COCs while concurrently providing a matrix onto which *DHC* and other microorganisms could attach to while reductively dechlorinating TCE.

Effectiveness

The high sorption characteristics of AC reduces contaminant mobility in the subsurface while other amendments, such as anaerobic bacteria and/or a chemical reductant such as ZVI provide the impetus for permanent degradation. For high concentrations of CVOCs, adsorption onto AC decreases the initial high aqueous contaminant concentration that inhibits reductive dechlorination and shortens the lag time for reductive dechlorination to begin. There are various commercial AC products that utilize one or more amendments for chlorinated solvent remediation including Remediation Products, Inc., BOS100®, Evonik Industries, EHC®Plus, and Regenesi's PlumeStop®. This technology is implementable.

Implementability

The use of AC for ISA is generally implemented using vertical injection points. Grid-based AC injections are often used for small, well-defined source areas and hot spots. For larger plumes, barrier applications are commonly utilized. AC amendments typically are emplaced in transects to form a series of permeable reactive zones that are perpendicular to the direction of groundwater flow. High pressure injection (approximately 300 to 1000 pounds per square inch [psi]) is needed to inject PAC due to the large particle size. CAC is emplaced by low pressure injection (approximately 30 to 60 psi) due to the small particle size. DPT could be used to target shallow zone groundwater and rotosonic drilling could be used to target intermediate zone groundwater.

Cost

The cost of ISA for this Site will likely be moderate to high and is dependent primarily on the ability to deliver the injected amendments to the necessary locations to treat the targeted TCE, the total number of injection points and the number of events required for successful treatment.

Screening Result

ISA using AC either as CAC or PAC can be combined with other technologies such as ISAB and/or ISCR to enhance the degradation of the targeted CVOCs. ISA will be retained for further evaluation.

5.4.5 Air Sparging

Air sparging involves the injection of air into an aquifer for the purpose of stripping contaminants from the groundwater and saturated soil matrix. Compressed air is forced into the aquifer by means of a series of screened injection wells. Chemicals dissolved in the groundwater and adsorbed onto soil particles are typically volatilized into the vapor phase and transported from the saturated zone to the vadose zone.

Typically, an air sparging system is installed as a series of vertical wells or injection points that are tied together using a common header. The injection points are oriented in a grid pattern with spacing determined by ROI and groundwater flow direction. ROI is dependent upon depth to contamination, degree of heterogeneity of subsurface geology, soil permeability, and flow rate.

Air sparging usually must be coupled with soil vapor extraction (SVE), to remove the CVOC vapors that have been sparged from the groundwater. Vapor extraction points would have to be installed in a grid pattern, and depending on the vapor concentrations, the vapors might have to be treated in a thermal oxidizer or adsorbed using AC. The AC would have to be sent to a commercial regeneration location for treatment of the adsorbed CVOCs.

Effectiveness

Air sparging can be used for source area removals, plume control, and the reduction of dissolved-phase organic chemicals. The effectiveness of air sparging systems is limited by the depth of groundwater containing VOCs and the permeability of the subsurface. Air sparging is most effective for organic chemicals having Henry's Constant values, K_H , greater than 2.4×10^{-4} atmospheres-meters cubed per mole ($\text{atm}\cdot\text{m}^3/\text{mol}$). The K_H values for PCE, TCE, and cis-1,2-DCE are 2.59×10^{-2} $\text{atm}\cdot\text{m}^3/\text{mol}$, 9.10×10^{-3} $\text{atm}\cdot\text{m}^3/\text{mol}$, and 7.58×10^{-3} $\text{atm}\cdot\text{m}^3/\text{mol}$, respectively, which are much greater than the rule-of-thumb value of 2.4×10^{-4} $\text{atm}\cdot\text{m}^3/\text{mol}$.

As previously mentioned, the targeted saprolite aquifer is characterized by relatively low permeability. Therefore, injection points would need to be placed close together and a long treatment time may ultimately be necessary in order for air sparging to be effective. However, this technology is considered to be effective.

Implementability

Implementing an air sparging system is theoretically achievable due to the conventional construction techniques that are involved. Vertical injection points would be installed via the direct push type method or conventional HSA or roto-sonic drilling. Site topography is conducive to the installation of an air sparging system. Each injection point would be individually piped and controlled to allow for discrete system adjustments. The treatment system would include components such as an air compressor, manifold header, electrically-actuated solenoid valves, and a master control panel. Installation and a 30-day full-scale air sparging system start up could be completed in a timely and cost-effective manner. However, a pilot study is recommended prior to full-scale implementation to obtain information such as breakout pressure, ROI of the injection points, groundwater COC mass removal rates, and the effect of air sparging on DO levels.

A UIC permit may also be required for implementation of this system into groundwater media. To complete the information required by the UIC permit, a small pilot study might be necessary to determine full-scale operational parameters. It usually takes 1 to 2 months to acquire a UIC permit.

Another issue regarding an air sparge system is the increased potential for air to migrate through openings in the concrete floor and pose a risk to manufacturing workers inside the building. Extreme care would have to be taken to properly design the SVE portion of the remedy to remove vapors for treatment before they can migrate upward through the building floor. This issue with manufacturing workers inside an active building could make this a non-implementable technology.

A permanent SVE system and air sparge system would have to be installed and operated in conjunction with the active manufacturing operations, and there would be a significant potential for damage to this system. Signify would have to provide an operator onsite, since it no longer owns the facility. Based on these constraints, this technology is determined not to be implementable for this Site.

Cost

The cost for groundwater remediation by air sparging is moderate to high, as compared to the other technologies evaluated; however, the cost would be high to implement this technology to remediate the entire groundwater plume with TCE concentrations in excess of the MCL. Capital costs are affected by the number of injection points, total length of installed air conveyance piping, trenching requirements, and the size of the air compressor. Multiple air sparging systems would be required to treat the entire groundwater plume. A pilot study is recommended to obtain full-scale design information. O&M costs would be moderate to high and would cover routine system care, system adjustments to optimize remediation performance, and emergency system call outs to keep the system running.

Screening Result

Air sparging is an active groundwater remediation technology that is rejected from further evaluation due to workers present inside an active manufacturing building, and implementability issues for a permanent system at a site in which Signify does not own or operate.

5.4.6 In Situ Containment with Treatment Downgradient of Area of Impact

The technology of containment with treatment downgradient of CVOC source areas is evaluated. One of the technologies proposed for implementation of this process option is a permeable reactive barrier (PRB). A PRB is a passive in-situ technology used for the remediation of groundwater. PRBs are typically installed as trenches and are constructed perpendicular to the path of migrating groundwater.

PRBs allow the passage of groundwater while prohibiting the movement of chemicals by utilizing zero-valent metals such as ZVI or a mixture of porous media and chemical-specific catalysts such as AC.

The chemicals contained within the groundwater react with the PRB media and are either broken down into harmless by-products, adsorbed to the media, or immobilized by precipitation. PRBs operate with no associated aboveground structures that could limit the use of the property being remediated.

An alternate application of this technology is the use of ISCR (using ZVI) and/or ISA (using some form of AC) through closely spaced vertical injection points that form a barrier through which impacted groundwater can flow and be treated. Because the soil is disturbed during the installation of the injection points, groundwater will preferentially flow towards this soil, which is more permeable than the surrounding soil.

Effectiveness

PRBs are effective as a technology for the treatment of groundwater containing elevated concentrations of CVOCs down to their MCLs or below. The effectiveness is dependent on site geology, geochemistry, contaminant contact, thickness of the PRB, selection of media, and installation depth. ZVI filings would be appropriate for use as the reactive media contained within the PRB for this Site. The concentrations of the chemicals entering the PRB must be well characterized in order to provide sufficient residence time for treatment. Some limitations to the effectiveness of this technology include the potential to leave a portion of the plume untreated due to preferential groundwater flow paths around the PRB and the potential for the permeability or activity of the PRB to decrease over time due to the precipitation of metals or salts, microbial growth, and oxidation of the media. As PRBs lose their adsorbing or reactive capacity, chemical breakthrough may occur, and media replacement is required. The time frame for when media requires replacement is generally unknown. Also, a PRB at this Site can only be installed to a depth of about 10 to 30 ft bgs, due to the presence of the buildings that would limit how far away from the target zone that benching down could occur to install the trench. Groundwater contamination would flow under the PRB, and as a result, the PRB technology would not be effective.

However, use of vertical borings to apply the ZVI and AC would allow the substrates to be injected at deeper depths, prohibiting groundwater impacted with VOC from flowing under the PRB, thereby being effective.

Implementability

Implementation of the PRB technology requires significant effort. An approximate 200-ft to 300-ft long PRB composed of ZVI or equivalent material would need to be installed perpendicular to groundwater flow containing contaminant concentrations in excess of the MCL for TCE. The PRB could only be installed to a depth of 10 to 30 ft bgs in the area of the building, due to the inability to bench down any deeper next to the excavation, and also due to shallow bedrock in some areas. Excavation would be performed using traditional equipment such as track hoes and dump trucks, and extensive shoring would be required due to the required depth to ensure adequate treatment of the impacted groundwater. Dewatering would potentially be necessary during construction and would be accomplished using mobile pumps. Once excavated, ZVI would be injected into the trench. A UIC permit for iron injection would be needed. Funnel and gate technology may also need to be implemented to ensure that groundwater on the edges of the PRB is directed through and not around the PRB. Due to depth of the CVOC plume, the PRB technology is not implementable.

However, use of closely spaced vertical borings to apply ZVI and/or AC would allow the substrates to be injected at deeper depths, thereby being implementable. Rotasonic drilling techniques will be the most effective method to deliver PRB materials into the subsurface at appropriate depths.

Cost

The overall cost for a PRB depends on site-specific conditions. The length and depth tend to be the largest factors that impact the cost of installation. There would be multiple trenches required for Site groundwater treatment, as indicated in **Figure 5-1** and **Figure 5-2**. The other major cost items associated with this type of system include ZVI installation, Site supervision and technical support, and off-Site disposal of soil (likely classified as hazardous) excavated from multiple PRBs. Capital costs associated with the construction of the PRBs would be high based on its proposed dimensions. Industry literature suggests an estimated unit cost for PRB construction of \$300 to \$1,500 per square ft of trench with an assumed barrier thickness of 2 ft to 4 ft. In addition, monitoring wells often need to be installed immediately upgradient and downgradient of the PRB as well as within the PRB to monitor performance resulting in additional costs.

O&M costs tend to be low when compared to conventional groundwater extraction and treatment. However, uncertainties associated with maintaining permeability in the subsurface environment in the vicinity of the PRB and the length of time that the ZVI will remain effective may increase these costs. The need for multiple PRB trenches makes this option cost prohibitive. As a result, costs would be extremely high for this technology.

As previously mentioned, the use of closely spaced vertical borings to apply ZVI and/or AC would be much more cost-effective than the PRB. Cost would still be high due to the cost of the ZVI

and AC as well as the cost to inject the material; however this cost would be much lower than installing multiple PRBs.

Screening Result

PRB technology will not be retained for further consideration, due to effectiveness, implementability, and cost constraints.; however, the application of ISCR (using ZVI) with the addition of ISA (using PAC or CAC) through vertical injection points is retained. ZVI was shown to be effective during the pilot study and adsorption will serve to slow down impacted groundwater to allow it to be treated by the ZVI and naturally present microorganisms. The application using vertical borings is also retained for implementability and cost reasons.

5.4.7 Extraction, Ex Situ Treatment, and Discharge

Extraction wells (or recovery wells) equipped with submersible pumps are used to withdraw contaminated groundwater from distinct points within an aquifer. The location of these wells is dependent upon capture zone modeling and analysis. Under most circumstances vertical extraction wells are utilized although horizontal extraction wells under a building can be used. The recovered groundwater is conveyed through a piping network and routed to a groundwater treatment unit. At the treatment unit, the recovered groundwater passes through an air stripper causing the mass transfer of CVOCs from water to air. The treatment unit could also be a biological treatment unit, but air stripping of CVOCs is the most common type of groundwater treatment.

VOC chemicals are not destroyed by air stripping, but rather are physically separated from the groundwater and transferred to air. Therefore, further treatment of air/vapor emissions may be required prior to discharge to the atmosphere, or a permit to discharge VOCs to the atmosphere may be needed. Chemical mass calculations coupled with an estimated groundwater extraction flow rate are used to determine if air/vapor emissions treatment is required. The treated air stripper water effluent is discharged via the local sanitary sewer, re-injected back into the aquifer, or discharged to receiving surface waters under a National Pollutant Discharge Elimination System permit. Treatment biologically would have to be pilot tested.

Effectiveness

Groundwater extraction and treatment is an appropriate technology for VOC chemical mass reduction and hydraulic containment; however, it normally is not useful for the restoration of aquifers to established health goals, such as the MCLs, because of the phenomena of tailing and rebound. Tailing refers to the progressively slower rate of decline in dissolved chemical concentrations with continued operation of a groundwater extraction and treatment system as the overall mass of chemicals within the groundwater decreases. Rebound is the fairly rapid increase in chemical concentrations that occurs after pumping for an extraction system has been discontinued.

Tailing presents two main difficulties for groundwater restoration including extended treatment times and residual concentrations which exceed the MCLs. Without tailing, chemicals theoretically could be removed by pumping a volume of water equivalent to the volume of the chemical plume; however, with tailing the treatment time increases significantly. Also with tailing, as dissolved chemical concentrations decline within the groundwater a residual (asymptotic) concentration level is reached, which often is above the cleanup standard.

At this site, extraction and treatment could be effective in areas of high groundwater CVOC concentrations. Treatment using air stripping would be effective based on the solubility and Henry's Law constants of the targeted COCs; however, almost all of the Site groundwater plume contains concentrations of COCs within one or two orders of magnitudes of the MCL for TCE. As previously discussed, as groundwater contaminant concentrations approach asymptotic levels, this technology suffers from the effects of tailing and rebound.

This technology has been effective on similar sites in Upstate South Carolina, but it normally is not used as a stand-alone technology when there are CVOC source areas to be addressed.

Implementability

Implementing an extraction and treatment system requires conventional construction techniques. Tasks to be completed include the installation of extraction wells and horizontal conveyance piping and the construction of a treatment system compound. All new extraction wells would need permits. However, since this is an active manufacturing facility, it would be very difficult to construct and maintain this system due to ongoing operations. Also, Signify would need to provide an operator for the system since they do not own or operate the Site. Based on these constraints, it is determined that extraction and ex situ treatment and discharge is not an implementable technology for the Site.

Cost

Capital costs associated with a groundwater extraction and treatment system for this site would be moderate to high. These costs would be dependent upon the number of additional extraction points and pumps, length of horizontal conveyance piping and associated trenching, type and size of air stripper, and possible treatment of the air stripper effluent. O&M costs would be expected to be moderate.

Screening Result

Based on the implementability constraints, groundwater extraction and treatment using air stripping or other VOC treatment technology was rejected from further evaluation.

5.5 Identification and Screening of Remedial Technology Type and Process Options for Soil and Subslab Vapor

The technologies and process options for soil and SSV addressed in this section are screened against the criteria of effectiveness, implementability, and cost. The screening process is summarized in **Table 5-2**.

5.5.1 No Action

The No Action alternative is a stand-alone remediation response for soil and SSV at the Site. This alternative would not provide any engineered treatment of associated COCs. This technology relies solely on natural attenuation mechanisms to reduce constituent concentrations; however, there are no sampling events to quantify constituent reduction or to monitor constituent migration. Under No Action, COCs are left in place without implementing any containment, removal, treatment, or other mitigating actions. This action can serve as a baseline for comparison with other response actions for soil and SSV.

Effectiveness

For No Action, reductions in soil and SSV constituent concentrations would not be expected other than those resulting from natural nondestructive (e.g., dilution, dispersion, leaching, precipitation, sorption, and volatilization) and natural destructive (e.g., aerobic and anaerobic biodegradation and abiotic degradation) attenuation processes. The persistence of TCE (and some PCE) and their degradation products in soil beneath the floor of the Main Building and beneath the Pole Winder Building indicates that achieving Site soil remediation goals would not occur in a short time period if No Action is used as a stand-alone technology. However, under current exposure scenarios, the risk to human health and the environment is considered low due to the concrete floor remaining in place at both buildings. No Action does not include groundwater monitoring, and it does not provide ICs to reduce the risk of future potential COC exposure. This technology is considered not to be effective.

Implementability

No Action would not involve any design, equipment, construction activities, or permitting; therefore, it is considered to be readily implementable.

Cost

Costs associated with No Action would be associated with a periodic Site remedy review. This remedy review would include a Site visit and follow-up written summary every five years for thirty years. A meeting with SCDHEC in Columbia, South Carolina every five years is also included. The relative life-cycle cost for No Action process would be low.

Screening Result

No Action is considered not to be effective. However, No Action will be retained for soil and SSV media in this FS, as a comparison with other remedial technologies and process options.

5.5.2 Institutional Controls

Types of ICs for soil include deed restrictions, which limit human exposure by restricting activity, use, and access to properties with residual contamination. Deed restrictions limit human exposure by restricting activity, use, and access to properties with residual contamination. Deed restrictions could prohibit the removal of the concrete floor and/or require maintaining the building roof, and also could prohibit future residential development on this part of the Site. In this case, a deed restriction would be placed on the use of on-Site soil, to protect the current and future owner/operators of the property from exposure to media potentially containing soil and SSV COCs in concentrations exceeding the PRGs.

Effectiveness

Deed restrictions would effectively protect human health by limiting future exposure to groundwater impacted from VOCs leaching from soils and exposure to impacted soil and SSV at concentrations exceeding PRGs. Deed restrictions can be achieved by notifying the Site owners and future landowners of the potential presence of impacted soil and soil vapors and requiring the concrete floor to be maintained at the Main Building and Pole Winder Building.

Under this option, reductions in soil and SSV constituent concentrations would not be expected except through natural attenuation processes. Soil and SSV monitoring to verify reductions in CVOOC constituent concentrations would not be performed if deed restrictions were used as a stand-alone technology or process option. As a result, this technology, as a stand-alone soil and/or SSV remedy, is not considered to be effective.

Implementability

There are no major technical implementation issues to obtaining a deed restriction for on-Site soils, assuming that both the Facility and adjacent property owners agree to this. This technology is considered implementable until such time that deed restrictions cannot be obtained.

Cost

The capital costs associated with obtaining a deed restriction for onsite soil is considered low when compared to active soil remediation options. There are no O&M major costs associated with this option, other than possibly the repair of roofs and/or patching of concrete floor cracks in the facility buildings, which are relatively low costs.

Screening Result

ICs are retained for inclusion as a component of comprehensive remediation alternatives developed in Section 6.0.

5.5.3 MNA or Active Groundwater Remediation Monitoring

MNA refers to the reliance on natural attenuation processes to achieve site-specific remedial objectives. Natural attenuation processes that are at work in an MNA approach include a variety of physical, chemical, and/or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, and/or concentration of VOCs in an environmental media. These in situ processes include biodegradation, dispersion, dilution, leaching, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants. Some of those processes likely are not occurring in soil. Under favorable subsurface conditions, the combined effect of nondestructive and destructive attenuation may result in the reduction of soil CVOC constituent concentrations in some, but not all, areas of the Site, at significantly less cost than a more active remediation method. However, the time frame to accomplish the remediation goals is often much greater than when active treatment technologies are used.

MNA is a USEPA-approved remediation approach that has been successfully implemented in South Carolina. MNA is generally used for impacted groundwater but may be applied to impacted soil depending on the contaminant. MNA typically does not require conventional remediation applications such as excavation, construction, disposal, and consequential disturbance to the surrounding environment. During MNA, groundwater CVOC constituent concentration and distribution are monitored to confirm the effectiveness of natural attenuation to determine if leaching from soils is contributing to groundwater impact and/or SSV impact. Groundwater concentrations could be entered into the USEPA Johnson and Ettinger Model to determine if theoretical indoor air concentrations of TCE are decreasing. Therefore, MNA may require the installation of additional monitoring points to better gauge CVOC constituent concentration reductions.

Monitoring may also be conducted for active groundwater remedial alternatives. Similar to the MNA scenario, groundwater concentrations during active remediation could be entered into the USEPA Johnson and Ettinger Model to determine if theoretical indoor air concentrations of TCE are decreasing.

Effectiveness

Chlorinated ethenes will aerobically biodegrade in groundwater, but typically at slow rates. They may not degrade in soil. Therefore, this technology, as a stand-alone remedy, is considered to not be effective in achieving PRGs but could be effective in conjunction with other treatment technologies.

Implementability

MNA or active groundwater remediation monitoring could be easily implemented in a relatively short time period. Conventional, readily available equipment and standard laboratory analytical methods are used to monitor existing and possible newly installed monitoring wells in the area of soil contamination. This technology is considered to be implementable.

Cost

The capital costs associated with groundwater monitoring are relatively low when compared to the other more aggressive technologies evaluated, and lower costs are due mainly to the lack of design, construction, and implementation requirements. Capital costs include any additional monitoring wells that may be required to supplement the existing Site monitoring well network. O&M costs are associated with periodic sampling and laboratory analysis can be significant, should monitoring be conducted for an extensive time period. Overall, the costs associated with MNA or active groundwater remediation monitoring are low.

Screening Result

MNA or Active Groundwater Remediation Monitoring is retained for soil and SSV for further evaluation in Section 6.0.

5.5.4 In Situ Containment

A containment remedy utilizes physical barriers to either prevent direct exposure to existing contaminants or to prevent migration of the contaminants into the environment. For this Site, the containment technology considered includes covers. Covers are characterized by a physical barrier between the impacted medium and the atmosphere, such as soil, asphalt, or concrete covers. Buildings and other permanent structures (e.g., walkways, roadways, and parking lots) can also serve as covers. No matter the type of cover material, covers are subject to damage and thus require ongoing, long-term maintenance to ensure their integrity and protectiveness.

Effectiveness

Soil COCs have the potential to leach to groundwater; however, the locations where soil COCs exceed proposed PRGs are covered with buildings with concrete floors and/or other permanent structures. As a result, the likelihood of continued soil to groundwater migration via leaching is minimal. Additionally, the buildings and existing concrete floors serve to eliminate direct human exposure to any soil or SSV COCs present. Since this is an active industrial facility, the integrity of the buildings and other permanent structures is maintained on a regular basis. There are currently no plans in the foreseeable future to change the facility operations or the land use in the areas of Site with soil and SSV impact. Containment is deemed effective.

Implementability

Since concrete floors are already in place at each building, this process option is readily implementable.

Cost

Since concrete floors are already in place at each building, this process option is a low cost. The only known cost would be repair of any floor cracks or building roofs.

Screening Result

The in situ containment via covers will be retained for inclusion in the comprehensive remedial alternatives.

5.5.5 In Situ Treatment

Two in situ soil treatment technologies, SVE and thermal treatment via electrical resistant heating (ERH) or thermal conductive heating (TCH), are screened in this subsection. For SSV, the subslab vapor and subslab depressurization technologies are also screened.

5.5.5.1 In Situ Soil Vapor Extraction

Air sparging/soil vapor extraction (AS/SVE) is an in situ technology that employs the injection of air under pressure into the groundwater through vertical or horizontal wells installed in the saturated zone that is combined with the vacuum extraction of air from vertical or horizontal extraction wells installed in the vadose zone. AS/SVE is used for remediation of both soil and groundwater as well as can be used to treat SSV. The area of influence for the AS portion of the system is dependent upon the depth of contamination, degree of heterogeneity of the subsurface geology, soil permeability, and flow rate. As the AS system injects air below the water table, discreet gas bubbles are formed into which volatile contaminants dissolved in groundwater, or sorbed onto soil particles, will partition. The volatilized contaminants migrate upwards with the air stream and are captured using SVE wells or venting wells. SVE uses a vacuum in the vadose zone, which results in migration of soil gas or sparged gas and SSV to vacuum extraction wells. The reduced soil gas pressure induces the volatilization of trapped contaminants from the soil and the partitioning of dissolved phase contaminants from the groundwater.

Effectiveness

Air sparging in groundwater, coupled with SVE for soil, can be used for source area removals, plume control, and the reduction of dissolved-phase organic chemicals. The effectiveness of air sparging systems is limited by the depth of groundwater containing VOCs and the permeability of the subsurface. Air sparging is most effective for organic chemicals having Henry's Constant values, K_H , greater than 2.4×10^{-4} atm-m³/mol. The K_H values for PCE, TCE, and cis-1,2-DCE are 2.59×10^{-2} atm-m³/mol, 9.10×10^{-3} atm-m³/mol, and 7.58×10^{-3} atm-m³/mol, respectively, which are much greater than the rule-of-thumb value of 2.4×10^{-4} atm-m³/mol.

The targeted saprolite aquifer and the overlying soils are characterized by relatively low permeability. Therefore, AS and SVE injection points would need to be placed close together and a long treatment time may ultimately be necessary in order for AS/SVE to be effective. However, this technology is considered to be effective.

Implementability

Implementing an AS/SVE system is theoretically achievable due to the conventional construction techniques that are involved. Vertical injection points would be installed via DPT and/or conventional HSA drilling or roto-sonic drilling. Site topography is conducive to the installation of an AS/SVE system. Each injection point would be individually piped and controlled to allow for discrete system adjustments. The treatment system would include components such as an air compressor, manifold header, electrically-actuated solenoid valves, and a master control panel. Installation and a 30-day full-scale air sparging system start up could be completed in a timely and cost-effective manner. However, a pilot study is recommended prior to full-scale implementation, to obtain information such as breakout pressure, ROI of the injection points, groundwater COC mass removal rates, and the effect of air sparging on DO levels.

A UIC permit also may be required for implementation of this system into groundwater media. To complete the information required by the UIC permit, a small pilot study might be necessary to determine full-scale operational parameters. It usually takes 1 to 2 months to acquire a UIC permit.

Another issue regarding an AS/SVE system is the increased potential for air to migrate through openings in the concrete floor and pose a risk to manufacturing workers inside the building. Extreme care would have to be taken to properly design the SVE portion of the remedy to remove vapors for treatment before they can migrate through the building floor. This issue with manufacturing workers inside an active building could make this a non-implementable technology.

A permanent AS/SVE system would have to be installed and operated in conjunction with the active manufacturing operations, and there would be a significant potential for damage to this system. Signify would have to provide an operator onsite, since it no longer owns the facility. Based on these constraints, this technology is determined not to be implementable for this Site.

Cost

The cost for soil remediation by AS/SVE is moderate to high, as compared to the other technologies evaluated. Capital costs are affected by the number of injection points, total length of installed air conveyance piping, trenching requirements, and the size of the air compressor. Multiple AS/SVE systems would be required to treat the entire groundwater plume. A pilot study is recommended to obtain full-scale design information. O&M costs would be moderate to high and would cover routine system care, system adjustments to optimize remediation performance, and emergency system call outs to keep the system running.

Screening Result

AS/SVE is an active soil and SSV remediation technology that was rejected from further evaluation due to workers present inside an active manufacturing building, and implementability issues for a permanent system at an active manufacturing site which Signify does not own or operate.

5.5.5.2 In Situ Thermal Treatment

ERH is one type of in situ thermal treatment technology. ERH involves the application of electrical current through the subsurface, resulting in the generation of heat. ERH uses the natural electrical resistance within the subsurface where energy is dissipated through ohmic, or resistive, losses. This manner of in situ heating allows energy to be focused into a specific area like a source zone. When the subsurface temperature is increased to the boiling point of the pore water or the saturated media in the treatment zone, steam is generated. Steam stripping in combination with volatilization removes VOCs from the soils in the targeted aquifer and enables them to be extracted from the subsurface. In addition, contaminants are directly volatilized from unsaturated soil. The extracted vapors are captured via a series of extraction wells similar to an SVE system and then are treated via a thermal oxidizer or AC units.

TCH differs from other heating methods (steam injection and ERH) in that it does not rely solely on steam as a heat source or water as a conductive path. It can heat soils to temperatures in excess of 500 degrees Celsius. A TCH system generally consists of subsurface heaters (electrical elements within a solid casing) used to generate heat, and a vapor extraction system used to capture the chemicals. Heater-vacuum wells that combine the vapor extraction well with a heating element situated inside a non-perforated pipe running down the length of the well casing are typically used.

Effectiveness

This technology is highly effective for small source areas, like the source area under the Main Building floor. It will address VOCs and dense non-aqueous phase liquid (DNAPL) (although there is no evidence of DNAPL at the Site). Due to the electricity requirements, it is very expensive, so probably only applicable and effective for an immediate source area. One drawback is that the vaporized steam from electrodes in the groundwater could escape through cracks in the building floor and potentially pose an indoor risk to workers if not adequately captured by the extraction system. Nonetheless, this technology is considered to be effective.

It should be noted that the highest detected TCE concentration detected beneath the Main Building floor is 1.4 milligram per kilogram (mg/kg) at soil boring B-49 at 6 ft bgs (see **Table 2-2**), which is a relatively low concentration. ERH and TCH are not cost-effective technologies for relatively low VOC concentrations, due to the infrastructure required and the high electricity costs.

Implementability

Equipment required for in situ thermal treatment includes the electrodes, voltage control system, vapor removal and treatment system, water removal and treatment system, and overall control technology. Operation of this system requires an extensive amount of electrical power for the electrodes. Areas to be treated under the Main Building would have to be shut down for a period of weeks or possibly several months for installation of the electrodes and extraction system through the floor. There would be a lot of noise generated with drilling operations, which likely would disrupt operations throughout the building. Since this is an active manufacturing facility, this technology is not implementable.

Cost

The capital costs associated with in situ thermal treatment via ERH or TCH are generally very high when compared to the other technologies due to design, construction, and implementation costs. O&M costs are very high due to electricity requirements. The highest TCE concentration of TCE detected in soil under the Main Building is 1.4 mg/kg, which is relatively low for in situ thermal treatment. Overall, the costs associated with in situ thermal treatment are considered to be very high, and this remedy is not cost-effective.

Screening Result

Since this technology is not implementable at an active manufacturing site, and because of its very high cost, in situ thermal treatment technology was rejected from further evaluation.

5.5.5.3 In Situ Subslab Passive Ventilation

A subslab passive ventilation system consists of installed perforated pipes, below the building concrete slab, which connect to a wind-driven turbine to create a negative pressure under the slab. The negative pressure allows for accumulated soil vapors to exhaust through the perforated pipes into the atmosphere at a safe emission point(s).

For subslab passive ventilation at the affected areas, the buildings must be razed to below the slab, the perforated pipes would have to be installed horizontally, or the floor of the building would have to be drilled through to implement this technology. Due to the active manufacturing at the site, this technology is more suitable for new construction or during significant building redevelopment. These systems are often paired with vapor barriers to increase effectiveness.

Effectiveness

Subslab ventilation is effective, especially when paired with a vapor barrier. However, with a relatively shallow water table, it is possible that groundwater could adversely impact the effectiveness of the system.

Implementability

The degree of implementability depends on whether the technology is installed at an existing building or during new construction. For an existing facility like the Shakespeare Site, the building floor would have to be removed, thereby shutting down manufacturing operations for an unknown period of time. Therefore, this technology is not implementable for the Site.

Cost

The capital cost of sub-slab passive ventilation is medium cost with a low O&M cost. The effectiveness of sub-slab ventilation is increased when paired with a vapor barrier.

Screening Result

Because this is an active manufacturing facility, this technology is not implementable, and in situ subslab passive ventilation technology is rejected from further consideration.

5.5.5.4 In Situ Subslab Depressurization

A subslab depressurization system is similar to a subslab passive ventilation system except it uses active forced air to remove harmful soil vapors. A blower creates a negative subslab pressure by removing air beneath the foundation. This induces soil vapor flow into subslab conveyance piping with discharge from the blower to a vent on the roof or at a safe emission point. The blower discharge is considered a point source and may be subject to permitting or other regulatory requirements. Exhausted air may require treatment such as by using AC.

For the Main Building and Pole Winder Building, horizontal wells (HWs) could be used as soil vapor conveyance piping to draw gases away from the building slabs. HWs allow wider area coverage with minimal to no in-building disturbances, compared to vertical conveyance piping, which would require drilling or coring equipment to be used inside the buildings. HWs for the two building would remove the need for process equipment or conveyance piping being used inside the building. A small footprint treatment compound would be added that contains the conveyance piping manifold and an exhaust stack. With HW drilling, site disturbances could be limited to a less populated area such as a parking lot. A subslab system with active depressurization would require routine O&M to ensure the system is functioning properly.

Effectiveness

This technology is effective in removing subslab vapors from the soil beneath both buildings, as long as the HWs are spaced close enough to achieve an acceptable ROI.

Implementability

There are bedrock outcrops just outside the east end of the Main Building, outside the foam room and paint room, so HWs could not be installed in this area. There are also underground utilities

in that area of the building that could prohibit horizontal wells. Groundwater is also relatively shallow particularly in the east of the building, which may also impact HW installation. As a result, HWs for a subslab depressurization system are not implementable at this Site.

Cost

Capital costs and O&M for an in situ subslab depressurization system would be high when compared to other potential SSV remedial technologies.

Screening Result

Due to implementability and cost factors, in situ subslab vapor depressurization is rejected from further consideration.

5.5.6 Ex Situ Excavation and Off-Site Disposal

Excavation consists of the removal of the contaminated soil from the VOC source area under the concrete floor inside the Main Building. There are also soil areas under the concrete floor in the Pole Winder Building that are impacted. Excavated soils would be loaded into roll off containers, staged onsite, and then transported to an appropriate disposal facility. Soil would likely be transported to a non-hazardous landfill, based on soil sampling data collected to date.

Effectiveness

This technology would be the most effective of all technologies in achieving the USEPA MCL-based SSL for TCE in soil and for the USEPA industrial air RSLs for TCE and cis-1,2-DCE in SSV. Because portions of the building floor in the Main Building and Pole Winder Building would require removal prior to excavating the contaminated soils, normal operations conducted inside the building would be suspended and manufacturing equipment temporarily moved. Since contaminated soils would be removed, at least down to a depth of 10 or 15 ft bgs, the technology is considered effective in addressing soil and SSV impacts.

Implementability

There are a number of implementability constraints, including overhead obstructions such as lighting and electrical conduit. The biggest implementability constraint would be removal of areas of the floors in the Main Building and Pole Winder Building where active manufacturing operations are occurring. As long as the Facility is operating, this process option is not implementable because operations would have to be shut down for months to remove the impacted soil at both locations.

Cost

The capital costs associated with this technology include shutting down manufacturing operations, moving of manufacturing equipment, removal of portions of the concrete floors, excavation and hauling of the soil outside of the buildings, staging and loading of soils, backfilling and replacement

of the floors, loading of soil into roll off containers, and transport to and disposal at a Subtitle D permitted landfill. The costs associated with this technology are considered to be high, with the shutdown of the manufacturing operations also being a high cost to the current Site owners.

Screening Result

Because of lack of implementability and high cost, ex situ excavation and offsite disposal is rejected.

5.6 Summary of Retained Technologies

The following remedial technologies were retained for inclusion in the remedial alternatives development process in **Section 6.0**:

- Groundwater
 - ICs,
 - MNA,
 - ISCO,
 - ISCR,
 - ISERD (combination of ISAB and ISCR), and
 - ISA.
- Soil
 - ICs,
 - Containment via Cover, and
 - MNA.
- SSV
 - ICs,
 - Containment via Cover, and
 - MNA.

As listed above, monitoring of groundwater via MNA has been identified for groundwater, soil, and SSV. For groundwater, MNA does not include active groundwater remediation monitoring; this monitoring is included as part of the active remediation technology or process option. For soil and SSV, MNA includes active groundwater remediation monitoring.

6.0 DEVELOPMENT AND DETAILED EVALUATION OF REMEDIAL ACTION ALTERNATIVES

The technologies that were retained from the screening process in Section 5.0 were developed into comprehensive remedial action alternatives. Initially, the remedial alternatives were individually assessed against seven of the nine NCP evaluation criteria. Results of the comparative analysis were then used to compare the remedial alternatives against one another to identify advantages, disadvantages, and tradeoffs between the alternatives.

6.1 Development of Remedial Action Alternatives

In accordance with USEPA guidance (USEPA, 1988), remedial alternatives were developed by combining the technologies retained during the identification and screening process. The objective of the alternatives development process is to provide an appropriate range of remedial alternatives and sufficient information to adequately analyze and compare them with the evaluation criteria. The remedial alternatives evaluated in this FS were developed to meet the RAOs, using the retained technologies either singly or in combination. The results of the bench-scale treatability testing and subsequent pilot testing, along with data from the pre-RI, RI, Sitewide groundwater assessment, and additional assessments of June 2023 to January 2024 were used in the alternatives assembly process.

The five assembled remedial alternatives are described in **Table 6-1** in terms of their source area treatment, active treatment outside the buildings, passive technology, groundwater monitoring, and institutional controls. In this section, the technologies retained in **Section 5.0** are assembled into combination remedial action alternatives that address groundwater, soil, and SSV. These technologies were selected based on successfully passing screening criteria and are believed to be the most appropriate technologies based on Site-specific conditions. The retained technologies were assembled into the following remedial alternatives for detailed analysis, as listed in **Table 6-1** and summarized below.

- Alternative 1: No Action
- Alternative 2: MNA, ICs, and Containment via Cover
- Alternative 3: ISCO, MNA, ICs, and Containment via Cover
- Alternative 4: ISCO, ISERD, ISA, MNA, ICs, and Containment via Cover
- Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover

6.2 Evaluation Criteria

A detailed analysis of the aforementioned remedial action alternatives is performed against the NCP criteria to form the basis for selecting a final Site remedy. The intent of this analysis is to present sufficient relevant information to allow decision-makers to select an appropriate remedy. Evaluation against the NCP criteria forms the basis for determining the ability of a remedial action alternative to satisfy CERCLA remedy selection requirements. A description of the nine criteria

as outlined in 40 CFR 300.430(e)(9)(iii) is presented in the following subsections. Screening of individual alternatives is being conducted against the first seven NCP criteria.

6.2.1 Protection of Human Health and the Environment

Remediation alternatives must be protective of human health and the environment. Each alternative was assessed to determine whether it can adequately protect human health and the environment, in both the short and long term, from unacceptable risks posed by COCs present at the Site by eliminating, reducing, or controlling exposure to meet the established site-specific remediation goals. The overall assessment of protection utilizes the assessments conducted under other evaluation criteria, especially compliance with ARARs, long-term effectiveness and permanence, and short-term effectiveness.

6.2.2 Compliance with ARARs and Other Criteria, Advisories, and Guidance

The alternatives are assessed to determine whether they meet ARARs under federal and state environmental laws as presented in Section 3.0 of this FS or whether they provide grounds for invoking one of the waivers presented in 40 CFR 300.430(f)(1)(ii)(c). Compliance with other criteria, advisories, and guidance is also evaluated.

6.2.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion evaluates the anticipated ability of the alternatives to maintain reliable protection of human health and the environment over time, once the remediation goals are met. Alternatives are assessed for the long-term effectiveness and permanence they afford with respect to the magnitude of residual risk and the adequacy and reliability of controls used to manage residual chemicals (untreated chemicals and treatment residuals) over the long term.

6.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the anticipated performance of the treatment technologies that each alternative employs. This evaluation relates to the statutory preference for selecting an alternative that utilizes treatment technologies to eliminate residuals or substantially reduce the inherent potential for Site residuals to cause future environmental releases or other risks to human health and the environment. Estimates of the degree to which the remediation alternative will reduce chemical toxicity, and/or mobility are beneficial when analyzing this factor.

6.2.5 Short-Term Effectiveness

The short-term impacts of the implementation period for each of the alternatives are assessed, considering the following factors, as appropriate:

- Short-term risks that might be posed to the community during implementation of an alternative;

- Potential impacts to industrial or remediation workers during remedial action and the effectiveness and reliability of protective measures;
- Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and
- Time required to achieve Site-specific media cleanup goals.

6.2.6 Implementability

The ease or difficulty of implementing the remediation alternatives is assessed by considering the following factors, as appropriate:

- Technical feasibility, including the reliability of the remedy, ease of undertaking additional remedial actions, and ability to monitor the effectiveness of the remedy;
- Administrative feasibility, including activities required to coordinate with other offices and agencies and the ability and time needed to obtain any necessary approvals and permits for both onsite and offsite activities; and
- Availability of necessary goods and services and materials.

6.2.7 Cost

In accordance with CERCLA guidance (USEPA, 1988), cost estimates for remedial alternatives are presented for comparison purposes only, are order-of-magnitude level, and have an estimated range of accuracy of -30% to +50%. The cost estimates include both capital and O&M costs. Present worth costs are determined over the time period of operation at a 3% discount rate per year. Detailed costs estimates for each remedial alternative are provided in **Attachment B**.

6.2.8 State Acceptance

This assessment evaluates the technical and administrative issues and concerns SCDHEC may have regarding each of the remedial alternatives. This criterion is being addressed by SCDHEC by virtue of their oversight of this project and is not addressed in this FS Report.

6.2.9 Community Acceptance

This assessment evaluates the issues and concerns the public may have regarding each of the alternatives. This criterion is being addressed by SCDHEC by virtue of their oversight of this project and is not addressed in this FS Report.

6.3 Detailed Criteria Evaluation of Remedial Action Alternatives

The following subsections present the individual analysis for Alternatives 1 through 5. A summary of the results of the detailed evaluation of each alternative for the first seven criteria (standard FS approach) appears in **Table 6-2**.

6.3.1 Alternative 1 – No Action

The No Action alternative is a baseline alternative included for comparison with the other remedial alternatives. The No Action alternative assumes that no action is taken, no monitoring is performed, no ICs are implemented, and no costs are incurred. No remedy review, site visits, or meetings with SCDHEC are included. This alternative would not achieve the RAOs.

6.3.1.1 Overall Protection of Human Health and the Environment

Alternative 1 would not provide control of exposure or reduction of risk to human health and the environment imposed by impacted groundwater at the Site. This alternative would not actively reduce the COC concentrations in groundwater to the RGs and, therefore, it would not achieve the RAOs. A decrease in COC concentrations in groundwater may occur over time through natural processes. However, such reduction would not be monitored, quantified, or documented.

6.3.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Chemical-specific ARARs: Since no remedial activities are associated with this alternative, compliance with the chemical-specific ARARs for groundwater would not be met until such time that natural attenuation processes have reduced COC concentrations to the RGs.

Location-specific ARARs: There are no location-specific ARARs for this Site.

Action-specific ARARs: Since no remedial activities would be conducted under this alternative, action-specific ARARs are not applicable.

6.3.1.3 Long-term Effectiveness and Permanence

This alternative would not provide for controls or long-term risk management measures for the untreated COCs. The current and potential future risks are likely to remain the same under this alternative.

6.3.1.4 Reduction of Toxicity, Mobility, or Volume

This alternative would not employ active treatment that would reduce the toxicity, mobility, or volume of the COCs in groundwater; therefore, this alternative would not satisfy the statutory preference for treatment. A decrease in the groundwater COC concentrations may occur slowly over time through natural processes although this would not be quantified because this alternative does not include any sampling.

6.3.1.5 Short-term Effectiveness

Because the No Action alternative would not involve any active remedial measures, no short-term risks to the community, workers or the environment are likely to exist. However, this alternative is not effective in the short term, because the reduction in COC concentrations via natural attenuation processes is much slower than with active treatment.

6.3.1.6 Implementability

Alternative 1 is very implementable. There are no technical or administrative limitations to implementing the No Action alternative.

6.3.1.7 Cost

Costs associated with No Action would be associated with a periodic review (every five years). There would be no remedy meetings with SCDHEC included. **Table 6-3** summarizes costs associated with Alternative 1 (\$0); the detailed cost estimate is presented in **Attachment B**.

6.3.2 Alternative 2 – MNA, ICs, and Containment via Cover

Alternative 2 does not include any source area treatment or any active groundwater treatment at the Site. This remedy depends on natural processes such as dilution, volatilization, and dispersion in on Site and offsite groundwater for reduction of VOC concentrations. The remedy does include the following groundwater monitoring frequency and extent: semi-annual monitoring of 72 wells (Year 1), 58 wells (Years 2-5), and 52 wells (Years 6-10), and annual monitoring of 49 wells (Years 11-15), 39 wells (Years 16-20), and 36 wells (Years 21-30).

The remedy also includes the following ICs: deed restrictions to prevent on-Site residential development and to prohibit on Site and offsite use of groundwater; and abandonment of off-Site water supply wells after providing a means for nearby residents to have access to potable water.

Containment via cover is a component of this alternative in which the soil and SSV PRG exceedances are addressed by the concrete floors present in the Main Building and Pole Winder Building. As a result, the likelihood of continued soil to groundwater migration via leaching is minimal. Additionally, the buildings and existing concrete floors serve to eliminate direct human exposure to any soil or SSV COCs present.

6.3.2.1 Protection of Human Health and the Environment

Alternative 2 provides some reduction in future risk to human health and the environment through natural attenuation mechanisms. With the provision of alternate water supplies to nearby offsite residents in conjunction with cessation of active pumping from residential wells, TCE concentrations in offsite groundwater have noticeably decreased in the past few years. However, without addressing on Site groundwater, there could be continued offsite TCE concentrations exceeding the MCL. With the ICs to prevent the use of onsite and offsite groundwater, this alternative would be protective of human health and environment.

6.3.2.2 Compliance with ARARs and Other Criteria, Advisories, and Guidance

Chemical-specific ARARs: Alternative 2 would result in a gradual reduction of COC concentrations over time in groundwater due to natural attenuation mechanisms. The time necessary to meet USEPA MCLs would be greater than 30 years, but as long as groundwater monitoring is conducted, future achievement of chemical-specific ARARs could be evaluated. This alternative would not comply with ARARs.

Location-specific ARARs: There are no location-specific ARARs for this Site.

Action-specific ARARs: This alternative would comply with ARARs when sampling personnel wear personal protective equipment (PPE). It will also comply with ARARs regarding the containment and offsite transport and disposal of investigation-derived waste (IDW) from monitoring well installations, groundwater injections, and from groundwater sampling.

TBC Guidance: The time necessary to meet USEPA industrial RSLs for soil and SSV would be greater than 30 years, but as long as groundwater monitoring is conducted, future achievement of the RSLs could be evaluated.

6.3.2.3 Long-Term Effectiveness and Permanence

The invoking of ICs (i.e., deed restrictions and groundwater use restrictions) would provide added effectiveness over the long term. Since this alternative would leave COCs in the groundwater at concentrations exceeding MCLs and TCE in soil exceeding the MCL-based SSL for an extended period of time, periodic five-year reviews would need to be conducted to ensure that the IC and MNA remedy continues to provide adequate protection to human health and the environment. The IC remedy would require the concrete floor to remain in place at the Main Building and Pole Winder Building. This alternative provides long-term effectiveness but not permanence.

6.3.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Since the MNA, ICs, and Containment via cover remedy is a passive remediation method, it would provide no active or enhanced reduction in toxicity, mobility, or volume of impacted groundwater, soil, or SSV through active treatment. However, chemical concentrations in groundwater would gradually be reduced, thereby achieving some passive reductions in groundwater and SSV in both toxicity and volume over time through natural attenuation mechanisms.

6.3.2.5 Short-Term Effectiveness

There would be little to no risk posed to the surrounding community during implementation of Alternative 2. In the event that additional monitoring wells would be required, potentially contaminated soil generated as drill cuttings would be immediately placed into drums and secured prior to offsite disposal. A clearly delineated work zone would be established during the installation of any additional monitoring wells to keep Facility workers and the surrounding community out of any potential danger. The concrete floor cover would remain in place for both

the Main Building and Pole Winder Building, to minimize exposure to SSV present under the floors.

Annual groundwater sampling activities would require PPE. Additional PPE, as necessary, would be worn by site personnel during the installation of any additional monitoring wells. Environmental impacts posed by annual sampling and the potential installation of additional monitoring wells would be minimal.

Primary natural attenuation processes, which would occur at this Site in all areas of the groundwater plume, include advection, dispersion, dilution, sorption to the aquifer matrix, and volatilization once the groundwater discharges to Town Creek. Based on the area and magnitude of the TCE plume, the time estimated to achieve site cleanup goals by using MNA is greater than 30 years. The ICs provide some short-term effectiveness, but without active treatment, this alternative does not provide complete short-term effectiveness in reducing VOC concentrations.

6.3.2.6 Implementability

Currently, there is a comprehensive groundwater monitoring well network established for the site, as shown in **Figures 1-6, 1-7, and 1-8** and other figures. No additional monitoring wells are anticipated to be necessary to implement Alternative 2. The concrete floor for containment is already in place for buildings with soil and SSV impact beneath. Based on the results of future groundwater monitoring events, additional wells may need to be installed. In addition, groundwater use and/or deed restrictions still need to be negotiated to prevent future exposure to site-related COCs in groundwater. This alternative is implementable to the degree that ICs can be negotiated with the Facility and with adjacent property owners.

6.3.2.7 Cost

The 30-year present worth cost of Alternative 2 is estimated to be \$1,137,000. This includes total first year capital costs of approximately \$108,000. The remainder of the cost associated with Alternative 2 includes semiannual groundwater sampling and associated reporting for Years 2 through 20, and annual monitoring for years 21 through 30. This alternative will also include a five-year remedy review with a Site visit and follow-up written summary every five years for thirty years. A meeting with SCDHEC in Columbia, South Carolina every five years is also included. **Table 6-4** summarizes costs associated with Alternative 2; the detailed cost estimate is presented in **Attachment B**.

6.3.3 Alternative 3 – ISCO, MNA, ICs, and Containment via Cover

Alternative 3 includes ISCO to treat groundwater in a source area hot spot under the concrete floor at Area 1 in the east end of the Main Building (**Figure 6-1 and Figure 6-2**). Ten ISCO DPT injection points installed through the concrete floor/ground into groundwater are planned inside and outside the building near the Foam Room; the injection zone would be 10-22 ft bgs, assuming a geoprobe can penetrate to that depth in every injection. Also, under the concrete floor at Areas 2B to 2H, seven areas/rows of ISCO DPT injections into groundwater in the west end of the Main

Building will be conducted with 7 to 13 points per row (**Figure 6-1 and Figure 6-2**). The targeted injection zone depths for Areas 2B through 2H are approximately 13-26 ft bgs for a total of 81 DPT points. Eleven new shallow monitoring wells will be installed at the Main Building to assist with monitoring the effectiveness of the ISCO injections (**Figure 6-2**).

Outdoor areas to treat shallow zone groundwater impact (not including near the Foam Room) include the following. For Area 2A, there are four ISCO DPT injection points near MW-6, with a targeted injection zone of 14-26 ft bgs. At Area 3A (on Site near MW-5), 17 ISCO DPT injection points on 6-ft centers are planned in a barrier-type application that is 100 ft long, with a targeted injection zone of 14-26 ft bgs. At Area 3B (offsite near MW-10), 18 ISCO DPT injection points on 6-ft centers are planned in a barrier-type application that is 110 ft long, with a targeted injection zone of 19-31 ft bgs. At Area 4 (on Site near MW-8), 35 ISCO DPT injection points on 6-ft centers are proposed in a barrier-type application that is 210 ft long, with a targeted injection zone of 14.5-26.5 ft bgs. At Area 5 (on Site near MW-9), 7 ISCO DPT injection points on 6-ft centers are planned in a barrier-type application, with a targeted injection zone of 14.8-26.8 ft bgs. The shallow groundwater zone injection locations are shown in **Figure 6-1**.

For impacted intermediate zone groundwater outside of Facility buildings, permanent injection wells are proposed. At Area 3 (on Site near MW-5I and MW-7I), 42 permanent ISCO injection wells installed on 10-ft centers are proposed in a barrier-type application that is 420 ft long. Half of the injection wells will be screened from 37-47 ft bgs and half of the wells will be screened from 47-57 ft bgs. For Area 5 (onsite near MW-9I), 21 permanent ISCO injection wells installed on 10-ft centers are planned in a barrier-type application that is 210 ft long with screen depths of 37.5-47.5 ft bgs. The intermediate zone injection well locations are shown on **Figure 6-3**.

Up to four ISCO injection events are planned for shallow and intermediate zone groundwater to address potential matrix back diffusion and rebound in groundwater COC concentrations. There are a total of 235 injection locations planned for the first ISCO injection event. Each subsequent ISCO injection event has approximately 25 percent fewer injection points. Injection events will be conducted every three years (Years 1, 4, 7, and 10). As described in Section 5.4.4.1, there are various chemical oxidants that can be used to treat CVOCs in groundwater. In this FS, Provectus Environmental Product's® Provect-OX2, a self-activating, extended release chemical oxidant is proposed and is used for cost estimating purposes. A Technical Data Sheet for Provect-OX2™ is provided in **Attachment C**.

Semi-annual monitoring of 29 wells will be conducted during the first semiannual event in years 1 through 12. Semi-annual monitoring of 83 wells will be performed during the second event in year 1. There will be semi-annual monitoring of 69 wells during the second event in years 2 through 6. Semi-annual monitoring of 63 wells will be conducted during the second event in years 7 through 12. Annual monitoring of 35 wells is planned in years 13 through 15, and annual monitoring of 22 wells will occur in years 16 through 30. Abandonment of the intermediate zone injection wells will occur after the fourth ISCO injection if sampling demonstrates that the groundwater PRGs have been met. Other selected monitoring wells will be abandoned at various times during the implementation of Alternative 3.

Containment via cover is a component of Alternative 3 in which the soil and SSV PRG exceedances are addressed by the concrete floors present in the Main Building and Pole Winder Building. As a result, the likelihood of continued soil to groundwater migration via leaching is minimal. Additionally, the buildings and existing concrete floors serve to eliminate direct human exposure to any soil or SSV COCs present.

In addition to the concrete cover, ISCO injections will be occurring inside both the east and west parts of the Main Building, at locations indicated in **Figure 6-1**. The highest indoor air industrial RSL exceedances occurred in the western portion of the Main Building (**Table 2-1** and **Figure 2-2**). SSV concentrations of TCE inside the Pole Winder Building were not very high (**Figure 2-2**), so no ISCO injections are planned for inside of that building. ISCO injections are planned outside and downgradient of both buildings.

6.3.3.1 Protection of Human Health and the Environment

CVOC concentrations in groundwater would be reduced based on this active treatment technology. On-Site workers injecting chemical would be protected by using adequate PPE. Deed restrictions and groundwater use restrictions would be implemented under Alternative 3 to ensure future protection from exposure to impacted groundwater and soil during and after remedial activities. This alternative would be protective of human health and the environment.

6.3.3.2 Compliance with ARARs and Other Criteria and Guidance

Chemical-specific ARARs: The attainment of Site chemical-specific ARARs may or may not be achieved; it is not possible at this time to determine if site-related COCs can be reduced to below their respective MCLs via active ISCO treatment, coupled with natural attenuation mechanisms. ISCO injection will target CVOCs in the shallow and intermediate groundwater zones, and CVOCs migrating in other parts of these zones will likely be impacted. However, some CVOCs have migrated into bedrock, and these will not be targeted by active injection. Due to the tight, low permeability saprolitic soils associated with the shallow and intermediate groundwater zones, there may be short-circuiting of the injected oxidant that may occur through preferential migration pathways, resulting in areas where the injected oxidant does not contact CVOCs bound up in the targeted aquifer.

While treatment to MCLs will likely not be achieved through the use of ISCO, for costing purposes it is assumed that four separate ISCO injection events conducted in the first ten years will result in reduction in CVOC concentrations to a point that MNA will be the preferred remedy. Groundwater areas containing elevated TCE concentrations are being targeted for active treatment, thereby ensuring that the highest concentrations of groundwater COCs currently remaining at the Site are treated prior to their further migration. Following active treatment, natural attenuation mechanisms would continue to reduce chemical concentrations in groundwater. Monitoring would continue following active remediation to evaluate any rebound in VOC concentrations and to determine compliance with the chemical-specific ARARs.

Location-specific ARARs: There are no location-specific ARARs for this Site.

Action-specific ARARs: This alternative would comply with ARARs when the monitoring well and injection well installation, chemical oxidant injection, and sampling personnel wear PPE. It will also comply with ARARs regarding the containment and offsite transport and disposal of IDW from well installations, groundwater injections, and groundwater sampling.

TBC Guidance: The time necessary to meet USEPA industrial RSLs for soil and SSV would be greater than 30 years, but as long as groundwater monitoring is conducted, future achievement of the RSLs could be evaluated.

6.3.3.3 Long-Term Effectiveness and Permanence

The objective of Alternative 3 is to actively treat groundwater containing elevated concentrations of PCE, TCE and their degradation products via four injection events conducted over a 10-year period. Treatment via ISCO is irreversible. The soil source in the unsaturated area under the floor of the Main Building will not be treated through the ISCO groundwater remedy, due to it being an active manufacturing facility and the inability to access the impacted soil. Active groundwater treatment should lower the TCE SSV concentrations over time in the Main Building.

The groundwater pilot study of 2021-2022 indicated that ISCO is an effective remedy, provided that the chemical oxidant can be adequately distributed into tight saprolite soils and make contact with the CVOCs. During the pilot study, adequate distribution was achieved in the immediate areas of observation well ISCO-OBSW-1 but not in the area of monitoring well TMW-31 due to obstructions encountered in the area of the Foam Room.

Long-term monitoring and maintenance of monitoring points will be required during active remediation as well as after the 10 years estimated for the duration of active remediation activities. Although it is unlikely that future direct exposure to groundwater would occur via installation of potable wells, ICs would provide added effectiveness over the long term. The IC remedy would require the concrete floor to remain in place at the Main Building and Pole Winder Building. Since this alternative would leave COCs in the groundwater at concentrations exceeding MCLs for an extended period of time, it is assumed that five-year remedy reviews would need to be completed for a 30-year duration to ensure that the MNA, ICs, and Containment via Cover continued to provide adequate protection to human health and the environment.

6.3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

A reduction in the toxicity and volume of COCs in groundwater would be achieved through the use of ISCO. Mobility would initially not be prevented due to CVOCs being bound up in tight soils that may be difficult to access and treat. Active groundwater treatment will occur within the Main Building, downgradient of the Main Building and Pole Winder Buildings to prevent additional COC migration offsite, and at one area north of the Site on the Dickert Property where an area of elevated TCE in shallow zone groundwater persists. The statutory preference for treatment as

a principal element is satisfied by this alternative. Natural attenuation mechanisms would further reduce COC concentrations and the overall mass of VOCs in groundwater over time.

6.3.3.5 Short-Term Effectiveness

The risk to the community would not be significantly increased by the use of ISCO. A slight to potentially moderate increase in risk to factory workers would exist during injection of chemical oxidant due to potential exposure to vapors that might migrate through the building floor during injection. Administrative controls, monitoring of indoor air, and engineering controls such as a vapor venting system at key locations inside the building treatment areas could be utilized to minimize this risk. PPE would also be required for personnel directly involved with chemical injection. Minimal PPE would be required for the post-ISCO injection monitoring program. The concrete floor cover would remain in place for both the Main Building and Pole Winder Building to minimize exposure to soil and SSV present under the floors.

The active treatment component for groundwater using ISCO is anticipated to require approximately 10 years (four injection events, spaced three years apart); this time frame may need to be modified based on the results of post-ISCO injection monitoring.

6.3.3.6 Implementability

The pilot study conducted in 2021 to 2022 demonstrated that ISCO is implementable at the Site, even with the ongoing manufacturing operations occurring inside the Facility buildings. The concrete floor for containment is already in place for all impacted buildings. Facility personnel have been very cooperative during previous assessment and pilot test activities. Injection events will have to be coordinated with facility personnel, especially inside the building. A UIC permit would need to be obtained from SCDHEC, which usually is easy to receive based on a standard application process. This process generally takes about one to two months maximum to complete.

This alternative is also implementable to the degree that ICs can be negotiated with the Facility and with adjacent property owners.

6.3.3.7 Cost

The present worth cost of Alternative 3 is estimated to be \$2,653,000 over a 30-year period. This includes a year 1 capital cost of \$895,000. The remainder of the cost associated with Alternative 3 includes multiple injection events through year 10, ongoing semiannual effectiveness monitoring and reporting for years 1 through 12, followed by annual monitoring and reporting for 18 years through year 30, and several well abandonment events. This alternative will also include a remedy review with a Site visit and follow-up written summary every five years for thirty years. A meeting with SCDHEC in Columbia, South Carolina every five years is also included. **Table 6-5** summarizes Alternative 3 costs; the detailed cost estimate is presented in **Attachment B**.

6.3.4 Alternative 4 – ISCO, ISERD, ISA, MNA, ICs and Containment via Cover

Alternative 4 includes ISCO to treat groundwater in the source area hot spot under the concrete floor at Area 1 at the east end of the Main Building (**Figure 6-1** and **Figure 6-2**). Ten ISCO DPT injection points installed through concrete floor/ground into groundwater are planned inside and outside the building near the Foam Room; the injection zone would be 10-22 ft bgs. Also, under the concrete floor at Areas 2B to 2H, seven areas/rows of ISERD DPT injections into groundwater in the west end of the Main Building with a total of 7 to 13 points per row will be conducted (**Figure 6-1** and **Figure 6-2**). The targeted injection zone depth is approximately 13-26 ft bgs with a total of approximately 81 DPT points. Eleven new shallow monitoring wells will be installed at the Main Building to assist with monitoring the effectiveness of the ISCO injections (**Figure 6-2**).

Outdoor areas to treat shallow zone groundwater impact (not including near the Foam Room) via ISERD (combination of ISAB and ISCR) include the following: For Area 2A, there are four ISERD DPT injection points near MW-6, with a targeted injection zone of 14-26 ft bgs. At Area 3A (on Site near MW-5), 17 ISERD DPT injection points on 6-ft centers are planned in a barrier-type application that is 100 ft long, with a targeted injection zone of 14-26 ft bgs. At Area 3B (offsite near MW-10), 18 ISERD DPT injection points on 6-ft centers are planned in a barrier-type application that is 110 ft long, with a targeted injection zone of 19-31 ft bgs. At Area 4 (on Site near MW-8), 35 ISERD DPT injection points on 6-ft centers are proposed in a barrier-type application that is 210 ft long, with a targeted injection zone of 14.5-26.5 ft bgs. At Area 5 (on Site near MW-9), 7 ISERD DPT injection points on 6-ft centers are planned in a barrier-type application, with a targeted injection zone of 14.8-26.8 ft bgs. These outside area shallow groundwater zone injection locations are shown in **Figure 6-1**.

For impacted intermediate zone groundwater outside of Facility buildings, roto sonic drilling will be used to conduct the injections. Permanent monitoring wells will not be used because the proposed product to be injected, EHC[®]Plus, is too thick to inject through permanent well screens. At Area 3 (on Site near MW-5I and MW-7I), 42 temporary ISERD injection points on 10-ft centers are proposed in a barrier-type application that is 420 ft long. Half of the injection intervals will be from 37-47 ft bgs, and half of the injection intervals will be from 47-57 ft bgs. For Area 5 (onsite near MW-9I), 21 temporary ISERD injection points on 10-ft centers are planned in a barrier-type application that is 210 ft long with injection intervals from 37.5-47.5 ft bgs. The intermediate zone injection well locations are shown on **Figure 6-3**.

Up to three ISERD injection events are planned for shallow and intermediate zone groundwater to address potential matrix back diffusion and rebound in groundwater COC concentrations. There are a total of 235 injection locations planned for the first ISERD injection event. Each subsequent ISERD injection event has one-third less injection points. Injection events will be conducted every three years (Years 1, 4, and 7). In this FS, Evonik Industries product, EHC[®]Plus, which contains fibrous organic carbon, ZVI, and PAC is proposed and is used for cost estimating purposes. Bioaugmentation using SDC-9[™] will also be conducted. Technical data sheets for EHC[®]Plus and SDC-9[™] are provided in **Attachment C**. A buffer, magnesium oxide, will need to be injected due to the low pH of the targeted groundwater.

Semi-annual monitoring of 29 wells will be conducted during the first semiannual event in years 1 through 9. Semi-annual monitoring of 83 wells will be performed during the second event in year 1. There will be semi-annual monitoring of 69 wells during the second event in years 2 through 6. Semi-annual monitoring of 63 wells during the second event will be performed in years 7 through 9. Annual monitoring of 35 wells is planned in years 10 through 15, and annual monitoring of 22 wells will occur in years 16 through 30. Abandonment of the intermediate zone injection wells will occur after the third ISCO injection if sampling demonstrates that the groundwater PRGs have been met. Other selected monitoring wells will be abandoned at various times during the implementation of Alternative 4.

Containment via cover is a component of Alternative 4 in which the soil and SSV PRG exceedances are addressed by the concrete floors present in the Main Building and Pole Winder Building. As a result, the likelihood of continued soil to groundwater migration via leaching is minimal. Additionally, the buildings and existing concrete floors serve to eliminate direct human exposure to any soil or SSV COCs present.

In addition to the concrete cover, ISCO injections will be occurring inside the east end of the Main Building and ISERD injections will be occurring inside the west end of the Main Building, at locations indicated in **Figure 6-1**. The highest indoor air industrial RSL exceedances occurred in the western portion of the Main Building (**Table 2-1**). SSV concentrations of TCE inside the Pole Winder Building were not very high (**Figure 2-1**), so no ISCO or ISERD injections are planned for inside of that building. ISERD injections are planned outside and downgradient of both buildings.

6.3.4.1 Protection of Human Health and the Environment

CVOC concentrations in groundwater would be reduced based on this active treatment technology. The injection of Provect-OX2™ and EHC®Plus into the aquifer could result in exposure to onsite workers on the injection crew; adequate PPE can mitigate this risk. Deed restrictions and groundwater use restrictions would be implemented under Alternative 4 to ensure future protection from exposure to impacted soil and groundwater during and after remedial activities. This alternative would be protective of human health and the environment.

6.3.4.2 Compliance with ARARs and Other Criteria and Guidance

Chemical-specific ARARs: The attainment of Site chemical-specific ARARs may or may not be achieved; it is not possible at this time to determine if site-related COCs can be reduced to below their respective MCLs via active treatment, coupled with natural attenuation mechanisms. The ISCO and ISERD injections will target CVOCs in the shallow and intermediate groundwater zones, and CVOCs migrating in other parts of these zones will likely be impacted. However, some CVOCs have migrated into bedrock, and these will not be targeted by active injection. Due to the tight, low permeability saprolitic soils associated with the shallow and intermediate groundwater zones, there may be short-circuiting of the injectants that may occur through preferential migration pathways, resulting in areas where the injectants do not contact CVOCs bound up in the targeted aquifer.

While treatment to MCLs will likely not be achieved through active ISCO and ISERD treatment, for costing purposes it is assumed that three separate events conducted in the first seven years will result in the reduction in CVOC concentrations to the point that MNA will be the preferred remedy. Groundwater areas containing elevated TCE concentrations are being targeted for active treatment, thereby ensuring that the highest concentrations of groundwater COCs currently remaining at the Site are treated prior to their further migration. Following active treatment, natural attenuation mechanisms would continue to reduce VOC concentrations in groundwater. Monitoring would continue following active remediation to evaluate any rebound in VOC concentrations and to determine compliance with the chemical-specific ARARs.

Location-specific ARARs: There are no location-specific ARARs for this Site.

Action-specific ARARs: This alternative will comply with ARARs when the new monitoring well installation, substrate injection, and sampling personnel wear PPE. It will also comply with ARARs regarding the containment and offsite transport and disposal of IDW from well installations, groundwater injections, and groundwater sampling.

TBC Guidance: The time necessary to meet USEPA industrial RSLs for soil and SSV would be greater than 30 years, but as long as groundwater monitoring is conducted, future achievement of the RSLs could be evaluated.

6.3.4.3 Long-Term Effectiveness and Permanence

The objective of Alternative 4 is to actively treat groundwater containing elevated concentrations of PCE, TCE and their degradation products via three injection events conducted over a 7-year period. Treatment by ISCO and ISERD is irreversible. The soil source in the unsaturated area under the floor of the Main Building will not be actively targeted through the ISCO and ISERD groundwater remedy, due to it being an active manufacturing facility and the inability to access the impacted soil. Active groundwater treatment should lower the TCE SSV concentrations over time in the Main Building.

The groundwater pilot study of 2021-2022 indicated that ISCO and ISERD is an effective remedy, providing that the chemical oxidant and ISERD substrate can be adequately distributed into tight saprolite soils and make contact with the CVOCs. Also, pH adjustment of the aquifer is necessary in order for the injected bioaugmentation culture to survive. During the pilot study, adequate distribution and pH adjustment was achieved in the intermediate zone area of observation well ERD-OBSW-1I and well MW-10I. However, the pH buffer may have not been well distributed in the shallow zone area, and pH adjustment was not accomplished in the shallow zone, based on results of sampling observation well ERD-OBSW-1S and monitoring well MW-10.

Long-term monitoring and maintenance of monitoring points will be required during active remediation as well as after the 7 years estimated for the duration of active remediation activities. Although it is unlikely that future direct exposure to groundwater would occur via installation of potable wells, ICs will provide added effectiveness over the long term. The IC remedy would require the concrete floor to remain in place at the Main Building and Pole Winder Building. Since

this alternative would leave COCs in the groundwater at concentrations exceeding MCLs for an extended period of time, it is assumed five-year remedy reviews would need to be completed for a 30-year duration to ensure that the MNA component of Alternative 4 continues to provide adequate protection to human health and the environment.

6.3.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

A reduction in the toxicity and volume of COCs in groundwater would be achieved through the use of ISCO and ISERD. Mobility would initially not be prevented due to CVOCs being bound up in tight soils that may be difficult to access and treat. Active groundwater treatment will occur within the Main Building, downgradient of the Main Building and Pole Winder Building to prevent additional COC migration offsite, and at one area north of the Site on the Dickert Property where an area of elevated TCE in shallow zone groundwater persists. The statutory preference for treatment as a principal element is satisfied by this alternative. Natural attenuation mechanisms would further reduce COC concentrations and the overall mass of VOCs in groundwater over time.

6.3.4.5 Short-Term Effectiveness

The risk to the community would not be significantly increased by the use of ISCO and ISERD. A slight to potentially moderate increase in risk to factory workers would exist during injection of Provect-OX2™ and EHC®Plus due to potential exposure to vapors that might migrate through the building floor during injection activities. Administrative controls, monitoring of indoor air, and engineering controls such as a vapor venting system at key locations inside the building treatment areas would be utilized to minimize this risk. PPE would also be required for personnel directly involved with chemical injection. Minimal PPE would be required for the post-injection monitoring program. The concrete floor cover would remain in place for the Main Building and Pole Winder Building to minimize exposure to soil and SSV present under the floors.

The active treatment component for groundwater using ISCO and ISERD is anticipated to require approximately 7 years (three injection events, spaced three years apart); this time frame may need to be modified based on the results of post-injection monitoring.

6.3.4.6 Implementability

The pilot study conducted in 2021 to 2022 demonstrated that ISCO and ISERD are implementable at the Site, even with the ongoing manufacturing operations inside the building. The concrete floor for containment is already in place for all impacted buildings. Facility personnel have been very cooperative during previous assessment and pilot test activities. Injection events will have to be coordinated with facility personnel, especially inside the building. A UIC permit would need to be obtained from SCDHEC, which usually is easy to receive based on a standard application process. This process takes about one to two months maximum to receive. Buffering of the aquifer will be necessary where ISERD is applied in order for the injected SDC-9™ DHC culture to survive. Buffering of the groundwater must be carefully controlled to avoid raising the pH too

high. The pilot study demonstrated that buffering of the targeted aquifer is possible, but it will be difficult to maintain over time.

This alternative is also implementable to the degree that ICs can be negotiated with the Facility and with adjacent property owners.

6.3.4.7 Cost

The present worth cost of Alternative 4 is estimated to be \$3,052,000 over a 30-year period. This includes a year 1 capital cost of \$1,230,000. The remainder of the cost associated with Alternative 4 includes multiple injection events through year 7, ongoing semiannual effectiveness monitoring and reporting for years 1 through 9, followed by annual monitoring and reporting through year 30, and several well abandonment events. This alternative will also include a remedy review with a Site visit and follow-up written summary every five years for thirty years. A meeting with SCDHEC in Columbia, South Carolina every five years is also included. **Table 6-6** summarizes Alternative 4 costs; the detailed cost estimate is presented in **Attachment B**.

6.3.5 Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover

Alternative 5 includes ISCO to address soils and treat groundwater in the source area hot spot under the concrete floor at Area 1 at the east end of the Main Building (**Figure 6-1** and **Figure 6-2**). Ten ISCO DPT injection points through concrete floor/ground into groundwater are planned inside and outside the building near the Foam Room; the injection zone would be 10-22 ft bgs. Also, under the concrete floor at Areas 2B to 2H, seven areas/rows of ISCR/CAC DPT injections into groundwater in the west end of the Main Building with 7 to 13 points per row will be conducted (**Figure 6-1** and **Figure 6-2**). The injection zone depth would be 13-26 ft bgs for a total of approximately 80 DPT points.

Outdoor areas to treat shallow zone groundwater impact (not including near the Foam Room) via ISCR and CAC include the following: For Area 2A, there are four ISCR/CAC DPT injection points near MW-6, with a targeted injection zone of 14-26 ft bgs. At Area 3A (on Site near MW-5), 17 ISCR/CAC DPT injection points on 6-ft centers are planned in a barrier-type application that is 100 ft long, with a targeted injection zone of 14-26 ft bgs. At Area 3B (offsite near MW-10), 18 ISCR/CAC DPT injection points on 6-ft centers are planned in a barrier-type application that is 110 ft long, with a targeted injection zone of 19-31 ft bgs. At Area 4 (on Site near MW-8), 35 ISCR/CAC DPT injection points on 6-ft centers are proposed in a barrier-type application that is 210 ft long, with a targeted injection zone of 14.5-26.5 ft bgs. At Area 5 (on Site near MW-9), 7 ISCR/CAC DPT injection points on 6-ft centers are planned in a barrier-type application, with a targeted injection zone of 14.8-26.8 ft bgs. These outside area shallow groundwater zone injection locations are shown on **Figure 6-1**.

For impacted intermediate zone groundwater outside of Facility buildings, rotosonic drilling will be used to conduct the injections. Permanent monitoring wells will not be installed to allow for flexibility in the intermediate groundwater zone treatment areas should additional injection events be necessary. At Area 3 (on Site near MW-5I and MW-7I), 42 temporary ISCR/CAC injection

points on 10-ft centers are proposed in a barrier-type application that is 420 ft long. Half of the injection intervals will be from 37-47 ft bgs, and half of the injection intervals will be from 47-57 ft bgs. For Area 5 (onsite near MW-9I), 21 temporary ISERD injection points on 10-ft centers are planned in a barrier-type application that is 210 ft long with injection intervals from 37.5-47.5 ft bgs. The intermediate zone injection well locations are shown on **Figure 6-3**.

Up to two ISCR/CAC injection events are planned for shallow and intermediate zone groundwater to address potential matrix back diffusion and rebound in groundwater COC concentrations. There are a total of 235 injection locations planned for the first ISCR/CAC injection event. The second injection event will include an estimated 85 injection points. Injection events will be conducted in year 1 and year 6. In this FS, Regenesis products, S-Micro ZVI™, a sulfidated ZVI, and Plume Stop®, a CAC, are proposed and used for cost estimating purposes. S-Micro ZVI™ is composed of colloidal, sulfidated ZVI suspended in glycerol. Plume Stop® is composed of very fine particles of AC (1-2 microns) suspended in water through the use of organic polymer dispersion chemistry. Technical data sheets for S-Micro ZVI™ and Plume Stop® are provided in **Attachment C**.

Semi-annual monitoring of 29 wells will be conducted during the first semiannual event in years 1 through 10. Semi-annual monitoring of 83 wells will be performed during the second event in year 1. There will be semi-annual monitoring of 69 wells during the second event in years 2 through 5. Semi-annual monitoring of 63 wells during the second event will be performed in years 6 through 10. Annual monitoring of 35 wells will be conducted in years 11 through 15, and annual monitoring of 22 wells will occur in years 16 through 30. Abandonment of the intermediate zone injection wells will occur after the third ISCO injection if sampling demonstrates that the groundwater PRGs have been met. Other selected monitoring wells will be abandoned at various times during the implementation of Alternative 5.

Containment via cover is a component of Alternative 5 in which the soil and SSV PRG exceedances are addressed by the concrete floors present in the Main Building and Pole Winder Building. As a result, the likelihood of continued soil to groundwater migration via leaching is minimal. Additionally, the buildings and existing concrete floors serve to eliminate direct human exposure to any soil or SSV COCs present.

In addition to the concrete cover, ISCO injections will be occurring inside the east end of the Main Building and ISCR/CAC injections will be occurring inside the west end of the Main Building, at locations indicated in **Figure 6-1**. The highest indoor air industrial RSL exceedances occurred in the western portion of the Main Building (**Table 2-1**). SSV concentrations of TCE inside the Pole Winder Building were not very high (**Figure 2-1**), so no ISCO or ISCR/CAC injections are planned for inside of that building. ISCR/CAC injections are planned outside and downgradient of both buildings.

6.3.5.1 Protection of Human Health and the Environment

CVOC concentrations in groundwater would be reduced based on active treatment. The injection of Provect-OX2™, S-Micro ZVI™, and Plume Stop® into the aquifer could result in exposure to

onsite workers on the injection crew; however, adequate PPE can mitigate this risk. Deed restrictions and groundwater use restrictions would be implemented under Alternative 5 to ensure future protection from exposure to impacted soil and groundwater during and after remedial activities. This alternative would be protective of human health and the environment.

6.3.5.2 Compliance with ARARs and Other Criteria and Guidance

Chemical-specific ARARs: The attainment of Site chemical-specific ARARs may or may not be achieved; it is not possible at this time to determine if site-related COCs can be reduced to below their respective MCLs via active chemical oxidation treatment, coupled with natural attenuation mechanisms. The ISCO and ISCR/CAC injections will target CVOCs in the shallow and intermediate groundwater zones, and CVOCs migrating in other parts of these zones will likely be impacted as well. However, some CVOCs have migrated into bedrock, and these will not be targeted by active injection. Due to the tight, low permeability saprolitic soils associated with the shallow and intermediate groundwater zones, there may be short-circuiting of the injectants that may occur through preferential migration pathways, resulting in areas where the injectants do not contact CVOCs bound up in the targeted aquifer.

While treatment to MCLs will likely not be achieved through active ISCO and ISCR/CAC treatment, for costing purposes it is assumed that two separate events conducted in the first six years will result in the reduction in CVOC concentrations to the point that MNA will be the preferred remedy. Groundwater areas containing elevated TCE concentrations are being targeted for active treatment, thereby ensuring that the highest concentrations of groundwater COCs currently remaining at the Site are treated prior to their further migration. Following active treatment, natural attenuation mechanisms would continue to reduce VOC concentrations in groundwater. Monitoring would continue following active remediation to evaluate any rebound in VOC concentrations and to determine compliance with the chemical-specific ARARs.

Location-specific ARARs: There are no location-specific ARARs for this Site.

Action-specific ARARs: This alternative would comply with ARARs when the new monitoring well installation, substrate injection, and sampling personnel wear PPE. It will also comply with ARARs regarding the containment and offsite transport and disposal of IDW from well installations, groundwater injections, and groundwater sampling.

TBC Guidance: The time necessary to meet USEPA industrial RSLs for soil and SSV would be greater than 30 years, but as long as groundwater monitoring is conducted, future achievement of the RSLs could be evaluated.

6.3.5.3 Long-Term Effectiveness and Permanence

The objective of Alternative 5 is to actively treat groundwater containing elevated concentrations of PCE, TCE and their degradation products via two injection events conducted over a 6-year period. Treatment by the ISCR component of this alternative is irreversible. Biological degradation promoted on the surface of the CAC is also irreversible. The soil source in the

unsaturated area under the floor of the Main Building will not be actively targeted through the ISCO and ISCR/ISA groundwater remedy, due to it being an active manufacturing facility and the inability to access the impacted soil. Active groundwater treatment should lower the TCE SSV concentrations over time in the Main Building.

The groundwater pilot study of 2021-2022 indicated that ISCR using ZVI is an effective remedy, provided that the ZVI used can be adequately distributed into tight saprolite soils and make contact with the CVOCs. During the pilot study, adequate distribution of the injectants was achieved in the intermediate zone area of observation well ERD-OBSW-1I and well MW-10I. However, the substrate may not have been well distributed in the shallow zone area, based on results of sampling observation well ERD-OBSW-1S and monitoring well MW-10.

Long-term monitoring and maintenance of monitoring points will be required during active remediation as well as after the 6 years estimated for the duration of active remediation activities. Although it is unlikely that future direct exposure to groundwater would occur via installation of potable wells, ICs will provide added effectiveness over the long term. The IC remedy would require the concrete floor to remain in place at the Main Building and the Pole Winder Building. Since this alternative would leave COCs in the groundwater at concentrations exceeding MCLs for an extended period of time, it is assumed that five-year remedy reviews would need to be completed for a 30-year duration to ensure that the MNA component of Alternative 5 continues to provide adequate protection to human health and the environment.

6.3.5.4 Reduction of Toxicity, Mobility, or Volume through Treatment

A reduction in the toxicity and volume of COCs in groundwater would be achieved through the use of ISCO and ISCR/ISA. Mobility would initially not be prevented due to CVOCs being bound up in tight soils that may be difficult to access and treat. Active groundwater treatment will occur within the Main Building, downgradient of the Main Building and Pole Winder Buildings to prevent additional COC migration offsite, and at one area north of the Site on the Dickert Property where an area of elevated TCE in shallow zone groundwater persists. The statutory preference for treatment as a principal element is satisfied by this alternative. Natural attenuation mechanisms would further reduce COC concentrations and the overall mass of VOCs in groundwater over time.

Natural attenuation mechanisms would further reduce COC concentrations and the overall mass of VOCs in groundwater.

6.3.5.5 Short-Term Effectiveness

The risk to the community would not be significantly increased by the use of ISCO and ISCR/CAC. A slight to potentially moderate increase in risk to factory workers would exist during injection of Provect-OX2™, S-Micro ZVI™, and Plume Stop® due to potential exposure to vapors that might migrate through the building floor during injection activities. Administrative controls, monitoring of indoor air, and engineering controls such as a vapor venting system at key locations inside the building treatment areas would be utilized to minimize this risk. PPE would also be required for

personnel directly involved with chemical injection. Minimal PPE would be required for the post-injection monitoring program. The concrete floor cover would remain in place for the Main Building and Pole Winder Building to minimize exposure to soil and SSV present under the floors.

The active treatment component for groundwater using ISCO and ISCR/CAC is anticipated to require approximately 6 years (two injection events, spaced five years apart); this time frame may need to be modified based on the results of post-injection monitoring.

6.3.5.6 Implementability

The pilot study conducted in 2021 to 2022 demonstrated that ISCO and ISCR are implementable at the Site, even with the ongoing manufacturing operations occurring inside the building. The concrete floor for containment is already in place for all impacted buildings. Facility personnel have been very cooperative during previous assessment and pilot test activities. Injection events will have to be coordinated with facility personnel, especially inside the building.

The adsorption component of Alternative 5 was not incorporated into the pilot test, but the ISCR/ZVI component of the pilot study seemed to enhance the favorable results of the ISERD technology in the targeted intermediate zone of the groundwater, so adsorption is also deemed to be implementable.

A UIC permit would need to be obtained from SCDHEC, which usually is easy to receive based on a standard application process. This process takes about one to two months maximum to receive

This alternative is also implementable to the degree that ICs can be negotiated with the Facility and with adjacent property owners.

6.3.5.7 Cost

The present worth cost of Alternative 5 is estimated to be \$2,393,000 over a 30-year period. This includes a year 1 capital cost of \$1,224,000. The remainder of the cost associated with Alternative 5 includes annual O&M costs for the treatment system for years 1 through 6, ongoing semiannual effectiveness monitoring for years 7 through 9, followed by annual monitoring through year 30. This alternative will also include a remedy review with a Site visit and follow-up written summary every five years for thirty years. A meeting with SCDHEC in Columbia, South Carolina every five years is also included. **Table 6-7** summarizes Alternative 5 costs; the detailed cost estimate is presented in **Attachment B**.

6.4 Comparative Analysis of Remedial Action Alternatives

The remedial action alternatives considered in this FS include:

- Alternative 1: No Action
- Alternative 2: MNA, ICs, and Containment via Cover
- Alternative 3: ISCO, MNA, ICs, and Containment via Cover

- Alternative 4: ISCO, ISERD, ISA, MNA, ICs, and Containment via Cover
- Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover

A criterion by criterion comparative analysis of the five remedial action alternatives evaluated for this Site is presented in the following subsections. The comparative analysis summarizes the advantages and disadvantages of the remedial alternatives relative to one another with respect to each evaluation criterion. Comparisons of the alternatives are summarized in **Table 6-2**. Remedial action alternatives were evaluated against the NCP threshold criteria (overall protection of human health and compliance with ARARs and other criteria, advisories, and guidance) and the NCP primary balancing criteria (long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost).

6.4.1 Protection of Human Health and the Environment

Alternatives 2 through 5, would achieve on-Site and off-Site future protection of human health and the environment, with implementation of ICs. Alternatives 3 through 5 would provide for human health protection through use of venting of any vapors from beneath the concrete floor of the buildings and the use of PPE during active remedy implementation inside the Main Building. Alternatives 2 through 5 would protect human health through use of PPE during injection and monitoring activities. Alternative 1 would not be protective of human health or the environment.

6.4.2 Compliance with ARARs and Other Criteria, Advisories, and Guidance

Although Alternatives 1 and 2 would result in a reduction of COC concentrations over time through ongoing natural attenuation, the time frame to achieve groundwater MCLs will be much greater than the three alternatives that employ active treatment. However, it is unlikely that any of the five alternatives will achieve groundwater MCLs due to the TCE being bound up in tight saprolite soils within the targeted shallow and intermediate groundwater zones. Semiannual groundwater monitoring followed by annual groundwater monitoring will allow for evaluation of ARAR compliance for Alternatives 2 through 5.

6.4.3 Long-Term Effectiveness and Permanence

The pilot study conducted in 2021 to 2022 demonstrated that ISCO and ISERD (comprised of ISAB and ISCR) are all effective active technologies for groundwater COC treatment at the Site; therefore, Alternatives 3, 4, and 5 are long-term effective. Alternatives 3, 4, and 5 are more long-term effective and more permanent than Alternatives 1 and 2, due to the active treatment processes that transform the targeted CVOCs in groundwater to inert end products. The active treatment for Alternatives 3 through 5 is irreversible and permanent. However, the effectiveness of the active treatment alternatives may be limited due to the tight aquifer materials present in the targeted groundwater treatment zones. The tightness of the aquifer material will likely contribute to matrix back diffusion and COC rebound, which will necessitate additional injection events associated with Alternatives 3 through 5.

Alternatives 4 and 5 are expected to be more long-term effective and permanent than Alternatives 3 and 4, because of the small size of the S-Micro ZVI™ particles (~3 microns) and the Plume Stop® particles (1-2 microns) that will be injected as part of Alternative 5. The gravitational forces for these products are relatively small and of a lower magnitude than groundwater attractive forces (electrostatic and induced dipole), which ultimately helps bond the small S-Micro ZVI™ and Plume Stop® to the aquifer matrix near the point of injection and to remain emplaced in the matrix after the injection pressure is relieved. EHC®Plus that is proposed for Alternative 4 contains PAC and requires hydraulic or pneumatic fracturing for emplacement. Once emplaced, EHC®Plus will remain where it is located and not migrate with the flow of groundwater. The ISCO product Provect-OX2™ will migrate with groundwater flow over time and react with any oxidizable materials encountered. As such, this ISCO product is better suited to treating small, localized source areas like the one present at Area 1.

The reactivity of Provect-OX2™ will be much less than EHC®Plus and S-Micro ZVI™, so Alternatives 4 and 5 are also better in this aspect than Alternative 3.

6.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 3, 4, and 5 meet the statutory preference for treatment. For Alternatives 3 through 5, reduction in the toxicity and volume of COCs in groundwater would be achieved. Mobility would initially not be prevented due to VOCs bound up in tight soils; however, the active remedial alternative injections will occur for shallow and intermediate zone groundwater with elevated CVOC concentrations. Alternatives 4 and 5 are more favorable in reducing mobility than Alternative 3 for reasons previously presented in Section 6.4.3. Natural attenuation mechanisms for all five alternatives would further reduce COC concentrations and the overall mass of VOCs in groundwater, although the time frame will be much longer than with active treatment.

6.4.5 Short-Term Effectiveness

The pilot study conducted in 2021 to 2022 demonstrated that ISCO and ISERD are effective technologies for the treatment of impacted groundwater at the Site. As such, Alternatives 3, 4, and 5 are effective in the short term, whereas Alternatives 1 and 2 will not be effective in the short term. Alternative 3 is the most effective of the three active remedies in the near term because ISCO works much more quickly than ISERD/ISA or ISCR/ISA if successful contact with the targeted CVOCs is achieved. However, both Alternatives 4 and 5 use products that stay where they are emplaced upon injection and do not migrate with groundwater flow, which increases the short-term effectiveness of these alternatives when compared to Alternative 3.

Alternative 5 is more short-term effective than Alternative 4 because no pH adjustment of the aquifer is required, which has been demonstrated to be difficult to control and maintain during the pilot study that was conducted. Alternative 3 will also likely not be as effective in the intermediate term (after one year) due to the chemical oxidant being spent. Alternative 3 (ISCO) will require more injection events (a total of four in the first ten years) when compared with Alternative 4

(ISERD/ISA with PAC; a total of three injection events in seven years) and Alternative 5 (ISCR/ISA with CAC; a total of two injection events in six years).

The risk to the community would not be significantly increased by the use of injectants for active treatment. A slight to potentially moderate increase in risk to factory workers will exist during the injection activities associated with Alternatives 3 through 5 due to potential exposure to vapors that might migrate through the Main Building floor. Administrative controls, monitoring of indoor air, and engineering controls such as a vapor venting system at key locations inside the Main Building treatment areas will be utilized to minimize this risk. PPE will also be required for personnel directly involved with chemical injections. Minimal PPE will be required for post-injection monitoring activities.

6.4.6 Implementability

Alternatives 1 and 2 are the most implementable of the five alternatives because they employ no active treatment. Alternative 2 is less implementable than Alternative 1 because ongoing groundwater monitoring is required. Alternatives 2 through 5 are implementable, assuming that ICs can be negotiated with the Facility and with adjacent property owners. Pilot study activities conducted in 2021 to 2022 demonstrated that ISCO and ISERD are implementable at the Site, even with the ongoing manufacturing operations occurring within Facility buildings. Facility personnel have been very cooperative during previous assessment and pilot test activities. Injection events for Alternatives 3, 4, and 5 will require close coordination with facility personnel, especially for planned work inside the Main Building.

A UIC permit will need to be obtained from SCDHEC for all three active alternatives, which usually is easy to receive based on a standard application process. This process generally requires one to two months maximum to complete.

6.4.7 Cost

For 30-year costs, Alternative 1 is the least costly alternative, followed by Alternatives 5, 3, and 4 in increasing order of cost. A summary of first year and 30-year estimated costs (present worth), along with the estimated years for active remediation, and the years of groundwater monitoring, appear in the table below. Detailed cost sheets for all five alternatives are provided in **Attachment B**.

Remedial Alternative	Years Active Remedy	Years Semi-Annual Monitoring	Years Annual Monitoring	30-Year Estimated Cost	Year 1 Estimated Capital Cost
1. No Action	0 Years	0	0	\$0	\$0
2. ICs and MNA	0 Years	10	20	\$1,137,000	\$108,000
3. ISCO, MNA, ICs, and Containment via Cover	10 Years for ISCO	12	18	\$2,653,000	\$895,000
4. ISCO, ISERD, ISA, MNA, ICs, and Containment via Cover	7 Years for ISCO/ISERD/ISA	9	21	\$3,052,000	\$1,230,000
5. ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover	6 years for ISCR/ISA	10	20	\$2,393,000	\$1,224,000

6.4.8 Comparison of Remedial Alternatives

The relative scoring system applied to each of the seven criteria for each of the five remedial alternatives is summarized at the bottom of **Table 6-2**. As indicated in the table, the relative scoring system results from highest comparative score to lowest score are as follows:

- Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover – Score of 27
- Alternative 3: ISCO, MNA, ICs, and Containment via Cover – Score of 24
- Alternative 4: ISCO, ISERD, ISA, MNA, ICs and Containment via Cover – Score of 23

- Alternative 2: MNA, ICs, and Containment via Cover – Score of 19
- Alternative 1: No Action - Score of 16

7.0 REFERENCES

AECOM, 2018. Remedial Investigation Report. AECOM, November 2018.

AECOM, 2019. Feasibility Study Work Plan. AECOM, May 2019.

AECOM, 2020a. Bench Scale Treatability Study Report. AECOM, May 2020.

AECOM, 2020b. Pilot Study Work Plan, AECOM. AECOM, October 2020.

AECOM, 2023a. Site-Wide Groundwater Monitoring Report. AECOM, May 2023.

AECOM, 2023b. Pilot Study Report. AECOM, May 2023.

AECOM, 2024. Feasibility Study Technical Memorandum. AECOM, February 2024.

USEPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. USEPA, October 1988.

PDF copies of AECOM, 2023a; AECOM 2023b, and AECOM 2024 are included on a DVD in **Attachment D** of the hard copy of this report.

FIGURES

Name: Figure 1-1 Site Location Map
Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Plot Study\Maps\Newberry_Shallow_Zone_TCE_Concentrations.aprx

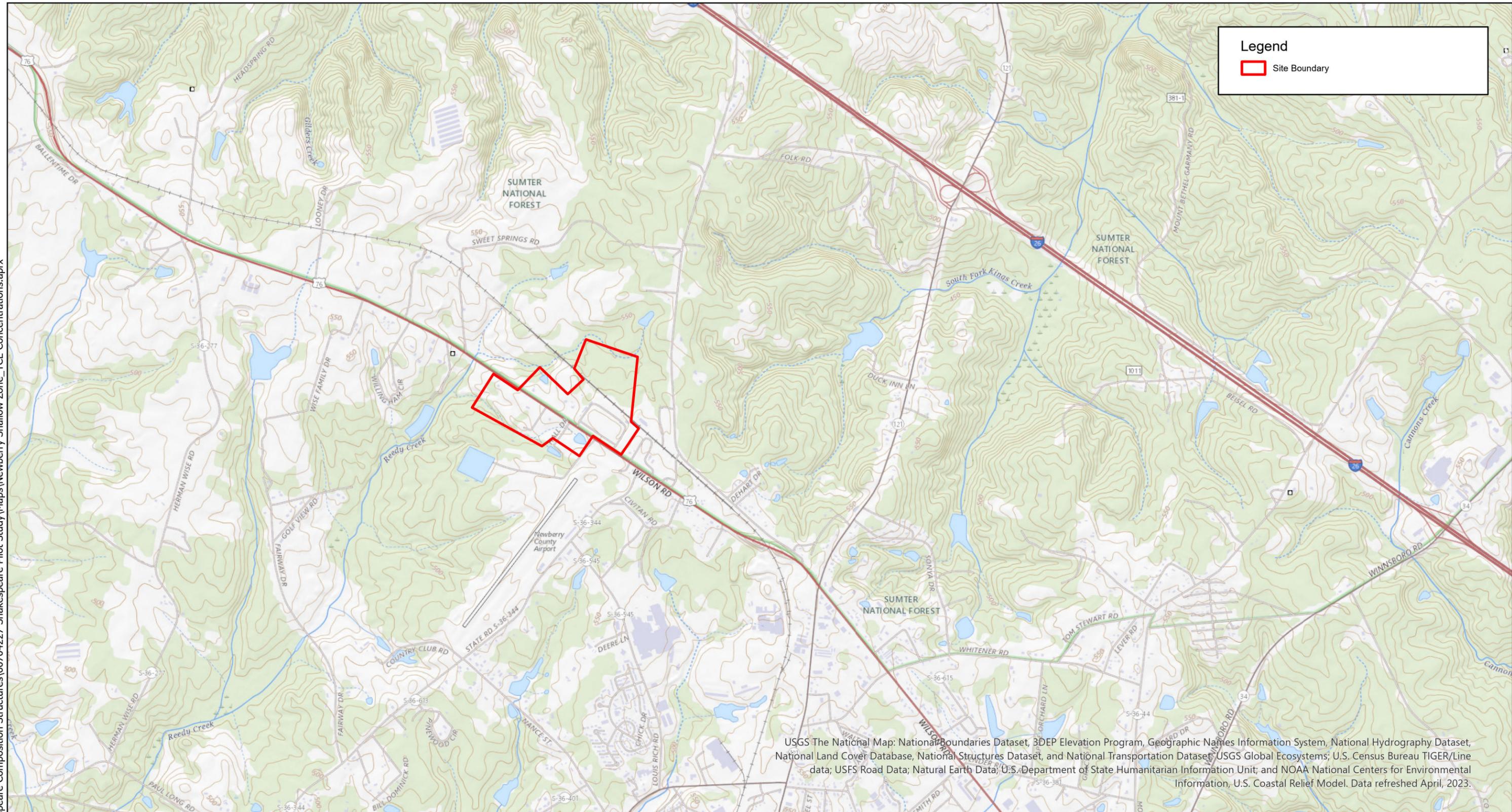
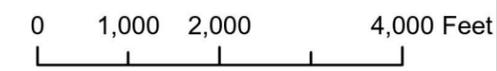


Figure 1-1 Site Location Map

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



Name: Figure 1-2A Site Plan
Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Plot Study\Maps\Newberry Shallow Zone_TCE Concentrations.aprx

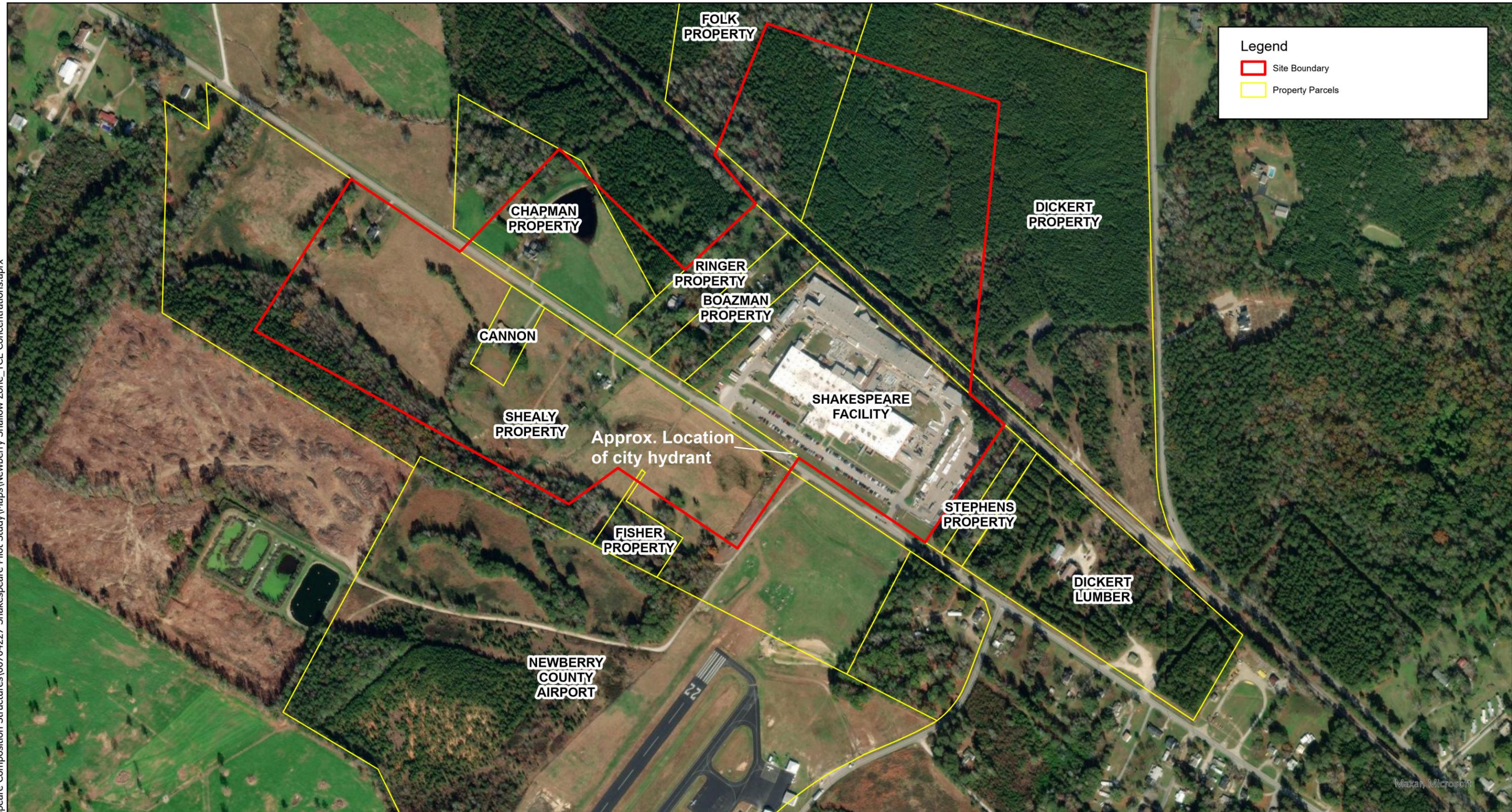
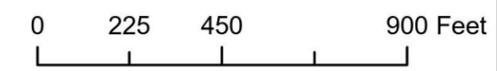


Figure 1-2A
Site Plan



Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



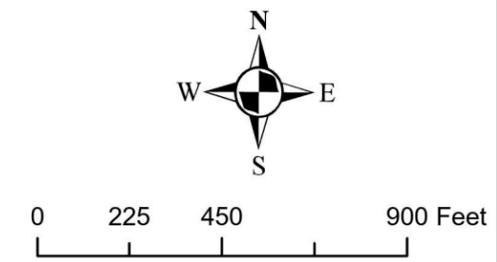
Name: Figure 1-2B Locations of Water Supply Wells
Path: L:\Legacy\Group\earth\Shakespeare Composition Structures\60704227 Shakespeare Plot Study\Maps\Newberry Shallow Zone_TCE Concentrations.aprx



Figure 1-2B
Locations of Water Supply Wells



Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



Name: Figure 1-3 Wells and Elevations in Shallow Zone
Path: Z:\Columbia-USCLM3\Legacy\22855SR-C87001\CAE\interoffice\60675505 Site Wide Samp - Signify\900 - CAD-GIS\Maps\Newberry Shallow Zone_Elevation.aprx

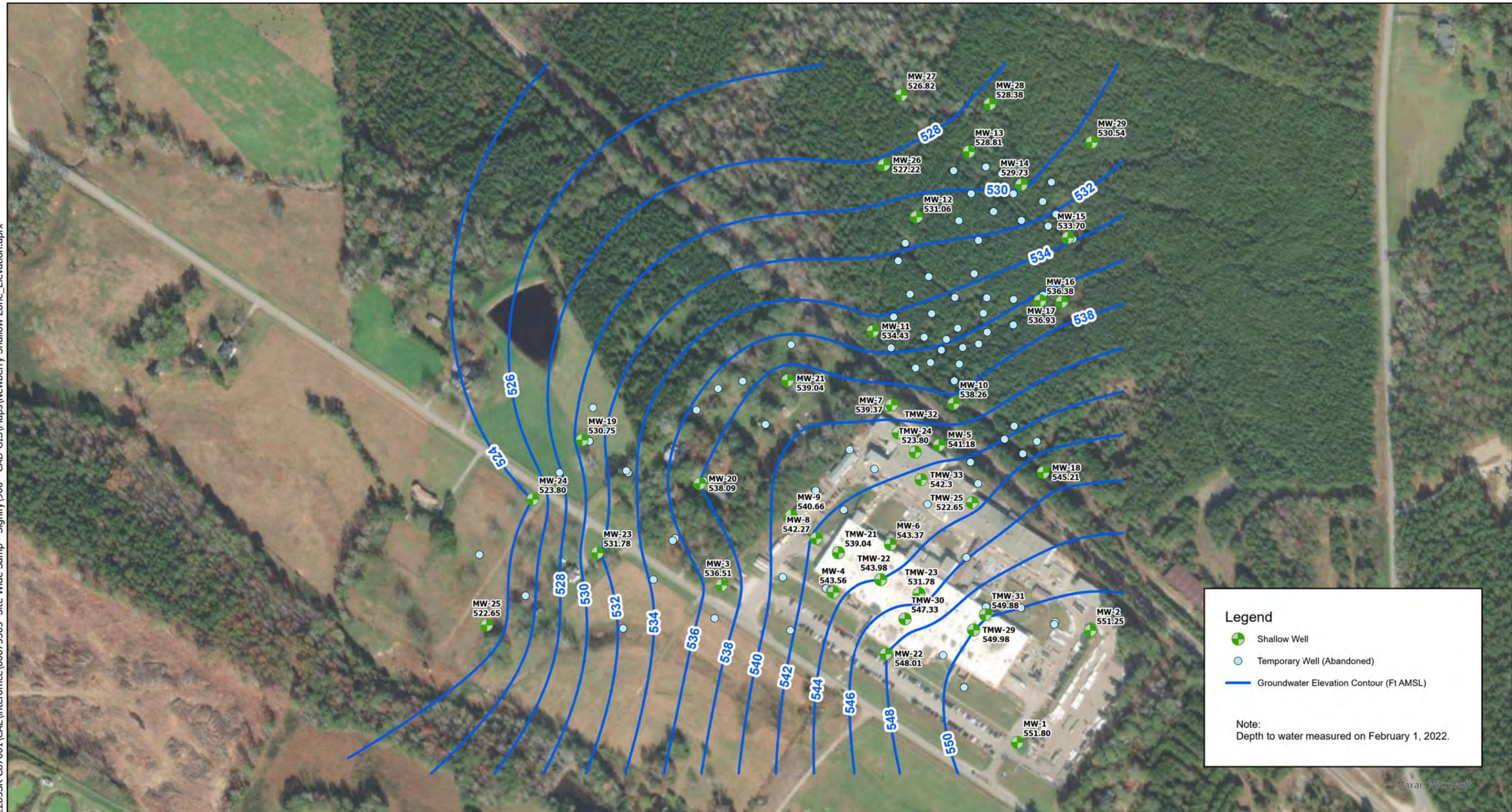
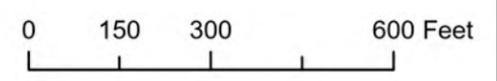


Figure 1-3
Wells and Elevation in Shallow Zone

Shakespeare Composition Structures
Newberry, South Carolina
Project Number: 60704227



Name: Figure 1-4 Wells and Elevations in the Intermediate Zone
Path: Z:\Columbia-USCLM3\Legacy\22855SR-c87001\CAE\interoffice\60675505 Site Wide Samp - Signify\900 - CAD-GIS\Maps\Newberry Intermediate Zone_Elevation.aprx

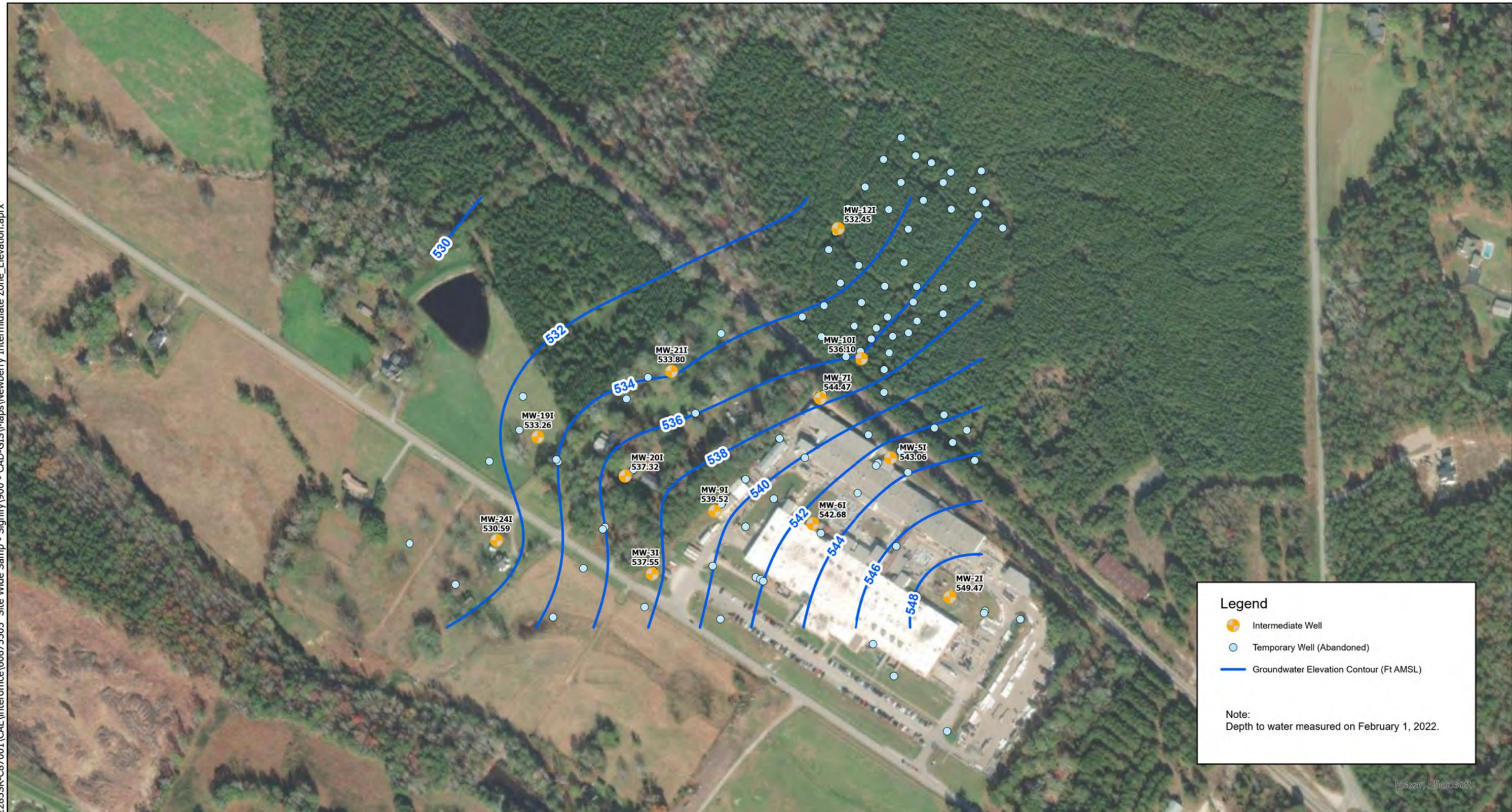
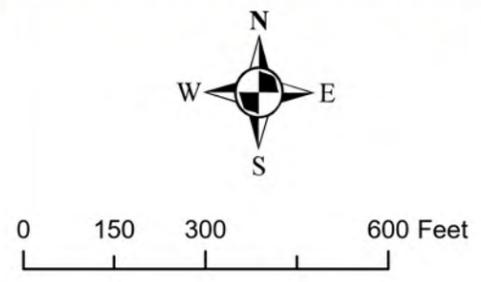
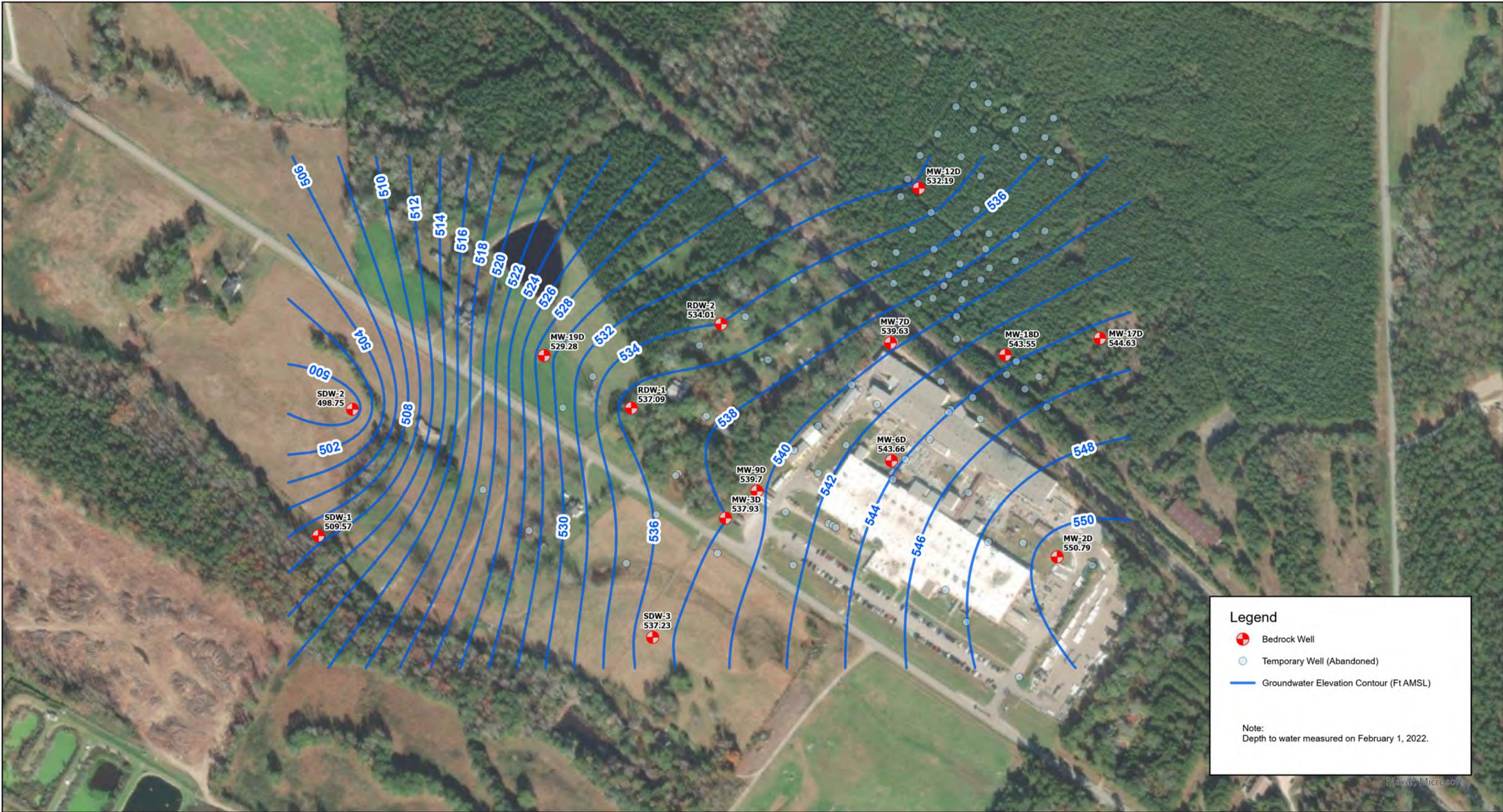


Figure 1-4
Wells and Elevations in Intermediate Zone

Shakespeare Composition Structures
Newberry, South Carolina
Project Number: 60704227



Name: Figure 1-5 Wells and Elevations in Bedrock Zone
Path: Z:\Columbia-USCLM3\Legacy\22855SR-C87001\CAE\interoffice\60675505 Site Wide Samp - Signify\900 - CAD-GIS\Maps\Newberry Deep Zone_Elevation.aprx



Legend

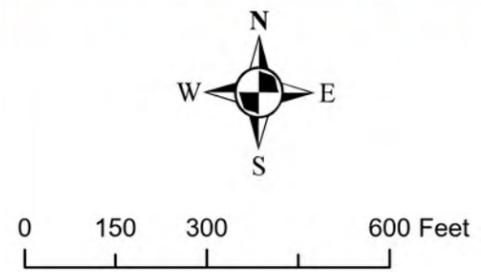
- Bedrock Well
- Temporary Well (Abandoned)
- Groundwater Elevation Contour (Ft AMSL)

Note:
Depth to water measured on February 1, 2022.



Figure 1-5
Wells and Elevations in Bedrock Zone

Shakespeare Composition Structures
Newberry, South Carolina
Project Number: 60704227



Name: Figure 1-6 TCE Concentrations in Shallow Zone
 Default Folder: Z:\Columbia-USCLM3\Legacy\2285SR-C87001\CAE\interoffice\60534283 Phillips RI Phase II\900 - CADD-GIS\Maps\Shakespeare_Shallow_Zone

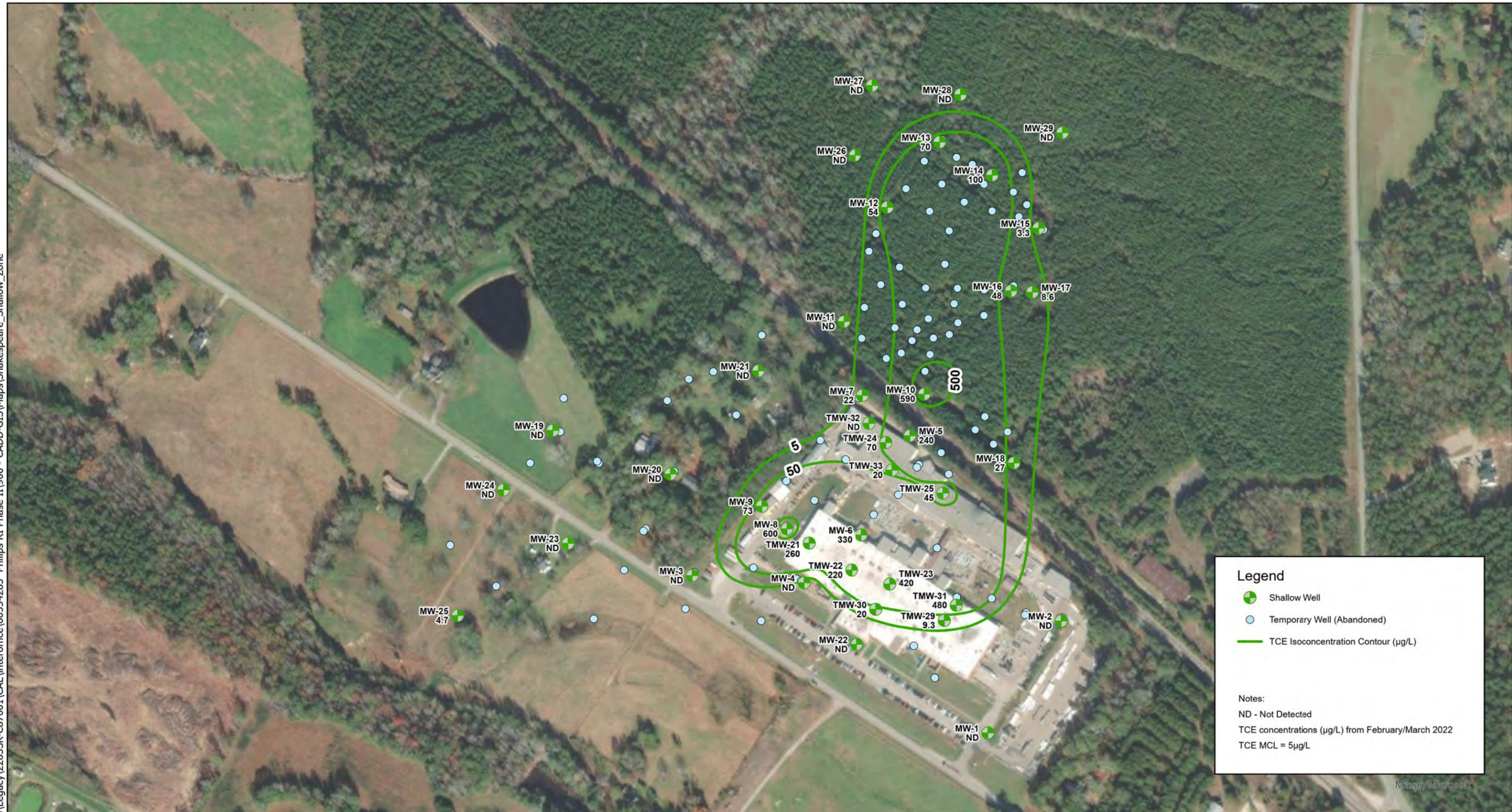
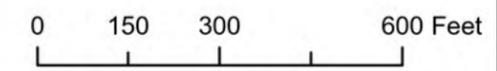


Figure 1-6
 TCE Concentrations
 in Shallow Zone

Shakespeare Composition Structures
 Newberry, South Carolina
 Project Number: 60704227



Name: Figure 1-7 TCE Concentrations in Intermediate Zone
Path: Z:\Columbia-USCLM3\Legacy\2285SR-C87001\CAE\interoffice\60675505 Site Wide Samp - Signify\900 - CAD-GIS\Maps\Newberry Intermediate Zone_TCE Concentrations.aprx

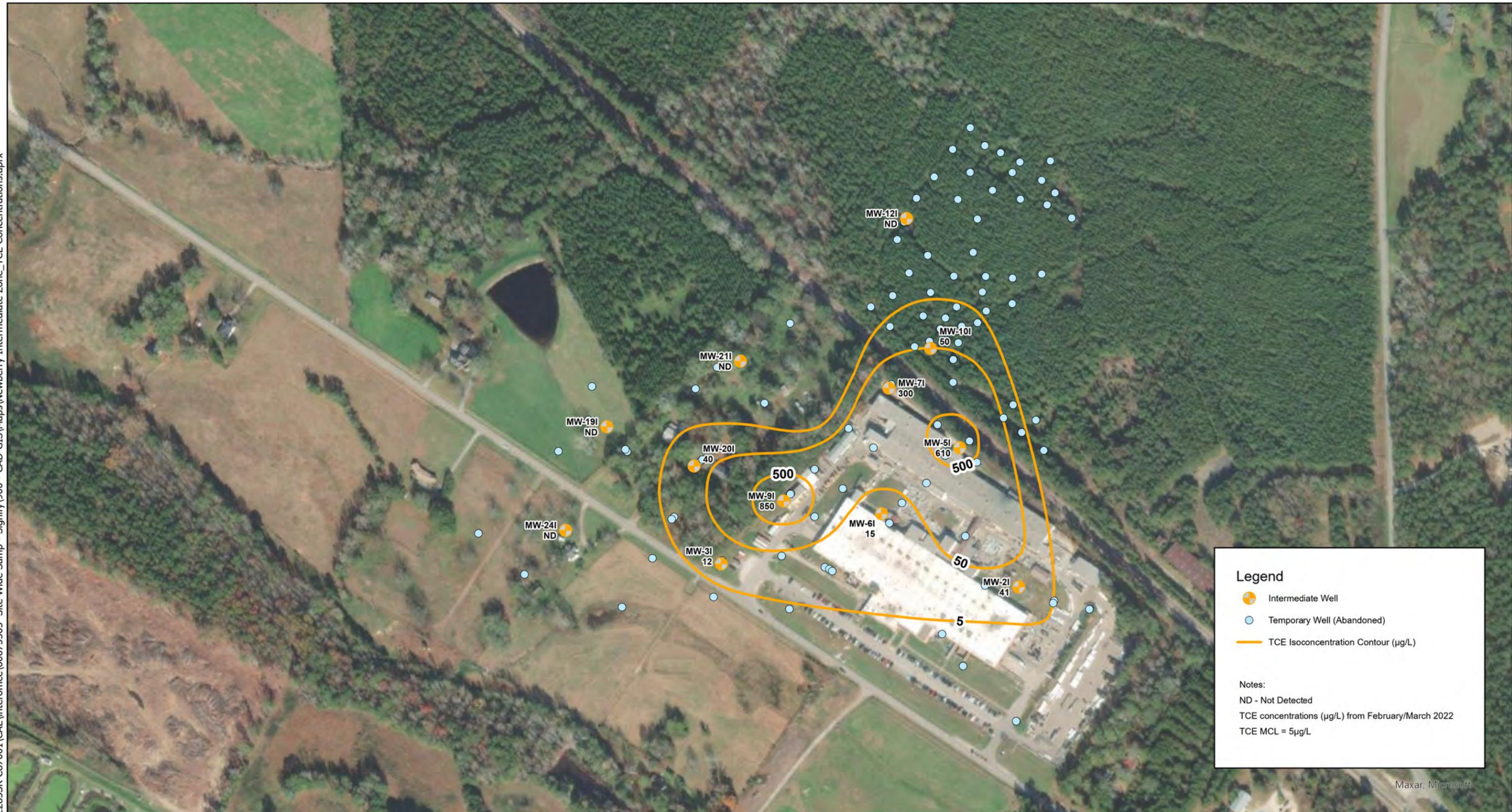
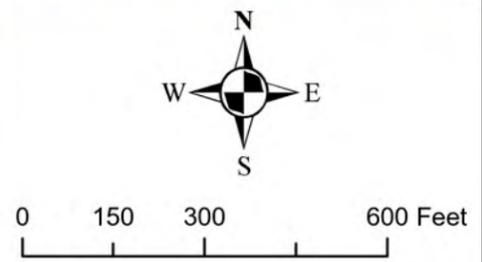
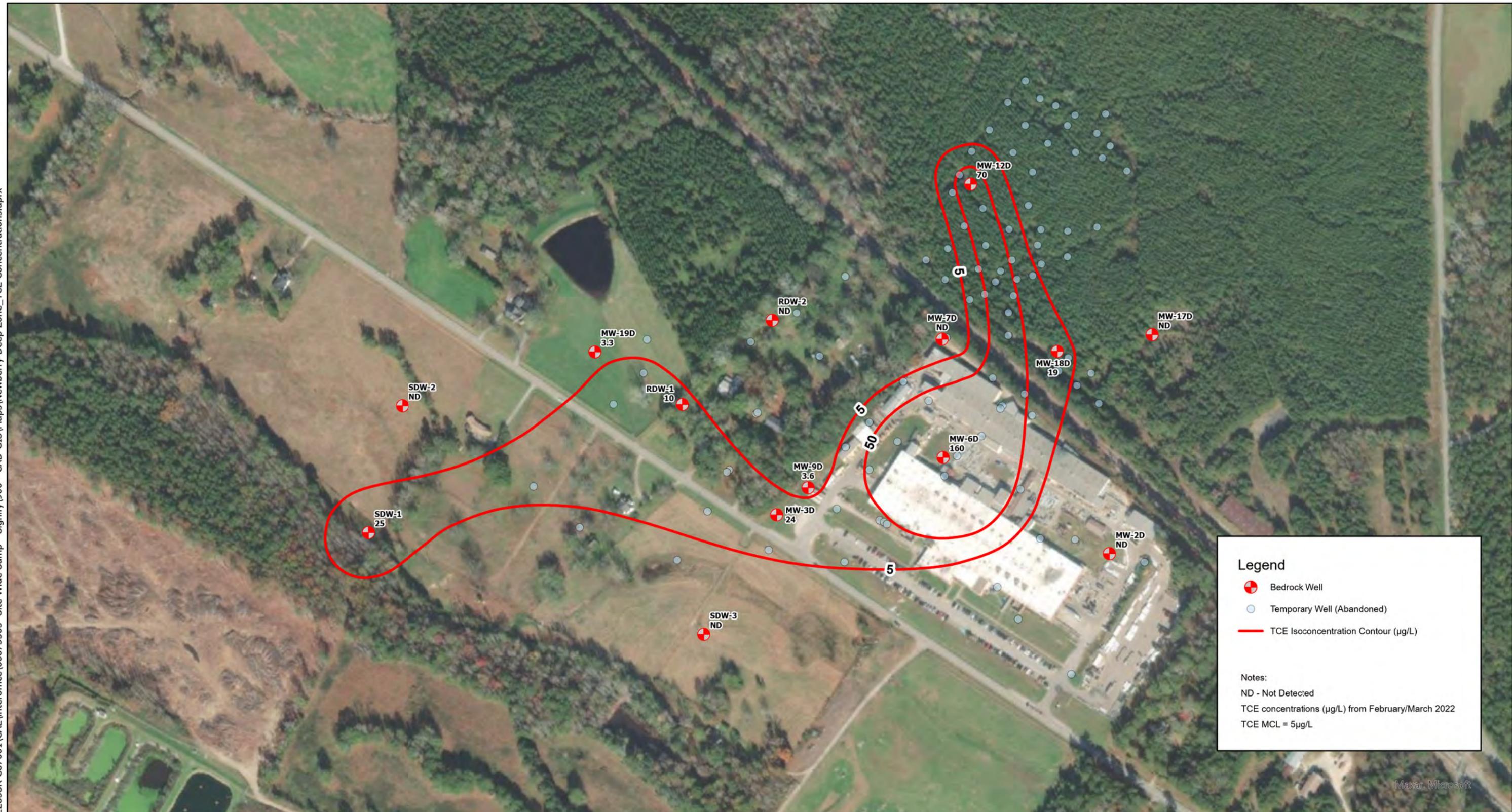


Figure 1-7
TCE Concentrations
in Intermediate Zone
Shakespeare Composition Structures
Newberry, South Carolina
Project Number: 60704227



Name: Figure 1-8 TCE Concentrations in Bedrock Zone
Path: Z:\Columbia-USCLM3\Legacy\22855SR-C87001\CAE\interoffice\60675505 Site Wide Samp - Signify\900 - CAD-GIS\Maps\Newberry Deep Zone_TCE Concentrations.aprx



Legend

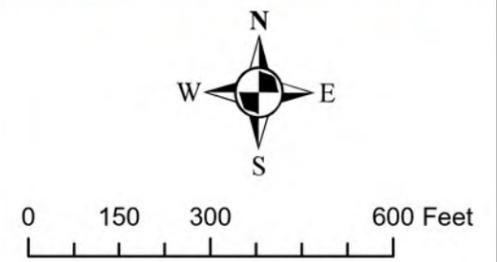
- Bedrock Well
- Temporary Well (Abandoned)
- TCE Isoconcentration Contour (µg/L)

Notes:
ND - Not Detected
TCE concentrations (µg/L) from February/March 2022
TCE MCL = 5µg/L



Figure 1-8 TCE Concentrations in Bedrock Zone

Shakespeare Composition Structures
Newberry, South Carolina
Project Number: 60704227

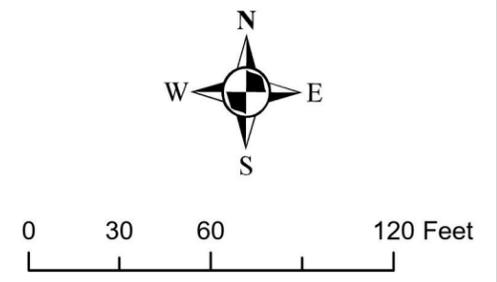


Name: Figure 1-9 TCE in ISCO Pilot Study Area Groundwater Shallow Zone Sept2023
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227_Shakespeare Pilot Study\Maps\Newberry Shallow Zone_Elevation.aprx



Figure 1-9
 TCE in ISCO Pilot Study Area Groundwater
 Shallow Zone - Update September 2023

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



NC CGIA, Maxar, Microsoft

Name: Figure 2-10 TCE in Enhanced Reductive Dechlorination Pilot Study Area Groundwater Shallow Zone
 Default Folder: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps

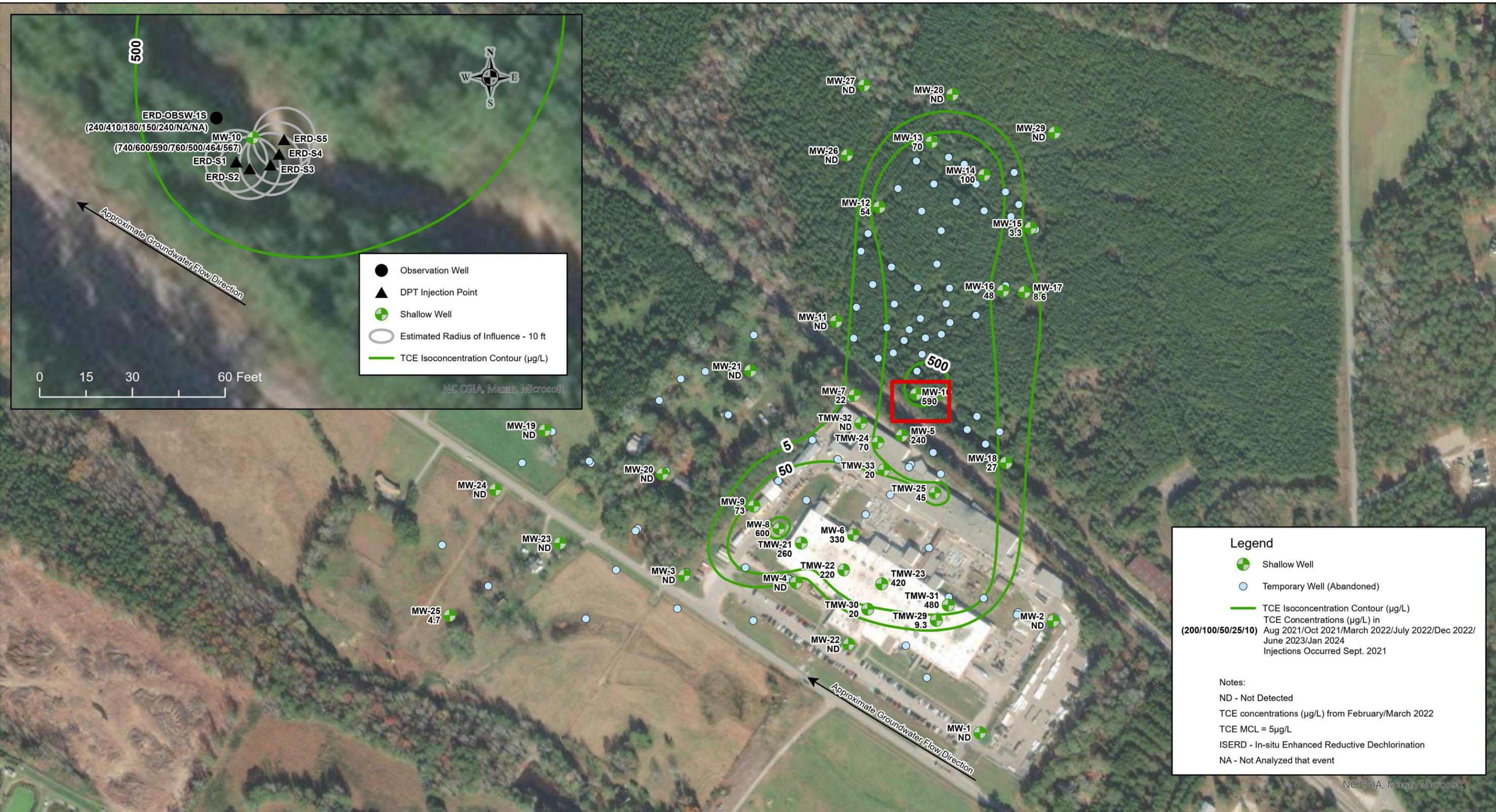
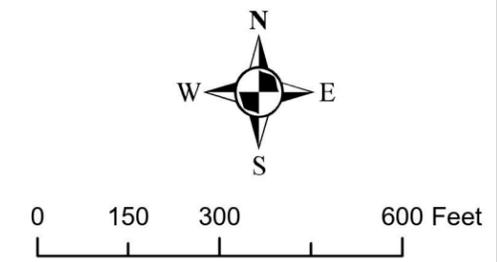


Figure 1-10
 TCE in ISERD Pilot Study Area Groundwater
 Shallow Zone - Updated January 2024

Shakespeare Composite Structures
 Newberry, South Carolina
 Project No: 60721186



Legend

- Shallow Well
- Temporary Well (Abandoned)
- TCE Isoconcentration Contour (µg/L)

TCE Concentrations (µg/L) in
 (200/100/50/25/10) Aug 2021/Oct 2021/March 2022/July 2022/Dec 2022/
 June 2023/Jan 2024
 Injections Occurred Sept. 2021

Notes:
 ND - Not Detected
 TCE concentrations (µg/L) from February/March 2022
 TCE MCL = 5µg/L
 ISERD - In-situ Enhanced Reductive Dechlorination
 NA - Not Analyzed that event

NC CGIA, Maxar, Microsoft

Name: Figure 1-11 TCE in ISERD Pilot Study Area Groundwater Intermediate Zone - Updated Jan 2024
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps\Newberry Intermediate Zone_TCE Concentrations.aprx

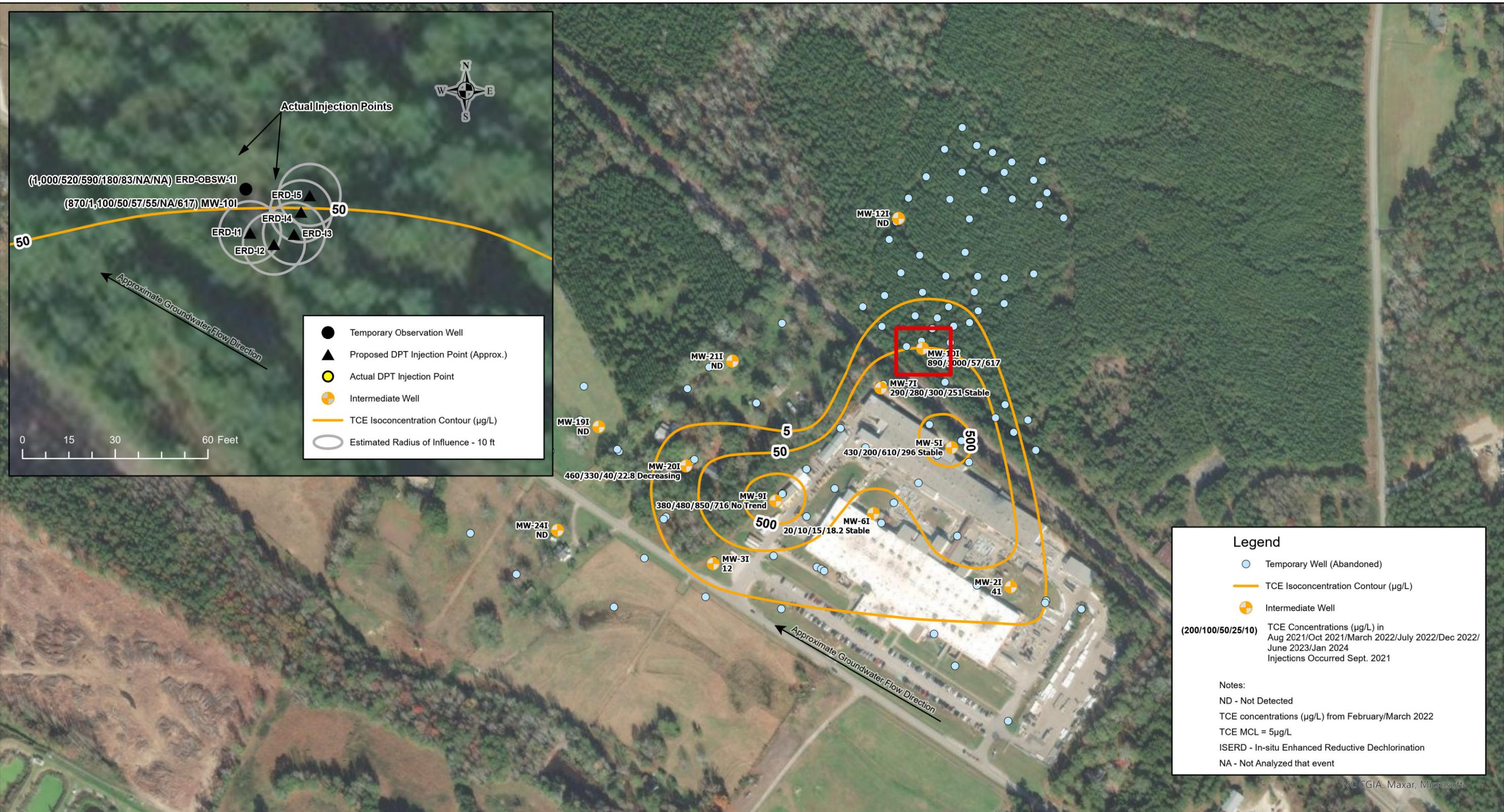
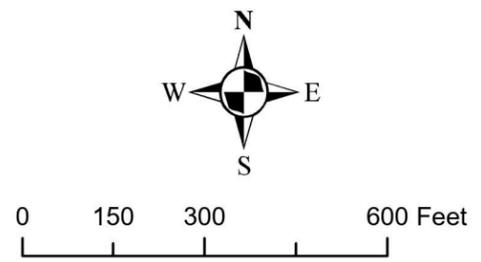


Figure 1-11
 TCE in ISERD Pilot Study Area Groundwater
 Intermediate Zone - Updated January 2024

Shakespeare Composite Structures
 Newberry, South Carolina
 Project No: 60721186

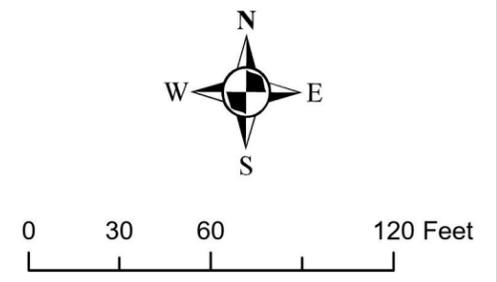


Name: Figure 2-1 TCE in ISCO Pilot Study Area Groundwater Shallow Zone Sept2023
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227_Shakespeare Pilot Study\Maps\Newberry Shallow Zone_Elevation.aprx



Figure 2-1
 TCE in ISCO Pilot Study Area Groundwater
 Shallow Zone - Updated September 2023

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



Name: Figure 2-2 TCE in Subslab Vapor Sep2023
Path: L:\Legacy\Group\earth\Shakespeare Composites Newberry FS\Shakespeare Composites Newberry FS.aprx

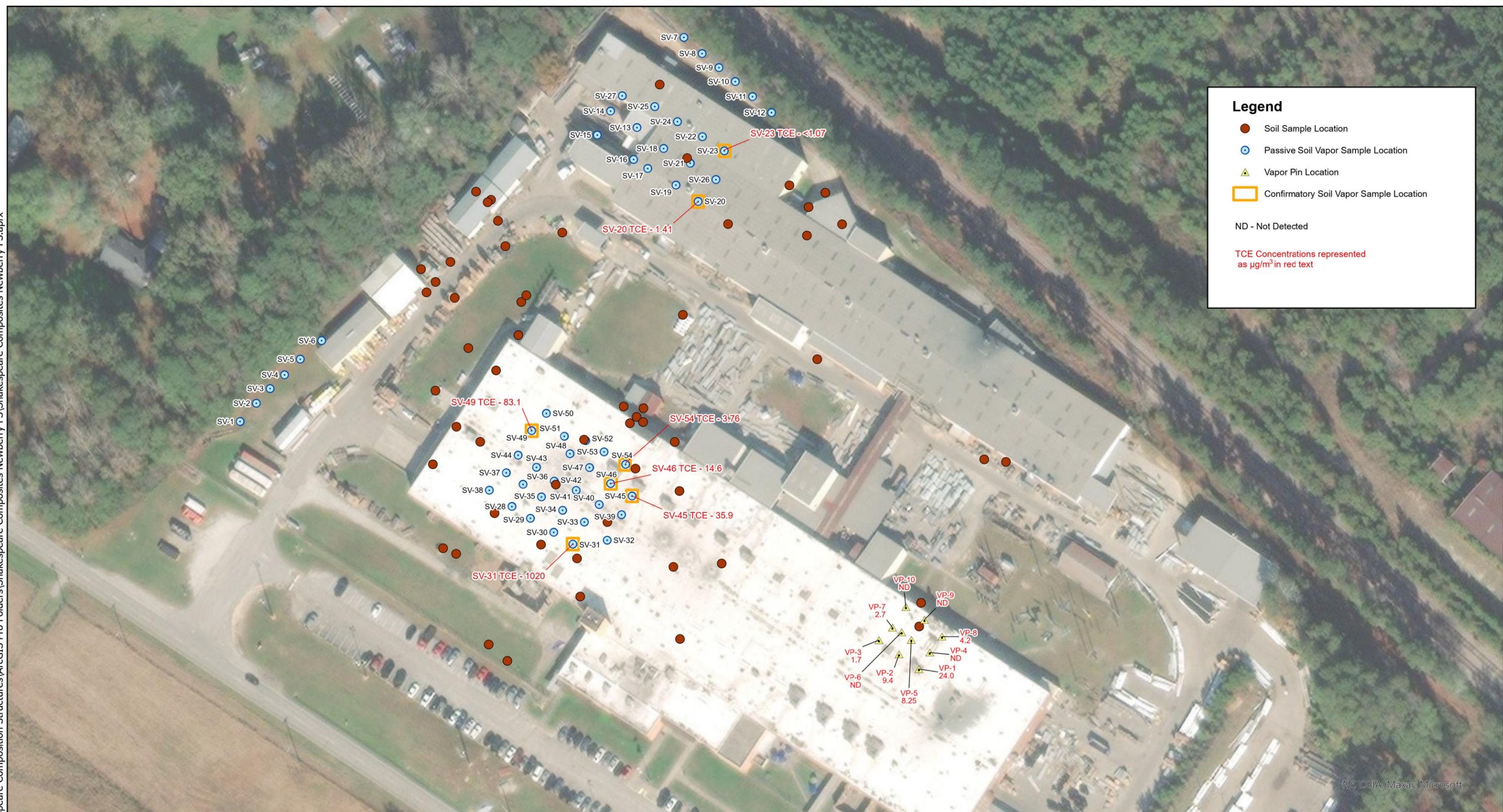
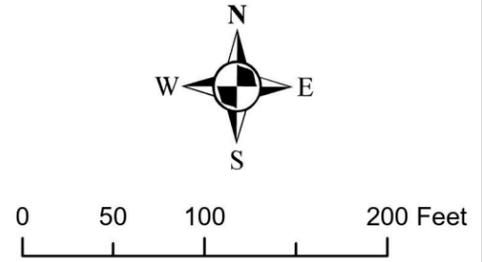
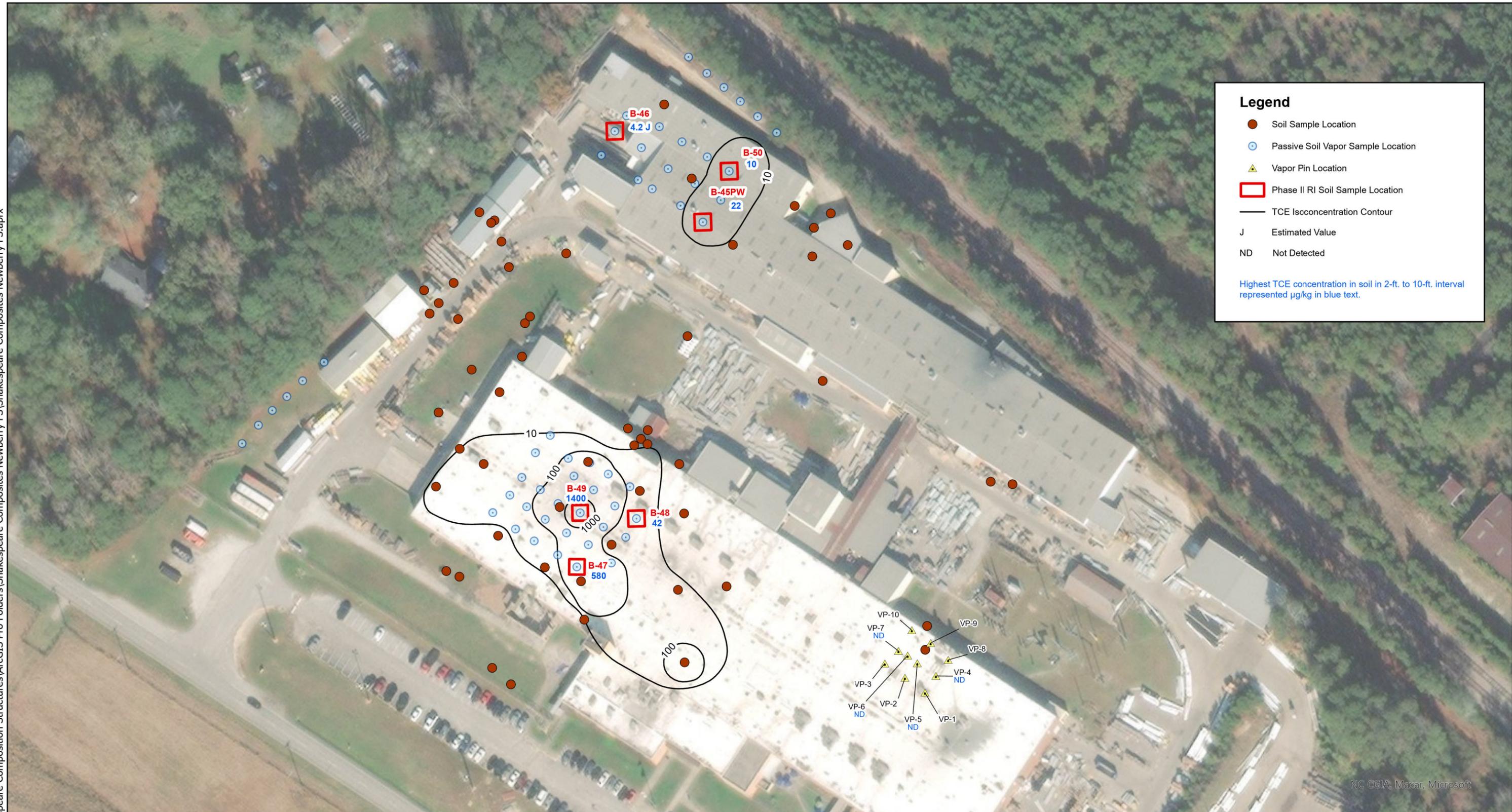


Figure 2-2
TCE in Subslab Vapor
Updated September 2023

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



Name: Figure 2-3 TCE in Subsurface Soils Sep2023
Path: L:\Legacy\Group\earth\Shakespeare Composites Newberry FS\Shakespeare Composites Newberry FS.aprx



Legend

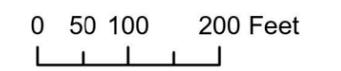
- Soil Sample Location
- Passive Soil Vapor Sample Location
- ▲ Vapor Pin Location
- Phase II RI Soil Sample Location
- TCE Isoconcentration Contour
- J Estimated Value
- ND Not Detected

Highest TCE concentration in soil in 2-ft. to 10-ft. interval represented $\mu\text{g}/\text{kg}$ in blue text.



Figure 2-3
TCE in Subsurface (2-10 Ft.) Soils
Updated September 2023

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



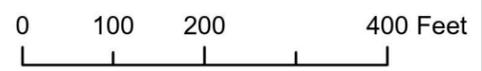
NC CGIA, Maxar, Microsoft

Name: Figure 2-4 Seismic Survey Nov2023
Path: L:\Legacy\Group\earth\Shakespeare Composites Newberry FS\Shakespeare Composites Newberry FS.aprx

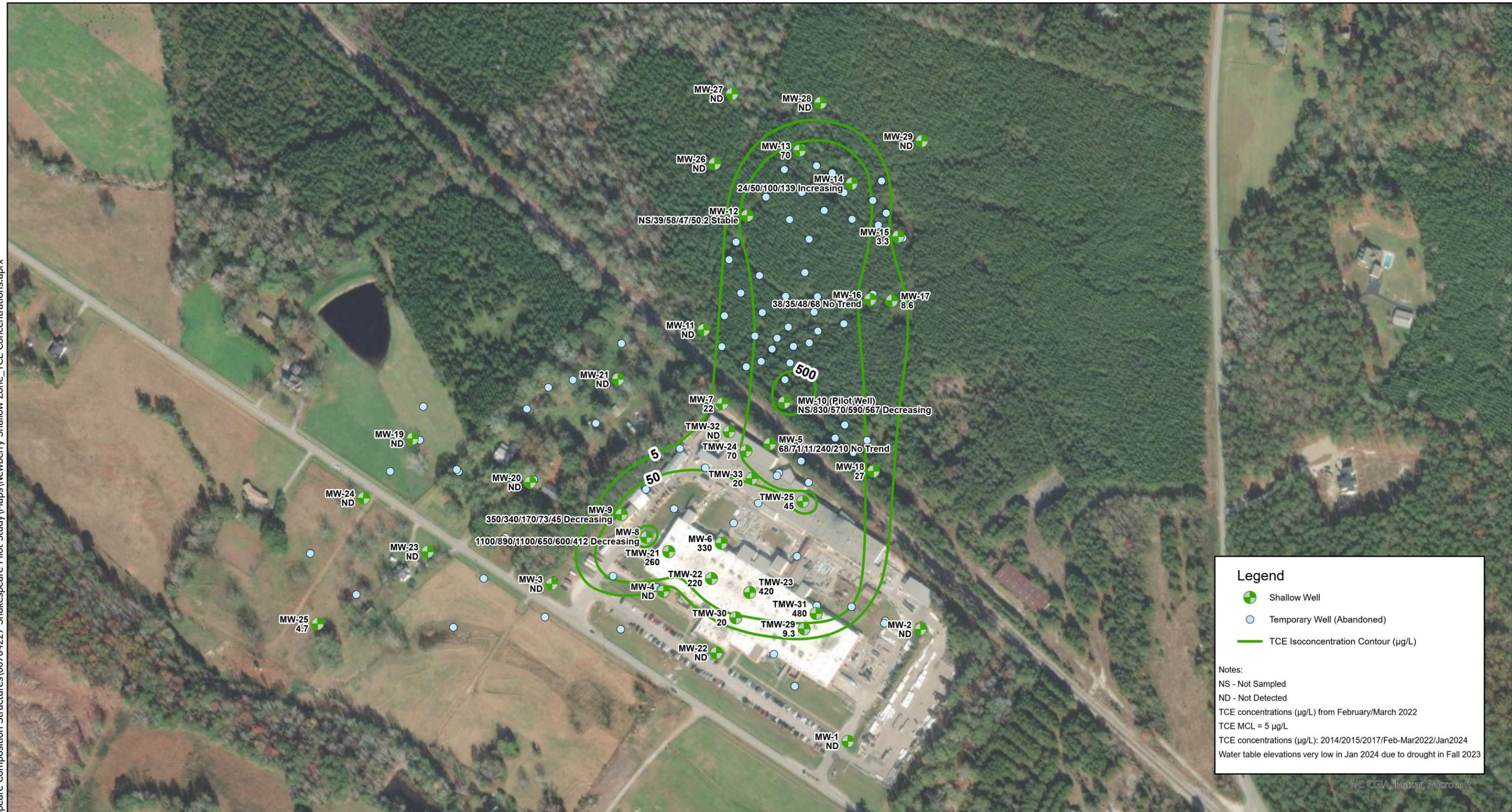


Figure 2-4
Seismic Survey Location Map
November 2023

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



Name: Figure 2-5 TCE Concentrations in Shallow Zone_Update Trends Jan2024
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps\Newberry_Shallow Zone_TCE Concentrations.aprx

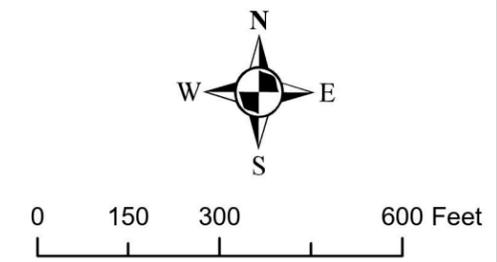


NC CGIA, Maxar, Microsoft



Figure 2-5
 TCE in Shallow Zone
 Updated Trends January 2024 - Selected MW-Series Wells for Mann Kendall Trend Plot Evaluations

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



Name: Figure 2-6 TCE Concentrations in Shallow Zone TMW Series Wells_Update Trends Jan2024
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps\Newberry Shallow Zone_TCE Concentrations.aprx

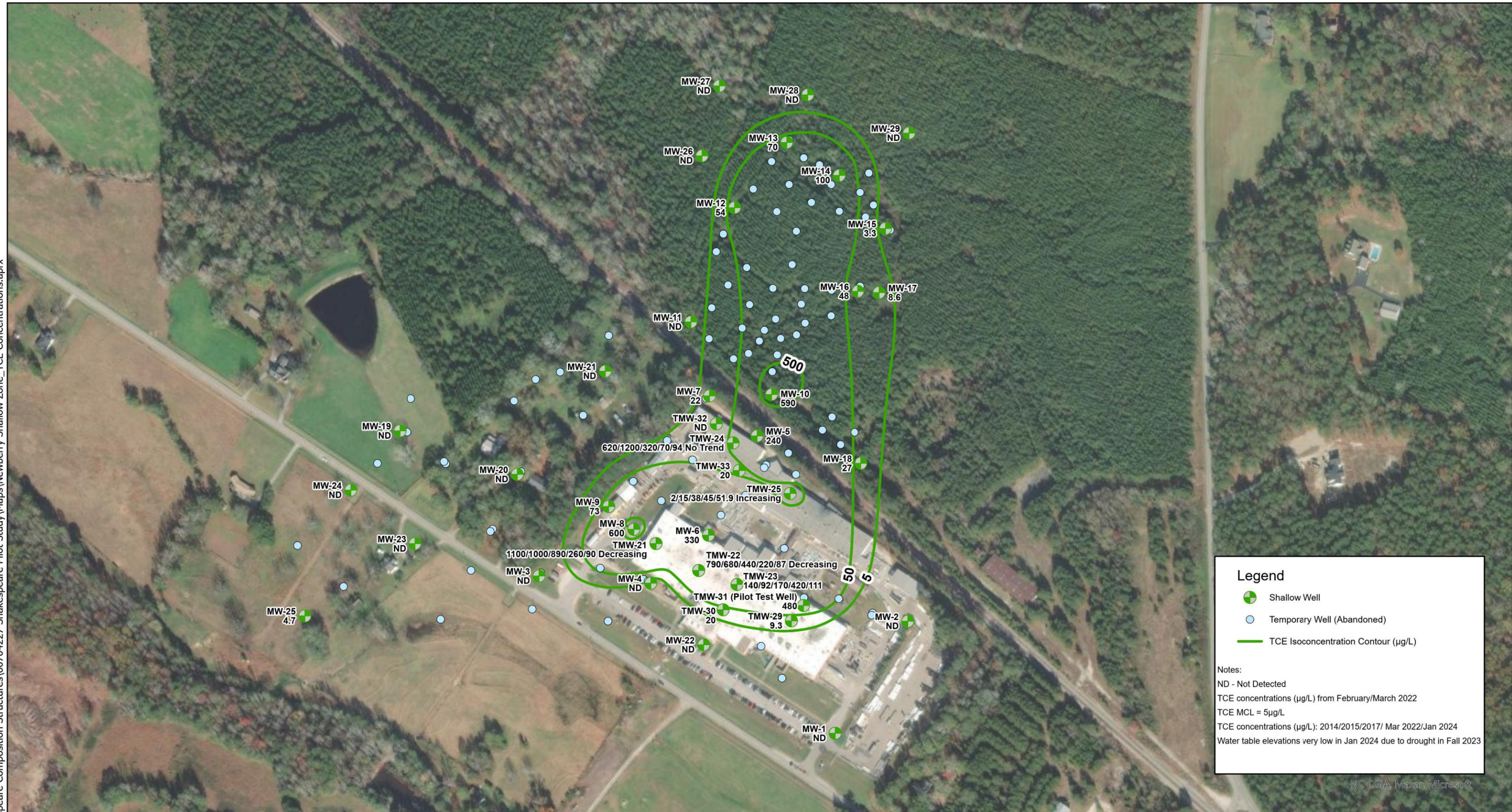
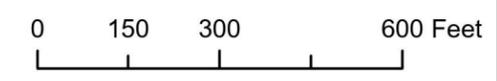
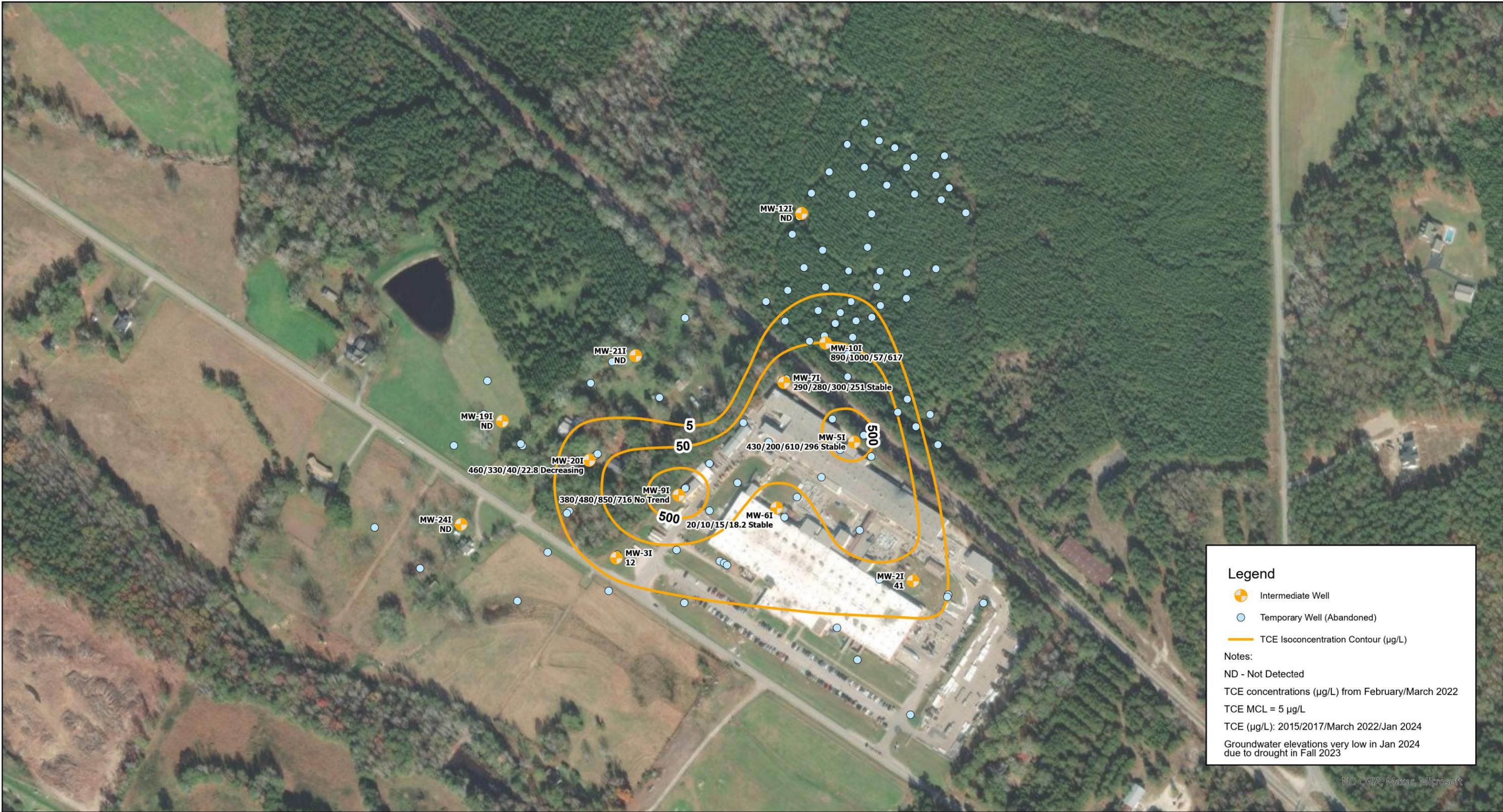


Figure 2-6
 TCE in Shallow Zone
 Updated Trends January 2024 - Selected TMW-Series Wells for Mann Kendall Trend Plot
 Evaluations

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



Name: Figure 2-7 TCE Concentrations in Intermediate Zone Updated Trends Jan2024
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps\Newberry Intermediate Zone_TCE Concentrations.aprx

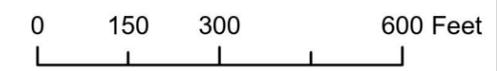


NC CGIA, Maxar, Microsoft



Figure 2-7
 TCE in Intermediate Zone
 Updated Trends January 2024 - Selected Wells for Mann Kendall Trend Plot Evaluations

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



Name: Figure 2-8 TCE Concentrations in Bedrock Zone
Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps\Newberry Deep Zone_TCE Concentrations.aprx

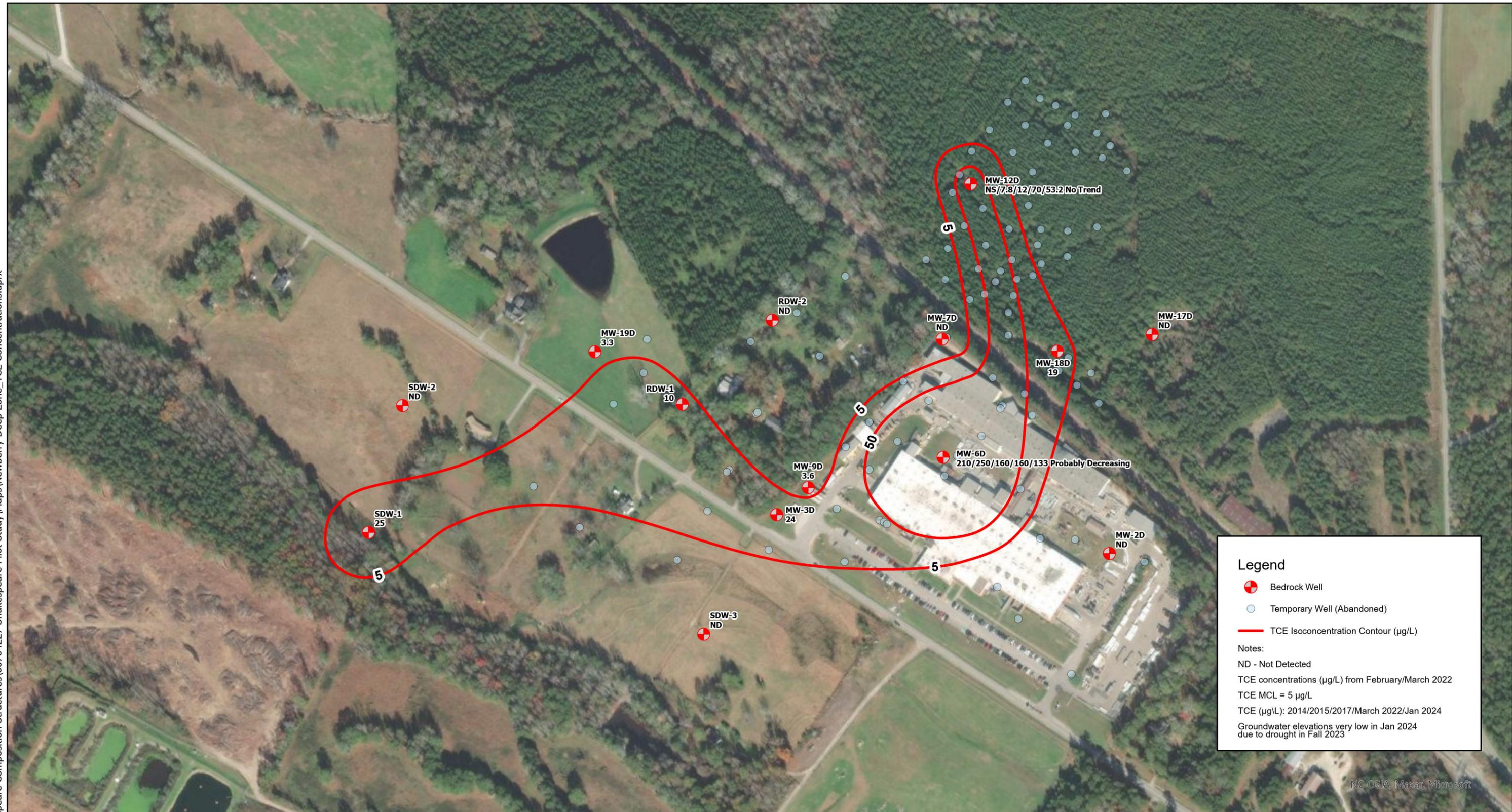
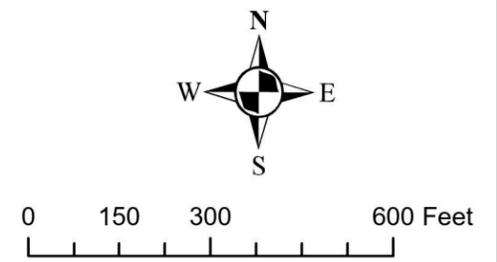


Figure 2-8
TCE in Bedrock Zone
Updated Trends January 2024 - Selected Wells for Mann Kendall Trend Plot Evaluations

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



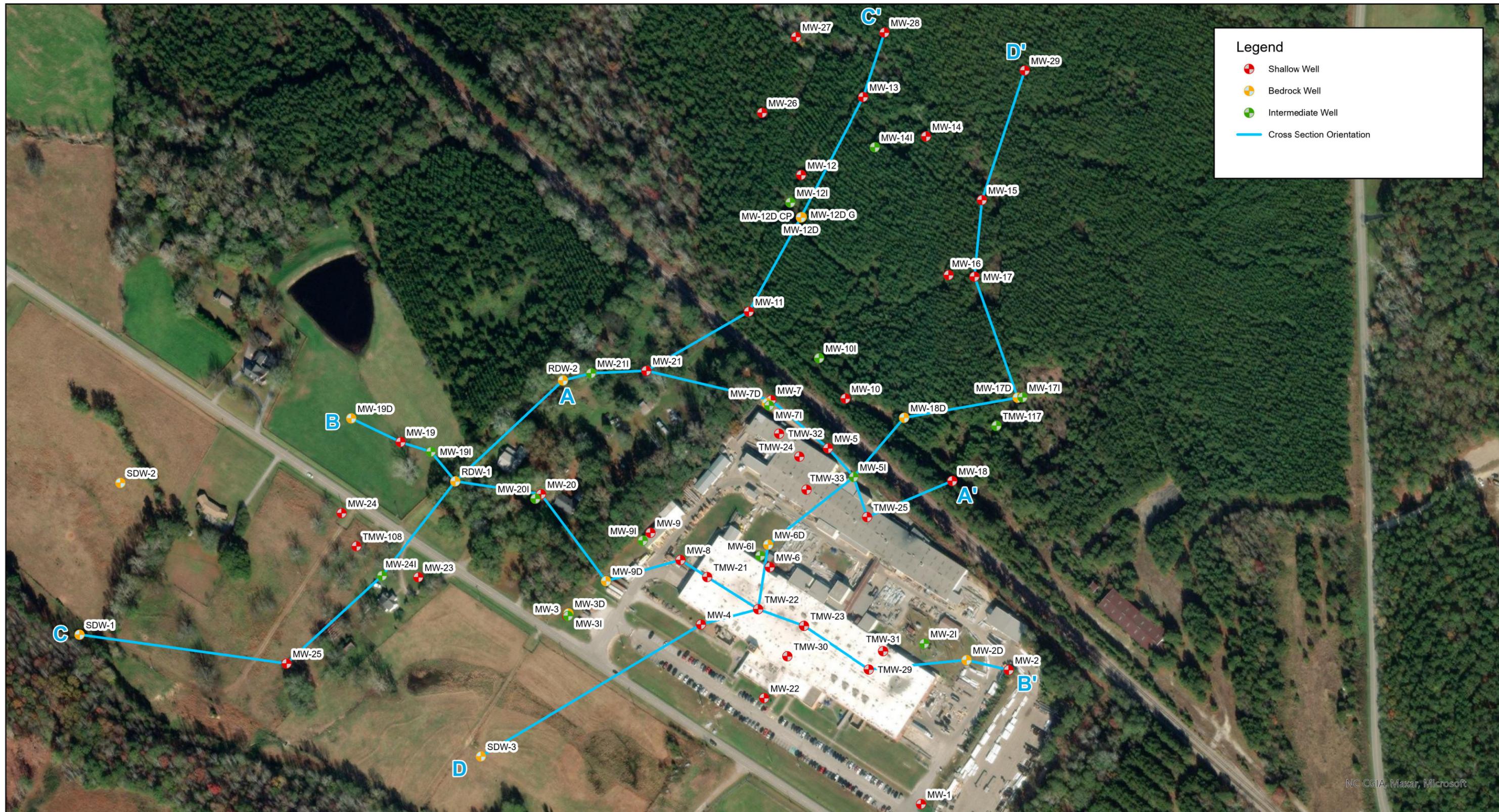


Figure 3-1
Orientation of Cross Sections

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186

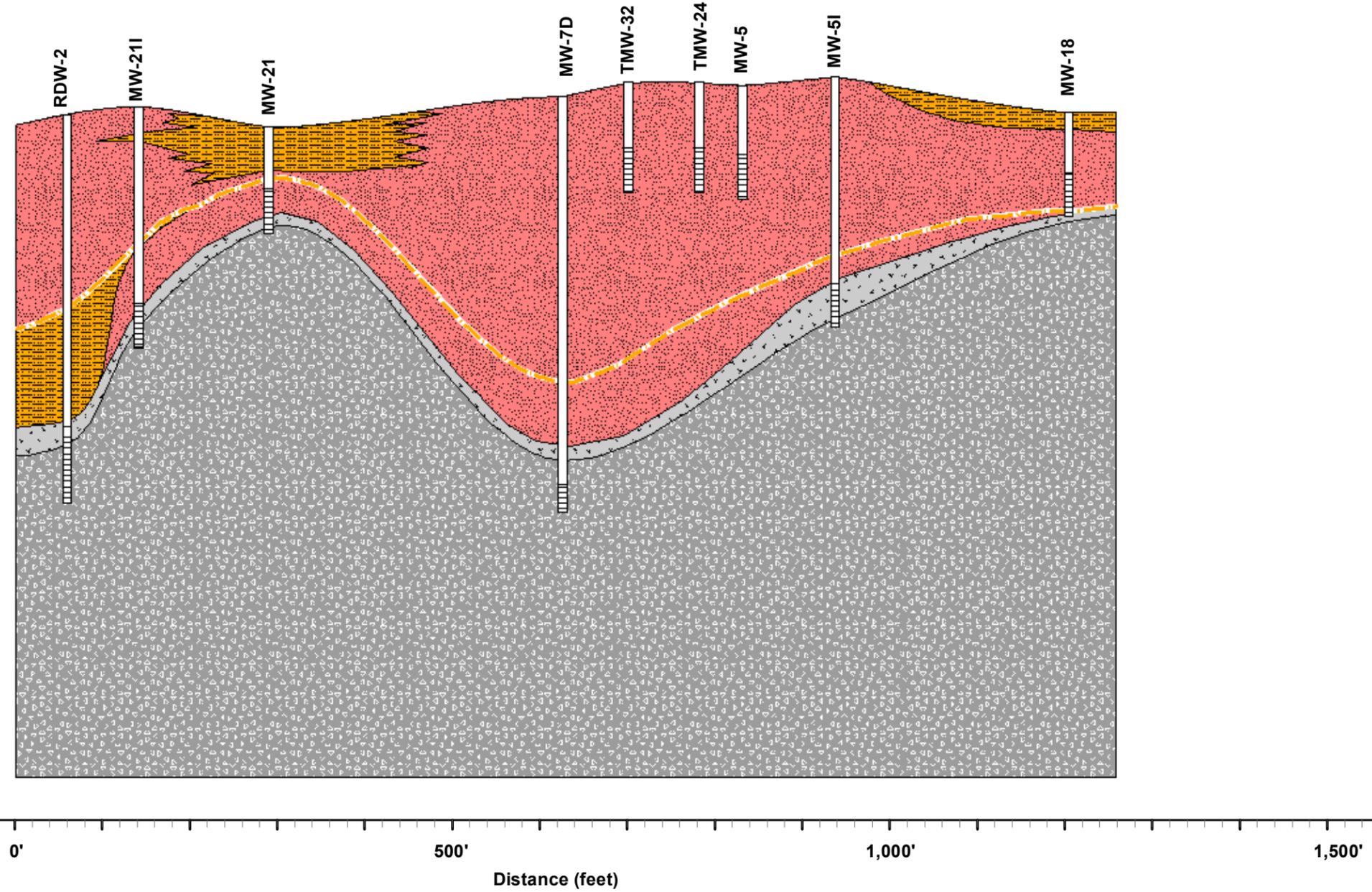
AECOM



0 125 250 500 Feet

Elevation (feet MSL)

5x Vertical Exaggeration



101 Research Drive
Columbia, SC 29203-9389
T: (803) 254-4400 F: (803) 771-6676

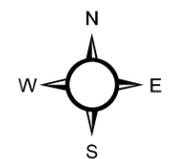
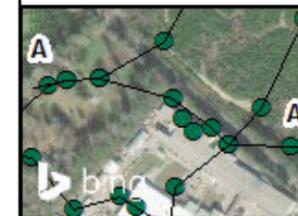
Legend

- SAPROLITE INTERFACE
- SAND
- SILT/CLAY
- WEATHERED BEDROCK
- BEDROCK
- Casing
- Screen

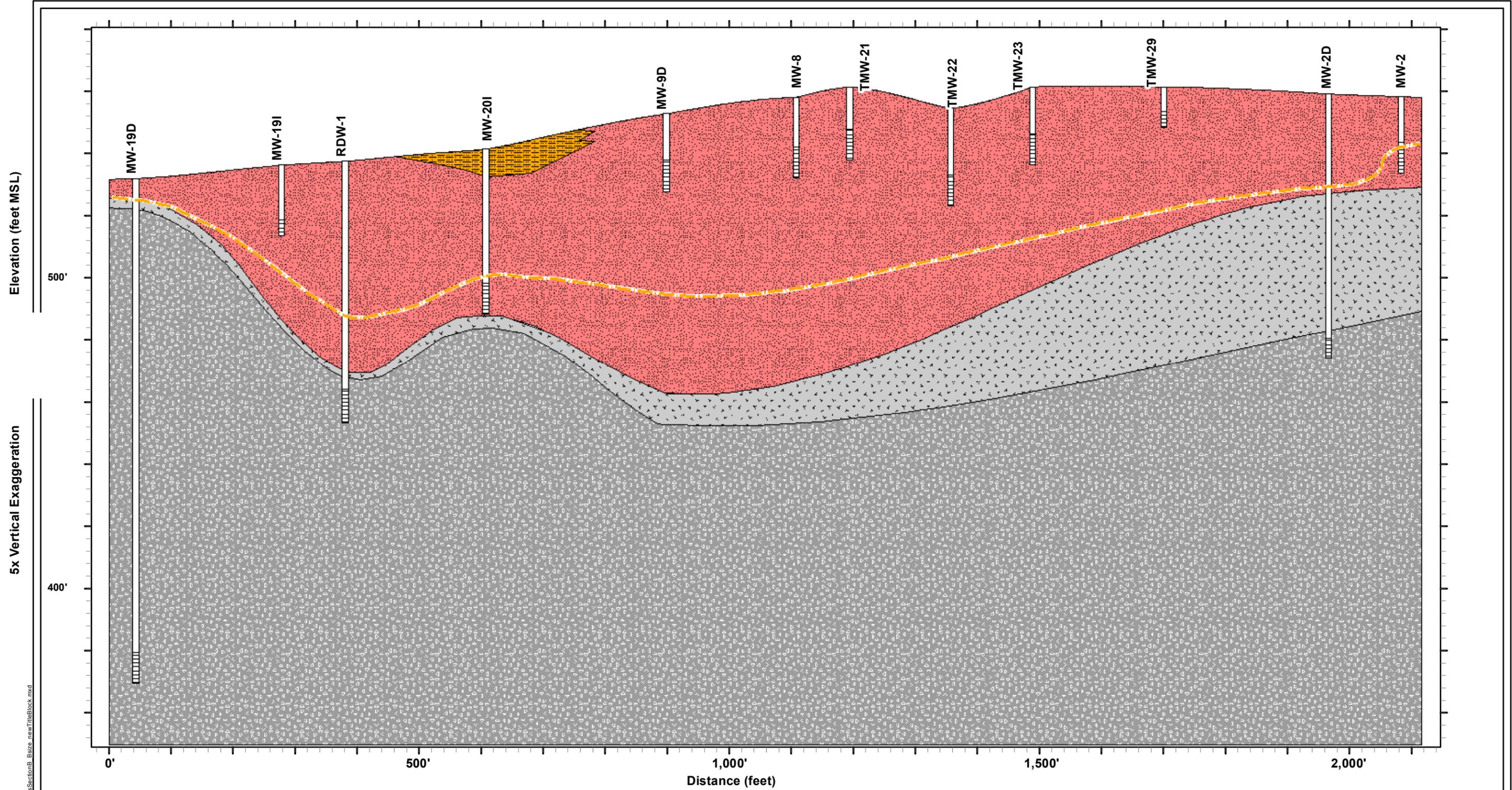
FIGURE 3-2: CROSS-SECTION A-A'
Shakespeare Composition Structures
Newberry, South Carolina

Project No.: 60721186 Date: 2018-09-07

Map Location



0 400 800
Feet



Elevation (feet MSL)

5x Vertical Exaggeration

0' 500' 1,000' 1,500' 2,000'

Distance (feet)

Path: C:\GIS\60328308_Shakespeare\MXD\CrossSectionB_Beize_newTitleBlock.mxd

AECOM

101 Research Drive
 Columbia, SC 29203-9389
 T: (803) 254-4400 F: (803) 771-6676

Legend

--- SAPROLITE INTERFACE

Lithology

- SAND
- SILT/CLAY
- WEATHERED BEDROCK
- BEDROCK

Casing

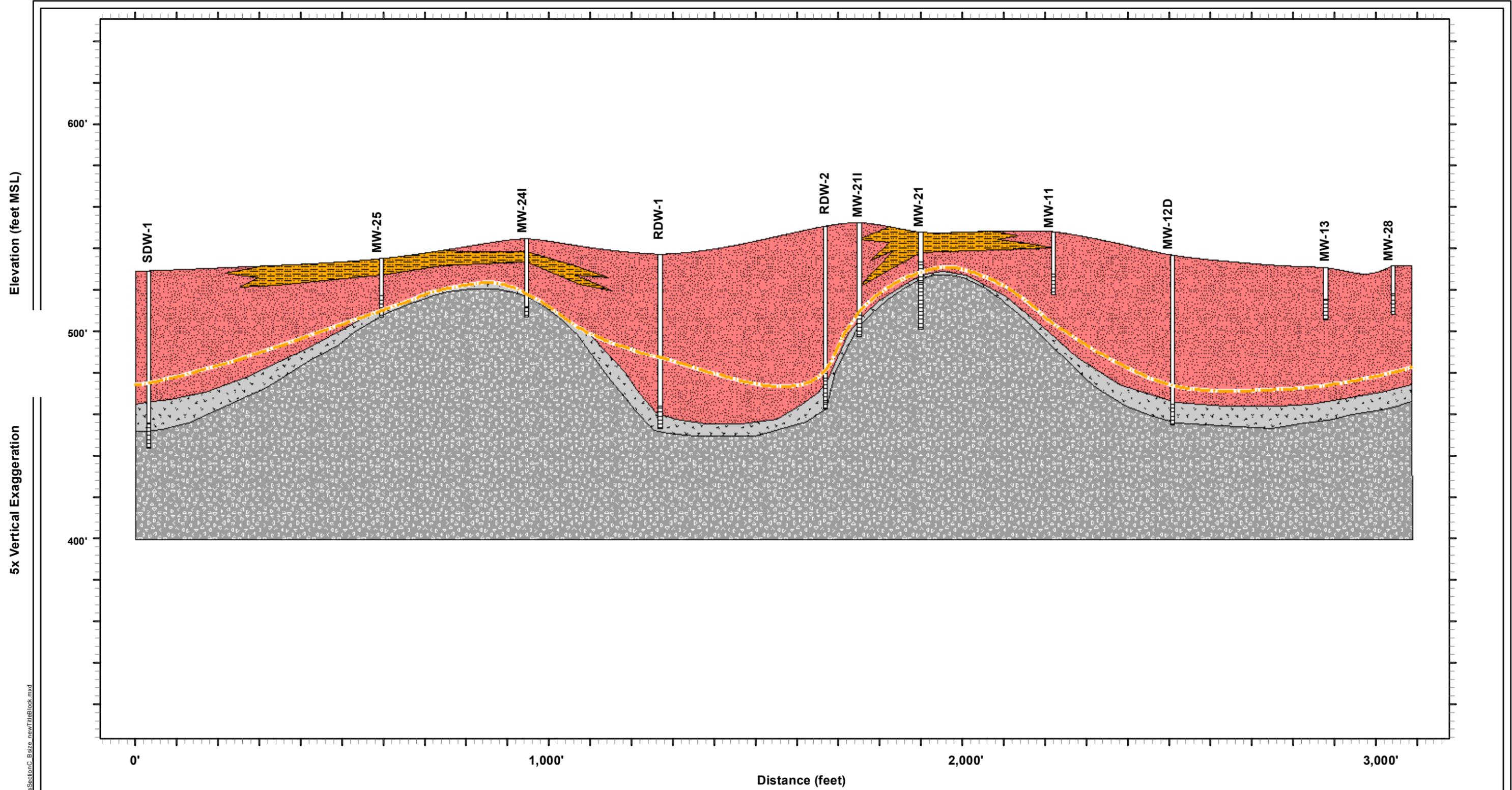
Screen

FIGURE 3-3: CROSS-SECTION B-B'
 Shakespeare Composition Structures
 Newberry, South Carolina

Project No.: 60721186 Date: 2018-09-07

Map Location

0 750 1,500 Feet



Path: C:\GIS\60328308_Shakespeare\MXD\CrossSectionC_Balze_new\TitleBlock.mxd



101 Research Drive
Columbia, SC 29203-9389
T: (803) 254-4400 F: (803) 771-6676

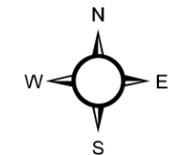
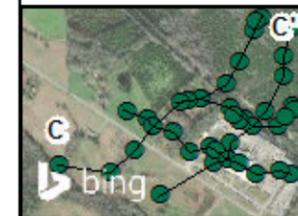
Legend

- SAPROLITE INTERFACE
- SAND
- SILT/CLAY
- WEATHERED BEDROCK
- BEDROCK
- Casing
- Screen

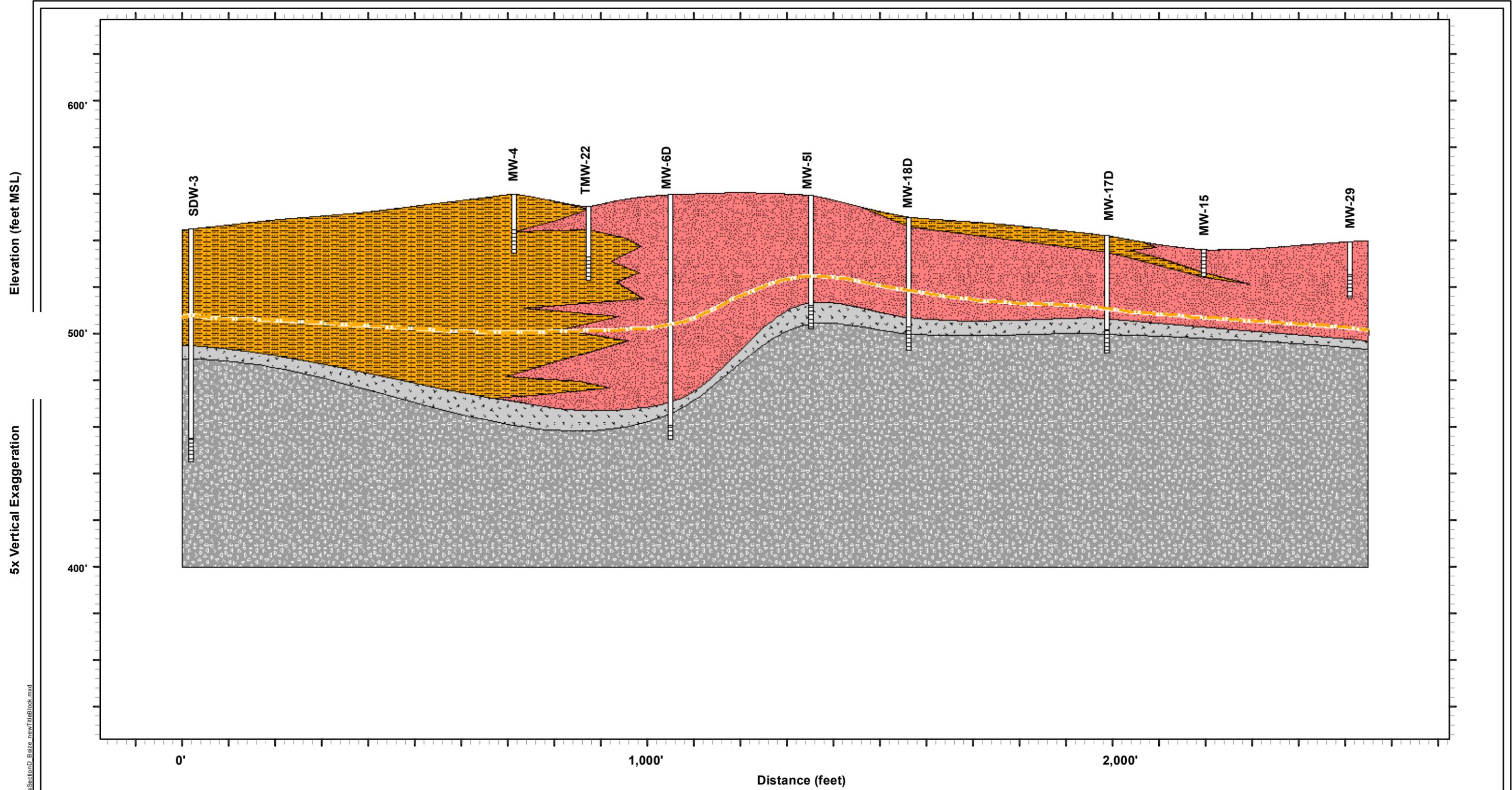
FIGURE 3-4: CROSS-SECTION C-C'
Shakespeare Composition Structures
Newberry, South Carolina

Project No.: 60721186 Date: 2018-09-07

Map Location



0 1,000 2,000
Feet



Path: C:\GIS\60328308_Shakespeare\MXD\CrossSectionD_Bsize_newTitleBlock.mxd



101 Research Drive
Columbia, SC 29203-9389
T: (803) 254-4400 F: (803) 771-6676

Legend

- SAPROLITE INTERFACE
- SAND
- SILT/CLAY
- WEATHERED BEDROCK
- BEDROCK
- Casing
- Screen

FIGURE 3-5: CROSS-SECTION D-D'
Shakespeare Composition Structures
Newberry, South Carolina

Project No.: 60721186 Date: 2018-09-07

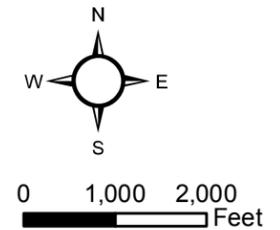
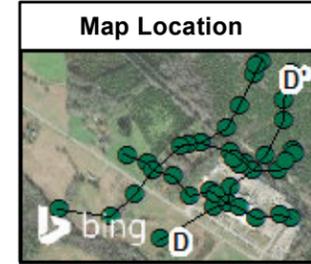
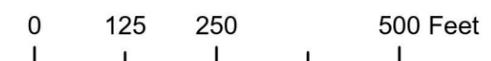




Figure 3-6
Surface Water Sample Locations

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



NC CGIA, Maxar, Microsoft

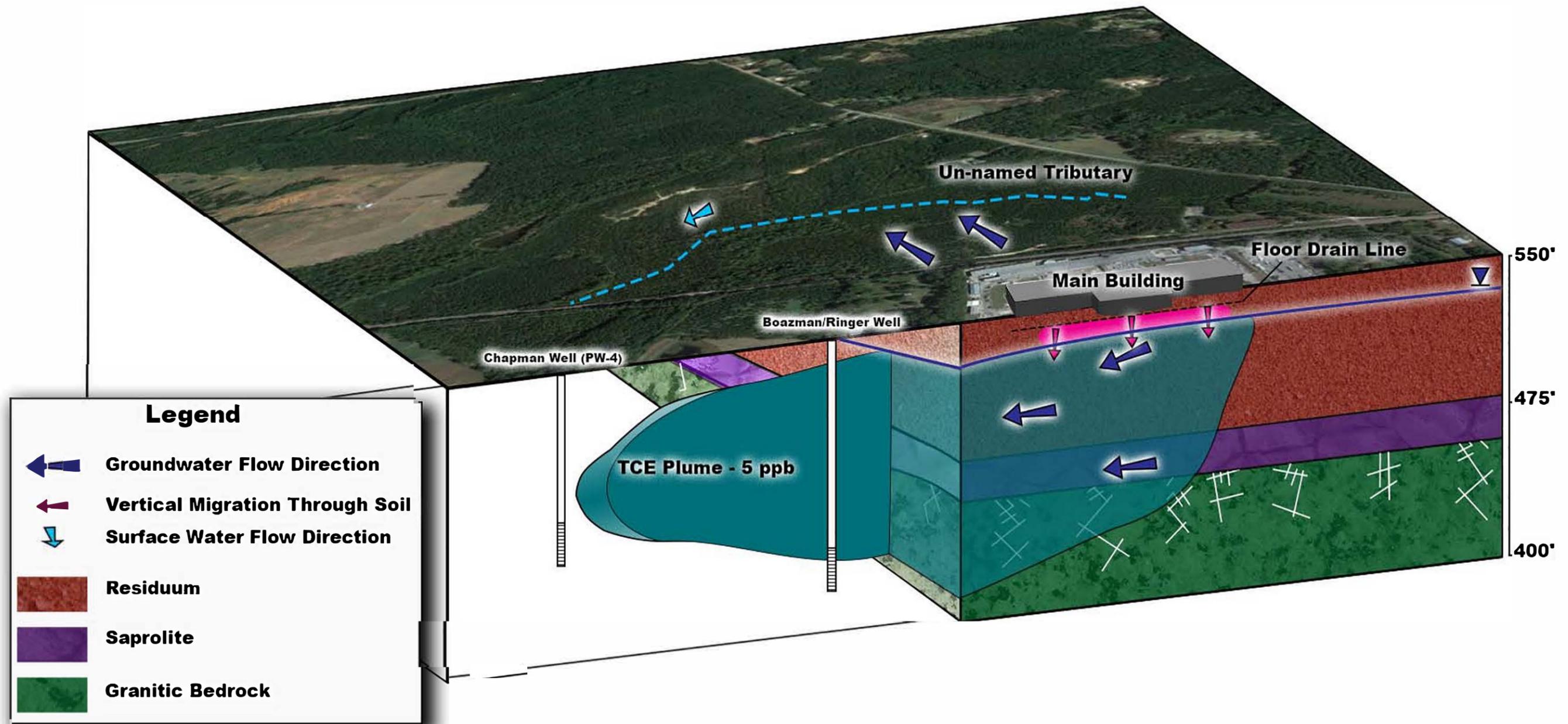


Figure 3-7: Conceptual Site Model

**Shakespear Composition Structures
 Newberry, South Carolina**

Project No.: 60721186; Date: 8/20/2018

Name: Figure 5-1 Targeted Groundwater Treatment Areas - Shallow Zone
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Plot Study\Maps\Newberry Shallow Zone_TCE Concentrations.aprx

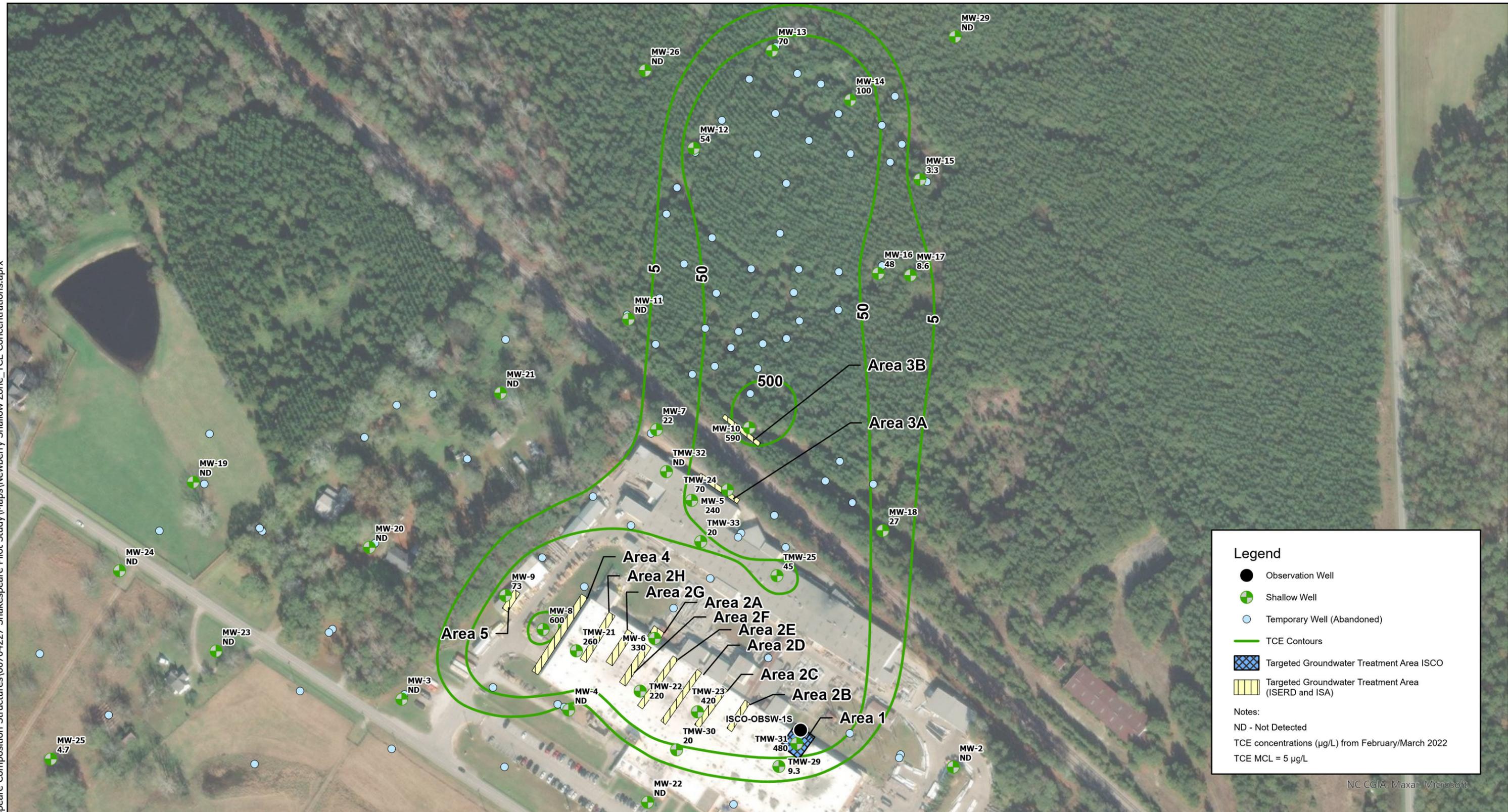
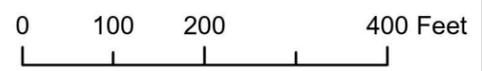


Figure 5-1
 Targeted Groundwater Treatment Areas
 Shallow Zone

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



Legend

- Observation Well
- ⊕ Shallow Well
- Temporary Well (Abandoned)
- TCE Contours
- ▣ Targeted Groundwater Treatment Area ISCO
- ▨ Targeted Groundwater Treatment Area (ISERD and ISA)

Notes:
 ND - Not Detected
 TCE concentrations (µg/L) from February/March 2022
 TCE MCL = 5 µg/L

NC CGIA, Maxar, Microsoft

Name: Figure 5-2 Targeted Groundwater Treatment Areas - Intermediate Zone
Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps\Newberry Intermediate Zone_TCE Concentrations.aprx

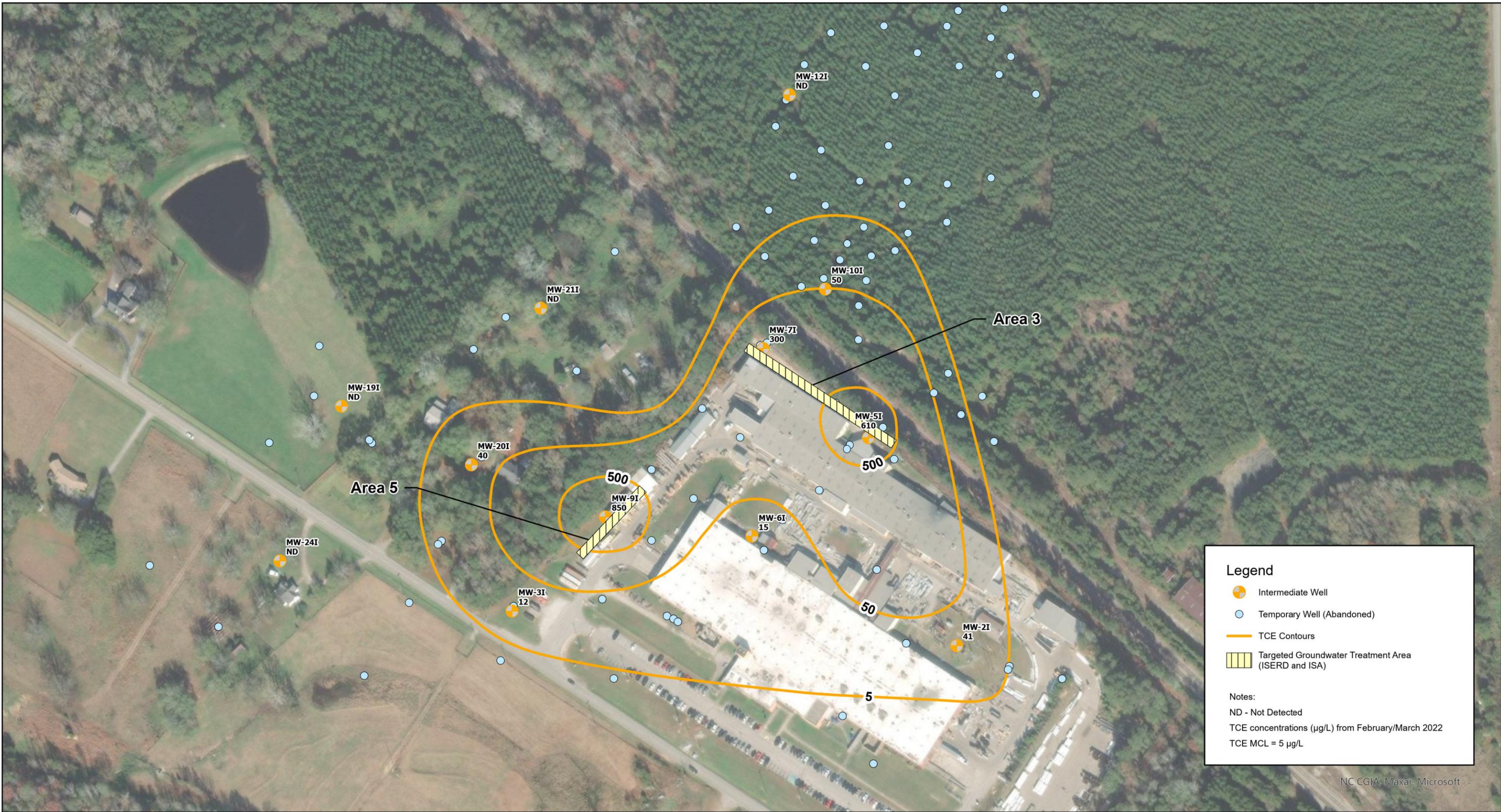
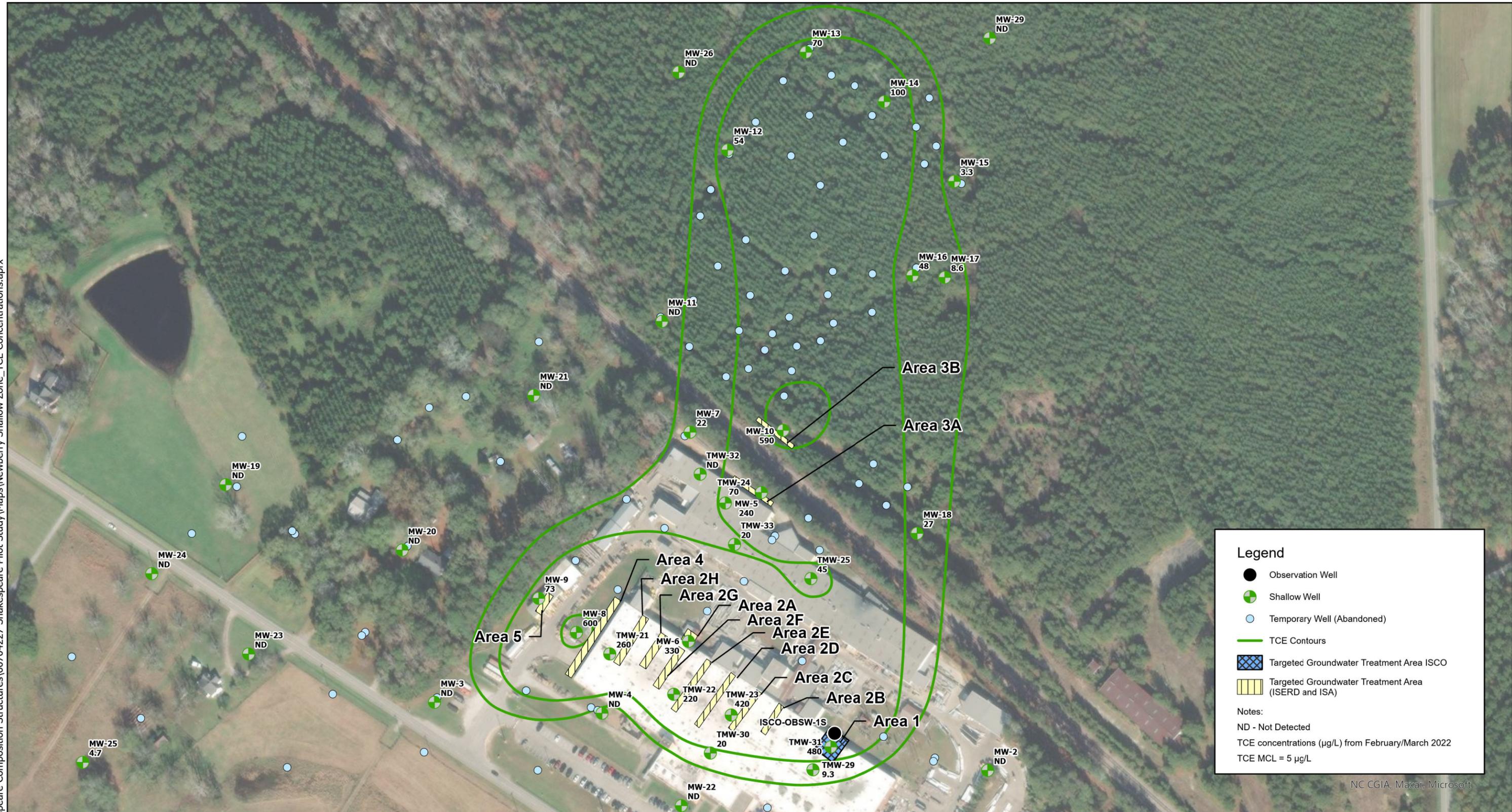


Figure 5-2
Targeted Groundwater Treatment Areas
Intermediate Zone

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



Name: Figure 6-1 Targeted Groundwater Treatment Areas - Shallow Zone ISCO_ISERD_ISA_MNA_ICs
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Pilot Study\Maps\Newberry_Shallow Zone_TCE Concentrations.aprx



Legend

- Observation Well
- ⊕ Shallow Well
- Temporary Well (Abandoned)
- TCE Contours
- ▣ Targeted Groundwater Treatment Area ISCO
- ▨ Targeted Groundwater Treatment Area (ISERD and ISA)

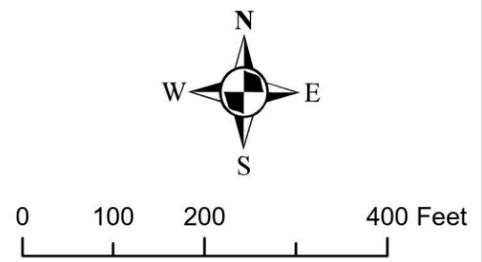
Notes:
 ND - Not Detected
 TCE concentrations (µg/L) from February/March 2022
 TCE MCL = 5 µg/L

NC CGIA, Maxar, Microsoft

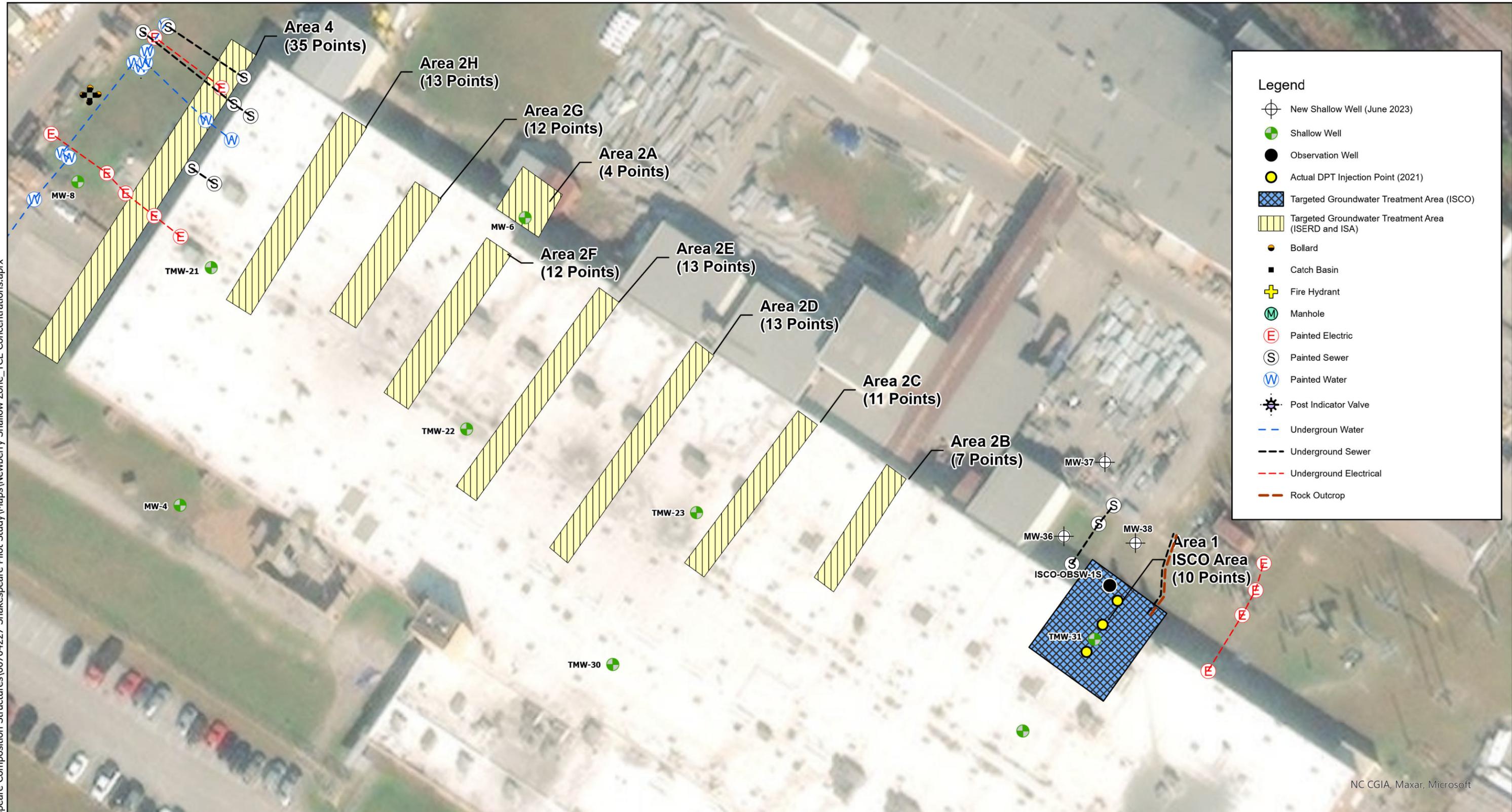


Figure 6-1
Targeted Groundwater Treatment Areas - Shallow Zone
ISCO, ISERD, ISA, MNA, and ICs

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



Name: Figure 6-2 Targeted Groundwater Treatment Areas - Shallow Zone Main Bldg ISCO_ISERD_ISA_MNA_ICs
 Path: L:\Legacy\Group\earth\Shakespeare Composite Structures\60704227 Shakespeare Shallow Zone_TCE Concentrations.aprx

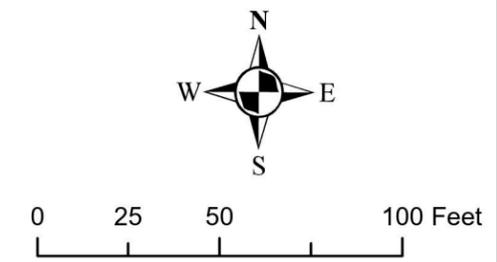


NC CGIA, Maxar, Microsoft



Figure 6-2
 Targeted Groundwater Treatment Areas - Shallow Zone - Main Building
 ISCO, ISERD, ISA, MNA, and ICs

Shakespeare Composite Structures
 Newberry, South Carolina
 Project Number: 60721186



Name: Figure 6-3 Targeted Groundwater Treatment Areas - Intermediate Zone ISCO ISERD MNA ISA and ICs
Path: L:\Legacy\Group\earth\Shakespeare Composition Structures\60704227 Shakespeare Pilot Study\Maps\Newberry Intermediate Zone_TCE Concentrations.aprx

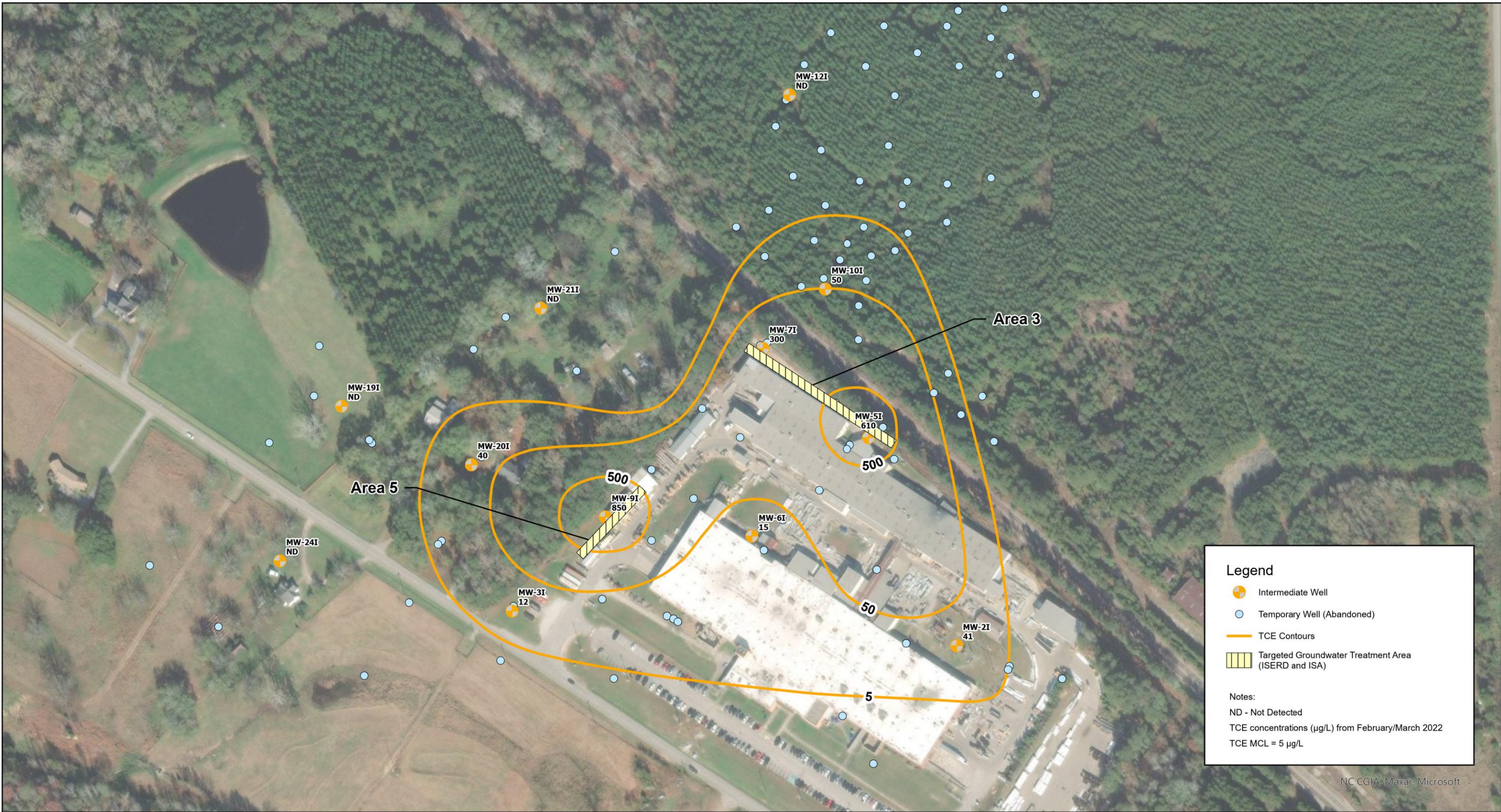
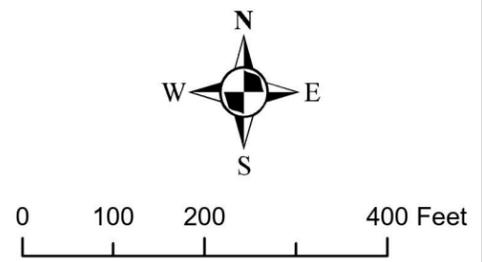


Figure 6-3
Targeted Groundwater Treatment Areas - Intermediate Zone
ISCO, ISERD, ISA, MNA, and ICs

Shakespeare Composite Structures
Newberry, South Carolina
Project Number: 60721186



TABLES

Table 2-1
Subslab Soil Vapor Data – 2018 and 2023 for Selected Compounds
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA RSL for Air		SV20 L977783-06 03/13/2018	SV23 L977783-07 03/13/2018	SV31 L977783-01 03/13/2018	SV45 L977783-02 03/13/2018	SV46 L977783-03 03/13/2018	SV49 L977783-05 03/13/2018
	Residential	Industrial						
<i>Volatile Organic Compounds by USEPA TO15 (ug/m3)</i>								
1,1,1-Trichloroethane	5200	22000	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	63	260	13.3	8.07	3.28	1.98	1.59	2.01
Benzene	0.36	1.6	7.28	9.34	14.4	1.62	0.739	2.48
Chloromethane	94	390	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	42	180	1.78	1.07	307	<0.793	<0.793	<0.793
Ethylbenzene	1.1	4.9	8.74	188	8.11	2.18	1.35	4.12
Isopropylbenzene	420	1800	9.7	2.77	<1.97	<0.983	<0.983	2.84
m&p-Xylene	100	440	14.8	365	26.8	7.64	4.45	102
Methylene Chloride	100	1200	NA	NA	NA	NA	NA	NA
o-Xylene	100	440	4.99	62.3	8.11	2.17	1.54	48.8
Tetrachloroethene	11	47	3.99	<1.36	30.6	32.2	24.7	23.3
Toluene	5200	22000	10.3	158	42.1	7.28	5.76	17.9
trans-1,2-Dichloroethene	42	180	<0.793	<0.793	8.24	<0.793	<0.793	<0.793
Trichloroethene	0.48	3	1.41	<1.07	1020	35.9	14.6	83.1
Vinyl Chloride	0.17	2.8	<0.511	<0.511	<1.02	<0.511	<0.511	<0.511
Xylene (Total)	100	440	NA	NA	NA	NA	NA	NA

Table 2-1
Subslab Soil Vapor Data – 2018 and 2023 for Selected Compounds
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA RSL for Air		SV54 L977783-04 03/13/2018	VP-1 92690806001 9/28/23	VP-2 92690806002 9/28/23	VP-3 92690806003 9/28/23	VP-4 92690806004 9/28/23	VP-5 92690806005 9/28/23
	Residential	Industrial						
<i>Volatile Organic Compounds by USEPA TO15 (ug/m3)</i>								
1,1,1-Trichloroethane	5200	22000	NA	<0.4	<0.4	<0.4	<0.4	<0.4
1,2,4-Trimethylbenzene	63	260	1.15	33.7	2.4	3.25	3.01	3.09
Benzene	0.36	1.6	0.689	4.25	1.77	2.43	2.41	1.81
Chloromethane	94	390	NA	0.717	<0.213	<0.213	<0.213	<0.213
cis-1,2-Dichloroethene	42	180	<0.793	<0.311	<0.311	<0.311	<0.311	<0.311
Ethylbenzene	1.1	4.9	1.1	14.4	3.2	4.64	4.21	3.91
Isopropylbenzene	420	1800	<0.983	<0.382	<0.382	<0.382	<0.382	<0.382
m&p-Xylene	100	440	3.55	56.8	12.2	19.3	16.4	16.7
Methylene Chloride	100	1200	NA	<0.34	<0.34	0.951	<0.34	2.19
o-Xylene	100	440	1.36	16.6	4.51	6.55	5.64	6.16
Tetrachloroethene	11	47	11.4	15.5	8.01	3.24	23.3	12.2
Toluene	5200	22000	3.73	14.8	9.98	10.4	13.7	8.36
trans-1,2-Dichloroethene	42	180	<0.793	<0.267	<0.267	<0.267	<0.267	<0.267
Trichloroethene	0.48	3	3.76	24	9.43	1.69	<0.364	8.25
Vinyl Chloride	0.17	2.8	<0.511	<0.243	<0.243	<0.243	<0.243	<0.243
Xylene (Total)	100	440	NA	73.4	16.7	25.9	22.1	22.9

Table 2-1
Subslab Soil Vapor Data – 2018 and 2023 for Selected Compounds
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA RSL for Air		VP-6 92690806006 09/28/23	VP-7 92690806007 09/28/23	VP-8 92690806008 09/28/23	VP-9 92690806009 09/28/23	VP-10 92690806010 09/28/23
	Residential	Industrial					
<i>Volatile Organic Compounds by USEPA TO15 (ug/m3)</i>							
1,1,1-Trichloroethane	5200	22000	1.65	1.44	<0.4	<0.4 U/J/i	<0.4
1,2,4-Trimethylbenzene	63	260	2.51	3.73	3.99	3.64 /J/i	4.88
Benzene	0.36	1.6	1.46	2.96	2.04	3.99 /J/i	2.92
Chloromethane	94	390	<0.213	0.77	<0.213	<0.213 U/J/i	<0.213
cis-1,2-Dichloroethene	42	180	<0.311	<0.311	<0.311	<0.311 U/J/i	<0.311
Ethylbenzene	1.1	4.9	3.25	5.16	3.86	4.55 /J/i	17.5
Isopropylbenzene	420	1800	<0.382	<0.382	<0.382	<0.382 U/J/i	<0.382
m&p-Xylene	100	440	12.6	22.8	15.6	19.3 /J/i	54.2
Methylene Chloride	100	1200	1.25	2.57	<0.34	1.35 /J/i	2.3
o-Xylene	100	440	4.55	7.63	6.76	11.4 /J/i	16.4
Tetrachloroethene	11	47	17	6.28	26.5	6.23 /J/i	4.99
Toluene	5200	22000	8.44	9.87	10.3	14 /J/i	26.1
trans-1,2-Dichloroethene	42	180	<0.267	<0.267	<0.267	<0.267 U/J/i	<0.267
Trichloroethene	0.48	3	<0.364	2.72	4.23	<0.364 U/J/i	<0.364
Vinyl Chloride	0.17	2.8	<0.243	<0.243	<0.243	<0.243 U/J/i	<0.243
Xylene (Total)	100	440	17.2	30.5	22.4	30.7 /J/i	70.8

Notes:

NA - Not Analyzed

USEPA RSL - United States Environmental Protection Agency Regional Screening Level based on a risk of 1E-06 and a hazard quotient of 1 (USEPA, November 2023).

Bold font indicates the analyte was detected.

Shading indicates an exceedance of the Residential Air RSL.

Bold outline indicates an exceedance of the Industrial Air RSL.

Table 2-2
Phase II RI and FS Soil Data
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Lab Sample ID Date Collected	Screening Values			Main Building															
	Industrial RSL	Residential RSL	MCL-Based SSL	B-48(2) TC30002-025 03/29/18	B-48(4) TC30002-026 03/29/18	B-48(6) TC30002-027 03/29/18	B-48(8) TC30002-028 03/29/18	B-48(10) TC30002-029 03/29/18	B-48(12) TC30002-030 03/29/18	B-48(14) TC30002-031 03/29/18	B-48(15) TC30002-032 03/29/18	B-49(2) TC30002-033 03/29/18	B-49(4) TC30002-034 03/29/18	B-49(6) TC30002-035 03/29/18	B-49(8) TC30002-036 03/29/18	B-49(10) TC30002-037 03/29/18	B-49(12) TC30002-038 03/29/18	B-49(14) TC30002-039 03/29/18	B-49(15) TC30002-040 03/29/18
Volatile Organic Compounds by Method 8260B/8260D (ug/kg)																			
1,1,1,2-Tetrachloroethane	8800	2000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	36000000	8100000	70	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,1,2,2-Tetrachloroethane	2700	600	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,1,2-Trichloro-1,2,2-Trifluoroethane	28000000	6700000	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,1,2-Trichloroethane	5000	1100	1.6	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,1-Dichloroethane	16000	3600	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,1-Dichloroethene	1000000	230000	2.5	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	3.3 J//	4.4 J//	2.9 J//	< 4.7	< 5.4	3.4 J//	< 5.3
1,1-Dichloropropene	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	930000	63000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	110	5.1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	110000	24000	200	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,2,4-Trimethylbenzene	1800000	300000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	64	5.3	0.086	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,2-Dibromoethane (EDB)	160	36	0.014	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,2-Dichlorobenzene	9300000	1800000	580	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,2-Dichloroethane	2000	460	1.4	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,2-Dichloropropane	11000	2500	1.7	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,3,5-Trimethylbenzene	1500000	270000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
1,3-Dichloropropane	23000000	1600000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	11000	2600	72	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
2,2-Dichloropropane	NS	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	190000000	27000000	NS	4.3 J//	5.2 J//	< 28	< 15	< 21	7.6 J//	7.5 J//	3.6 J//	5.1 J//	< 20	< 22	19	< 19	7 J//	16 J//	< 21
2-Chlorotoluene	23000000	1600000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	1300000	200000	NS	< 7.9	< 9.8	< 14	< 7.6	< 10	< 11	< 13	< 8.7	< 9.1	< 9.9	< 11	< 8.5	< 9.5	< 11	< 9.8	< 11
4-Chlorotoluene	23000000	1600000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	140000000	33000000	NS	< 7.9	< 9.8	< 14	< 7.6	< 10	< 11	< 13	< 8.7	< 9.1	< 9.9	< 11	< 8.5	< 9.5	< 11	< 9.8	< 11
Acetone	1.1E+09	70000000	NS	170	290	110	360	1200 E//	500	240	53	120	320	180	140	260	190	130	
Benzene	5100	1200	2.6	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Bromobenzene	1800000	290000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	630000	150000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	1300	290	22	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Bromoform	86000	19000	21	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Bromomethane (Methyl bromide)	30000	6800	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Carbon disulfide	3500000	770000	NS	< 3.9	2 J//	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Carbon tetrachloride	2900	650	1.9	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Chlorobenzene	1300000	280000	68	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Chloroethane	23000000	5400000	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Chloroform	1400	320	22	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Chloromethane (Methyl chloride)	460000	110000	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
cis-1,2-Dichloroethene	370000	63000	21	2.6 J//	7.3	14	8.3	< 5.2	< 5.5	< 6.3	2.7 J//	57	470	900	210 E//	140	30	200 E//	160
cis-1,3-Dichloropropene	8200	1800	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Cyclohexane	27000000	6500000	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Dibromochloromethane	39000	8300	21	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Dibromomethane	99000	24000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	370000	87000	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Diisopropyl ether	9400000	2200000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	25000	5800	780	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	13	13	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
Hexachloro-1,3-butadiene	5300	1200	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	9900000	1900000	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	< 4.3	< 4.7	< 5.4	< 4.9	< 5.3
m&p-Xylene	2400000	550000	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	1.2E+09	78000000	NS	< 3.9	< 4.9	< 7.1	< 3.8	< 5.2	< 5.5	< 6.3	< 4.3	< 4.5	< 4.9	< 5.4	3.3 J//	< 4.7	< 5.4	< 4.9	< 5.3
Methyl tertiary butyl																			

Table 2-2
Phase II RI and FS Soil Data
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Lab Sample ID Date Collected	Screening Values			Main Building			
	Industrial RSL	Residential RSL	MCL-Based SSL	VP-4 92690805002 09/28/23	VP-5 92690805003 09/28/23	VP-6 92690805006 09/28/23	VP-7 92690805007 09/28/23
	Volatile Organic Compounds by Method 8260B/8260D (ug/kg)						
1,1,1,2-Tetrachloroethane	8800	2000	NS	< 2.7	< 4.3	< 2.3	< 2.6
1,1,1-Trichloroethane	36000000	8100000	70	< 3.7	< 5.9	< 3.1	< 3.6
1,1,2,2-Tetrachloroethane	2700	600	NS	< 1.9	< 3	< 1.6	< 1.8
1,1,2-Trichloro-1,2,2-Trifluoroethane	28000000	6700000	NS	NA	NA	NA	NA
1,1,2-Trichloroethane	5000	1100	1.6	< 2.4	< 3.7	< 2	< 2.3
1,1-Dichloroethane	16000	3600	NS	< 2.9	< 4.6	< 2.5	< 2.8
1,1-Dichloroethene	1000000	230000	2.5	< 2.9	< 4.6	< 2.5	< 2.8
1,1-Dichloropropene	NS	NS	NS	< 3.4	< 5.4	< 2.9	< 3.3
1,2,3-Trichlorobenzene	930000	63000	NS	< 5.7	< 9.1	< 4.8	< 5.6
1,2,3-Trichloropropane	110	5.1	NS	< 3.6	< 5.7	< 3	< 3.5
1,2,4-Trichlorobenzene	110000	24000	200	< 6	< 9.5	< 5	< 5.8
1,2,4-Trimethylbenzene	1800000	300000	NS	< 4.2	< 6.7	4.6	< 4.1
1,2-Dibromo-3-chloropropane (DBCP)	64	5.3	0.086	< 2.8	U,IK//	< 2.3	U,IK//
1,2-Dibromoethane (EDB)	160	36	0.014	< 3.1	< 5	< 2.6	< 3
1,2-Dichlorobenzene	9300000	1800000	580	< 2.6	< 4.1	< 2.1	< 2.5
1,2-Dichloroethane	2000	460	1.4	< 4.7	< 7.5	< 3.9	< 4.5
1,2-Dichloropropane	11000	2500	1.7	< 2.1	< 3.4	< 1.8	< 2.1
1,3,5-Trimethylbenzene	1500000	270000	NS	< 2.4	< 3.8	< 2	< 2.3
1,3-Dichlorobenzene	NS	NS	NS	< 2.2	< 3.5	< 1.8	< 2.1
1,3-Dichloropropane	23000000	1600000	NS	< 2.2	< 3.5	< 1.9	< 2.1
1,4-Dichlorobenzene	11000	2600	72	< 1.8	< 2.9	< 1.5	< 1.8
2,2-Dichloropropane	NS	NS	NS	< 5.4	< 8.5	< 4.5	< 5.2
2-Butanone (MEK)	190000000	27000000	NS	< 34	< 54.1	< 28.6	< 33
2-Chlorotoluene	23000000	1600000	NS	< 2.5	< 4	< 2.1	< 2.4
2-Hexanone	1300000	200000	NS	< 6.8	< 10.9	< 5.7	< 6.6
4-Chlorotoluene	23000000	1600000	NS	< 3.9	< 6.3	< 3.3	< 3.8
4-Methyl-2-pentanone	140000000	33000000	NS	< 6.8	< 10.9	< 5.7	< 6.6
Acetone	1.1E+09	70000000	NS	< 45.5	< 72.3	< 38.2	55.8
Benzene	5100	1200	2.6	5	J//	8.8	J//
Bromobenzene	1800000	290000	NS	< 2.3	< 3.7	< 1.9	< 2.2
Bromochloromethane	630000	150000	NS	< 2.1	< 3.3	< 1.8	< 2
Bromodichloromethane	1300	290	22	< 2.7	< 4.3	< 2.3	< 2.7
Bromofom	86000	19000	21	< 2.5	< 4	< 2.1	< 2.4
Bromomethane (Methyl bromide)	30000	6800	NS	< 22	U,v1//	< 34.9	U,v1//
Carbon disulfide	3500000	770000	NS	NA	NA	NA	NA
Carbon tetrachloride	2900	650	1.9	< 2.7	< 4.2	< 2.2	< 2.6
Chlorobenzene	1300000	280000	68	< 4.1	< 6.5	< 3.4	< 3.9
Chloroethane	23000000	5400000	NS	< 5.5	< 8.7	< 4.6	< 5.3
Chloroform	1400	320	22	< 5.9	< 9.4	< 5	< 5.7
Chloromethane (Methyl chloride)	460000	110000	NS	< 6	< 9.5	< 5	< 5.8
cis-1,2-Dichloroethene	370000	63000	21	< 2.4	< 3.9	< 2	< 2.4
cis-1,3-Dichloropropene	8200	1800	NS	< 1.9	< 3.1	< 1.6	< 1.9
Cyclohexane	27000000	6500000	NS	NA	NA	NA	NA
Dibromochloromethane	39000	8300	21	< 4	< 6.3	< 3.3	< 3.9
Dibromomethane	99000	24000	NS	< 1.5	U,v1//	< 1.3	U,v1//
Dichlorodifluoromethane	370000	87000	NS	< 7.2	U,IH,IK,L1,v1//	< 11.5	U,IH,IK,L1,v1//
Diisopropyl ether	9400000	2200000	NS	< 1.9	< 3	< 1.6	< 1.9
Ethylbenzene	25000	5800	780	< 3.3	< 5.2	5.4	J//
Hexachloro-1,3-butadiene	5300	1200	NS	< 11.6	< 18.4	< 9.7	< 11.2
Isopropylbenzene	9900000	1900000	NS	< 2.4	< 3.8	< 2	< 2.3
m&p-Xylene	2400000	550000	NS	6.7	J//	10.5	J//
Methyl acetate	1.2E+09	78000000	NS	NA	NA	NA	NA
Methyl tertiary butyl ether (MTBE)	210000	47000	NS	< 2.7	< 4.2	< 2.2	< 2.6
Methylcyclohexane	410000	98000	NS	NA	NA	NA	NA
Methylene chloride	1000000	57000	1.3	< 19.4	< 30.9	< 16.3	65.5
n-Butylbenzene	58000000	3900000	NS	< 4.5	< 7.1	< 3.7	< 4.3
n-Propylbenzene	24000000	3800000	NS	< 2.5	< 4	< 2.1	< 2.4
Naphthalene	8600	2000	NS	< 3.7	< 5.9	< 3.1	< 3.6
o-Xylene	2800000	640000	NS	< 3.1	< 5	3.8	J//
p-Isopropyltoluene	NS	NS	NS	< 3.5	< 5.5	< 2.9	< 3.4
sec-Butylbenzene	120000000	7800000	NS	< 3.1	< 5	< 2.6	< 3
Styrene	35000000	6000000	110	33	54.8	109	62.4
tert-Butylbenzene	120000000	7800000	NS	< 2.5	< 4	< 2.1	< 2.4
Tetrachloroethene	100000	24000	2.3	< 2.2	< 3.6	< 1.9	< 2.2
Toluene	47000000	4900000	690	7.4	10	J//	5.2
trans-1,2-Dichloroethene	300000	70000	31	< 6	< 9.6	< 5.1	< 5.8
trans-1,3-Dichloropropene	8200	1800	NS	< 2.4	< 3.9	< 2	< 2.4
Trichloroethene	6000	940	1.8	< 5.7	< 9.1	< 4.8	< 5.5
Trichlorofluoromethane	350000000	23000000	NS	< 3.9	U,v1//	< 3.3	U,v1//
Vinyl acetate	3800000	910000	NS	< 14.6	< 23.2	< 12.2	< 14.1
Vinyl chloride	1700	59	0.69	< 3.6	< 5.7	< 3	< 3.5
Xylenes (total)	2500000	580000	9900	6.7	J//	10.5	J//

Notes:

Screening values consist of the industrial and residential soil values from the USEPA RSL Table based on risk of 1E-06 for carcinogens and HQ of 1 for noncarcinogens, and the MCL-based SSLs (USEPA, November 2023).
Value for 1,3-Dichloropropene used as a surrogate value for cis-1,3-Dichloropropene and trans-1,3-Dichloropropene.
Bold font indicates the analyte was detected.
Green shading indicates an exceedance of the Industrial Soil RSL.
MCL - maximum contaminant level
mg/kg - milligrams per kilogram
NS - no standard
RSL - regional screening level
SSL - soil screening level
USEPA - United States Environmental Protection Agency

Table 2-3
Sample Results - ISCO Pilot Study Wells
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL ¹	MW-2				MW-34	MW-35	MW-36	MW-37
		WH20094-001 08/19/21	XC01066-006 03/01/22	XG20043-007 07/20/22	XL28017-003 12/28/22	92671746001 06/08/23	92671746002 06/08/23	92671746003 06/08/23	92671746004 06/08/23
Volatile Organic Compounds by USEPA Method 8260D (µg/L)									
Acetone	NS	< 10	< 10	< 10	11	43	< 25.6	24.7 J//	< 5.1
Chloroform	80 ²	< 0.5	< 0.5	< 0.5	< 0.5	< 0.43	< 2.2	0.57 J//	< 0.43
cis-1,2-Dichloroethene	70	< 0.5	< 0.5	< 0.5	< 0.5	< 0.38	6.6	< 0.38	< 0.38
Ethylbenzene	700	< 0.5	< 0.5	< 0.5	< 0.5	0.59 J//	< 1.5	< 0.3	< 0.3
Methylene chloride	5	< 0.5	< 0.5	< 0.5	< 0.5	< 2	19 J,C9//	< 2	< 2
Styrene	100	< 0.5	5.1	< 0.5	< 0.5	109	22	6.5	9.9
Toluene	1000	< 0.5	< 0.5	< 0.5	< 0.5	0.63 J//	< 2.4	< 0.48	< 0.48
Trichloroethene (TCE)	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.38	681	12.7	21.1
Metals by USEPA Method 6010D (mg/L)									
Dissolved Iron	0.3 ³	0.05 J	NA	NA	< 0.1	NA	NA	NA	NA
Chloride and Nitrate by USEPA Method 300.0 (mg/L)									
Chloride	250 ³	2.3	2.2	NA	2.2	NA	NA	NA	NA
Nitrate	10	0.078 B//	NA	NA	0.074	NA	NA	NA	NA
TDS by USEPA Method SM 2540C-2011, -2015 (mg/L)									
Total Dissolved Solids	500 ³	< 25	34	NA	26	NA	NA	NA	NA
Field Parameters									
Color/Odor	NS	clear	clear/no	clear	clear	clear/none	clear/none	brown/none	clear/none
Dissolved oxygen (mg/L)	NS	7.26	8.30	6.89	6.78	1.74	1.33	5.15	4.12
ORP (mV)	NS	187.4	821.6	627.3	330.2	-222.3	-266.3	37.4	17.3
pH	NS	4.91	4.63	5.36	5.36	6.02	5.76	5.74	5.73
Specific Conductivity (uS/cm)	NS	0.02	21.74	20	24	99.8	62.8	94.6	51.5
Temperature (Celsius)	NS	22	19.61	22.2	19.3	22.4	22.2	20.1	22.6
Turbidity (NTU)	NS	6.98	0.05	3.79	4.51	58.78	44.47	1014	121.7

Notes:

-a - Indicates a field duplicate sample.

¹ - United States Environmental Protection Agency Maximum Contaminant Level (USEPA, March 2018).

² - 1998 Final Rule for Disinfectants and Disinfection By-Products: The total for trihalomethanes is 80 µg/L.

³ - Secondary MCL.

NA - Not Analyzed

NS - No Standard

Bold font indicates the analyte was detected.

Bold outline indicates an exceedance of the USEPA MCL.

Data Qualifiers

Separates the laboratory added data qualifiers from the validation data qualifiers. The laboratory added data qualifiers precede the first “/”. The result qualifiers follow the first

“/”, and the analysis qualifiers follow the second “/”.

The result qualifiers are a product of the data validation process, and the analysis qualifier defines the type of

Laboratory Data Qualifiers

C9 - Common laboratory contaminant

H - Out of holding time.

J - Estimated result less than the limit of quantitation and greater than or equal to the detection limit.

B - Detected in the method blank.

Result Data Qualifiers

None added.

Analysis Data Qualifiers

h - Holding time exceeded by less than two times.

Table 2-3
Sample Results - ISCO Pilot Study Wells
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL ¹	MW-38	MW-38 (Dup)	TMW-29		TMW-31			TMW-31 (Dup)	TMW-31
		92671746005	92671746010	WH20094-003	XC01066-003	WH20094-002	XC01066-004	XG20043-006	XG20043-008	XL28017-001
		06/08/23	06/08/23	08/20/21	03/01/22	08/20/21	03/01/22	07/20/22	07/20/22	12/28/22
Volatile Organic Compounds by USEPA Method 8260D (µ)										
Acetone	NS	< 5.1	< 5.1	24	7.9 J//	< 100	< 50	< 100	< 50	< 500
Chloroform	80 ²	0.95 J//	1 J//	< 0.5	< 0.5	< 5	< 2.5	< 5	< 2.5	< 25
cis-1,2-Dichloroethene	70	< 0.38	< 0.38	< 0.5	< 0.5	8.5	3	9.6	9.5	32
Ethylbenzene	700	< 0.3	< 0.3	< 0.5	< 0.5	< 5	< 2.5	< 5	< 2.5	< 25
Methylene chloride	5	< 2	< 2	< 0.5	< 0.5	< 5	< 2.5	< 5	< 2.5	< 25
Styrene	100	1.1	0.95 J//	50	120	< 5	< 2.5	7.5 /J/A	5 /J/A	< 25
Toluene	1000	< 0.48	< 0.48	< 0.5	< 0.5	< 5	< 2.5	< 5	< 2.5	< 25
Trichloroethene (TCE)	5	10	9.6	12	9.3	920	480	860	1200	3600
Metals by USEPA Method 6010D (mg/L)										
Dissolved Iron	0.3 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride and Nitrate by USEPA Method 300.0 (mg/L)										
Chloride	250 ³	NA	NA	3.1	2.8	6.1	6	5.6	NA	3.2
Nitrate	10	NA	NA	NA	NA	NA	NA	1.3	NA	NA
TDS by USEPA Method SM 2540C-2011, -2015 (mg/L)										
Total Dissolved Solids	500 ³	NA	NA	< 25	51	41	65	62	NA	55
Field Parameters										
Color/Odor	NS	clear/none	clear/none	clear	lt. tan/no	NA	lt. purple	clear	NA	clear
Dissolved oxygen (mg/L)	NS	4.57	4.57	4.53	8.01	4.43	5.17	4.14	NA	4.84
ORP (mV)	NS	97.4	97.4	185.7	539.1	169.6	869.1	640.3	NA	222.8
pH	NS	5.45	5.45	4.5	4.49	4.71	4.62	5.28	NA	5.62
Specific Conductivity (uS/cm)	NS	66.4	66.4	0.035	37.75	0.048	63.22	58	NA	67
Temperature (Celsius)	NS	20.5	20.5	23.5	21.31	23.6	24.25	23.7	NA	24.4
Turbidity (NTU)	NS	32.93	32.93	4.43	276.76	17.91	1.02	8.88	NA	9.78

Notes:

-a - Indicates a field duplicate sample.

¹ - United States Environmental Protection Agency Maximum Contaminant Level (USEPA, March 2018).

² - 1998 Final Rule for Disinfectants and Disinfection By-Products: The total for trihalomethanes is 80 µg/L.

³ - Secondary MCL.

NA - Not Analyzed

NS - No Standard

Bold font indicates the analyte was detected.

Bold outline indicates an exceedance of the USEPA MCL.

Data Qualifiers

Separates the laboratory added data qualifiers from the validation data qualifiers. The laboratory added data qualifiers precede the first “/”. The result qualifiers follow the first

“/”, and the analysis qualifiers follow the second “/”.

The result qualifiers are a product of the data validation process, and the analysis qualifier defines the type of

Laboratory Data Qualifiers

C9 - Common laboratory contaminant

H - Out of holding time.

J - Estimated result less than the limit of quantitation and greater than or equal to the detection limit.

B - Detected in the method blank.

Result Data Qualifiers

None added.

Analysis Data Qualifiers

h - Holding time exceeded by less than two times.

Table 2-3
Sample Results - ISCO Pilot Study Wells
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL ¹	TMW-31		ISCO-OBSW-1S				
		92690805001 09/29/23	92706733001 01/02/24	WH20094-009 08/20/21	XC01066-005 03/01/22	XG20043-005 07/20/22	XL28017-002 12/28/22	92690805004 09/29/23
Volatile Organic Compounds by USEPA Method 8260D (µ)								
Acetone	NS	< 63.9	< 5.1	< 100	< 200	< 500	< 500	< 25.6
Chloroform	80 ²	< 5.4	< 0.43	5.9	< 10	< 25	< 25	< 2.2
cis-1,2-Dichloroethene	70	14.8	< 0.38	6.7	< 10	< 25	< 25	5.9
Ethylbenzene	700	< 3.8	< 0.3	< 5	< 10	< 25	< 25	< 1.5
Methylene chloride	5	< 24.4	< 2	< 5	< 10	< 25	< 25	< 9.8
Styrene	100	< 3.6	< 0.29	< 5	< 10	< 25	< 25	< 1.5
Toluene	1000	< 6.1	< 0.48	< 5	< 10	< 25	< 25	< 2.4
Trichloroethene (TCE)	5	1810	1.1	960	< 10	< 25	< 25	909
Metals by USEPA Method 6010D (mg/L)								
Dissolved Iron	0.3 ³	NA						
Chloride and Nitrate by USEPA Method 300.0 (mg/L)								
Chloride	250 ³	NA	NA	5.7	< 100	7	6.1	NA
Nitrate	10	NA	NA	NA	NA	2.4	NA	NA
TDS by USEPA Method SM 2540C-2011, -2015 (mg/L)								
Total Dissolved Solids	500 ³	NA	NA	67	260	340	110	NA
Field Parameters								
Color/Odor	NS	clear	NA	clear	NA	purple	lt purple	clear
Dissolved oxygen (mg/L)	NS	5.99	4.07	3.64	NA	6.85	4.85	6.11
ORP (mV)	NS	NA	259.7	-119.6	NA	720.1	631.4	NA
pH	NS	4.98	5.19	5.72	NA	6.01	6.09	5.75
Specific Conductivity (uS/cm)	NS	72.17	53	0.094	NA	219	160	133.51
Temperature (Celsius)	NS	23.85	22.2	23.8	NA	22.2	18.7	23.09
Turbidity (NTU)	NS	2.52	6.03	NA	NA	8.84	8.15	9.23

Notes:

-a - Indicates a field duplicate sample.

¹ - United States Environmental Protection Agency Maximum Contaminant Level (USEPA, March 2018).

² - 1998 Final Rule for Disinfectants and Disinfection By-Products: The total for trihalomethanes is 80 µg/L.

³ - Secondary MCL.

NA - Not Analyzed

NS - No Standard

Bold font indicates the analyte was detected.

Bold outline indicates an exceedance of the USEPA MCL.

Data Qualifiers

Separates the laboratory added data qualifiers from the validation data qualifiers. The laboratory added data qualifiers precede the first “/”. The result qualifiers follow the first

“/”, and the analysis qualifiers follow the second “/”.

The result qualifiers are a product of the data validation process, and the analysis qualifier defines the type of

Laboratory Data Qualifiers

C9 - Common laboratory contaminant

H - Out of holding time.

J - Estimated result less than the limit of quantitation and greater than or equal to the detection limit.

B - Detected in the method blank.

Result Data Qualifiers

None added.

Analysis Data Qualifiers

h - Holding time exceeded by less than two times.

Table 2-4
Sample Results- ISERD Pilot Study Wells
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL ¹	MW-10		MW-10-DUP		MW-10						ERD-OBSW-1S					
		WH20094-006 08/20/21	WH20094-007 08/20/21	WJ29086-003 10/29/21	XC08061-004 03/08/22	XG20043-001 07/19/22	XL19029-001 12/19/22	92671746006 06/09/23	92706733016 01/03/24	WH20094-008 08/20/21	WJ29086-004 10/29/21	XC08061-003 03/08/22	XG20043-002 07/19/22	XL19029-002 12/19/22	92671746007 06/09/23		
Volatile Organic Compounds by USEPA Method 8260D (µg/L)																	
1,1-Dichloroethene	7	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.4	< 1.4	< 0.5	< 5	H//	< 0.5	< 0.5	< 0.7	
1,2-Dichloroethane	5	3.6	3.5	< 50	H/h	< 10	< 25	5.7	3.2	3.1	0.51	< 5	H//	0.82	0.92	0.95	
1,4-Dichlorobenzene	75	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.3	< 1.3	0.45	J/	< 5	H//	< 0.5	< 0.67	
2-Butanone (MEK)	NS	< 50	< 50	< 1000	H/h	< 200	< 500	< 100	< 15.8	< 15.8	< 10	< 100	H//	< 10	< 10	< 7.9	
2-Hexanone	NS	< 50	< 50	< 1000	H/h	< 200	< 500	28	< 1.9	< 1.9	< 10	< 100	H//	< 10	< 10	< 0.95	
Acetone	NS	< 50	< 50	< 1000	H/h	< 200	< 500	< 100	< 20.4	< 20.4	< 10	< 100	H//	5.7	J/BJ/TC	< 10.2	
Benzene	5	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.4	< 1.4	< 0.5	< 5	H//	< 0.5	< 0.5	< 0.69	
Chlorobenzene	100	< 2.5	3.5	< 50	H/h	< 10	< 25	< 5	< 1.1	< 1.1	0.97	< 5	H//	< 0.5	< 0.5	< 0.57	
Chloroethane	NS	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 2.6	< 2.6	< 0.5	< 5	H//	< 0.5	< 0.5	< 1.3	
Chloroform	80 ²	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.7	< 1.7	< 0.5	< 5	H//	< 0.5	< 0.5	< 0.86	
cis-1,2-Dichloroethene	70	2.9	2.5	< 50	H/h	< 10	< 25	15	13.8	16	0.65	< 5	H//	86	110	81.4	
Methyl acetate	NS	< 5	< 5	< 100	H/h	< 20	< 50	< 10	< 9.6	NA	< 1	< 10	H//	0.6	J//	< 4.8	
Methylene chloride	5	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	15.1	J,C9//	< 7.8	< 5	H//	< 0.5	< 0.5	8.7	
Styrene	100	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.2	< 1.2	< 0.5	< 5	H//	< 0.5	0.48	J//	
Toluene	1000	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.9	< 1.9	< 0.5	< 5	H//	< 0.5	< 0.5	< 0.97	
trans-1,2-Dichloroethene	100	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.6	2.1	J//	< 5	H//	< 0.5	< 0.5	< 0.79	
Trichloroethene (TCE)	5	740	790	600	H//h	590	760	500	464	567	240	410	H//	180	150	199	
Vinyl chloride	2	< 2.5	< 2.5	< 50	H/h	< 10	< 25	< 5	< 1.5	< 1.5	< 0.5	< 5	H//	< 0.5	< 0.5	< 0.77	
Xylenes (total)	10000	< 5	< 5	< 100	H/h	< 20	< 50	4.3	NA	< 1.4	< 1	< 10	H//	< 1	< 1	NA	
Metals by USEPA Method 6010D (mg/L)																	
Dissolved Iron	0.3 ³	< 0.1	NA	0.46		1.9	11	14	NA	15.5	0.13	0.68	< 0.1	1.5	0.98	NA	
Dissolved Manganese	0.05 ³	NA	NA	NA		0.052	NA	NA	NA	NA	NA	NA	0.064	NA	NA	NA	
Iron	0.3 ³	0.087	J	NA		1.2	5.9	31	43	NA	26.7	0.21	1.1	3.4	1.8	1.2	
Manganese	0.05 ³	NA	NA	NA		0.18	NA	0.06	NA	NA							
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																	
Alkalinity	NS	< 20	NA	190	NA	NA	330	110	NA	NA	21	54	NA	33	24	NA	
Bicarbonate Alkalinity	NS	< 20	NA	160	NA	NA	NA	NA	NA	NA	21	54	NA	NA	NA	NA	
Carbonate Alkalinity	NS	< 20	NA	25	NA	NA	NA	NA	NA	NA	20	< 20	NA	NA	NA	NA	
Chloride, Sulfate, Nitrate, and Nitrite by USEPA Method 300.0/353.2 (mg/L)																	
Chloride	250 ³	37	NA	29	NA	28	25	20	NA	NA	69	83	94	110	87	NA	
Sulfate	250 ³	0.25	J	2.5	J	0.58	J//	1.3	< 1	NA	1.4	0.29	J	< 1	< 1	NA	
Nitrate - N	10	1.2	B	< 1	NA	0.17	< 0.02	0.12	NA	NA	1.8	0.026	B	0.24	0.29	0.71	
Nitrite - N	1	< 0.02	NA	< 1	NA	0.015	J//	0.72	< 0.02	NA	< 0.02	< 0.02	NA	0.012	J//	0.053	
Dissolved Gases by USEPA Method RSK-175 (µg/L)																	
Ethane	NS	< 10	NA	< 10	NA	< 10	< 10	< 10	NA	< 5.9	< 10	< 10	< 10	< 10	< 10	NA	
Ethene	NS	< 10	NA	< 10	NA	2.8	J//	8	J//	< 5.7	< 10	< 10	< 10	< 10	< 10	NA	
Methane	NS	< 10	NA	9.1	J	2600	9100	7500	NA	4720	3.1	J	< 10	150	270	200	
TOC by USEPA Method SM 5310C-2011, -2014 (mg/L)																	
Total Organic Carbon	NS	< 1	NA	4800		920	390	250	NA	26.1	< 1	71	21	6.3	H//	3.1	
Microbial (cells/mL)																	
Dehalococoides	NS	< 0.5	NA	6260	<2.5	NA	< 1.4	NA	NA	NA	< 0.5	< 1.9	< 0.5	NA	< 0.5	NA	
Dehalobacter spp	NS	1.7	J	28500	<2.5	NA	< 14.3	NA	NA	NA	< 4.8	20700	< 130	NA	11700	NA	
BAV1 Vinyl Chloride Reductase	NS	< 0.5	NA	< 1000	<2.5	NA	< 1.4	NA	NA	NA	< 0.5	< 1.9	< 0.5	NA	< 0.5	NA	
tceA Reductase	NS	< 0.5	NA	< 1000	<2.5	NA	< 1.4	NA	NA	NA	< 0.5	< 1.9	< 0.5	NA	< 0.5	NA	
Vinyl chloride Reductase	NS	< 0.5	NA	< 1000	<2.5	NA	< 1.4	NA	NA	NA	< 0.5	< 1.9	< 0.5	NA	< 0.5	NA	
Field Parameters																	
Color/Odor	NS	NA	NA	white/cloudy	white/NA	milky white	milky/NA	clear/slight	NA	NA	NA	cloudy	cloudy/NA	clear	clear/NA	clear/odor	
Dissolved oxygen (mg/L)	NS	2.68	2.68	0.65	0.30	0.3	0.27	0.13	0.2	1.72	0.1	0.87	0.8	0.71	0.59		
ORP (mV)	NS	152.8	152.8	-127.3	-100.4	-211	-119.1	-43.0	-21.2	149.9	26.1	52.3	138.2	197.6	50.5		
pH	NS	5.17	5.17	10.03	9.85	9.91	6.86	6.63	6.25	5.21	6.22	5.82	7.95	5.47	5.57		
Specific Conductivity (uS/cm)	NS	0.165	0.165	0.418	0.488	65	597	467.3	251	0.292	0.389	0.352	377	369	317.5		
Temperature (Celsius)	NS	18.8	18.8	17.3	17.6	19.7	15.0	17.4	15.2	18.7	17.2	18.0	20.3	16.0	17.2		
Turbidity (NTU)	NS	13.81	13.81	63.74	>1100	388.3	>1100	32.00	55.10	11.56	178.4	150	16.22	7.73	0		

Notes:

-a - Indicates a field duplicate sample.

¹ - United States Environmental Protection Agency Maximum Contaminant Level (USEPA, March 2018).

² - 1998 Final Rule for Disinfectants and Disinfection By-Products: The total for trihalomethanes is 80 µg/L.

³ - Secondary MCL.

NS - No Standard

Bold font indicates the analyte was detected.

Bold outline indicates an exceedance of the USEPA MCL.

Data Qualifiers

Separates the laboratory added data qualifiers from the validation data qualifiers. The laboratory added data qualifiers precede the first "/". The result qualifiers follow the first "?", and the analysis qualifiers follow the second "?". The result qualifiers are a product of the data validation process, and the analysis qualifier defines the type of QC excursion.

Laboratory Data Qualifiers

C9 - Common laboratory contaminant

H - Out of holding time.

J - Estimated result less than the limit of quantitation and greater than or equal to the detection limit.

B - Detected in the method blank.

Result Data Qualifiers

None added.

Analysis Data Qualifiers

h - Holding time exceeded by less than two times.

Table 2-4
Sample Results- ISERD Pilot Study Wells
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL ¹	MW-101						ERD-OBSW-11				
		WH20094-004 08/20/21	WJ29086-001 10/29/21	XC08061-002 03/08/22	XG20043-003 07/19/22	XL19029-003 12/19/22	92706733017 01/03/24	WH20094-005 08/20/21	WJ29086-002 10/29/21	XC08061-001 03/08/22	XG20043-004 07/19/22	XL19029-004 12/19/22
Volatile Organic Compounds by USEPA Method 8260D (µg/L)												
1,1-Dichloroethene	7	< 5	< 0.5	< 2.5	1.4	1.3	< 1.4	< 5	< 0.5	2.5	1.7	0.93
1,2-Dichloroethane	5	< 5	0.95	< 2.5	1.1	1.1	< 1.3	< 5	0.61	< 2.5	0.94	0.7
1,4-Dichlorobenzene	75	< 5	< 0.5	< 2.5	< 0.5	< 0.5	< 1.3	< 5	< 0.5	< 2.5	< 0.5	< 0.5
2-Butanone (MEK)	NS	< 100	< 10	< 50	< 10	< 10	< 15.8	< 100	< 10	22 J//	< 10	< 10
2-Hexanone	NS	< 100	< 10	< 50	< 10	< 10	< 1.9	< 100	< 10	< 50	< 10	< 10
Acetone	NS	< 100	8.9 J//	< 50	< 10	< 10	< 20.4	< 100	7.3 J//	< 50	< 10	< 10
Benzene	5	< 5	< 0.5	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 2.5	< 0.5	0.42 J//
Chlorobenzene	100	< 5	< 0.5	< 2.5	< 0.5	< 0.5	< 1.1	4.9 J/	< 0.5	< 2.5	< 0.5	< 0.5
Chloroethane	NS	< 5	< 0.5	< 2.5	< 0.5	< 0.5	< 2.6	< 5	< 0.5	< 2.5	< 0.5	0.42 J//
Chloroform	80 ²	< 5	0.67	< 2.5	< 0.5	< 0.5	< 1.7	< 5	1.1	< 2.5	< 0.5	< 0.5
cis-1,2-Dichloroethene	70	< 5	1.8	690	570	550 H/h	164	< 5	1.6	53	420	340 H/h
Methyl acetate	NS	< 10	< 1	< 5	< 1	< 1	NA	< 10	2.2	3.7 J//	5.7	3.5
Methylene chloride	5	< 5	< 0.5	< 2.5	0.45 J//	< 0.5	< 7.8	< 5	2.3	< 2.5	0.49 J//	< 0.5
Styrene	100	< 5	< 0.5	< 2.5	< 0.5	< 0.5	< 1.2	< 5	< 0.5	< 2.5	0.57	< 0.5
Toluene	1000	< 5	< 0.5	< 2.5	< 0.5	< 0.5	< 1.9	< 5	< 0.5	< 2.5	< 0.5	0.45 J//
trans-1,2-Dichloroethene	100	< 5	< 0.5	< 2.5	< 0.5	< 0.5	< 1.6	< 5	< 0.5	< 2.5	3.1	1
Trichloroethene (TCE)	5	870	1100 E//	50	57	55	617	1000	520 E//	590	180	83
Vinyl chloride	2	< 5	< 0.5	< 2.5	0.49 J//	< 0.5	< 1.5	< 5	< 0.5	2.5	4.5	4.6
Xylenes (total)	10000	< 10	< 1	< 5	< 1	< 1	< 1.4	< 10	< 1	< 5	< 1	0.55 J//
Metals by USEPA Method 6010D (mg/L)												
Dissolved Iron	0.3 ³	< 0.1	0.79	11	12	12	0.141	< 0.1	0.7	< 0.1	0.049 J//	2.6
Dissolved Manganese	0.05 ³	NA	NA	1	NA	NA	NA	NA	NA	0.68	NA	NA
Iron	0.3 ³	< 0.1	6.4	12	15	12	2.03	0.48	1.2	5	11	14
Manganese	0.05 ³	NA	NA	0.98	NA	NA	NA	NA	NA	1.7	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)												
Alkalinity	NS	24	36	NA	39	41	NA	24	180	NA	320	280
Bicarbonate Alkalinity	NS	24	36	NA	NA	NA	NA	24	170	NA	NA	NA
Carbonate Alkalinity	NS	< 20	< 20	NA	NA	NA	NA	< 20	< 20	NA	NA	NA
Chloride, Sulfate, Nitrate, and Nitrite by USEPA Method 300.0/353.2 (mg/L)												
Chloride	250 ³	9.2	39	8.2	8.7	8.4	NA	8.1	9	10	8.6	7.9
Sulfate	250 ³	< 1	0.32 J	< 1	< 1	< 1	NA	< 1	< 5	< 1	< 1	< 1
Nitrate - N	10	1.1 B	< 0.02	< 0.02	0.07	0.078	NA	0.098 B	< 0.1	< 0.02 H//	0.21	0.59
Nitrite - N	1	< 0.02	< 0.02	< 0.02	0.025	< 0.02	NA	0.0098 J	< 0.1	< 0.02 H//	0.02	0.022
Dissolved Gases by USEPA Method RSK-175 (µg/L)												
Ethane	NS	< 10	< 10	< 10	< 10	< 10	< 5.9	< 10	< 10	5.7 J//	< 10	< 10
Ethene	NS	< 10	< 10	< 10	< 10	< 10	< 5.7	< 10	< 10	14	11	9.6 J//
Methane	NS	< 10	< 10	1400	1700	1500 B//	257	2.9 J	15	4500	8700	8300
TOC by USEPA Method SM 5310C-2011, -2014 (mg/L)												
Total Organic Carbon	NS	< 1	13	16	10 H//	3.7	< 0.5	< 1	460	140	96 H//	150
Microbial (cells/mL)												
Dehalococcoides	NS	3.2	1	<1.3	NA	< 0.7	NA	< 0.5	105	1	NA	< 7.7
Dehalobacter spp	NS	82.8	521	391	NA	1240	NA	130	11300	5920	NA	< 76.9
BAV1 Vinyl Chloride Reductase	NS	< 0.5	< 0.5	<1.3	NA	< 0.7	NA	< 0.5	< 31.3	<0.5	NA	< 7.7
tceA Reductase	NS	0.1 J	< 0.5	<1.3	NA	< 0.7	NA	< 0.5	< 31.3	<0.5	NA	< 7.7
Vinyl chloride Reductase	NS	0.1 J	< 0.5	<1.3	NA	< 0.7	NA	< 0.5	13.7 J	<0.5	NA	< 7.7
Field Parameters												
Color/Odor	NS	NA	slight white/cloudy	white/NA	clear	clear/NA	NA	NA	white/cloudy	white/NA	milky white	milky/NA
Dissolved oxygen (mg/L)	NS	2.5	0.21	0.14	0.48	0.25	0.87	1.73	0.12	0.12	0.25	0.08
ORP (mV)	NS	158.3	28.1	-70.9	-103	58.9	117.2	82.7	-191.4	579.7	-570.1	-118.8
pH	NS	5.35	5.66	6.08	6.16	6.06	5.68	5.41	9.76	9.56	8.95	7.50
Specific Conductivity (uS/cm)	NS	0.088	0.132	0.120	122	126	81	0.086	0.374	0.523	59	800
Temperature (Celsius)	NS	18.5	17.3	17.2	19.7	15.9	16	19.1	17.3	17.1	20.9	15.7
Turbidity (NTU)	NS	5.13	140.5	70.8	30.21	8.75	6.92	8.41	696	161	183.7	>1100

Notes:

-a - Indicates a field duplicate sample.

¹ - United States Environmental Protection Agency Maximum Contaminant Level (USEPA, March 2018).

² - 1998 Final Rule for Disinfectants and Disinfection By-Products: The total for trihalomethanes is 80 µg/L.

³ - Secondary MCL.

NS - No Standard

Bold font indicates the analyte was detected.

Bold outline indicates an exceedance of the USEPA MCL.

Data Qualifiers

Separates the laboratory added data qualifiers from the validation data qualifiers. The laboratory added data qualifiers precede the first "/". The result qualifiers follow the first "/", and the analysis qualifiers follow the second "/". The result qualifiers are a product of the data validation process, and the analysis qualifier defines the type of QC excursion.

Laboratory Data Qualifiers

C9 - Common laboratory contaminant

H - Out of holding time.

J - Estimated result less than the limit of quantitation and greater than or equal to the detection limit.

B - Detected in the method blank.

Result Data Qualifiers

None added.

Analysis Data Qualifiers

h - Holding time exceeded by less than two times.

Table 3-1 Permanent Monitoring Well Construction Details Shakespeare Composite Structures Site Newberry, South Carolina												
Well ID	Date of Installation	Location and Purpose	TD	Screen Interval (feet)	Diameter	Material	TOC Elevation (ft amsl)	Ground Elevation (ft amsl)	Depth to Bedrock (feet)	Top of Bedrock Elevation (ft amsl)	TD Elevation (ft amsl)	
Shallow Wells												
MW-1	4/10/2014	Former Shakespeare property. Permanent well installed at former location of TMW-8	14.2	4.2 - 14.2	2 inch	Sch 40 PVC	561.85	561.85	15	546.85	547.65	
MW-2	4/10/2014	Former Shakespeare property. Permanent well installed at former location of TMW-7	24.7	14.7-24.7	"	"	558.42	558.42	----	----	533.72	
MW-3	4/10/2014	Former Shakespeare facility property - southwest corner of plant property	26	14.7-24.7	"	"	549.00	549.00	----	----	523.00	
MW-4	4/11/2014	Former Shakespeare property. Permanent well installed at former location of TMW-3	26	15.2-25.2	"	"	560.13	560.13	----	----	534.13	
MW-5	4/14/2014	Former Shakespeare property. Permanent well installed at former location of TMW-11	26	15.8-25.8	"	"	557.74	557.74	----	----	531.74	
MW-6	4/14/2014	Former Shakespeare property. Permanent well installed at former location of TMW-5	26	15.7-25.7	"	"	561.32	561.32	----	----	535.32	
MW-7	4/15/2014	Former Shakespeare property. Permanent well installed at former location of TMW-16	26	14.8-24.8	"	"	554.72	554.72	----	----	528.72	
MW-8	4/15/2014	Former Shakespeare property. Permanent well installed at former location of TMW-13	26	15.5-25.5	"	"	558.27	558.27	----	----	532.27	
MW-9	4/16/2014	Former Shakespeare property. Permanent well installed at former location of TMW-17	26	15.8-25.8	"	"	556.36	556.36	----	----	530.36	
TMW-21	5/21/2014	Former Shakespeare property - west end of main building. Temporary well converted to permanent well.	23.5	13.5-23.5	1 inch	"	561.45	561.45	----	----	537.95	
TMW-22	5/21/2014	Former Shakespeare property - west end of main building. Temporary well converted to permanent well.	25	15-25	"	"	561.47	561.47	----	----	536.47	
TMW-23	5/27/2014	Former Shakespeare property - central portion of main building. Temporary well converted to permanent well.	25	15-25	"	"	561.48	561.48	----	----	536.48	
TMW-24	5/29/2014	Former Shakespeare property - west end of pole winder building. Temporary well converted to permanent well.	25	15-25	"	"	559.96	559.96	----	----	534.96	
TMW-25	5/29/2014	Former Shakespeare property - central portion of pole winder building. Temporary well converted to permanent well.	25	15-25	"	"	560.03	560.03	----	----	535.03	
TMW-29	6/3/2014	Former Shakespeare property - east central portion of main building. Temporary well converted to permanent well.	13	8-13	"	"	561.58	561.58	----	----	548.58	
TMW-30	6/3/2014	Former Shakespeare property - Inside south central portion of main building. Temporary well converted to permanent well.	25	15-25	"	"	561.50	561.50	----	----	536.50	
TMW-31	6/3/2014	Former Shakespeare property - Inside north portion of main building. Temporary well converted to permanent well.	21	11-21	"	"	561.52	561.52	----	----	540.52	
ISCO OSW-1	8/6/2021	Former Shakespeare property - outside north portion of main building.	20	10 - 20	2 inch	"	560.72	560.71	----	----	540.71	
TMW-32	6/4/2014	Former Shakespeare property - Inside northwest corner of pole winder building. Temporary well converted to permanent well.	25	15-25	"	"	551.59	551.59	----	----	526.59	
TMW-33	6/4/2014	Former Shakespeare property - Inside west central portion of pole winder building. Temporary well converted to permanent well.	25	15-25	"	"	531.58	531.58	----	----	506.58	
MW-10	8/4/2015	Dickert property - Former Location of TMW-42	30.32	20.3 - 30.3	2 inch	Sch 40 PVC	550.96	550.96	42	508.96	520.64	
ISERD OSW-1	8/5/2021	Dickert property - West of MW-10	30	20 - 30	"	"	560.72	560.71	----	----	530.71	
MW-11	"	Dickert property - Former Location of TMW-87	30.32	20.3 - 30.3	"	"	548.24	548.24	----	----	517.92	
MW-12	"	Dickert property - Former Location of TMW-73	31.37	20.37 - 30.37	"	"	537.03	537.31	----	----	505.94	
MW-13	"	Dickert property - Former Location of TMW-89	25.29	15.29 - 25.29	"	"	531.19	531.16	14	517.16	505.87	
MW-14	8/5/2015	Dickert property - Former Location of TMW-95	20.22	10.22 - 20.22	"	"	532.07	531.97	----	----	511.75	
MW-15	"	Dickert property - Former Location of TMW-98	11.63	1.63 - 11.63	"	"	536.41	536.32	----	----	524.69	
MW-16	"	Dickert property - Former Location of TMW-99	20.29	10.29 - 20.29	"	"	543.35	543.23	----	----	522.94	
MW-17	"	Dickert property - east of MW16	30.27	10.59 - 20.59	"	"	542.37	542.36	----	----	512.09	
MW-18	8/3/2015	Dickert property - Former Location of TMW 72	23.67	13.67 - 23.67	"	"	551.58	551.6	18	533.60	527.93	
MW-19	8/6/2015	Chapman property - Former Location of TMW-105	14.77	4.77 - 14.77	"	"	531.58	531.59	11	520.59	516.82	
MW-20	"	Boazman property - Former Location of TMW -38/102	35.3	25.3 - 35.3	"	"	541.92	541.86	----	----	506.56	
MW-21	8/7/2015	Ringer property - South of TMW-39	24.17	14.17 - 24.17	"	"	548.24	548.28	----	----	524.11	
MW-22	8/26/2015	Former Shakespeare property - South of entrance to main building	26.2	16.2 - 26.2	"	"	560.01	560.2	----	----	534.00	
MW-23	12/15/2015	Shealy property - Former Location of TMW-107	30	10-20	"	"	543.48	543.75	----	----	518.75	
MW-24	12/16/2015	Shealy property - Former Location of TMW-109	30	20 - 30	"	"	541.35	541.35	----	----	511.35	
MW-25	2/27/2016	Shealy property - Southwest of MW241 and MW23	30	20 - 30	"	"	535.60	535.5	30	505.50	505.5	
MW-26	3/26/2018	Dickert property - north of MW-13	24.5	14.5 - 24.5	1 inch	Sch 40 PVC	533.67	533.88	----	----	509.38	
MW-27	3/27/2018	Dickert property - north of MW-14	30	20 - 30	"	"	530.65	530.62	----	----	500.62	
MW-28	3/27/2018	Folk property - west-northwest of MW-12	23.5	13.5 - 23.5	"	"	532.43	532.23	----	----	508.73	
MW-29	3/27/2018	Folk property - northwest of MW-12	24	14 - 24	"	"	539.53	539.79	----	----	515.79	
MW-34	6/6/2023	Fomer Shakespeare property - Permanent well inside northeast portion of main building.	25	13-23	"	"	561.32	561.53	----	----	536.53	
MW-35	6/6/2023	Fomer Shakespeare property - Permanent well inside northeast portion of main building.	24	13-23	"	"	561.21	561.58	----	----	537.58	
MW-36	6/6/2023	Fomer Shakespeare property - Permanent well outside northeast portion of main building.	16	13-23	"	"	560.63	559.93	----	----	543.93	
MW-37	6/6/2023	Fomer Shakespeare property - Permanent well outside northeast portion of main building.	15.5	5-15	"	"	559.72	560.25	----	----	544.75	
MW-38	6/7/2023	Fomer Shakespeare property - Permanent well outside northeast portion of main building.	14	4-14	"	"	560.42	561.02	----	----	547.02	
Intermediate Wells												
MW-21	8/18/2015	Former Shakespeare property - west of MW-2	46.5	36.5 - 46.5	2 inch	"	559.97	560.19	50	510.19	513.69	
MW-31	8/11/2015	Former Shakespeare property - adjacent to MW-3	54.73	44.7 - 54.7	"	"	548.84	548.96	----	----	494.23	
MW-51	8/19/2015	Former Shakespeare property - east of MW-5	57	47 - 57	"	"	559.70	559.6	56	503.60	502.6	
MW-61	8/21/2015	Former Shakespeare property - adjacent to MW-6	50	40 - 50	"	"	560.28	560.19	----	----	510.19	
MW-71	8/20/2015	Fomrer Shakespeare property - adjacent to MW-7	47.1	37.1 - 47.1	"	"	560.07	555.3	----	----	508.2	
MW-91	8/21/2015	Former Shakespeare property - adjacent to MW-9	47.6	37.6 - 47.6	"	"	556.07	556.08	----	----	508.48	
MW-101	8/24/2015	Dickert property - northwest of MW-10	41	31 - 41	"	"	548.4	548.5	----	----	507.5	
ERD OBSW-11	8/5/2021	Dickert property - northwest of MW-101	36	26-36	2 inch	"	551.2	551.42	----	----	515.42	
MW-121	6/12/2017	Dickert property - south of MW-12	47	36.8 - 46.8	"	"	536.6	536.44	----	----	489.44	
MW-191	5/6/2017	Chapman property - east of MW-19	23	17.6 - 22.6	"	"	536.4	536.51	----	----	513.51	
MW-201	8/11/2015	Boazman property - adjacent to MW-20, former Location of TMW-36	53.11	43.1 - 53.1	"	"	541.25	541.51	----	----	488.4	
MW-211	8/10/2015	Ringer property - adjacent to MW-21	54.83	44.8 - 54.8	"	"	552.82	552.9	49	503.90	498.07	
MW241	2/18/2016	Shealy property - southwest of MW23	35	35 - 30	"	"	544.99	545.06	31	514.06	510.06	
Bedrock Wells												
MW-2D	8/8/2014	Fomer Shakespeare property - west of MW-21, north of main building in pole test area	84.9	78.5 - 84.8	4 inch	open hole	559.28	559.28	76	483.28	483.28	
MW-3D	8/6/2014	Former Shakespeare property - southwest corner of Shakespeare property, adjacent to MW-3	105.02	88.5 - 105	"	"	549.34	549.34	80	469.34	469.34	
MW-6D	8/7/2014	Former Shakespeare property - north of MW-6, between main building and pole winder building	105.08	99.6 - 105.2	"	"	559.91	559.91	95	464.91	464.91	
MW-7D	7/21/2014	Former Shakespeare property - northwest corner of Shakespeare property, adjacent to MW-7	94.87	88.5 - 94.8	"	"	555.25	555.25	84	471.25	471.25	
MW9D	4/14/2016	Former Shakespeare property - west end of facility, south of MW-9	155	154.06-144.6	"	"	552.91	533.04	91	442.04	442.04	
MW-12D	7/12/2017	Dickert property - south of MW-12	82	72 - 82	2 inch	Schedule 40 PVC	537.31	537.18	63	474.18	474.18	
MW-17D	7/14/2017	Dickert property - east of MW-17	50	40 - 50	"	"	552.77	552.7	38	514.7	514.70	
MW-18D	8/21/2015	Dickert property - between MW-10 and MW-18	64.7	54.7 - 64.7	2 inch	Schedule 40 P VC	550.10	550.26	43	507.26	507.26	
MW-19D	7/17/2017	Chapman property - west of MW-19	162.5	152 - 162	"	"	532.10	532.1	10	522.1	522.10	
RDW-1	8/6/2014	Ringer property - southwest side	84.25	73.3 - 95.4	4 inch	Open hole	537.69	537.69	74.1	463.59	463.59	
RDW-2	8/4/2014	Ringer Property - north west side	69.65	71.3 - 85	"	"	551.16	551.16	71	480.16	480.16	
SDW-1	11/19/2014	Shealy property - southwest of MW241/MW25	85.88	73.5 - 85.88	"	"	529.67	529.63	75	454.63	454.63	
SDW2	4/13/2016	Shealy property - west of MW241	88.7	83.7 - 88.7	2 inch	Schedule 40 P VC	527.77	527.76	40	487.76	487.76	
SDW-3	7/9/2017	Shealy property - southwest of MW-3 cluster	106	90 - 100	"	"	545.12	545.17	56	489.17	489.17	

Notes:
ft amsl - feet above mean sea level
PVC - polyvinyl chloride

Table 3-2
Groundwater Elevation Summary - 2017 to January 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Well ID	Top of Casing Elevation	6/28/2017		6/4/2018		2/1/2022		12/11/2023		1/2/2024	
		Depth to Water	Groundwater Elevation								
Shallow Wells											
MW-1	561.85	12.21	549.64	12.39	549.46	10.05	551.80				
MW-2	558.42	9.13	549.29	9.16	549.26	7.17	551.25				
MW-3	549.00	15.03	533.97	13.46	535.54	12.49	536.51				
MW-4	560.13	18.49	541.64	18.42	541.71	16.57	543.56				
MW-5	557.74	17.15	540.59	17.10	540.64	16.26	541.48	19.78	537.96		
MW-6	561.32	19.36	541.96	19.50	541.82	17.95	543.37				
MW-7	554.72	16.13	538.59	15.85	538.87	15.35	539.37				
MW-8	558.27	17.85	540.42	12.63	545.64	16.00	542.27	19.86	538.41		
MW-9	556.36	18.39	537.97	17.89	538.47	15.70	540.66	20.49	535.87		
MW-10	550.96	12.65	538.31	12.55	538.41	12.70	538.26				
MW-11	548.23	13.49	534.74	13.66	534.57	13.80	534.43				
MW-12	537.03	6.33	530.70	5.94	531.09	5.97	531.06	10.48	526.55		
MW-13	531.12	3.38	527.74	2.24	528.88	2.31	528.81				
MW-14	532.07	2.35	529.72	2.65	529.42	2.34	529.73	5.82	526.25		
MW-15	536.41	3.24	533.17	3.24	533.17	2.71	533.70				
MW-16	543.34	7.98	535.36	7.71	535.63	6.96	536.38	11.22	532.12		
MW-17	542.24	6.34	535.90	6.15	536.09	5.31	536.93				
MW-18	551.59	8.18	543.41	8.21	543.38	6.38	545.21				
MW-19	531.58	3.80	527.78	4.13	527.45	0.83	530.75				
MW-20	541.72	7.94	533.78	7.09	534.63	3.63	538.09				
MW-21	548.24	11.41	536.83	10.76	537.48	9.20	539.04				
MW-22	560.11	15.30	544.81	15.30	544.81	12.10	548.01				
TMW-21	561.45	20.61	540.84	20.20	541.25	18.40	543.05			21.77	539.7
TMW-22	561.47	19.11	542.36	19.24	542.23	17.49	543.98			20.69	540.8
TMW-23	561.48	16.10	545.38	18.29	543.19	16.55	544.93			19.70	541.8
TMW-24	559.96	19.19	540.77	19.45	540.51	18.49	541.47			21.78	538.2
TMW-25	560.03	21.60	538.43	17.65	542.38	16.58	543.45			14.63	545.4
TMW-29	561.58	Dry	---	Dry	---	11.60	549.98				
TMW-30	561.50	16.09	545.41	13.62	547.88	14.17	547.33				
TMW-31	561.52	13.43	548.09	16.15	545.37	11.64	549.88			14.47	547.0
TMW-32	559.93	20.05	539.88	NA	---	NA	---				
TMW-33	560.01	18.45	541.56	NA	---	17.71	542.30				
MW-23	543.48	20.47	523.01	19.91	523.57	11.70	531.78				
MW-24	541.35	15.14	526.21	14.09	527.26	17.55	523.80				
MW-25	535.60	15.71	519.89	15.20	520.40	12.95	522.65				
MW-26	533.67	NA		6.31	527.36	6.45	527.22				
MW-27	530.65	NA		4.35	526.30	3.83	526.82				
MW-28	532.43	NA		4.31	528.12	4.05	528.38				
MW-29	539.53	NA		9.19	530.34	8.99	530.54				

Table 3-2
Groundwater Elevation Summary - 2017 to January 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Well ID	Top of Casing Elevation	6/28/2017		6/4/2018		2/1/2022		12/11/2023		1/2/2024	
		Depth to Water	Groundwater Elevation								
Intermediate Wells											
MW-2I	559.97	13.69	546.28	12.82	547.15	10.50	549.47				
MW-3I	548.84	14.59	534.25	13.76	535.08	11.29	537.55				
MW-5I	559.70	16.70	543.00	18.42	541.28	16.64	543.06	20.38	539.32		
MW-6I	560.28	18.81	541.47	19.19	541.09	17.60	542.68	20.84	539.44		
MW-7I	560.07	16.35	543.72	16.14	543.93	15.60	544.47	19.62	540.45		
MW-9I	556.07	19.26	536.81	15.69	540.38	16.55	539.52	20.42	535.65		
MW-10I	548.4	11.14	537.26	11.16	537.24	12.30	536.10			14.70	533.7
MW-12I	536.6	4.16	532.47	8.96	527.67	4.18	532.45				
MW-19I	536.4	6.49	529.94	5.65	530.78	3.17	533.26				
MW-20I	541.25	7.90	533.35	7.60	533.65	3.93	537.32	10.18	531.07		
MW-21I	552.82	20.98	531.84	21.11	531.71	19.02	533.80				
MW-24I	544.99	16.98	528.01	15.92	529.07	14.40	530.59				
Bedrock Wells											
MW-2D	559.28	10.28	549.00	10.32	548.96	8.49	550.79				
MW-3D	549.34	15.20	534.14	13.83	535.51	11.41	537.93				
MW-6D	559.91	18.02	541.89	17.83	542.08	16.25	543.66	19.50	540.41		
MW-7D	555.25	16.20	539.05	16.08	539.17	15.62	539.63				
MW-9D	552.91					13.21	539.70				
MW-12D	537.31	6.05	531.26	5.16	532.15	5.12	532.19	9.90	527.41		
RDW-1	537.69	5.23	532.46	4.41	533.28	0.60	537.09				
RDW-2	551.16	19.19	531.97	19.72	531.44	17.15	534.01				
MW-17D	552.77	10.31	542.46	9.56	543.21	8.14	544.63				
MW-18D	550.10	8.61	541.49	11.16	538.94	6.55	543.55				
MW-19D	532.10	8.78	523.32	5.55	526.55	2.82	529.28				
SDW-1	529.646	22.15	507.496	21.61	508.04	20.08	509.57				
SDW-2	527.75	69.50	458.25	73.15	454.60	29.00	498.75				
SDW-3	545.12	17.88	527.24	10.65	534.47	7.89	537.23				

Dry - Groundwater was not measurable in well during this event.

NA - Well was not present at time of the measurement event.

Dec. 11, 2023 and Jan. 2, 2024: Only a subset of wells were measured for water level depth.

Table 3-3
Vertical Gradient Calculations - February 2022
Sitewide Groundwater Monitoring Event
Shakespeare Composite Structures
Newberry, South Carolina

Well ID	TOC Elevation	Depth to Top of Well Screen	Top of Well Screen Elevation	Screen Length (ft)	Screen Mid-point elevation	Depth to Groundwater	Groundwater Elevations	Vertical Gradient - Shallow - Intermediate zone
MW-2	558.42	14.7	543.72	10	538.72	7.17	551.25	0.09
MW-2I	559.97	36.5	523.47	10	518.47	10.5	549.47	
MW-3	549.00	14.7	534.30	10	529.30	12.49	536.51	-0.04
MW-3I	548.84	44.7	504.14	10	499.14	11.27	537.57	
MW-5	557.74	15.8	541.94	10	536.94	16.26	541.48	-0.05
MW-5I	559.70	47	512.70	10	507.70	16.64	543.06	
MW-6	561.32	15.7	545.62	10	540.62	17.95	543.37	0.03
MW-6I	560.28	40	520.28	10	515.28	17.6	542.68	
MW-7	554.72	14.8	539.92	10	534.92	15.35	539.37	-0.19
MW-7I	560.07	47.6	512.47	10	507.47	15.6	544.47	
MW-9	556.36	15.8	540.56	10	535.56	15.7	540.66	0.05
MW-9I	556.07	37.6	518.47	10	513.47	16.55	539.52	
MW-10	550.96	20.3	530.66	10	525.66	12.7	538.26	0.16
MW-10I	548.4	31	517.40	10	512.40	12.3	536.10	
MW-12	537.03	20.37	516.66	10	511.66	5.97	531.06	-0.08
MW-12I	536.6	36.8	499.83	10	494.83	4.18	532.45	
MW-19	531.58	4.77	526.81	10	521.81	0.83	530.75	-0.46
MW-19I	536.4	17.6	518.83	5	516.33	3.17	533.26	
MW-20	541.72	25.3	516.42	10	511.42	3.63	538.09	0.04
MW-20I	541.25	43.1	498.15	10	493.15	3.93	537.32	
MW-21	548.24	14.17	534.07	10	529.07	9.2	539.04	0.20
MW-21I	552.82	44.8	508.02	10	503.02	19.02	533.80	
MW-24	541.35	7.5	533.85	10	528.85	17.55	523.80	-0.28
MW-24I	544.99	35	509.99	10	504.99	14.4	530.59	

Average Vertical Gradient -0.044

Table 3-4
Surface Water Sample Results Summary Table
Remedial Investigation Report
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	SW-1		SW-2		SW-3		SW-4		SW-5	
		PH29019-001 08/29/14	QI17060-001 09/17/15	PH29019-002 08/29/14	QI17060-002 09/17/15	PH29019-003 08/29/14	QI17060-003 09/17/15	SF270320-001 06/28/17	SF270320-002 06/28/17		
Volatile Organic Compounds by USEPA Method 8260B (µg/L)											
1,1,1-Trichloroethane	200	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,1,2,2-Tetrachloroethane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,1,2-Trichloroethane	5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,1-Dichloroethane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,1-Dichloroethene	7	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,2,4-Trichlorobenzene	70	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,2-Dibromoethane (EDB)	0.05	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,2-Dichlorobenzene	600	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,2-Dichloroethane	5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,2-Dichloropropane	5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,3-Dichlorobenzene	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
1,4-Dichlorobenzene	75	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
2-Butanone (MEK)	NS	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10
2-Hexanone	NS	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10
4-Methyl-2-pentanone	NS	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10	< 10 //y	< 10
Acetone	NS	< 20 //y	3.7 J//	< 20 //y	2.6 J//	11 J//y	2.9 J//	< 10 //y	< 5	< 5	< 5
Benzene	5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Bromodichloromethane	80 ¹	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Bromoform	80 ¹	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Bromomethane (Methyl bromide)	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Carbon disulfide	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Carbon tetrachloride	5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Chlorobenzene	100	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Chloroethane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Chloroform	80 ¹	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Chloromethane (Methyl chloride)	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	0.24 J//	< 5 //y	< 5	< 5 //y	< 5
cis-1,2-Dichloroethene	70	0.51 J//y	0.52 J//	< 5 //y	6.3	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
cis-1,3-Dichloropropene	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Cyclohexane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Dibromochloromethane	80 ¹	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Dichlorodifluoromethane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Ethylbenzene	700	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Isopropylbenzene	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Methyl acetate	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Methyl tertiary butyl ether (MTBE)	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Methylcyclohexane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Methylene chloride	5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Styrene	100	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Tetrachloroethene	5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Toluene	1000	< 5 //y	< 5	< 5 //y	0.38 J//	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
trans-1,2-Dichloroethene	100	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
trans-1,3-Dichloropropene	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Trichloroethene	5	< 5 //y	< 5	< 5 //y	0.92 J//	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	0.93 J//
Trichlorofluoromethane	NS	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5
Vinyl chloride	2	< 2 //y	< 2	< 2 //y	< 2	< 2 //y	< 2	< 2 //y	< 2	< 2 //y	< 2
Xylenes (total)	10000	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5	< 5 //y	< 5

Notes:
 Bold font indicates the analyte was detected.

**Table 4-1
Areas, Media, COCs, and RAOs
Shakespeare Composite Structures, Newberry, South Carolina**

Area	Media	Chemicals of Concern (COCs)	Remedial Action Objective (RAO)
Area 1: Paint Room and Adjacent Area, Inside and Outside East End of Main Building	Groundwater in and Downgradient of the Foam Room/ Paint Room Area	TCE, with degradation products cis-1,2-DCE and VC, plus PCE	Control, reduce, or eliminate ingestion and direct contact by human receptors with VOCs in concentrations exceeding the groundwater PRG.
Areas 2A-2H: Area Outside of Main Building Near MW-6 and Inside West End of Main Building	Groundwater Outside Building in Area of MW-6, and Beneath Concrete Floor Inside Building	TCE, with degradation products cis-1,2-DCE and VC, plus PCE	Control, reduce, or eliminate ingestion and direct contact by human receptors with VOCs in concentrations exceeding the groundwater RG.
Area 3: Area Extending from Pole Winder Building Offsite onto the Dickert Property	Groundwater Outside and Downgradient of Pole Winder Building and Extending Off-Site and onto Dickert Property	TCE, with degradation products cis-1,2-DCE and VC, plus PCE	Control, reduce, or eliminate ingestion and direct contact by human receptors with VOCs in concentrations exceeding the groundwater PRG.
Area 4: Area to West and Just Outside of Main Building	Groundwater in Area to West of Main Building	TCE, with degradation products cis-1,2-DCE and VC, plus PCE	Control, reduce, or eliminate ingestion and direct contact by human receptors with VOCs in concentrations exceeding the groundwater PRG.
Area 5: Area to West of Main Building and Beyond the Smaller Building	Groundwater in Area to West of Smaller Building and Adjacent to the Property Line	TCE, with degradation products cis-1,2-DCE and VC, plus PCE	Control, reduce, or eliminate ingestion and direct contact by human receptors with VOCs in concentrations exceeding the groundwater PRG.
Area 1 and Areas 2A through 2H	Soil in Areas Under East End of Main Building (Area 1) and West End of Main Building (Areas 2A-2H)	TCE	Control, reduce, or eliminate leaching to groundwater at soil concentrations greater than the MCL-based SSL.
Area 1 and in Vicinity of Areas 2A through 2H	Soil (Subslab) Vapor in Areas Under East End of Main Building (Area 1) and West End of Main Building (Areas 2A-2H)	TCE, cis-1,2-DCE	Control, reduce, or eliminate inhalation of VOCs by human receptors at concentrations exceeding the residential air RSL.

Abbreviations

PRG - Preliminary Remediation Goal
RSL - Risk Screening Level
SSL - Soil Screening Level
DCE - Dichloroethene
TCE- Trichloroethene

Table 4-2
Evaluation of Potential Chemical-Specific ARARs
Shakespeare Composite Structures, Newberry, South Carolina

Media	Potential ARAR or TBC	Reference	COC ^A	ARARs Groundwater MCL	SSLs MCL-based mg/kg	USEPA Soil Regional Screening Level Carcinogenic Risk Level = 10 ⁻⁶		USEPA Soil Regional Screening Level Hazard Quotient = 1		USEPA Air Regional Screening Level		Evaluation	
						Residential RSL	Industrial RSL	Residential RSL	Industrial RSL	Residential RSL	Industrial RSL		
						mg/kg	mg/kg	mg/kg	mg/kg	ug/m3	ug/m3		
Groundwater	South Carolina Primary Drinking Water Regulations	SC Code of Regulations 61-58	cis-1,2-Dichloroethene	70	—	—	—	—	—	—	—	ARAR	
			Tetrachloroethene	5	—	—	—	—	—	—	—		
			Trichloroethene	5	—	—	—	—	—	—	—		
			Vinyl Chloride	2	—	—	—	—	—	—	—		
	National Primary Drinking Water Standards	40 CFR Part 141	cis-1,2-Dichloroethene	70	—	—	—	—	—	—	—	—	ARAR
			Tetrachloroethene	5	—	—	—	—	—	—	—		
			Trichloroethene	5	—	—	—	—	—	—	—		
			Vinyl Chloride	2	—	—	—	—	—	—	—		
Surface Water	South Carolina (SC) Water Classification Standards	SC Code of Regulations SCCR R.61-68 (uses Federal MCLs)	cis-1,2-Dichloroethene	70	—	—	—	—	—	—	—	ARAR	
			Tetrachloroethene	5	—	—	—	—	—	—	—		
			Trichloroethene	5	—	—	—	—	—	—	—		
			Vinyl Chloride	2	—	—	—	—	—	—	—		
Waste Mgmt	SC Hazardous Waste Mgmt Regulations	SCCR R.61.79.261	Testing and disposal of investigation and well installation waste to evaluate if RCRA hazardous									ARAR	
		SCCR R.61.79.268	Land disposal of any wastes determined to be RCRA hazardous									ARAR	

— Not applicable for this chemical or medium.
ARAR - Applicable or Relevant and Appropriate
COC - chemical of concern
MCL - maximum contaminant level
RCRA - Resource Conservation and Recovery Act
USEPA - United States Environmental Protection Agency
^A Final Site COCs are identified in Section 3.4.4.1 of the FS.

**Table 4-3
Evaluation of Potential Location-Specific ARARs
Shakespeare Composite Structures, Newberry, South Carolina**

Site Feature/Location	Citation	Requirement Synopsis	Consideration in this FS
Federal			
Within area where action may cause irreparable harm, loss or destruction of significant artifacts	National Historical Preservation Act (16 USC Section 469)); 36 CFR Part 65	Required that action be taken to recover and preserve artifacts when alteration of terrain threatens significant scientific, prehistorical, historical, or archaeological data.	Not an ARAR since Site is not a designated archaeological area.
Critical habitat upon which endangered species or threatened species depends	Endangered Species Act of 1973 (16 USC 1531 <u>et seq.</u>); 50 CFR Part 200, 50 CFR Part 402; Fish and Wildlife Coordination Act (16 USC 661 <u>et seq.</u>); 33 CFR Parts 320-330	If endangered or threatened species are present, action must be taken to conserve endangered or threatened species, including consultation with the Department of Interior.	Not an ARAR since Site does not have endangered or threatened species.
Within flood plain	Protection of floodplains (40 CFR 6, Appendix A); Fish and Wildlife Coordination Act (16 USC 661 <u>et seq.</u>); 40 CFR 6.302; Flood plains Executive Order (EO 11988)	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values; applies to action that will occur in a flood plain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood prone areas.	Not an ARAR since Site is not in a 100-year flood plain.
Wetlands	Clean Water Action Section 404; 40 CFR Part 230, 33 CFR Parts 320-330	For wetlands as defined by U.S. Army Corps of Engineers regulations, must take action to prohibit discharge of dredged or fill material into wetlands without permit.	No wetlands have been identified on the Site, so not an ARAR.

Table 4-3
Evaluation of Potential Location-Specific ARARS
Shakespeare Composite Structures, Newberry, South Carolina

Site Feature/Location	Citation	Requirement Synopsis	Consideration in this FS
Wetlands	40 CFR Part 6, Appendix A	For action involving construction of facilities or management of property in wetlands (as defined by 40 CFR Part 6, Appendix A, section 4(j)), action must be taken to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible.	No wetlands have been identified on the Site, so not an ARAR.
Wilderness area	Wilderness Act (16 USC 1131 <u>et seq.</u>); 50 CFR 35.1 <u>et seq.</u>	For Federally-owned area designated as wilderness area, the area must be administered in such manner as will leave it unimpaired as wilderness and to preserve its wilderness.	Not an ARAR since Site is not in a wilderness area.
State			
Within 100-year flood plain	S.C. R.61-264.18 (b)	Facility located within a 100-year flood plain must be designed, constructed, and maintained to permit washout of any waste materials.	Not an ARAR since Site is not in a 100-year flood plain.
Wetlands	S.C. Pollution Control Act	Facility must not be located in a wetland.	No wetlands have been identified on the Site, so not an ARAR.

ARAR – Applicable or Reasonable and Appropriate
CFR – Code of Federal Regulations
S.C. – South Carolina
USC – United States Code

Table 4-4
Evaluation of Potential Action-Specific ARARs
Shakespeare Composite Structures, Newberry, South Carolina

Criteria	Citation	Description of Criteria	Evaluation for this Site	Requirements and/or Applicability
Federal (Some Delegated to State of South Carolina)				
CERCLA Off-site Rule	40 CFR 300.440	Provides the requirements for off-site waste disposal options (i.e. landfills). The Off-Site Rule requires that wastes generated during a CERCLA action be disposed of off-site only at a facility that EPA has determined “acceptable” to receive CERCLA wastes. The Off-Site Rule generally requires that a facility used for the offsite management of CERCLA wastes must be in physical compliance with the Resource Conservation and Recovery Act and other applicable federal and state laws.	ARAR	Wastes generated during a soil removal action, if any, will only be transported to an EPA-approved disposal facility authorized to accept such wastes. Potential receiving facilities include RCRA Subtitle C and D landfills, incinerators, or other approved TSDs.
Clean Water Act: National Pollutant Discharge Elimination System	40 CFR 122.26, 122.44 and 125	Regulates the discharge of pollutants to surface water bodies and identifies the requirements for construction site operators to implement appropriate erosion and sediment control best management practices.	Not a true ARAR for this Site	Under CERCLA, removal/remedial actions are exempt from administrative requirements such as permitting and notifications (42 USC 9621). However, erosion and sediment control best management practices would be employed during implementation of any soil removal/remedial action.
Federal Hazardous Material Transportation Law U.S. Department of Transportation Rules for the Transportation of Hazardous Materials	49 U.S.C. 51 et seq. 49 CFR 107, 171, 176, and 180	Provides the requirements for the classifying, packaging, labeling, manifesting, segregating, handling, and transporting of hazardous materials.	ARAR	Wastes generated during a removal action, if any, would be appropriately managed from the time of collection to disposal. Transportation of hazardous waste on the highway system, rail system, by water, or by air would abide by this regulation.

Table 4-4
Evaluation of Potential Action-Specific ARARs
Shakespeare Composite Structures, Newberry, South Carolina

Criteria	Citation	Description of Criteria	Evaluation for this Site	Requirements and/or Applicability
National Oil and Hazardous Substances Pollution Contingency Plan	40 CFR 300.415	Provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.	Not an ARAR	<p>Identifies circumstances that mandate a removal/remedial action. The following circumstances initiated the need for a removal/remedial action at the area under the building.</p> <ul style="list-style-type: none"> • Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants • High levels of hazardous substances, pollutants, or contaminants in soils largely at or near the surface that may migrate • Weather conditions that may cause hazardous substances, pollutants, or contaminants to migrate or be released <p>A removal/remedial action would be implemented to reduce the potential for occurrence of such circumstances. None of these conditions are known to exist to date at this site.</p>
RCRA: Identification and Listing of Hazardous Waste and Standards Applicable to Generators of Hazardous Waste	40 CFR Part 261 and 40 CFR 262.11 (SCHW MR R.61-79.261 and 262.11)	Identifies the list and characteristics of solid wastes which are subject to regulation as hazardous wastes.	ARAR	<p>All waste handling and disposal will be conducted in accordance with RCRA requirements. Under RCRA, wastes are deemed hazardous if the waste is a listed hazardous waste or has characteristics of a hazardous waste. Remediation wastes at this site are not known to be listed hazardous wastes and do not possess characteristics of corrosivity, and/or reactivity; however, wastes potentially could possess the characteristics of ignitability or toxicity. Chemicals, toxicity characteristic leaching procedure (TCLP) regulatory levels, environmental sampling data, and waste characterization data will be evaluated to determine if remediation wastes, if any, are hazardous by toxicity.</p>

**Table 4-4
Evaluation of Potential Action-Specific ARARs
Shakespeare Composite Structures, Newberry, South Carolina**

Criteria	Citation	Description of Criteria	Evaluation for this Site	Requirements and/or Applicability																	
RCRA: Land Disposal Restrictions	40 CFR 268 (SCHW MR R.61-79.268)	Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed, establishes minimum treatment standards that have to be achieved prior to land disposal, and defines limited circumstances under which an otherwise restricted waste may be disposed of in land disposal units.	ARAR	<p>If hazardous groundwater or soil waste is to be treated for land disposal, treatment standards for major VOC species are as follows:</p> <table border="1"> <thead> <tr> <th rowspan="2">Regulated Hazardous Constituent</th> <th colspan="2">Treatment Standard</th> </tr> <tr> <th>Wastewater Concentration mg/L</th> <th>Non-Wastewater Concentration mg/kg</th> </tr> </thead> <tbody> <tr> <td>cis-1,2-DCE</td> <td>1.4</td> <td>5 mg/L TCLP</td> </tr> <tr> <td>Tetrachloroethene</td> <td>1.2</td> <td>21 mg/L TCLP</td> </tr> <tr> <td>Trichloroethene</td> <td>0.69</td> <td>0.11 mg/L TCLP</td> </tr> <tr> <td>Vinyl Chloride</td> <td>2.77</td> <td>0.6 mg/L TCLP</td> </tr> </tbody> </table>	Regulated Hazardous Constituent	Treatment Standard		Wastewater Concentration mg/L	Non-Wastewater Concentration mg/kg	cis-1,2-DCE	1.4	5 mg/L TCLP	Tetrachloroethene	1.2	21 mg/L TCLP	Trichloroethene	0.69	0.11 mg/L TCLP	Vinyl Chloride	2.77	0.6 mg/L TCLP
Regulated Hazardous Constituent	Treatment Standard																				
	Wastewater Concentration mg/L	Non-Wastewater Concentration mg/kg																			
cis-1,2-DCE	1.4	5 mg/L TCLP																			
Tetrachloroethene	1.2	21 mg/L TCLP																			
Trichloroethene	0.69	0.11 mg/L TCLP																			
Vinyl Chloride	2.77	0.6 mg/L TCLP																			
South Carolina																					
South Carolina Pollution Control Act		Improve water quality through the implementation of management techniques for controlling storm water runoff.	Not a true ARAR for this Site	Under CERCLA, removal/remedial actions are exempt from administrative requirements such as permitting and notifications (42 USC 9621). However, erosion and sediment control best management practices will be employed during implementation of the removal/remedial action.																	

ACGIH - American Conference of Governmental Industrial Hygienists
HAZWOPER - hazardous waste operations and emergency response
PEL - permissible exposure limit
TLV - threshold limit value

**Table 4-5
Evaluation of Potential TBCs
Shakespeare Composite Structures, Newberry, South Carolina**

Media	Potential ARAR or TBC	Reference	COC ^A	ARARs	SSLs	Soil Regional Screening Level		Soil Regional Screening Level		Air Regional Screening Level		Evaluation
				Groundwater MCL	MCL-based	Carcinogenic Risk Level = 10 ⁻⁶		Hazard Quotient = 1				
						Residential RSL	Industrial RSL	Residential RSL	Industrial RSL	Residential RSL	Industrial RSL	
Units	μg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/m3	ug/m3			
On-Site Soil	USEPA Regional Screening Levels (RSLs)	USEPA, November 2023	Trichloroethene	—	—	0.94	6	—	—	—	—	TBC
	USEPA Soil Screening Levels (SSLs)	USEPA, November 2023	Trichloroethene	—	0.0018	—	—	—	—	—	—	TBC
Surface Water	SC Water Classification Standards	SCCR R.61-68 (Fresh water aquatic life)	cis-1,2-Dichloroethene	No Standard	—	—	—	—	—	—	—	TBC
			Tetrachloroethene	No Standard	—	—	—	—	—	—	—	
			Trichloroethene	No Standard	—	—	—	—	—	—	—	
			Vinyl Chloride	No Standard	—	—	—	—	—	—	—	

Notes:

— Not applicable for this chemical or medium.

COC - chemical of concern

MCL - maximum contaminant level

TBC - to be considered

^A Final Site COCs are identified in Section 3.3.4.1 of the FS.

**Table 4-6
COCs, PRGs, and Potential GRAs by Media
Shakespeare Composite Structures, Newberry, South Carolina**

Medium	COC	PRG*	Units	Remedial Evaluation Areas	Potential General Response Action (GRA) for Remedial Evaluation					
					No Action	Monitored Natural Attenuation/ Institutional Controls	In Situ Containment	In Situ Treatment Inside Area of Impact	In Situ Containment/ Treatment Downgradient of Area of Impact	Ex Situ Extraction, Treatment, and Discharge/ Disposal
Groundwater	TCE	5	µg/L	Shallow Zone Inside Building: Assume approx. 60' by 50' treatment area. Shallow Zone Outside Building: Assume 50' by 30' treatment area.	X	X	X	X	X	X
Groundwater	cis-1,2-DCE	70	µg/L	Shallow Zone Outside Building: Assume 20' by 20' in the vicinity of MW-6; install 7 rows of DPT injections through floor of west end of main building, 7 to 13 DPT points per row planned.	X	X	X	X	X	X
Groundwater	VC	2	µg/L	Shallow Zone Inside Fence: Assume 100' long treatment area upgradient of MW-5. Shallow Zone Outside Fence on Dickert Property: Assume 110' long treatment area upgradient of MW-10.	X	X	X	X	X	X
Groundwater	PCE	5	µg/L	Shallow Zone Outside Building and Upgradient of MW-8: Assume 210' long treatment area.	X	X	X	X	X	X
Soil (MCL based)	TCE	1.8	µg/kg	Shallow Zone Between Small Building and Well MW-9: Assume 40' long treatment area. Intermediate Zone: Assume 210' long upgradient of MW-9I.	X	X	X	X	X	X
Subslab Vapor	TCE	3	µg/m3	Same areas beneath Main Building as for groundwater	X	X	X	X		X
Subslab Vapor	cis-1,2-DCE	180	µg/m3	Same areas beneath Main Building as for groundwater	X	X	X	X		X

* USEPA maximum contaminant levels (MCLs) for groundwater, MCL-based SSL for soil, and air RSL for soil vapor are used as preliminary remediation goals (PRGs) at this time, pending SCDHEC development of a risk-based closure process.

** "X" denotes that one or more technologies/process options for this GRA will be considered as part of the FS process.

DCE - Dichloroethene

TCE - Trichloroethene

VC - Vinyl Chloride

**TABLE 5-1
SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS
SHAKESPEARE COMPOSITE STRUCTURES
NEWBERRY, SOUTH CAROLINA**

General Response Action	Remedial Technology or Process Option	Technology or Process Option Description	Technology or Process Option Evaluation	Retain Technology and Develop Alternative?
No Action	No Action	No active treatment, no monitoring, no LUCs, and no periodic evaluations.	Implementable for the Site, but not effective for the Site. No cost (\$0).	Retain (for comparison with other technologies/process options)
Land Use Controls	Institutional Actions and Controls	Add deed restrictions, to prohibit groundwater extraction and use; prohibit soil excavation from under the Main Building and Pole Winder Building; maintain concrete floors inside buildings; and/or limit property use to commercial and/or industrial.	Implementable for the site; could be effective with other technologies but not by itself. Could meet the groundwater RAOs in conjunction with another technology or process option.	Retain
Natural Attenuation	Monitored Natural Attenuation	Continue to monitor groundwater on site and off site to confirm that constituent concentrations are not increasing. Depend on natural attenuation processes such as biodegradation, dispersion, dilution, and attenuation to continue to reduce VOC concentrations in groundwater.	This is implementable and could be effective to meet the remedial action objectives in conjunction with another technology or process option. Field and laboratory testing of groundwater to date has indicated that biodegradation of VOCs without enhancement is likely limited.	Retain
In-Situ Treatment Inside Area of Impact	Targeted In Situ Chemical Oxidation	A chemical oxidant such as sodium permanganate, sodium persulfate, or potassium persulfate would be injected (targeted locations) at groundwater plume hot spot areas using a geoprobe rig for the shallow groundwater zone. Rotosonic drilling is required for intermediate zone groundwater treatment. The saprolite is composed of relatively tight soils, so the injections would need to be conducted on close centers for adequate contact. Multiple injections might be necessary.	This is implementable with a geoprobe rig and rotosonic rig although the June 2023 field assessment indicated a number of geoprobe refusal locations inside and outside the paint room on east side of Main Building. Bench-scale laboratory testing conducted in 2019, and pilot scale testing in the field in 2021 and 2022, indicated that this technology could be effective for impacted site groundwater.	Retain
	Targeted In Situ Anaerobic Bioremediation	An organic substrate (e.g., lactate, EVO, molasses) would be injected into the shallow zone groundwater hot spot areas using a geoprobe rig. Rotosonic drilling is required for intermediate groundwater zone treatment. The saprolite is composed of relatively tight soils, so the injections would need to be conducted on close centers for adequate contact. Multiple injections might be necessary.	This is implementable with a geoprobe rig and rotosonic rig although June 2023 field assessment indicated a number of geoprobe refusal locations inside and outside the paint room on east side of Main Building. This technology would be effective for impacted groundwater as demonstrated by the 2019 bench-scale test results and the 2021-2022 field pilot test results.	Retain
	Targeted In Situ Chemical Reduction	A chemical reductant such as ZVI would be injected (targeted locations) into shallow groundwater zone hot spot areas, using a geoprobe rig. Rotosonic drilling is required for deeper groundwater treatment. The saprolite is composed of tight soils, so the injections would have to be made on close centers. Multiple injections might be necessary because micro-scale ZVI does not migrate with groundwater.	This is implementable with a geoprobe rig and rotosonic rig although June 2023 field assessment indicated a number of geoprobe refusal locations inside and outside the paint room on east side of Main Building. This technology would be effective for impacted groundwater as demonstrated by the 2019 bench-scale test results and the 2021-2022 field pilot test results.	Retain
	Targeted In Situ Adsorption	Activated carbon in the form of CAC or PAC would be injected (targeted locations) into shallow groundwater zone plume hot spot areas using a geoprobe rig. Rotosonic drilling is required for intermediate groundwater zone treatment. CAC or PAC would be injected to provide a media to adsorb the targeted COCs while concurrently providing a matrix onto which intrinsic microorganisms could attach to while reductively dechlorinating the targeted VOCs.	This is implementable with a geoprobe rig and a rotosonic rig. This technology should be combined with chemical reduction and/or in situ anaerobic bioremediation to increase effectiveness.	Retain
	Targeted AS/SVE	Groundwater sparging points and vapor extraction points would be installed in the hot spot areas of the plume. Groundwater would be extracted and then processed through an air stripping unit or other type of treatment system. Extracted vapors would be vented to the atmosphere or first run through a granular activated carbon polishing unit before discharge if necessary. Treated groundwater would be discharged to the local POTW.	This is somewhat implementable, because there is a POTW discharge line on the other side of the property for extracted groundwater. However, because this is an active manufacturing facility, an active system of continually injecting air and removing groundwater and vapors is not implementable in the active work areas of the Facility. Also, the June 2023 field assessment indicated a number of geoprobe refusal locations inside and outside the paint room. Effectiveness is not proven because no pilot test was conducted. Costs for installation air sparge points and vapor extraction point in concrete floor are considered to be high, with the temporary shutdown of the manufacturing operations also being a high cost to the Facility.	Reject (not implementable and not cost effective)
	Targeted In Situ Thermal Treatment	Electrical resistance heating or thermal conductance heating electrodes and vapor extraction points would be installed within the targeted groundwater plume, and VOCs would be driven off by steam and/or combusted by heat. Vapors would need to be treated with granular activated carbon before discharge to the atmosphere.	Because this is an active manufacturing facility, an active system of continual heating through electrodes installed through the surface and the associated thermal treatment infrastructure is not implementable in the active work areas of the Facility. Also, this is not a cost effective technology for the relatively small areas of impact to be treated.	Reject (not implementable and not cost effective)

**TABLE 5-1
SCREENING OF GROUNDWATER REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS
SHAKESPEARE COMPOSITE STRUCTURES
NEWBERRY, SOUTH CAROLINA**

In Situ Containment/ Treatment Downgradient of Area of Impact	Flow Through Barrier Wall Injections	Flow through barrier wall injections of combined ZVI and CAC would be installed outside of Facility buildings to promote VOC degradation at downgradient portions of the groundwater plume.	The 2019 bench-scale treatability study demonstrated the effectiveness of ZVI by itself and when combined with an organic carbon substrate. A combination of ZVI and organic carbon substrate was tested in the field during the 2021-2022 pilot study. The low pH of the targeted groundwater at the site required buffering during the pilot study to promote effective reductive dechlorination. Buffering of site groundwater to within the optimal range for reductive dechlorination proved to be difficult implement.	Retain
	Permeable Reactive Barrier Wall	PRBs would be installed along the western and northwestern Facility property line into the saturated groundwater zone with ZVI or other barrier medium that would promote groundwater flow through the barrier to promote VOC degradation. Depth to groundwater is 15-25 feet deep on site. Depth of contamination is as deep as approximately 60 feet along the Facility boundary.	This technology is not implementable because groundwater impact is so deep that the PRBs may not be able to be installed to the necessary depth to treat groundwater impact in the intermediate zone. Bedrock outcrops and shallow bedrock depths in portions of the site may impact installation. This technology would also be very costly because at least two PRBs would have to be installed along the western and northwestern property boundaries.	Reject (not implementable and not cost effective)
Ex Situ Extraction, Treatment, and Discharge	Groundwater extraction, air stripping, and discharge to POTW	Groundwater extraction wells would be installed in the targeted treatment area, and groundwater would be pumped to an onsite air stripping unit for treatment. Treated groundwater with VOCs removed would be discharged to the local POTW.	This process option would only be somewhat effective for treatment of the relatively low concentrations of VOCs in groundwater (i.e., less than 1 mg/L), mainly because of tailing and rebound that occurs at lower VOC concentrations. As such, this process option would likely never attain the PRGs. This technology is not implementable in some site areas due to the bedrock outcrops, shallow bedrock, and tight saprolite areas. Having an extraction system that needs to be maintained for an unknown number of years in active manufacturing areas would be difficult to implement. O&M costs will be moderate to high depending on how long the system is operated.	Reject (not implementable)
	Groundwater extraction, on-site biological treatment, and discharge to POTW	Groundwater extraction wells would be installed in the targeted treatment areas, and groundwater would be pumped to an on-site holding tank. An onsite biological treatment system would be installed for biological treatment, followed by clarification. Treated groundwater with VOCs removed would be discharged to the local POTW.	This is not a proven technology for chlorinated VOCs at this site. Bench-scale and pilot scale testing would need to be conducted. This technology is not implementable in some site areas due to the bedrock outcrops, shallow bedrock, and tight saprolite areas. Having an extraction system that needs to be maintained for an unknown number of years in active manufacturing areas would be difficult to implement. O&M costs will be moderate to high depending on how long the system is operated. A biological system would take up much more land area than an air stripping unit.	Reject (not implementable)

Abbreviations

- AS - air sparging
- CAC - colloidal activated carbon
- COC - chemical of concern
- LUC - land use control
- mg/L - milligrams per liter
- O&M - operation and maintenance
- PAC - powdered activated carbon
- POTW - publicly owned treatment works
- PRB - permeable reactive barrier
- PRG - preliminary remediation goal
- RAO - remedial action objective
- SVE - soil vapor extraction
- VOC - volatile organic compound
- ZVI - zero valent iron

**TABLE 5-2
SCREENING OF SOIL AND SUBSLAB VAPOR REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS
SHAKESPEARE COMPOSITE STRUCTURES
NEWBERRY, SOUTH CAROLINA**

General Response Action	Remedial Technology or Process Option	Technology or Process Option Description for the Newberry Site	Technology or Process Option Evaluation for the Newberry Site	Retain Technology and Develop Alternative?
No Action	No Action	No active treatment, no monitoring, no land use controls, and no periodic evaluations.	Implementable for the Site, but not effective for the Site. No cost (\$0).	Retain (for comparison with other technologies/process options)
Land Use Controls	Institutional Actions and Controls	Implement deed restrictions, to prohibit soil excavation from under the Main Building and Pole Winder Building and to prohibit exposure to SSV; maintain concrete floors inside buildings; and/or limit property use to commercial and/or industrial.	Implementable for the Site; could be effective with other technologies but not by itself. Could meet the remedial action objectives in conjunction with another technology or process option.	Retain
Natural Attenuation	Monitored Natural Attenuation	Continue to monitor groundwater on site and off site to confirm that groundwater constituent concentrations are not increasing and that no additional soil source area is present. Depend on natural attenuation processes such as biodegradation, dispersion, dilution, and attenuation to continue to reduce VOC concentrations in soil to the degree possible. Could use groundwater monitoring results to periodically use in Johnson & Ettinger Model to determine theoretical indoor air concentrations.	This is implementable and could be effective to meet the RAOs in conjunction with another technology or process option. Field and laboratory testing of groundwater to date has indicated that biodegradation of VOCs without enhancement is likely limited, so natural reduction of soil VOC concentration will also likely be minimal.	Retain
In-Situ Containment or Treatment Inside Area of Impact	Containment via Cover	A containment remedy would utilize the physical barrier/cover of the existing concrete floors and building roofs to either prevent direct exposure to impacted soil and SSV or to prevent or minimize migration of the contaminants from soil and SSV into the environment.	This is an effective remedy and is implementable since the concrete floor and buildings are already present. Costs would be low, primarily having to do with maintenance of the floors and building roofs.	Retain
	Soil Vapor Extraction	SVE would be a component of an AS/SVE system. AS employs the injection of air under pressure into the targeted groundwater through vertical or horizontal wells installed in the saturated zone. This is combined with the soil vapor extraction (SVE) of air from vertical or horizontal extraction wells installed in the vadose zone. Vertical injection points would be installed via DPT or rotasonic drilling. The treatment system would include an air compressor, manifold header, electrically-actuated solenoid valves, and a master control panel. Extracted vapors may have to be treated with activated carbon prior to discharge.	This technology is effective, but it is not implementable because operations would have to be shut down for several weeks to months for system installation. The system could not be operated easily due to ongoing manufacturing. Costs for installation air sparge points and vapor extraction point in concrete floor are considered to be high, with the temporary shutdown of the manufacturing operations also being a high cost to the Facility.	Reject (not implementable and not cost effective)
	In Situ Thermal Treatment	Electrical resistance heating or thermal conductance heating electrodes and vapor extraction points would be installed within the targeted groundwater plume, and VOCs would be driven off by steam and/or combusted by heat. Vapors would need to be treated with granular activated carbon before discharge to the atmosphere.	Because this is an active manufacturing facility, an active system of continual heating through electrodes installed through the surface and the associated thermal treatment infrastructure is not implementable in the active work areas of the Facility. Also, this is not a cost effective technology for the relatively small areas of impact to be treated.	Reject (not implementable and not cost effective)
	Subslab Passive Ventilation	A subslab passive ventilation system consists of perforated pipes installed below the building concrete slab that connect to a wind-driven turbine(s) to create a negative pressure under the slab. The negative pressure allows for SSV to enter the perforated pipes and to subsequently exhaust into the atmosphere at a safe emission point(s).	Subslab ventilation is effective, especially when paired with a vapor barrier. The buildings must be razed to below the slab to install the system, or the floors of the buildings with SSV impact would have to be trenched and drilled through, causing disruption to Facility operations. As such, this technology is not implementable. The capital cost for installation of a subslab passive ventilation system is high for an existing building.	Reject (not implementable and not cost effective)
	Subslab Depressurization	A subslab depressurization system uses active forced air to remove harmful soil vapors. A blower creates a negative subslab pressure by removing air beneath the foundation. This induces soil vapor flow into subslab conveyance piping with discharge from the blower to a safe emission point(s). Horizontal wells could be used as soil vapor conveyance piping to draw gases away from the building slab. Exhausted air may require treatment by granular activated carbon prior to discharge.	This technology is effective in removing subslab vapors from the soil beneath the building, as long as the horizontal wells are spaced close enough to achieve an acceptable ROI. The buildings must be razed to below the slab to install the system, or the floors of the buildings with SSV impact would have to be trenched and drilled through, causing disruption to Facility operations. As such, this technology is not implementable. The capital cost for installation of a subslab ventilation system is high for an existing building.	Reject (not implementable and not cost effective)

**TABLE 5-2
SCREENING OF SOIL AND SUBSLAB VAPOR REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS
SHAKESPEARE COMPOSITE STRUCTURES
NEWBERRY, SOUTH CAROLINA**

General Response Action	Remedial Technology or Process Option	Technology or Process Option Description for the Newberry Site	Technology or Process Option Evaluation for the Newberry Site	Retain Technology and Develop Alternative?
Ex Situ Excavation and Disposal	Excavation and Off-Site Disposal	Remedy would include removal of the concrete floor and removal of contaminated soil from the VOC source area under the floor inside the main building. Excavated soils would be loaded into roll off containers, staged on site, and then transported to a non-hazardous waste landfill. The excavation area would be backfilled with clean fill material, and a new or repaired concrete floor would be installed.	Because contaminated soils would be removed, at least down to a depth of 10 or 15 feet below the ground surface, the technology is considered effective. This process option is not implementable because operations would have to be shut down for months to remove the impacted soil. Costs for concrete floor removal, excavation, transport, disposal, and restoration of floor are considered to be high, with the temporary shutdown of the manufacturing operations also being a high cost to the Facility.	Reject (not implementable and not cost effective)

Abbreviations

- AS - air sparging
- COC - chemical of concern
- DPT - direct push technology
- LUC - land use control
- O&M - operation and maintenance
- RAO - remedial action objective
- ROI - radius of influence
- SSV - subslab vapor
- SVE - soil vapor extraction
- VOC - volatile organic compound

**TABLE 6-1
COMPONENTS OF REMEDIAL ALTERNATIVES
SHAKESPEARE COMPOSITE STRUCTURES
NEWBERRY, SOUTH CAROLINA**

REMEDIAL ALTERNATIVE	REMEDY COMPONENTS				
	Source Area Treatment	Active Groundwater Treatment Outside Building	Passive Treatment Technology	Groundwater Monitoring	Institutional Controls
Alternative 1 - No Action	None	None	Natural processes such as dilution, volatilization, dispersion in onsite and offsite groundwater	None	None
Alternative 2 - MNA, ICs, Containment via Cover	Containment via concrete floors that remain in place for Main Building and Pole Winder Building.	None	Natural processes such as dilution, volatilization, dispersion in onsite and offsite groundwater	Semi-annual monitoring of 72 wells (Year 1), 58 wells (Years 2-5), and 52 wells (Years 6-10). Annual monitoring of 49 wells (Years 11-15), 39 wells (Years 16-20), and 36 wells (Years 21-30).	Deed restrictions to prevent onsite residential development and prohibit onsite and offsite use of groundwater; abandon offsite water supply wells. For soil and SSV, deed restrictions could include prohibiting the removal of the concrete floors at the Main Building and Pole Winder Building.
Alternative 3 - ISCO, MNA, ICs, and Containment via Cover	Area 1: Ten ISCO DPT injection points through concrete floor/ground into groundwater inside/outside Main Building near Foam Room; injection zone 10-22 ft bgs. Containment via concrete floor. Area 2B to 2H: Seven areas of ISCO DPT injections into groundwater in west end of Main Building; 7 to 13 points per row; injection zone 13-26 ft bgs. Total of 81 DPT points. Containment via concrete floor. Containment via concrete floor that remains in place at the Pole Winder Building.	Shallow Zone Groundwater DPT Injections - Four Events Spaced Three Years Apart: Area 2A (on site): 4 ISCO DPT injection points near MW-6, injection zone 14-26 ft bgs. Area 3A (on site near MW-5): 17 ISCO DPT injection points on 6-ft centers (100 feet long), injection zone 14-26 ft bgs. Area 3B (off site near MW-10): 18 ISCO DPT injection points on 6-ft centers (110 feet long), injection zone 19-31 ft bgs. Area 4 (on site near MW-8): 35 ISCO DPT injection points on 6-ft centers (210 feet long), injection zone 14.5-26.5 ft bgs. Area 5 (on site near MW-9): 7 ISCO DPT injection points on 6-ft centers (40 feet long), injection zone 14.8-26.8 ft bgs. Intermediate Zone Groundwater with Permanent Injection Wells - Four Events Spaced Three Years Apart: Area 3 (on site near MW-5I and MW-7I): 42 permanent ISCO injection wells on 10-foot centers (420 feet long), injection zone: half of the wells 37-47 ft bgs and half of the wells 47-57 ft bgs. Area 5 (on site near MW-9I): 21 permanent ISCO injection wells on 10-foot centers, 37.5-47.5 feet bgs (210 feet long).	Natural processes such as dilution, volatilization, dispersion in onsite and offsite groundwater	Semi-annual monitoring of 29 wells - First Event Each Year (Years 1-12). Semi-annual monitoring of 83 wells -Second Event (Year 1). Semi-annual monitoring of 69 wells - Second Event (Years 2-6). Semi-annual monitoring of 63 wells - Second Event (Years 7-12). Annual monitoring of 35 wells (Years 13-15). Annual Monitoring of 22 wells (Years 16-30).	Deed restrictions to prevent on-site residential development and prohibit onsite and offsite use of groundwater; abandon offsite water supply wells. For soil and SSV, deed restrictions could include prohibiting the removal of the concrete floors at the Main Building and Pole Winder Building.
Alternative 4 - ISCO, ISERD, ISA, MNA, ICs, Containment via Cover	Area 1: Ten ISCO DPT injection points through concrete floor/ground into groundwater inside/outside Main Building near Foam Room; injection zone 10-22 ft bgs. Containment via concrete floor. Area 2B to 2H: Seven areas of ISERD/ISA DPT injections into groundwater in west end of Main Building; 7 to 13 points per row; injection zone 13-26 ft bgs. Total of 81 DPT points. Containment via concrete floor. Containment via concrete floor that remains in place at the Pole Winder Building.	Shallow Zone Groundwater DPT Injections - Three Events Spaced Three Years Apart: Area 2A (on site): 4 ISERD/ISA DPT injection points near MW-6, injection zone 14-26 ft bgs. Area 3A (on site near MW-5): 17 ISERD/ISA DPT injection points on 6-ft centers (100 feet long), injection zone 14-26 ft bgs. Area 3B (off site near MW-10): 18 ISERD/ISA DPT injection points on 6-ft centers (110 feet long), injection zone 19-31 ft bgs. Area 4 (on site near MW-8): 35 ISERD/ISA DPT injection points on 6-ft centers (210 feet long), injection zone 14.5-26.5 ft bgs. Area 5 (on site near MW-9): 7 ISERD/ISA DPT injection points on 6-ft centers (40 feet long), injection zone 14.8-26.8 ft bgs. Intermediate Zone Groundwater Rotosonic Injections -Three Events Spaced Three Years Apart: Area 3 (on site near MW-5I and MW-7I): 42 rotosonic ISERD/ISA injection points on 10-foot centers (420 feet long), injection zone: half of the points 37-47 ft bgs and half of the points 47-57 ft bgs. Area 5 (on site near MW-9I): 21 rotosonic ISERD/ISA injection points on 10-foot centers, 37.5-47.5 feet bgs (210 feet long).	Natural processes such as dilution, volatilization, dispersion in onsite and offsite groundwater	Semi-annual monitoring of 29 wells - First Event Each Year (Years 1-9). Semi-annual monitoring of 83 wells -Second Event (Year 1). Semi-annual monitoring of 69 wells -Second Event (Years 2-6). Semi-annual monitoring of 63 wells -Second Event (Years 7-9). Annual monitoring of 35 wells (Years 10-15). Annual Monitoring of 22 wells (Years 16-30).	Deed restrictions to prevent on-site residential development and prohibit onsite and offsite use of groundwater; abandon offsite water supply wells. For soil and SSV, deed restrictions could include prohibiting the removal of the concrete floors at the Main Building and Pole Winder Building.

**TABLE 6-1
COMPONENTS OF REMEDIAL ALTERNATIVES
SHAKESPEARE COMPOSITE STRUCTURES
NEWBERRY, SOUTH CAROLINA**

REMEDIAL ALTERNATIVE	REMEDY COMPONENTS				
	Source Area Treatment	Active Groundwater Treatment Outside Building	Passive Treatment Technology	Groundwater Monitoring	Institutional Controls
<p><u>Alternative 5</u> - ISCO, ISCR, ISA, MNA, ICs, Containment via Cover</p>	<p><u>Area 1</u>: Ten ISCO DPT injection points through concrete floor/ground into groundwater inside/outside Main Building near Foam Room; injection zone 10-22 ft bgs. Containment via concrete floor.</p> <p><u>Area 2B to 2H</u>: Seven areas of ISCR/CAC DPT injections into groundwater in west end of Main Building; 7 to 13 points per row; injection zone 13-26 ft bgs. Total of 81 DPT points. Containment via concrete floor.</p> <p>Containment via concrete floor that remains in place at the Pole Winder Building.</p>	<p><u>Shallow Zone Groundwater DPT Injections - Two Events Spaced Five Years Apart</u>: <u>Area 2A</u> (on site): 4 ISCR/CAC DPT injection points near MW-6, injection zone 14-26 feet bgs. <u>Area 3A</u> (on site near MW-5): 17 ISCR/CAC DPT injection points on 6-ft centers (100 feet long), injection zone 14-26 ft bgs. <u>Area 3B</u> (off site near MW-10): 18 ISCR/CAC DPT injection points on 6-ft centers (110 feet long), injection zone 19-31 ft bgs. <u>Area 4</u> (on site near MW-8): 35 ISCR/CAC DPT injection points on 6-ft centers (210 feet long), injection zone 14.5-26.5 ft bgs. <u>Area 5</u> (on site near MW-9): 7 ISCR/CAC DPT injection points on 6-ft centers (40 feet long), injection zone 14.8-26.8 ft bgs. ISCR uses ZVI.</p> <p><u>Intermediate Zone Groundwater Rotosonic Injections - Two Events Spaced Five Years Apart</u>: <u>Area 3</u> (on site near MW-5I and MW-7I): 42 rotosonic ISCR/CAC injection points on 10-foot centers (420 feet long), injection zone: half of the points 37-47 ft bgs and half of the points 47-57 ft bgs. <u>Area 5</u> (on site near MW-9I): 21 rotosonic ISCR/CAC injection points on 10-foot centers, 37.6-47.6 feet bgs (210 feet long). ISCR uses ZVI.</p>	<p>Natural processes such as dilution, volatilization, dispersion in onsite and offsite groundwater</p>	<p>Semi-annual monitoring of 29 wells - First Event Each Year (Years 1-10). Semi-annual monitoring of 83 wells -Second Event (Year 1). Semi-annual monitoring of 69 wells -Second Event (Years 2-6). Semi-annual monitoring of 63 wells -Second Event (Years 7-9). Annual monitoring of 35 wells (Years 10-15). Annual Monitoring of 22 wells (Years 16-30).</p>	<p>Deed restrictions to prevent on-site residential development and prohibit onsite and offsite use of groundwater; abandon offsite water supply wells. For soil and SSV, deed restrictions could include prohibiting the removal of the concrete floors at the Main Building and Pole Winder Building.</p>

Abbreviations

- bgs - below ground surface
- CAC - colloidal activated carbon
- DPT - direct push technology
- ft - feet
- IC - institutional control
- ISA - in situ adsorption
- ISERD - in situ enhanced reductive dechlorination
- ISCO - in situ chemical oxidation
- ISCR - in situ chemical reduction
- MNA - monitored natural attenuation
- ZVI - zero valent iron

**TABLE 6-2
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
SHAKESPEARE COMPOSITE STRUCTURES, NEWBERRY, SOUTH CAROLINA**

NCP Evaluation Criteria ¹	Remedial Alternative				
	Alternative 1: No Action	Alternative 2: MNA, ICs, Containment via Cover	Alternative 3: ISCO, MNA, ICs, and Containment via Cover	Alternative 4: ISCO, ISERD, ISA, MNA, ICs, and Containment via Cover	Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover
Threshold Criteria					
1. Protection of Human Health and the Environment	Does not protect human health or environment.	Provides for the protection of human health and the environment since ICs are included. Provides for human health protection during monitoring.	Provides for the protection of human health and the environment since ICs are included. Provides for human health protection through use of PPE during active remedy installation and monitoring.	Provides for the protection of human health and the environment since ICs are included. Provides for human health protection through use of PPE during active remedy installation and monitoring.	Provides for the protection of human health and the environment since ICs are included. Provides for human health protection through use of PPE during active remedy installation and monitoring.
Score ²	1	3	4	4	4
2. Compliance with ARARs and Other Criteria, Advisories, and Guidance	Does not comply with ARARs, since no monitoring is included to evaluate compliance.	Complies with ARARs at such time as shows achievement of ARARs; much slower time frame for compliance than other three active alternatives; complies with other criteria.	Complies with ARARs at such time as monitoring shows achievement of ARARs; complies with other criteria.	Complies with ARARs at such time as monitoring shows achievement of ARARs; complies with other criteria.	Complies with ARARs at such time as monitoring shows achievement of ARARs; complies with other criteria.
Score ²	1	2	3	3	3
Primary Balancing Criteria					
3. Long-term Effectiveness and Permanence	Does not provide long-term effectiveness or permanence	Provides some long-term effectiveness through monitoring of groundwater and natural attenuation of CVOC concentrations; ICs also helps provide effectiveness; remedy does not provide permanence.	Provides more long-term effectiveness and permanence than Alternatives 1 and 2 through active in situ groundwater treatment. It is not clear whether or not ARAR compliance can be achieved through this remedy. More effective than Alternative 4 because pH adjustment of the targeted aquifer is not required. Better for treatment of small well-defined source areas. Treatment by ISCO is irreversible.	Provides more long-term effectiveness and permanence than Alternatives 1 and 2 through active in situ groundwater treatment. It is not clear whether or not ARAR compliance can be achieved through this remedy. Less effective than Alternatives 3 and 5 because pH adjustment of the targeted aquifer is required. Treatment by ISCO and ISERD is irreversible.	Provides more long-term effectiveness and permanence than Alternatives 1 and 2 through active in situ groundwater treatment. It is not clear whether or not ARAR compliance can be achieved through this remedy. More effective than Alternative 4 because pH adjustment of the targeted aquifer is not required. Effectiveness and permanence deemed better than Alternative 4. Treatment by ISCR is irreversible.
Score ²	1	2	3	3	4
4. Reduction of Toxicity, Mobility, or Volume Through Treatment	Does not result in the reduction of toxicity, mobility, or volume through treatment, except for ongoing natural attenuation processes	Does not result in the reduction of toxicity, mobility, or volume through treatment, except for ongoing natural attenuation processes.	Results in the reduction of toxicity and volume through ISCO. Does not fully address mobility due to inability to completely penetrate tight saprolite soils. Meets statutory preference for treatment.	Results in the reduction of toxicity and volume through ISERD/ISCR. May not fully address mobility due to inability to completely penetrate tight saprolite soils but would be more effective than Alternatives 2 and 3 because the majority of the injectate will stay in place where injected. Meets statutory preference for treatment.	Results in the reduction of toxicity and volume through ISERD/ISCR. May not fully address mobility due to inability to completely penetrate tight saprolite soils, but it would be more effective in reducing mobility of CVOCs than Alternatives 2 and 3 because the injectate will stay in place where injected. Meets statutory preference for treatment.

**TABLE 6-2
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
SHAKESPEARE COMPOSITE STRUCTURES, NEWBERRY, SOUTH CAROLINA**

NCP Evaluation Criteria ¹	Remedial Alternative				
	Alternative 1: No Action	Alternative 2: MNA, ICs, Containment via Cover	Alternative 3: ISCO, MNA, ICs, and Containment via Cover	Alternative 4: ISCO, ISERD, ISA, MNA, ICs, and Containment via Cover	Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover
Threshold Criteria					
Score ²	2	2	3	4	4
5. Short-term Effectiveness	Does not provide any short-term effectiveness	Provides short-term effectiveness by ICs, but without active treatment, this alternative does not provide short term effectiveness in reducing CVOC concentrations in a rapid manner.	Provides more short-term effectiveness than Alternatives 1 and 2 through active treatment. Also, more short-term effective than Alternatives 4 and 5 because ISCO works much more quickly than other technologies. However, chemical oxidants are also used up more quickly than the Alternative 4 and 5 injectants, resulting in more frequent reinjections being required.	This alternative is more short term effective than Alternative 2 but IESRD works more slowly than Alternative 3 Alternative 5.	This alternative is more short term effective than Alternative 2 but ISCR/Adsorption works more slowly than Alternative 3; however, less injections are likely for this Alternative when compared to Alternative 3. This alternative is more short term effective than Alternative 4. Alternative 5 would require fewer reinjections than Alternatives 3 and 4.
Score ²	1	2	4	3	5
6. Implementability	Very implementable because there is nothing to do	Alternative 2 is implementable assuming ICs can be established with the Facility owner and with adjacent property owners.	Alternative 3 is implementable assuming ICs can be established with the Facility owner and with adjacent property owners Pilot study demonstrated that ISCO, is implementable at the Site, even with the ongoing manufacturing operations. Alternative 3 is more implementable than Alternative 4 because pH adjustment of the targeted aquifer is not required.	Alternative 4 is implementable assuming ICs can be established with the Facility owner and with adjacent property owners Pilot study demonstrated that ISCO and ISERD are implementable at the Site, even with the ongoing manufacturing operations. Alternative 4 is less implementable than Alternatives 3 and 5 because pH adjustment of the targeted aquifer is required.	Alternative 5 is implementable assuming ICs can be established with the Facility owner and with adjacent property owners Pilot study demonstrated that ISCO is implementable at the Site, even with the ongoing manufacturing operations. Alternative 5 is more implementable than Alternative 4 because pH adjustment of the targeted aquifer is not required.
Score ²	5	4	4	3	4

**TABLE 6-2
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
SHAKESPEARE COMPOSITE STRUCTURES, NEWBERRY, SOUTH CAROLINA**

NCP Evaluation Criteria ¹	Remedial Alternative				
	Alternative 1: No Action	Alternative 2: MNA, ICs, Containment via Cover	Alternative 3: ISCO, MNA, ICs, and Containment via Cover	Alternative 4: ISCO, ISERD, ISA, MNA, ICs, and Containment via Cover	Alternative 5: ISCO, ISCR, ISA, MNA, ICs, and Containment via Cover
Threshold Criteria					
7. Cost ³ (30-Year Period, +50%, estimated cost, -30%)	\$0	\$1,705,000 (+50%) \$1,137,000 \$796,000 (-30%)	\$3,980,000 (+50%) \$2,653,000 \$1,857,000 (-30%)	\$4,578,000 (+50%) \$3,052,000 \$2,136,000 (-30%)	\$3,590,000 (+50%) \$2,393,000 \$1,675,000 (-30%)
Score ²	5	4	3	3	3
Total Score for all Seven Criteria	16	19	24	23	27

¹Note: -- State and community acceptance criteria will be evaluated by virtue of the SCDHEC document review and public comment process.

²Scoring:

- 1 = Unacceptable, does not meet the minimum requirements
- 2 = Alternative is on the **Low** end of the alternative criteria
- 3 = Alternative is **Fair** with respect to meeting the alternative criteria
- 4 = Alternative is **Good** with respect to meeting the alternative criteria
- 5 = Alternative is **Very Good** with respect to meeting the alternative criteria

³ According to the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1988), "Typically study estimate costs made during the Feasibility Study are expected to provide an accuracy of +50% to -30%."

Abbreviations

- ARAR - Applicable or Relevant and Appropriate Requirement
- CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
- CVOC – chlorinated volatile organic compound
- IC – institutional control
- ISA – in situ adsorption
- ISCO – in situ chemical oxidation
- ISCR – in situ chemical reduction
- ISERD – in situ enhanced reductive dechlorination
- NCP – National Contingency Plan
- PPE – personal protective equipment

**TABLE 6-3
 COST ESTIMATE SUMMARY FOR ALTERNATIVE 1
 NO ACTION
 SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Total Cost	Unit	Unit Cost	Cost
No Tasks	1	\$0.00	\$0.00
Total Cost (Years 1 through 30)			\$0.00

Assumptions:

No Action is taken, no monitoring is performed, no ICs are implemented, no well abandonments take place, no remedy review, site visits, or meetings with SC

**TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: MNA Plan	1	\$20,731.00	\$20,731.00
Task 02: Semi-Annual MNA Monitoring, Annual Report (Year 1)	1	\$68,813.00	\$68,813.00
Task 03: Well Abandonments (End of Year 1)	1	\$7,741.00	\$7,741.00
Task 04: Deed Restrictions	1	\$10,881.00	\$10,881.00
Total First Year Estimated Cost			\$108,166.00
Present Value Cost	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$108,166.00	\$109,000.00
Task 05: Semi-Annual MNA Monitoring, Annual Report (Years 2 through 5)	4 Years ²	\$57,000.00	\$198,000.00
Task 06: Well Abandonments (End of Year 5)	1 Year ¹	\$5,000.00	\$5,000.00
Task 07: Semi-Annual MNA Monitoring, Annual Report (Years 6 through 10)	5 Years ²	\$50,000.00	\$214,000.00
Task 08: Well Abandonments (End of Year 10)	1 Year ¹	\$5,000.00	\$5,000.00
Task 09: Annual MNA Monitoring, Annual Report (Years 11 through 15)	5 Years ²	\$38,000.00	\$161,000.00
Task 10: Well Abandonments (End of Year 15)	1 Year ¹	\$6,000.00	\$5,000.00
Task 11: Annual MNA Monitoring, Annual Report (Years 16 through 20)	5 Years ²	\$28,000.00	\$120,000.00
Task 12: Well Abandonments (End of Year 20)	1 Year ¹	\$4,000.00	\$4,000.00
Task 13: Annual MNA Monitoring, Annual Report (Years 21 through 30)	10 Years ²	\$26,000.00	\$198,000.00
Task 14: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	21,000.00	118,000.00
Total Present Value Cost			\$1,137,000.00

Assumptions:

Task 01: Includes labor to generate a Monitored Natural Attenuation (MNA) Plan

Task 02: Includes the following:

- Semi-annual groundwater sampling event - First Event (Year 1)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled = 16. Sample for VOCs, 16 passive diffusion bags (PDBs)
- Number of Events = 1; Field Crew = 2
- Semi-annual groundwater sampling event - Second Event (Year 1)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 72. Sample 72 for VOCs, 20 for MNA parameters. 36 PDBs
- Number of Events = 1; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 03: Includes the cost to abandon 14 wells and cost of the oversight labor at the end of Year 1

Task 04: Includes the following:

- Deed Restrictions

Task 05: Includes the following:

- Semi-annual groundwater sampling event - First Event each year (Years 2-5)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled = 25. Sample for VOCs, 22 PDBs
- Number of Events = 4; Field Crew = 2
- Semi-annual groundwater sampling event - Second Event each Year (Years 2-5)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 58. Sample for 58 for VOCs, 20 for MNA parameters. 25 PDBs
- Number of Events = 4; Field Crew = 2

Task 06: Includes the cost to abandon 6 wells and cost of oversight labor at the end of Year 5; Field crew = 1

Task 07: Includes the following:

- Semi-annual groundwater sampling event - First Event each year (Years 6-10)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled = 16. Sample for VOCs, 13 PDBs
- Number of Events - 5; Field Crew = 2
- Semi-annual groundwater sampling event - Second Event each Year (Years 6-10)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 52. Sample for 52 for VOCs, 20 for MNA parameters. 19 PDBs
- Number of Events = 5; Field Crew = 2

Task 08: Includes the cost to abandon 3 wells and cost of oversight labor at the end of Year 10; Field crew = 1

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task 09: Includes the following:

- Annual groundwater sampling event (Years 11-15)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 49. Sample for VOCs, 34 PDBs
- Number of Events - 5; Field Crew = 2

Task 10: Includes the cost to abandon 10 wells and cost of oversight labor at the end of Year 15; Field crew = 1

Task 11: Includes the following:

- Annual groundwater sampling event (Years 16-20)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 39. Sample for VOCs, 28 PDBs
- Number of Events - 5; Field Crew = 2

Task 12: Includes the cost to abandon 2 wells and cost of oversight labor at the end of Year 20; Field crew = 1

Task 13: Includes the following:

- Annual groundwater sampling event (Years 21-30)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 36. Sample for VOCs, 28 PDBs
- Number of Events - 5; Field Crew = 2

Task 14: Includes the following:

- Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
- Five-Year Remedy Review Report
- Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

**TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: Remedial Design Work Plan, UIC Permit, Health and Safety Plan Update, Flux Meters	1	\$106,417.00	\$106,417.00
Task 02: First ISCO Injection Event and Oversight - 235 Injection Locations	1	\$712,702.00	\$712,702.00
Task 03: Semi-Annual Performance Monitoring - 1st Event of Each Year	1	\$16,856.00	\$16,856.00
Task 04: Semi-Annual Performance Monitoring - 2nd Event of Each Year + Annual MNA Monitoring Event, Annual Report - Year 1	1	58,629.00	\$58,629.00
Total First Year Estimated Cost			\$894,604.00
Present Value Cost	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$894,604.00	\$895,000.00
Task 03: Semi-Annual Performance Monitoring - Years 2 through 12	11 Years ²	\$17,000.00	\$131,000.00
Task 05: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 2 through 6	5 Years ²	\$45,000.00	\$192,000.00
Task 06: Deed Restrictions - Year 2	1 Year ¹	\$11,000.00	\$11,000.00
Task 07: Second Injection Event (176 Injection Locations) - Year 4	1 Year ¹	\$372,000.00	\$353,000.00
Task 08: Third Injection Event, Well Abandonments (118 Injection Locations) - Year 7	1 Year ¹	\$247,000.00	\$235,000.00
Task 09: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 7 through 9	3 Years ²	\$42,000.00	\$113,000.00
Task 10: Fourth Injection Event (60 Injection Locations) - Year 10	1 Year ¹	\$127,000.00	\$121,000.00
Task 11: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 10 through 12	3 Years ²	\$42,000.00	\$113,000.00
Task 12: Well Abandonments (Year 12)	1 Year ¹	\$30,000.00	\$28,000.00
Task 13: Long Term Monitoring, Annual Report - Years 13 through 15	3 Years ²	\$27,000.00	\$71,000.00
Task 14: Well Abandonments (Year 15)	1 Year ¹	\$7,000.00	\$6,000.00
Task 15: Long Term Monitoring, Annual Report - Years 16 through 20	5 Years ²	\$23,000.00	\$96,000.00
Task 16: Long Term Monitoring, Annual Report - Years 21 through 30	10 Years ²	\$23,000.00	\$170,000.00
Task 17: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	\$21,000.00	\$118,000.00
Total Present Value Cost			\$2,653,000.00

Assumptions:

Task 01: Includes labor to generate Remedial Design Work Plan including time to finalize design with injection contractor, UIC Permit preparation, and Health and Safety Plan update. Also, labor to deploy/retrieve ten passive flux meters into five locations to better define treatment zones and quantify chemical quantities as well as the installation, development, and survey of 11 shallow zone monitoring wells for the west portion of the main building.

Task 02: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, Injection Contractor, and Driller.
- Installation of Permanent Injection Wells for Intermediate Zone (63 total)
- First Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (235 injection locations) - Year 1
- 38 days to complete injection + 2 days for setup/break down. Field Crew = 3 people + 1 person for oversight.
- Survey of Injection Locations, Soil Cuttings Disposal for Permanent Injection Wells; Field Crew = 1

Task 03: Includes the following:

- Semi-annual groundwater sampling event - First event each year (Years 2-12)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled per event = 29. Sample 29 wells for VOCs and 18 wells for Total Dissolved Solids (TDS), and Chloride (Cl)
- Number of events = 11; Field Crew = 2

Task 04: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Year 1)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 83. Sample 83 wells for VOCs, 18 wells for TDS and Cl, 8 wells for MNA parameters. 33 PDBs.
- Number of Events = 1; Field Crew = 2
- Purge Water Disposal, Abandon 14 wells; Field Crew = 1

Task 05: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 2-6)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 69. Sample 69 wells for VOCs, 18 wells for TDS and Cl, 11 wells for MNA parameters. 22 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 06: Includes the following:

- Deed Restrictions

Task 07: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant and Injection Contractor
- Second Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (176 injection locations) - Year 4
- Oversight of Injection Event = 30 days; Field Crew = 3 people + 1 oversight person
- Survey of Injection Locations; Field Crew = 1

**TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Task 08: Includes the following:

Private Utility Locate, Procure Chemical Oxidant and Injection Contractor
Third Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (118 injection locations) - Year 7
Oversight of Injection Event = 19 days; Field Crew = 3 people + 1 oversight person
Survey of Injection Locations, Abandon 6 wells; Field Crew = 1

Task 09: Includes the following:

Semi-annual groundwater sampling event - Second event each year (Years 7-9)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 63. Sample 63 for VOCs, 18 for TDS and Cl, 19 for MNA parameters. 16 PDBs
Number of Events = 3; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 10: Includes the following:

Private Utility Locate, Procure Chemical Oxidant and Injection Contractor
Fourth Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (60 injection locations) - Year 10
Oversight of Injection Event = 9 days; Field Crew = 3 people + 1 oversight person
Survey of Injection Locations; Field Crew = 1

Task 11: Includes the following:

Semi-annual groundwater sampling event - Second event each year (Years 10-12)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 63. Sample 63 wells for VOCs, 18 wells for TDS and Cl, 11 wells for MNA parameters. 16 PDBs
Number of Events = 3; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 12: Includes the cost to abandon 28 monitoring wells and 63 injection wells plus cost of oversight labor at the end of Year 12; Field crew = 1

Task 13: Includes the following:

Annual groundwater sampling event (Years 13-15)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 35. Sample 35 wells for VOCs. 21 PDBs
Number of Events = 3; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 14: Includes the cost to abandon 13 wells and cost of oversight labor at the end of Year 15; Field crew = 1

Task 15: Includes the following:

Annual groundwater sampling event (Years 16-20)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
Number of Events = 5; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 16: Includes the following:

Annual groundwater sampling event (Years 21-30)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
Number of Events = 10; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 17: Includes the following:

Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
Five-Year Remedy Review Report
Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$. Where:
i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$. Where:
i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.
n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: Remedial Design Work Plan, UIC Permit, Health and Safety Plan Update, Flux Meters	1	\$106,417.00	\$106,417.00
Task 02: First ISCO and ERD Injection Event and Oversight - 235 Injection Locations	1	\$1,041,162.00	\$1,041,162.00
Task 03: Semi-Annual Performance Monitoring - 1st Event of Each Year	1	\$20,244.00	\$20,244.00
Task 04: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Year 1	1	61,995.00	\$61,995.00
Total First Year Estimated Cost			\$1,229,818.00

Present Value Cost	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$1,229,818.00	\$1,230,000.00
Task 03: Semi-Annual Performance Monitoring - Years 2 through 9	8 Years ²	\$20,000.00	\$123,000.00
Task 05: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 2 through 6	5 Years ²	\$48,000.00	\$206,000.00
Task 06: Deed Restrictions (Year 2)	1 Year ¹	\$11,000.00	\$11,000.00
Task 07: Second Injection Event (Year 4)	1 Year ¹	\$557,000.00	\$529,000.00
Task 08: Third Injection Event, Well Abandonments (Year 7)	1 Year ¹	\$296,000.00	\$281,000.00
Task 09: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 7 through 9	3 Years ²	\$45,000.00	\$122,000.00
Task 10: Well Abandonments (Year 9)	1 Year ¹	\$30,000.00	\$28,000.00
Task 11: Long Term Monitoring - Years 10 through 15	6 Years ²	\$27,000.00	\$132,000.00
Task 12: Well Abandonments (Year 15)	1 Year ¹	\$7,000.00	\$6,000.00
Task 13: Long Term Monitoring - Years 16 through 20	5 Years ²	\$23,000.00	\$96,000.00
Task 14: Long Term Monitoring - Years 21 through 30	10 Years ²	\$23,000.00	\$170,000.00
Task 15: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	\$21,000.00	\$118,000.00
Total Present Value Cost			\$3,052,000.00

Assumptions:

Task 01: Includes labor to generate Remedial Design Work Plan including time to finalize design with injection contractor, UIC Permit preparation, and Health and Safety Plan update. Also, labor to deploy/retrieve ten passive flux meters into five locations to better define treatment zones and quantify chemical quantities as well as the installation, development, and survey of 11 shallow zone monitoring wells for the west portion of the main building.

Task 02: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant and ERD Chemicals, Injection Contractor, and Driller
- Installation of Permanent Injection Wells for Intermediate Zone (63 total)
- First Injection Event of Chemical Oxidant and ERD Chemicals into Shallow Zone and Intermediate Zone (235 injection locations) - Year 1
- 38 days to complete injection + 2 days for setup/break down. Field Crew = 3 people + 1 person for oversight.
- Survey of Injection Locations, Soil Cuttings Disposal for Permanent Injection Wells; Field Crew = 1

Task 03: Includes the following:

- Semi-annual groundwater sampling event - First event each year (Years 2-9)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled per event = 29. Sample 29 wells for VOCs, 6 wells for Total Dissolved Solids (TDS), and Chloride (Cl), and 14 wells for MNA parameters
- Number of events = 8; Field Crew = 2

Task 04: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Year 1)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 83. Sample 83 wells for VOCs, 6 wells for TDS and Cl, 22 wells for MNA, 3 wells for qPCR. 33 PDBs
- Number of Events = 1; Field Crew = 2
- Purge Water Disposal, Abandon 14 wells; Field Crew = 1

Task 05: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 2-6)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 69. Sample 69 wells for VOCs, 6 wells for TDS and Cl, 22 wells for MNA, 3 wells for qPCR. 22 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 06: Includes the following:

- Deed Restrictions

Task 07: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, ERD Chemicals, and Injection Contractor
- Second Injection Event of Chemical Oxidant and ERD Chemicals into Shallow Zone and Intermediate Zone (160 injection locations) - Year 4
- Oversight of Injection Event = 27 days; Field Crew = 1
- Survey of Injection Locations; Field Crew = 1

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task 08: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, ERD Chemicals, and Injection Contractor
- Third Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (85 injection locations) - Year 7
- Oversight of Injection Event = 15 days; Field Crew = 1
- Survey of Injection Locations, Abandon 6 wells; Field Crew = 1

Task 09: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 7-9)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 63. Sample 63 wells for VOCs, 6 wells for TDS and Cl, 22 wells for MNA, 3 wells for qPCR. 16 PDBs
- Number of Events = 3; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 10: Includes the cost to abandon 28 monitoring wells and 63 injection wells plus cost of oversight labor at the end of Year 9; Field crew = 1

Task 11: Includes the following:

- Annual groundwater sampling event (Years 10-15)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 35. Sample 35 wells for VOCs. 21 PDBs
- Number of Events = 6; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 12: Includes the cost to abandon 13 wells and cost of oversight labor in Year 15; Field crew = 1

Task 13: Includes the following:

- Annual groundwater sampling event (Years 16-20)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 14: Includes the following:

- Annual groundwater sampling event (Years 21-30)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
- Number of Events = 10; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 15: Includes the following:

- Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
- Five-Year Remedy Review Report
- Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$. Where:
i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.1% = 5.4%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$. Where:
i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.1% = 5.4%.
n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

**TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: Remedial Design Work Plan, UIC Permit, Health and Safety Plan Update, Flux Meters	1	\$105,637.00	\$105,637.00
Task 02: First ISCO + ISCR/ISA Injection Event and Oversight - 235 Injection Locations	1	\$1,041,252.00	\$1,041,252.00
Task 03: Semi-Annual Performance Monitoring - 1st Event of Each Year	1	\$18,256.00	\$18,256.00
Task 04: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Year 1	1	\$58,739.00	\$58,739.00
Total First Year Estimated Cost			\$1,223,884.00
Present Value Cost	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$1,223,884.00	\$1,224,000.00
Task 03: Semi-Annual Performance Monitoring - Years 2 through 10	9 Years ²	\$18,000.00	\$122,000.00
Task 05: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 2 through 5	4 Years ²	\$46,000.00	\$160,000.00
Task 06: Deed Restrictions (Year 2)	1 Year ¹	\$11,000.00	\$11,000.00
Task 07: Second ISCO + ISCR/ISA Injection Event (85 locations) - Year 6	1 Year ¹	\$374,000.00	\$355,000.00
Task 08: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 6 through 10	5 Years ²	\$42,000.00	\$179,000.00
Task 09: Well Abandonment - Year 10	1 Year ¹	\$10,000.00	\$9,000.00
Task 10: Long Term Monitoring, Annual Report - Years 11 through 15	5 Years ²	\$27,000.00	\$113,000.00
Task 11: Well Abandonment - Year 15	1 Year ¹	\$7,000.00	\$6,000.00
Task 12: Long Term Monitoring, Annual Report - Years 16 through 20	5 Years ²	\$23,000.00	\$96,000.00
Task 13: Long Term Monitoring, Annual Report - Years 21 through 30	10 Years ²	17,000.00	\$125,000.00
Task 14: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	\$21,000.00	\$118,000.00
Total Present Value Cost			\$2,393,000.00

Assumptions:

Task 01: Includes labor to generate Remedial Design Work Plan including time to finalize design with injection contractor, UIC Permit preparation, and Health and Safety Plan update. Also, labor to deploy/retrieve ten passive flux meters into five locations to better define treatment zones and quantify chemical quantities as well as the installation, development, and survey of 11 shallow zone monitoring wells for the west portion of the main building.

Task 02: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, CAC, ZVI, Injection Contractor, and Driller
- First Injection Event of Chemical Oxidant and CAC/ZVI into Shallow Zone and Intermediate Zone (235 injection locations)
- 38 days to complete injection + 2 days for setup/break down. Field Crew = 3 people + 1 person for oversight
- Survey of Injection Locations

Task 03: Includes the following:

- Semi-annual groundwater sampling event - First event each year (Years 2-10)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled per event = 29. Sample 29 wells for VOCs, 13 wells for Total Iron and Dissolved Iron, and 7 wells for TDS and Cl.
- Number of Events = 9, Field Crew = 2

Task 04: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Year 1)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 83. Sample 83 wells for VOCs, 6 wells for TDS and Cl, 10 wells for Total Iron and Dissolved Iron, 11 wells for MNA. 33 PDBs
- Number of Events = 1; Field Crew = 2
- Soil Cuttings and Purge Water Disposal, Abandon 14 wells; Field Crew = 1

Task 05: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 2-5)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 69. Sample 69 wells for VOCs, 7 wells for TDS and Cl, 10 wells for Total Iron and Dissolved Iron, 11 wells for MNA. 22 PDBs
- Number of Events = 4; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 06: Includes the following:

- Deed Restrictions

**TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Task 07: Includes the following:

Private Utility Locate, Procure Chemical Oxidant, PAC, ZVI, and Injection Contractor
Second Injection Event of Chemical Oxidant and PAC/ZVI (85 injection locations)
Field Crew = 1; 13 days to complete injection + 2 days for setup/break down
Survey of Injection Locations
Abandon 6 wells; Field Crew = 1

Task 08: Includes the following:

Semi-annual groundwater sampling event - Second event each year (Years 6-10)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 63. Sample 63 wells for VOCs, 7 wells for TDS and Cl, 10 wells for Total Iron and Dissolved Iron, 11 wells for MNA.
16 PDBs
Number of Events = 5; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 09: Includes the cost to abandon 28 wells and cost of oversight labor in Year 10; Field crew = 1

Task 10: Includes the following:

Annual groundwater sampling event (Years 11-15)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 35. Sample 35 wells for VOCs. 21 PDBs
Number of Events = 5; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 11: Includes the cost to abandon 12 wells and cost of oversight labor in Year 15; Field crew = 1

Task 12: Includes the following:

Annual groundwater sampling event (Years 16-20)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
Number of Events = 5; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 13: Includes the following:

Annual groundwater sampling event (Years 21-30)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
Number of Events = 10; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 14: Includes the following:

Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
Five-Year Remedy Review Report
Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.
n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

ATTACHMENTS

Attachment A
Historic Groundwater Tables

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Main Building																
		MW-1				MW-1-PDB	MW-2				MW-3				MW-4			
		PE22065-001 05/22/14	QG08070-003 07/07/15	SF20036-001 06/19/17	XC02133-010 03/02/22	XC02133-009 03/02/22	QG08070-008 07/08/15	SF13096-005 06/13/17	XC01066-006 03/01/22	XG20043-007 07/20/22	XL28017-003 12/28/22	QG08070-004 07/07/15	SF12046-002 06/12/17	SF12046-002 06/12/17	XB24099-007 02/23/22	QG08070-006 07/08/15	SF12046-005 06/12/17	XB28047-001 02/28/22
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>																		
1,1,1,2-Tetrachloroethane	NS	NA																
1,1,1-Trichloroethane	200	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 1	< 5	< 5	< 5	< 1	< 5	< 5	< 1	
1,1,2-Trichloroethane	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,1,2-Trichlorotrifluoroethane	NS	NA																
1,1-Dichloroethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,1-Dichloroethene	7	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,1-Dichloropropene	NS	NA																
1,2,3-Trichlorobenzene	NS	NA																
1,2,3-Trichloropropane	NS	NA																
1,2,4-Trichlorobenzene	70	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,2-Dichlorobenzene	600	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,2-Dichloroethane	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,2-Dichloropropane	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,3-Dichlorobenzene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,3-Dichloropropane	NS	NA																
1,4-Dichlorobenzene	75	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
1,4-Dioxane (p-Dioxane)	NS	NA																
2,2-Dichloropropane	NS	NA																
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
2-Chlorotoluene	NS	NA																
2-Hexanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
4-Chlorotoluene	NS	NA																
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
Acetone	NS	< 20	< 20	< 20	< 10	4.7 J//	< 20	< 20	< 10	< 10	< 20	< 20	< 20	< 10	< 20	< 20	4.8 J//	
Benzene	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Bromobenzene	NS	NA																
Bromochloromethane	NS	NA																
Bromodichloromethane	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Bromoform	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Carbon disulfide	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Carbon tetrachloride	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Chlorobenzene	100	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Chloroethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Chloroform	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
cis-1,2-Dichloroethene	70	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
cis-1,3-Dichloropropene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Cyclohexane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Dibromochloromethane	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Dibromomethane	NS	NA																
Dichlorodifluoromethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Diisopropyl ether	NS	NA																
Ethylbenzene	700	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Hexachloro-1,3-butadiene	NS	NA																
Isopropylbenzene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
m&p-Xylene	10,000	NA																
Methyl acetate	NS	< 5	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 1	< 5	< 5	< 5	< 1	< 5	< 5	< 1	
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	
Methylene chloride	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Naphthalene	NS	NA																
o-Xylene	10,000	NA																
p-Isopropyltoluene	NS	NA																
Styrene	100	0.45 J//	< 5	< 5	< 0.5	< 0.5	< 5	< 5	5.1	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Tetrachloroethene	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Toluene	1000	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
trans-1,2-Dichloroethene	100	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
trans-1,3-Dichloropropene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	
Trichloroethene (TCE)	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5</									

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Main Building																
		MW-1				MW-1-PDB	MW-2				MW-3				MW-4			
		PE22065-001 05/22/14	QG08070-003 07/07/15	SF20036-001 06/19/17	XC02133-010 03/02/22	XC02133-009 03/02/22	QG08070-008 07/08/15	SF13096-005 06/13/17	XC01066-006 03/01/22	XG20043-007 07/20/22	XL28017-003 12/28/22	QG08070-004 07/07/15	SF12046-002 06/12/17	SF12046-002 06/12/17	XB24099-007 02/23/22	QG08070-006 07/08/15	SF12046-005 06/12/17	XB28047-001 02/28/22
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																		
Iron	0.3 ²	0.023 J	NA	0.11	NA	NA	NA	NA	NA	NA	< 0.1	NA						
Manganese	0.05 ²	0.23	NA	0.035	NA													
Dissolved Iron	0.3 ²	NA	< 0.1	NA														
Dissolved Manganese	0.05 ²	0.22	NA	0.018	NA													
Ferrous Iron	NS	NA	NA	< 0.05	NA													
Ferric Iron (calculation)	NS	0.063	NA	0.077 J//	NA													
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																		
Alkalinity	NS	< 10	NA	3.1 J//	NA	NA	NA	NA	NA	NA	< 20	NA						
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																		
Chloride	250 ²	NA	NA	2.2	NA	NA	NA	NA	NA	2.2	2.2	NA						
Nitrate	10	NA	0.074	NA														
Nitrite	1	NA	< 0.02	NA														
Sulfate	250 ²	11	NA	0.7 J//	NA	NA	NA	NA	NA	NA	< 1	NA						
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																		
Sulfide	NS	< 1	NA	< 1	NA													
Dissolved Gases by USEPA Method AM20GAX (ug/L)																		
Ethane	NS	0.25	NA	0.01 Jn	NA	NA	NA	NA	NA	NA	< 10	NA						
Methane	NS	0.49	NA	47 n	NA	NA	NA	NA	NA	NA	< 10	NA						
Carbon Dioxide	NS	NS	NA	27000 n	NA													
Ethene	NS	0.092	NA	0.0047 Jn	NA	NA	NA	NA	NA	NA	< 10	NA						
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																		
TOC	NS	NA																
Microbial																		
Dehalococcoides	NS	< 0.3	NA	< 0.5	NA													
Dehalobacter spp	NS	3.6	NA	< 4.6	NA													
BAV1 Vinyl Chloride Reductase	NS	NA	NA	< 0.5	NA													
tceA Reductase	NS	NA	NA	< 0.5	NA													
Vinyl chloride Reductase	NS	NA	NA	< 0.5	NA													
1,1 DCA Reductase	NS	NA																
1,2 DCA Reductase	NS	NA																
cerA Reductase	NS	NA																
Chloroform Reductase	NS	NA																
Dehalobacter DCM	NS	NA																
Dehalobium chloroformia	NS	NA																
Dehalogenimonas spp	NS	NA																
Desulfotobacterium spp	NS	NA																
Desulfuromonas spp	NS	NA																
Dichloromethane Dehalogenase	NS	NA																
Epoxyalkane Transferase	NS	NA																
Ethene Monooxygenase	NS	NA																
Methanogens	NS	NA																
PCE Reductase 1	NS	NA																
PCE Reductase 2	NS	NA																
Phenol Hydroxylase	NS	NA																
Soluble Methane Monooxygenase	NS	NA																
Sulfate Reducing Bacteria	NS	NA																
Toluene Dioxygenase	NS	NA																
Toluene Monooxygenase	NS	NA																
Toluene Monooxygenase 2	NS	NA																
Total Eubacteria	NS	NA																
trans-1,2-DCE Reductase	NS	NA																
Trichlorobenzene Dioxygenase	NS	NA																

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Main Building														
		MW-5			MW-5-PDB	MW-6			MW-7			MW-7-PDB				
		QG08070-001	SF12046-004	XB24099-014	92706733008	PE22065-003	QG08070-007	SF20036-002	SF20036-008 (Dup-MW-6A)	XB24099-015	PE22065-002	QG08070-002	QG08070-005 (DUP-1)	SF12046-003	XC03052-004	XC03052-003
07/07/15	06/12/17	02/24/22	01/02/24	05/22/14	07/08/15	06/19/17	06/19/17	02/24/22	05/22/14	07/07/15	07/07/15	06/12/17	03/03/22	03/03/22		
Volatile Organic Compounds by USEPA Method 8260B (µg/L)																
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	< 0.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 0.66	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 0.45	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	NA	< 50	< 25	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 1	< 1
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 0.65	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 0.73	< 50	< 25	0.76 J//	0.72 J//	< 2.5	1.5 J//	1.9 J//	1.8 J//	1 J//	0.55	0.43 J//
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 0.7	< 50	< 25	1.5 J//	1.5 J//	< 2.5	1.9 J//	3.6 J//	3.5 J//	1.8 J//	1.1	0.84
1,1-Dichloropropene	NS	NA	NA	NA	< 0.85	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	NS	NA	NA	NA	< 1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NS	NA	NA	NA	< 0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 1.3	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 0.68	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	NA	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 0.68	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,2-Dichloroethane	5	< 5	< 5	1.1	< 0.64	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 0.71	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 0.68	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	< 0.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 0.67	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	NS	NA	NA	NA	< 0.78	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 7.9	< 100	< 50	< 10	< 10	< 50	< 10	< 10	< 10	< 10	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	< 0.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	< 10	< 10	< 10	< 0.95	< 100	< 50	< 10	< 10	< 50	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	< 0.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 5.4	< 100	< 50	< 10	< 10	< 50	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	NS	< 20	6.4 J/B/T	4 J/B/F	128	< 200	< 100	< 20	4.5 J//	< 50	< 20	< 20	< 20	J//E	< 10	6.2 J//
Benzene	5	< 5	< 5	< 0.5	< 0.69	< 50	< 25	0.66 J//	0.63 J//	< 2.5	0.29 J//	0.36 J//	0.5 J//	< 5	< 0.5	< 0.5
Bromobenzene	NS	NA	NA	NA	< 0.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NS	NA	NA	NA	< 0.94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 0.61	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Bromoform	80 ¹	< 5	< 5	< 0.5	< 0.68	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 3.3	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Carbon disulfide	NS	< 5	< 5	< 0.5	NA	< 50	< 25	< 5	< 5	< 2.5	0.47 J//	< 5	< 5	< 5	< 0.5	< 0.5
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 0.67	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Chlorobenzene	100	< 5	< 5	< 0.5	< 0.57	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Chloroethane	NS	< 5	< 5	< 0.5	< 1.3	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Chloroform	80 ¹	0.9	2 J//	1.1	< 0.86	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 1.1	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
cis-1,2-Dichloroethene	70	< 5	< 5	0.58	< 0.77	620	740	530	430	220	95	110	110	44	48	38
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 0.73	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Cyclohexane	NS	< 5	< 5	< 0.5	NA	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 0.72	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Dibromomethane	NS	NA	NA	NA	< 0.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 0.69	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	< 0.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	< 5	< 5	< 0.5	< 0.61	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	< 3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	< 5	< 5	< 0.5	NA	< 50	3.1	3.6 J//	3.4 J//	< 2.5	2.1 J//	2.2 J//	2.2 J//	< 5	< 0.5	< 0.5
m&p-Xylene	10,000	NA	NA	NA	< 1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	< 5	< 5	< 1	NA	< 50	< 25	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 1	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 0.84	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Methylcyclohexane	NS	< 5	< 5	< 5	NA	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 5	< 5
Methylene chloride	5	< 5	< 5	< 0.5	< 3.9	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Naphthalene	NS	NA	NA	NA	< 1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	10,000	NA	NA	NA	< 0.68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	NS	NA	NA	NA	< 0.83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	< 5	< 5	< 0.5	< 0.58	1.3 J//	< 25	2 J//	2.9 J//	2.5 J//	0.14 J//	< 5	< 5	< 5	< 0.5	< 0.5
Tetrachloroethene	5	< 5	< 5	< 0.5	< 0.58	< 50	< 25	< 5	< 5	2.7	< 5	0.81 J//	< 5	< 5	< 0.5	< 0.5
Toluene	1000	0.8	< 5	< 0.5	< 0.97	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 0.79	18 J//	26	21	19	7.8	0.87 J//	1.5 J//	1.6 J//	< 5	0.45 J//	< 0.5
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 0.73	< 50	< 25	< 5	< 5	< 2.5	< 5	< 5	< 5	< 5	< 0.5	< 0.5
Trichloroethene (TCE)	5	71	11	240	210	40 J//	64	27	28	330	19	69	69	190	22	17
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 0											

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

		Main Building														
Sample ID Laboratory ID	USEPA	MW-5			MW-5-PDB	MW-6			MW-7			MW-7-PDB				
		QG08070-001	SF12046-004	XB24099-014	92706733008	PE22065-003	QG08070-007	SF20036-002	SF20036-008 (Dup-MW-6A)	XB24099-015	PE22065-002	QG08070-002	QG08070-005 (DUP-1)	SF12046-003	XC03052-004	XC03052-003
Date Collected	MCL	07/07/15	06/12/17	02/24/22	01/02/24	05/22/14	07/08/15	06/19/17	06/19/17	02/24/22	05/22/14	07/07/15	07/07/15	06/12/17	03/03/22	03/03/22
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																
Iron	0.3 ²	NA	NA	0.052 J//	NA	5.6	NA	11	NA	5.7	0.045 J	NA	NA	NA	0.06 J//	NA
Manganese	0.05 ²	NA	NA	NA	NA	0.071	NA	0.032	NA	NA	0.1	NA	NA	NA	0.23	NA
Dissolved Iron	0.3 ²	NA	NA	< 0.1	NA	NA	NA	NA	NA	5.9	NA	NA	NA	NA	< 0.1	NA
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	0.072	NA	0.034	NA	NA	<0.1	NA	NA	NA	0.22	NA
Ferrous Iron	NS	NA	NA	< 0.05	NA	5.7	NA	58	NA	5.7	0.15	NA	NA	NA	< 0.05	NA
Ferric Iron (calculation)	NS	NA	NA	NA	NA	<0.1	NA	< 0.1	NA	NA	0.3	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																
Alkalinity	NS	NA	NA	< 20	NA	12	NA	2.9 J//	NA	< 20	5.6 J	NA	NA	NA	< 20	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																
Chloride	250 ²	NA	NA	NA	NA	14	NA	15	NA	NA	6.1	NA	NA	NA	14	NA
Nitrate	10	NA	NA	2.3 B//	NA	NA	NA	NA	NA	0.053 B//	NA	NA	NA	NA	< 0.02	NA
Nitrite	1	NA	NA	< 0.02	NA	NA	NA	NA	NA	0.015 J//	NA	NA	NA	NA	< 0.02	NA
Sulfate	250 ²	NA	NA	< 1	NA	2.9	NA	4.9	NA	1.9	<1.0	NA	NA	NA	0.66 J//	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																
Sulfide	NS	NA	NA	NA	NA	0.9	NA	< 1	NA	NA	<1.0	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)																
Ethane	NS	NA	NA	< 10	NA	0.18	NA	0.084 Jn	NA	< 10	0.012J	NA	NA	NA	< 10	NA
Methane	NS	NA	NA	5.6 J//	NA	400	NA	560 n	NA	790	79	NA	NA	NA	69 B//	NA
Carbon Dioxide	NS	NA	NA	NA	NA	NA	NA	260000	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	NA	NA	< 10	NA	0.5	NA	0.13 n	NA	< 10	0.0075J	NA	NA	NA	< 10	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																
TOC	NS	NA	NA	1.6	NA	NA	NA	NA	NA	1.4	NA	NA	NA	NA	1.5	NA
Microbial																
Dehalococcoides	NS	NA	NA	0.5	NA	34.1	NA	5.1	NA	6.5	< 0.3	NA	NA	NA	< 0.5	NA
Dehalobacter spp	NS	NA	NA	< 4.9	NA	3110	NA	4550	NA	200	< 3	NA	NA	NA	< 4.8	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	< 0.5	NA	NA	NA	0.1 J	NA	< 0.5	NA	NA	NA	NA	< 0.5	NA
tceA Reductase	NS	NA	NA	< 0.5	NA	NA	NA	0.1 J	NA	< 0.5	NA	NA	NA	NA	< 0.5	NA
Vinyl chloride Reductase	NS	NA	NA	< 0.5	NA	NA	NA	0.4 J	NA	< 0.5	NA	NA	NA	NA	< 0.5	NA
1,1 DCA Reductase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
1,2 DCA Reductase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
cerA Reductase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Chloroform Reductase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Dehalobacter DCM	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Dehalobium chlorocoercia	NS	NA	NA	384	NA	NA	NA	NA	NA	2470	NA	NA	NA	NA	< 4.8	NA
Dehalogenimonas spp	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Desulfobacterium spp	NS	NA	NA	13.8	NA	NA	NA	NA	NA	4470	NA	NA	NA	NA	< 4.8	NA
Desulfuromonas spp	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Dichloromethane Dehalogenase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Epoxyalkane Transferase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Ethene Monooxygenase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Methanogens	NS	NA	NA	2.6 J	NA	NA	NA	NA	NA	1410	NA	NA	NA	NA	1.4 J	NA
PCE Reductase 1	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
PCE Reductase 2	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Phenol Hydroxylase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	45.5	NA	NA	NA	NA	2.7 J	NA
Soluble Methane Monooxygenase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	139	NA	NA	NA	NA	< 4.8	NA
Sulfate Reducing Bacteria	NS	NA	NA	474	NA	NA	NA	NA	NA	38900	NA	NA	NA	NA	9.8	NA
Toluene Dioxygenase	NS	NA	NA	6	NA	NA	NA	NA	NA	22.2	NA	NA	NA	NA	0.3 J	NA
Toluene Monooxygenase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	3220	NA	NA	NA	NA	< 4.8	NA
Toluene Monooxygenase 2	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	208	NA	NA	NA	NA	< 4.8	NA
Total Eubacteria	NS	NA	NA	5670	NA	NA	NA	NA	NA	88900	NA	NA	NA	NA	5850	NA
trans-1,2-DCE Reductase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	< 4.9	NA	NA	NA	NA	NA	< 4.8	NA	NA	NA	NA	< 4.8	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Main Building															MW-34	MW-35	MW-36
		MW-8				MW-8-PDB		MW-9		MW-9-PDB		MW-9-PDB		MW-22					
		PE22065-004 05/22/14	QG08070-009 07/08/15	SF20036-005 06/19/17	XC04096-002 03/04/22	XC04096-001 03/04/22	92706733018 01/03/24	QG08070-010 07/08/15	SF12046-001 06/12/17	XC04096-004 03/04/22	XC04096-003 03/04/22	92706733019 01/03/24	QI08038-00BF13096-006 09/08/15	06/13/17	XB24099-017 02/24/22	06/08/23			
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>																			
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	< 0.78	NA	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA	NA	
1,1,1-Trichloroethane	200	< 50	< 5	< 5	< 2.5	< 2.5	< 0.83	< 25	< 5	< 0.5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 0.33	< 1.7	< 0.33	
1,1,2,2-Tetrachloroethane	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 0.56	< 25	< 5	< 0.5	< 0.5	< 0.22	< 5	< 5	< 0.5	< 0.22	< 1.1	< 0.22	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 50	< 5	< 5	< 5	< 5	NA	< 25	< 5	< 1	< 1	NA	< 5	< 5	< 1	NA	NA	NA	
1,1,2-Trichloroethane	5	< 50	< 5	< 5	< 2.5	< 2.5	< 0.81	< 25	< 5	< 0.5	< 0.5	< 0.32	< 5	< 5	< 0.5	< 0.32	< 1.6	< 0.32	
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	< 0.32	< 1.6	< 0.32											
1,1-Dichloroethane	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 0.92	< 25	< 5	< 0.5	< 0.5	< 0.37	< 5	< 5	< 0.5	< 0.37	< 1.8	< 0.37	
1,1-Dichloroethene	7	< 50	2.8 J//	2.6 J//	2.2 J//	2.7 J//	3.1 J//	< 25	< 5	< 0.5	< 0.5	< 0.35	< 5	< 5	< 0.5	< 0.35	< 1.7	< 0.35	
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	< 1.1	NA	NA	NA	NA	< 0.43	NA	NA	NA	NA	NA	NA	
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	< 2	NA	NA	NA	NA	< 0.81	NA	NA	NA	NA	< 0.81	< 4	< 0.81
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	< 0.65	NA	NA	NA	NA	< 0.26	NA	NA	NA	NA	NA	NA	
1,2,4-Trichlorobenzene	70	< 50	< 5	< 5	< 2.5	< 2.5	< 1.6	< 25	< 5	< 0.5	< 0.5	< 0.64	< 5	< 5	< 0.5	< 0.64	< 3.2	< 0.64	
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 50	< 5	< 5	< 2.5	< 2.5	< 0.85	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 1.7	< 0.34	
1,2-Dibromoethane (EDB)	0.05	< 50	< 5	< 5	< 2.5	< 2.5	NA	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 0.27	< 1.4	< 0.27	
1,2-Dichlorobenzene	600	< 50	< 5	< 5	< 2.5	< 2.5	< 0.85	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 1.7	< 0.34	
1,2-Dichloroethane	5	< 50	< 5	< 5	< 2.5	< 2.5	< 0.8	< 25	< 5	< 0.5	< 0.5	< 0.32	< 5	< 5	< 0.5	< 0.32	< 1.6	< 0.32	
1,2-Dichloropropane	5	< 50	< 5	< 5	< 2.5	< 2.5	< 0.89	< 25	< 5	< 0.5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 0.36	< 1.8	< 0.36	
1,3-Dichlorobenzene	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 0.85	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 1.7	< 0.34	
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	< 0.71	NA	NA	NA	NA	< 0.28	NA	NA	NA	NA	NA	NA	
1,4-Dichlorobenzene	75	< 50	< 5	< 5	< 2.5	< 2.5	< 0.83	< 25	< 5	< 0.5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 0.33	< 1.7	< 0.33	
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	< 38.7	< 194	< 38.7											
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	< 0.97	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	
2-Butanone (MEK)	NS	< 100	< 10	< 10	23 J//	< 50	< 9.9	< 50	< 10	< 10	< 10	< 4	< 10	< 10	< 10	< 4	< 19.8	< 4	
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 0.8	NA	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA	NA	
2-Hexanone	NS	< 100	< 10	< 10	< 50	< 50	< 1.2	< 50	< 10	< 10	< 10	< 0.48	< 10	< 10	< 10	< 0.48	< 2.4	< 0.48	
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 0.81	NA	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA	NA	
4-Methyl-2-pentanone	NS	< 100	< 10	< 10	< 50	< 50	< 6.8	< 50	< 10	< 10	< 10	< 2.7	< 10	< 10	< 10	< 2.7	< 13.6	< 2.7	
Acetone	NS	< 200	< 20	< 20	< 50	< 50	394	< 100	< 20	J//E	4.5 J//	< 10	223	6.5 J//	< 20	< 10	43	< 25.6	24.7 J
Benzene	5	< 50	< 5	< 5	< 2.5	< 2.5	< 0.86	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 1.7	< 0.34	
Bromobenzene	NS	NA	NA	NA	NA	NA	< 0.72	NA	NA	NA	NA	< 0.29	NA	NA	NA	NA	NA	NA	
Bromochloromethane	NS	NA	NA	NA	NA	NA	< 1.2	NA	NA	NA	NA	< 0.47	NA	NA	NA	NA	< 0.47	< 2.3	< 0.47
Bromodichloromethane	80 ¹	< 50	< 5	< 5	< 2.5	< 2.5	< 0.77	< 25	< 5	< 0.5	< 0.5	< 0.31	0.6 J//	< 5	< 0.5	< 0.31	< 1.5	< 0.31	
Bromoform	80 ¹	< 50	< 5	< 5	< 2.5	< 2.5	< 0.85	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 1.7	< 0.34	
Bromomethane (Methyl bromide)	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 4.2	< 25	< 5	< 0.5	< 0.5	< 1.7	< 5	< 5	< 0.5	< 1.7	< 8.3	< 1.7	
Carbon disulfide	NS	< 50	< 5	< 5	< 2.5	< 2.5	NA	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 0.73	< 3.6	< 0.73	
Carbon tetrachloride	5	< 50	< 5	< 5	< 2.5	< 2.5	< 0.83	< 25	< 5	< 0.5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 0.33	< 1.7	< 0.33	
Chlorobenzene	100	< 50	< 5	< 5	< 2.5	< 2.5	< 0.71	< 25	< 5	< 0.5	< 0.5	< 0.28	< 5	< 5	< 0.5	< 0.28	< 1.4	< 0.28	
Chloroethane	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 1.6	< 25	< 5	< 0.5	< 0.5	< 0.65	< 5	< 5	< 0.5	< 0.65	< 3.2	< 0.65	
Chloroform	80 ¹	< 50	3.1 J//	1.6 J//	< 2.5	< 2.5	< 1.1	< 25	< 5	< 0.5	< 0.5	< 0.43	2.3 J//	0.5 J//	< 0.5	< 0.43	< 2.2	0.57 J	
Chloromethane (Methyl chloride)	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 1.4	< 25	< 5	< 0.5	< 0.5	< 0.54	< 5	< 5	< 0.5	< 0.54	< 2.7	< 0.54	
cis-1,2-Dichloroethene	70	80	78	74	76	83	130	11 J//	7	11	11	4.5	< 5	< 5	< 0.5	< 0.38	6.6	< 0.38	
cis-1,3-Dichloropropene	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 0.91	< 25	< 5	< 0.5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 0.36	< 1.8	< 0.36	
Cyclohexane	NS	< 50	< 5	< 5	< 2.5	< 2.5	NA	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 0.35	< 1.8	< 0.35	
Dibromochloromethane	80 ¹	< 50	< 5	< 5	< 2.5	< 2.5	< 0.9	< 25	< 5	< 0.5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 0.36	< 1.8	< 0.36	
Dibromomethane	NS	NA	NA	NA	NA	NA	< 0.98	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	
Dichlorodifluoromethane	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 0.86	< 25	< 5	< 0.5	< 0.5	< 0.35	< 5	< 5	< 0.5	< 0.35	< 1.7	< 0.35	
Diisopropyl ether	NS	NA	NA	NA	NA	NA	< 0.77	NA	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA	NA	
Ethylbenzene	700	< 50	< 5	< 5	< 2.5	< 2.5	< 0.76	< 25	< 5	< 0.5	< 0.5	< 0.3	< 5	< 5	< 0.5	0.59 J	< 1.5	< 0.3	
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	< 3.8	NA	NA	NA	NA	< 1.5	NA	NA	NA	NA	NA	NA	
Isopropylbenzene	NS	< 50	0.74 J//	0.59 J//	< 2.5	< 2.5	NA	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 0.33	< 1.7	< 0.33	
m&p-Xylene	10,000	NA	NA	NA	NA	NA	< 1.8	NA	NA	NA	NA	< 0.71	NA	NA	NA	NA	< 0.71	< 3.5	< 0.71
Methyl acetate	NS	< 50	< 5	< 5	< 5	< 5	NA	< 25	< 5	< 1	< 1	NA	< 5	< 5	< 1	< 2.4	< 12	< 2.4	
Methyl tertiary butyl ether (MTBE)	NS	< 50	< 5	< 5	< 2.5	< 2.5	< 1.1	< 25	< 5	< 0.5	< 0.5	< 0.42	< 5	< 5	< 0.5	< 0.42	< 2.1	< 0.42	
Methylcyclohexane	NS	< 50	< 5	< 5	< 2.5	< 2.5	NA	< 25	< 5	< 5	< 5	NA	< 5	< 5	< 5	< 1.5	< 7.6	< 1.5	
Methylene chloride	5	< 50	< 5	< 5	< 2.5	< 2.5	< 4.9	< 25	< 5	< 0.5	< 0.5	< 2	< 5	< 5	< 0.5	< 2	19 J,C9	< 2	
Naphthalene	NS	NA	NA	NA	NA	NA	< 1.6	NA	NA	NA	NA	< 0.64	NA	NA	NA	NA	NA	NA	
o-Xylene	10,000	NA	NA	NA	NA	NA	< 0.84												

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Main Building																
		MW-8				MW-8-PDB	MW-8-PDB	MW-9			MW-9-PDB	MW-9-PDB	MW-22			MW-34	MW-35	MW-36
		PE22065-004	QG08070-009	SF20036-005	XC04096-002	XC04096-001	92706733018	QG08070-010	SF12046-001	XC04096-004	XC04096-003	92706733019	QI08038-00BF13096-006	XB24099-017				
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																		
Iron	0.3 ²	0.24	NA	0.21	0.97	NA	NA	NA	NA	0.3	NA	NA	NA	NA	< 0.1	NA	NA	NA
Manganese	0.05 ²	0.13	NA	0.059	0.08	NA	NA	NA	NA	0.045	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	< 0.1	NA	NA	NA	NA	< 0.1	NA	NA	NA	NA	< 0.1	NA	NA	NA
Dissolved Manganese	0.05 ²	0.17	NA	0.06	0.076	NA	NA	NA	NA	0.043	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NS	0.38	NA	< 0.05	0.051 H//	NA	NA	NA	NA	< 0.05 H//	NA	NA	NA	NA	< 0.05	NA	NA	NA
Ferric Iron (calculation)	NS	<1.0	NA	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																		
Alkalinity	NS	11	NA	< 10	< 20	NA	NA	NA	NA	< 20	NA	NA	NA	NA	< 20	NA	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																		
Chloride	250 ²	6.6	NA	5.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	NA	0.053 B//	NA	NA	NA	NA	0.69 B//	NA	NA	NA	NA	1.2 B//	NA	NA	NA
Nitrite	1	NA	NA	NA	0.036	NA	NA	NA	NA	< 0.02	NA	NA	NA	NA	< 0.02	NA	NA	NA
Sulfate	250 ²	4.2	NA	< 1	0.55 J//	NA	NA	NA	NA	0.27 J//	NA	NA	NA	NA	7.4	NA	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																		
Sulfide	NS	<1	NA	< 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)																		
Ethane	NS	0.041	NA	0.014 Jn	< 10	NA	NA	NA	NA	< 10	NA	NA	NA	NA	< 10	NA	NA	NA
Methane	NS	150	NA	340 n	220	NA	NA	NA	NA	4.2 J//	NA	NA	NA	NA	2.7 J//	NA	NA	NA
Carbon Dioxide	NS		NA	210000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	0.039	NA	0.03 Jn	< 10	NA	NA	NA	NA	< 10	NA	NA	NA	NA	< 10	NA	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																		
TOC	NS	NA	NA	NA	1.8	NA	NA	NA	NA	< 1	NA	NA	NA	NA	< 1	NA	NA	NA
Microbial																		
Dehalococcoides	NS	0.6	NA	< 0.5	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA
Dehalobacter spp	NS	256	NA	< 4.6	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	110	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	< 0.5	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA
tceA Reductase	NS	NA	NA	< 0.5	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA
Vinyl chloride Reductase	NS	NA	NA	< 0.5	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	< 0.5	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Dehalobium chlorocoercia	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	38.8	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Desulfotobacterium spp	NS	NA	NA	NA	< 5	NA	NA	NA	NA	13.3	NA	NA	NA	NA	546	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	135	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	273	NA	NA	NA
Methanogens	NS	NA	NA	NA	< 5	NA	NA	NA	NA	1.5 J	NA	NA	NA	NA	0.5 J	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	528	NA	NA	NA	NA	77.4	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	124	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	2250	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	4430	NA	NA	NA	NA	< 4.9	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	< 5	NA	NA	NA	NA	39.9	NA	NA	NA	NA	414	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	573 I	NA	NA	NA	NA	326000	NA	NA	NA	NA	19400	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	< 5	NA	NA	NA	NA	< 4.7	NA	NA	NA	NA	< 4.9	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Main Building																
		MW-37		MW-38	TMW-21				TMW-22				TMW-23				TMW-29	
		06/08/23	06/08/23	QG09023-006 07/09/15	SF14078-001 06/14/17	XB28047-005 02/28/22	92706733004 01/02/24	QG09023-005 07/09/15	SF14078-002 06/14/17	XB28047-006 02/28/22	92706733003 01/02/24	QG09023-003 07/09/15	SF14078-003 06/14/17	XC01061-002 03/01/22	92706733002 01/02/24	PF04097-011 06/04/14	XC01066-003 03/01/22	
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>																		
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	< 0.31	NA	NA	NA	< 0.31	NA	NA	NA	< 0.31	NA	NA	
1,1,1-Trichloroethane	200	< 0.33	< 0.33	< 100	< 100	< 0.5	< 0.33	< 25	< 50	< 0.5	< 0.33	< 5	< 5	< 5	< 0.33	< 5	< 0.5	
1,1,2,2-Tetrachloroethane	NS	< 0.22	< 0.22	< 100	< 100	< 0.5	< 0.22	< 25	< 50	< 0.5	< 0.22	< 5	< 5	< 5	< 0.22	< 5	< 0.5	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	NA	NA	< 100	< 100	< 1	NA	< 25	< 50	< 1	NA	< 5	< 5	< 10	NA	< 5	< 1	
1,1,2-Trichloroethane	5	< 0.32	< 0.32	< 100	< 100	< 0.5	< 0.32	< 25	< 50	< 0.5	< 0.32	< 5	< 5	< 5	< 0.32	< 5	< 0.5	
1,1,2-Trichlorotrifluoroethane	NS	< 0.32	< 0.32	NA														
1,1-Dichloroethane	NS	< 0.37	< 0.37	< 100	< 100	< 0.5	< 0.37	< 25	< 50	< 0.5	< 0.37	< 5	< 5	< 5	< 0.37	< 5	< 0.5	
1,1-Dichloroethene	7	< 0.35	< 0.35	< 100	< 100	3.9	6.3	< 25	< 50	3.1	2.2	< 5	< 5	< 5	< 0.35	< 5	< 0.5	
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	< 0.43	NA	NA	NA	< 0.43	NA	NA	NA	< 0.43	NA	NA	
1,2,3-Trichlorobenzene	NS	< 0.81	< 0.81	NA	NA	NA	< 0.81	NA	NA	NA	< 0.81	NA	NA	NA	< 0.81	NA	NA	
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	< 0.26	NA	NA	NA	< 0.26	NA	NA	NA	< 0.26	NA	NA	
1,2,4-Trichlorobenzene	70	< 0.64	< 0.64	< 100	< 100	< 0.5	< 0.64	< 25	< 50	< 0.5	< 0.64	< 5	< 5	< 5	< 0.64	< 5	< 0.5	
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 0.34	< 0.34	< 100	< 100	< 0.5	< 0.34	< 25	< 50	< 0.5	< 0.34	< 5	< 5	< 5	< 0.34	< 5	< 0.5	
1,2-Dibromoethane (EDB)	0.05	< 0.27	< 0.27	< 100	< 100	< 0.5	NA	< 25	< 50	< 0.5	NA	< 5	< 5	< 5	NA	< 5	< 0.5	
1,2-Dichlorobenzene	600	< 0.34	< 0.34	< 100	< 100	< 0.5	< 0.34	< 25	< 50	< 0.5	< 0.34	< 5	< 5	< 5	< 0.34	< 5	< 0.5	
1,2-Dichloroethane	5	< 0.32	< 0.32	< 100	< 100	< 0.5	< 0.32	< 25	< 50	< 0.5	< 0.32	< 5	< 5	< 5	< 0.32	< 5	< 0.5	
1,2-Dichloropropane	5	< 0.36	< 0.36	< 100	< 100	< 0.5	< 0.36	< 25	< 50	< 0.5	< 0.36	< 5	< 5	< 5	< 0.36	< 5	< 0.5	
1,3-Dichlorobenzene	NS	< 0.34	< 0.34	< 100	< 100	< 0.5	< 0.34	< 25	< 50	< 0.5	< 0.34	< 5	< 5	< 5	< 0.34	< 5	< 0.5	
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	< 0.28	NA	NA	NA	< 0.28	NA	NA	NA	< 0.28	NA	NA	
1,4-Dichlorobenzene	75	< 0.33	< 0.33	< 100	< 100	< 0.5	< 0.33	< 25	< 50	< 0.5	< 0.33	< 5	< 5	< 5	< 0.33	< 5	< 0.5	
1,4-Dioxane (p-Dioxane)	NS	< 38.7	< 38.7	NA														
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	
2-Butanone (MEK)	NS	< 4	< 4	< 200	< 200	8 J//	< 4	< 50	< 100	2.8 J//	< 4	< 10	< 10	< 100	< 4	< 10	< 10	
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 0.32	NA	NA	NA	< 0.32	NA	NA	NA	< 0.32	NA	NA	
2-Hexanone	NS	< 0.48	< 0.48	< 200	< 200	< 10	< 0.48	< 50	< 100	< 10	< 0.48	< 10	< 10	< 100	< 0.48	< 10	< 10	
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 0.32	NA	NA	NA	< 0.32	NA	NA	NA	< 0.32	NA	NA	
4-Methyl-2-pentanone	NS	< 2.7	< 2.7	< 200	< 200	< 10	< 2.7	< 50	< 100	< 10	< 2.7	< 10	< 10	< 100	< 2.7	< 10	< 10	
Acetone	NS	< 5.1	< 5.1	< 400	41 J//	100 J//	< 5.1	58 J//	35 J//	38 J//	19 J	19 J//	29 J//	18.1 J	55 J//	7.9 J//		
Benzene	5	< 0.34	< 0.34	< 100	< 100	< 0.5	< 0.34	< 25	< 50	< 0.5	< 0.34	< 5	< 5	< 5	< 0.34	< 5	< 0.5	
Bromobenzene	NS	NA	NA	NA	NA	NA	< 0.29	NA	NA	NA	< 0.29	NA	NA	NA	< 0.29	NA	NA	
Bromochloromethane	NS	< 0.47	< 0.47	NA	NA	NA	< 0.47	NA	NA	NA	< 0.47	NA	NA	NA	< 0.47	NA	NA	
Bromodichloromethane	80 ¹	< 0.31	< 0.31	< 100	< 100	< 0.5	< 0.31	< 25	< 50	< 0.5	< 0.31	< 5	< 5	< 5	< 0.31	< 5	< 0.5	
Bromoform	80 ¹	< 0.34	< 0.34	< 100	< 100	< 0.5	< 0.34	< 25	< 50	< 0.5	< 0.34	< 5	< 5	< 5	< 0.34	< 5	< 0.5	
Bromomethane (Methyl bromide)	NS	< 1.7	< 1.7	< 100	< 100	< 0.5	< 1.7	< 25	< 50	< 0.5	< 1.7	< 5	< 5	< 5	< 1.7	< 5	< 0.5	
Carbon disulfide	NS	< 0.73	< 0.73	< 100	< 100	< 0.5	NA	< 25	< 50	< 0.5	NA	< 5	< 5	< 5	NA	< 5	< 0.5	
Carbon tetrachloride	5	< 0.33	< 0.33	< 100	< 100	< 0.5	< 0.33	< 25	< 50	< 0.5	< 0.33	< 5	< 5	< 5	< 0.33	< 5	< 0.5	
Chlorobenzene	100	< 0.28	< 0.28	< 100	< 100	< 0.5	< 0.28	< 25	< 50	< 0.5	< 0.28	< 5	< 5	< 5	< 0.28	< 5	< 0.5	
Chloroethane	NS	< 0.65	< 0.65	< 100	< 100	< 0.5	< 0.65	< 25	< 50	< 0.5	< 0.65	< 5	< 5	< 5	< 0.65	< 5	< 0.5	
Chloroform	80 ¹	< 0.43	0.95 J	9.5 J//	< 100	1.3 J//	< 0.43	6.6 J//	5.7 J//	0.87 J//	< 0.43	< 5	0.8 J//	8.9 J//	4.3 J//	< 5	< 0.5	
Chloromethane (Methyl chloride)	NS	< 0.54	< 0.54	< 100	< 100	< 0.5	< 0.54	< 25	< 50	< 0.5	< 0.54	< 5	< 5	< 5	< 0.54	< 5	< 0.5	
cis-1,2-Dichloroethene	70	< 0.38	< 0.38	58 J//	50 J//	130 J//	146 J//	31 J//	33 J//	49 J//	19.2 J//	6.3 J//	3.8 J//	0.49 J	< 5	< 0.5	< 0.5	
cis-1,3-Dichloropropene	NS	< 0.36	< 0.36	< 100	< 100	< 0.5	< 0.36	< 25	< 50	< 0.5	< 0.36	< 5	< 5	< 5	< 0.36	< 5	< 0.5	
Cyclohexane	NS	< 0.35	< 0.35	< 100	< 100	< 0.5	NA	< 25	< 50	< 0.5	NA	< 5	< 5	< 5	NA	< 5	< 0.5	
Dibromochloromethane	80 ¹	< 0.36	< 0.36	< 100	< 100	< 0.5	< 0.36	< 25	< 50	< 0.5	< 0.36	< 5	< 5	< 5	< 0.36	< 5	< 0.5	
Dibromomethane	NS	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	
Dichlorodifluoromethane	NS	< 0.35	< 0.35	< 100	< 100	< 0.5	< 0.35	< 25	< 50	< 0.5	< 0.35	< 5	< 5	< 5	< 0.35	< 5	< 0.5	
Diisopropyl ether	NS	NA	NA	NA	NA	NA	< 0.31	NA	NA	NA	< 0.31	NA	NA	NA	< 0.31	NA	NA	
Ethylbenzene	700	< 0.3	< 0.3	< 100	< 100	< 0.5	< 0.3	< 25	< 50	< 0.5	< 0.3	< 5	< 5	< 5	< 0.3	< 5	< 0.5	
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	< 1.5	NA	NA	NA	< 1.5	NA	NA	NA	< 1.5	NA	NA	
Isopropylbenzene	NS	< 0.33	< 0.33	< 100	< 100	< 0.5	NA	< 25	< 50	< 0.5	NA	< 5	< 5	< 5	NA	< 5	< 0.5	
m&p-Xylene	10,000	< 0.71	< 0.71	NA	NA	NA	< 0.71	NA	NA	NA	< 0.71	NA	NA	NA	< 0.71	NA	NA	
Methyl acetate	NS	< 2.4	< 2.4	< 100	8.1 J//	< 1	NA	< 25	< 50	< 1	NA	< 5	< 5	< 10	NA	< 5	< 1	
Methyl tertiary butyl ether (MTBE)	NS	< 0.42	< 0.42	< 100	< 100	< 0.5	< 0.42	< 25	< 50	< 0.5	< 0.42	< 5	< 5	< 5	< 0.42	< 5	< 0.5	
Methylcyclohexane	NS	< 1.5	< 1.5	< 100	< 100	< 5	NA	< 25	< 50	< 5	NA	< 5	< 5	< 50	NA	< 5	< 5	
Methylene chloride	5	< 2	< 2	< 100	< 100	< 0.5	< 2	< 25	< 50	< 0.5	< 2	< 5	< 5	< 5	< 2	< 5	< 0.5	
Naphthalene	NS	NA	NA	NA	NA	NA	< 0.64	NA	NA	NA	< 0.64	NA	NA	NA	< 0.64	NA	NA	
o-Xylene	10,000	< 0.34	< 0.34	NA	NA	NA	< 0.34	NA	NA	NA	< 0.34	NA	NA	NA	< 0.34	NA	NA	
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	< 0.41	NA	NA	NA	< 0.41	NA	NA	NA	< 0.41	NA	NA	
Styrene	100	9.9	1.1	8.6 J//	< 100	56 J//	0.57 J	24 J//	18 J//	31 J//	< 0.29	68 J//	43 J//	20 J//	2.4 J//	81 J		

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Main Building															
		MW-37	MW-38	TMW-21				TMW-22				TMW-23				TMW-29	
		06/08/23	06/08/23	QG09023-006 07/09/15	SF14078-001 06/14/17	XB28047-005 02/28/22	92706733004 01/02/24	QG09023-005 07/09/15	SF14078-002 06/14/17	XB28047-006 02/28/22	92706733003 01/02/24	QG09023-003 07/09/15	SF14078-003 06/14/17	XC01061-002 03/01/22	92706733002 01/02/24	PF04097-011 06/04/14	XC01066-003 03/01/22
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																	
Iron	0.3 ²	NA	NA	NA	NA	< 0.1	NA	NA	NA	< 0.1	NA						
Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	NA	< 0.1	NA	NA	NA	< 0.1	NA						
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NS	NA	NA	NA	NA	0.089	NA	NA	NA	< 0.05	NA						
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																	
Alkalinity	NS	NA	NA	NA	NA	< 20	NA	NA	NA	< 20	NA						
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																	
Chloride	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	NA	NA	0.37	NA	NA	NA	0.026	NA	NA	NA	NA	NA	NA	2.8
Nitrite	1	NA	NA	NA	NA	0.011 J//	NA	NA	NA	< 0.02	NA						
Sulfate	250 ²	NA	NA	NA	NA	< 1	NA	NA	NA	< 1	NA						
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																	
Sulfide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)																	
Ethane	NS	NA	NA	NA	NA	< 10	NA	NA	NA	< 10	NA						
Methane	NS	NA	NA	NA	NA	280	NA	NA	NA	120	NA						
Carbon Dioxide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	NA	NA	NA	NA	< 10	NA	NA	NA	< 10	NA						
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																	
TOC	NS	NA	NA	NA	NA	< 1	NA	NA	NA	< 1	NA						
Microbial																	
Dehalococcoides	NS	NA	NA	NA	NA	< 0.5	NA	NA	NA	0.7	NA						
Dehalobacter spp	NS	NA	NA	NA	NA	9640	NA	NA	NA	< 4.9	NA						
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	< 0.5	NA	NA	NA	< 0.5	NA						
tceA Reductase	NS	NA	NA	NA	NA	< 0.5	NA	NA	NA	< 0.5	NA						
Vinyl chloride Reductase	NS	NA	NA	NA	NA	< 0.5	NA	NA	NA	< 0.5	NA						
1,1 DCA Reductase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
1,2 DCA Reductase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
cerA Reductase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Chloroform Reductase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Dehalobacter DCM	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Dehalobium chloroform	NS	NA	NA	NA	NA	246	NA	NA	NA	< 4.9	NA						
Dehalogenimonas spp	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Desulfotobacterium spp	NS	NA	NA	NA	NA	11400	NA	NA	NA	< 4.9	NA						
Desulfuromonas spp	NS	NA	NA	NA	NA	141	NA	NA	NA	< 4.9	NA						
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Epoxyalkane Transferase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Ethene Monooxygenase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Methanogens	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
PCE Reductase 1	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
PCE Reductase 2	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Phenol Hydroxylase	NS	NA	NA	NA	NA	2760	NA	NA	NA	129	NA						
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	331	NA	NA	NA	< 4.9	NA						
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	7690	NA	NA	NA	3180	NA						
Toluene Dioxygenase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Toluene Monooxygenase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	253	NA	NA	NA	1.6 J	NA						
Total Eubacteria	NS	NA	NA	NA	NA	2400000	NA	NA	NA	69900	NA						
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	< 5.2	NA	NA	NA	< 4.9	NA						

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Main Building										
	USEPA	TMW-30			TMW-31			92690805001	92706733001		
		QG09023-004	SF14078-004	XC01061-001	QG09023-002	SF14078-005	XC01066-004			XG20043-006	XL28017-001
MCL	07/09/15	06/14/17	03/01/22	07/09/15	06/14/17	03/01/22	07/20/22	12/28/22	09/29/23	01/02/24	
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>											
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA	NA	< 3.9	< 0.31	
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.2	
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 2.8	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 25	< 100	< 5	< 10	< 50	NA	
1,1,2-Trichloroethane	5	0.3 J//	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.1	
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.6	
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.4	
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA	NA	< 5.3	< 0.43	
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA	NA	< 10.1	< 0.81	
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	< 3.3	< 0.26	
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 8	
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.2	
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	NA	
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.2	
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4	
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.4	
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.2	
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	< 3.6	< 0.28	
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.2	
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	< 4.8	< 0.39	
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 50	< 200	< 50	< 100	< 500	< 49.5	
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	< 4	< 0.32	
2-Hexanone	NS	< 10	< 10	< 10	< 50	< 200	< 50	< 100	< 500	< 6	
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	< 4	< 0.32	
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 50	< 200	< 50	< 100	< 500	< 33.9	
Acetone	NS	21	11 J/B/T	12	51 J//	70 J/B/T	< 50	< 100	< 500	< 63.9	
Benzene	5	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.3	
Bromobenzene	NS	NA	NA	NA	NA	NA	NA	NA	< 3.6	< 0.29	
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA	NA	< 5.8	< 0.47	
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 3.8	
Bromoform	80 ¹	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.3	
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 20.8	
Carbon disulfide	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	NA	
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.2	
Chlorobenzene	100	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 3.6	
Chloroethane	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 8.1	
Chloroform	80 ¹	6.1	3.3 J//	2.1	< 25	< 100	< 2.5	< 5	< 25	< 5.4	
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 6.8	
cis-1,2-Dichloroethene	70	5.6	1.2 J//	< 0.5	2 J//	9.3 J//	3	9.6	32	14.8	
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.6	
Cyclohexane	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	NA	
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.5	
Dibromomethane	NS	NA	NA	NA	NA	NA	NA	NA	< 4.9	< 0.39	
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.3	
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA	NA	< 3.8	< 0.31	
Ethylbenzene	700	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 3.8	
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA	NA	< 19.1	< 1.5	
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	NA	
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	< 8.9	< 0.71	
Methyl acetate	NS	< 5	< 5	< 1	< 25	< 100	< 5	< 10	< 50	NA	
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 5.3	
Methylcyclohexane	NS	< 5	< 5	< 5	< 25	< 100	< 2.5	< 50	< 250	NA	
Methylene chloride	5	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 24.4	
Naphthalene	NS	NA	NA	NA	NA	NA	NA	NA	< 8.1	< 0.64	
o-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	< 4.2	< 0.34	
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA	NA	< 5.2	< 0.41	
Styrene	100	32	6.9	18	27	18 J//	< 2.5	7.5	< 25	< 3.6	
Tetrachloroethene	5	0.9 J//	0.6 J//	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 3.6	
Toluene	1000	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 6.1	
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 5	
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 4.5	
Trichloroethene (TCE)	5	150 /M/m	74	20	330	1400	480	860	3600	1810	
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 25	< 100	< 2.5	< 5	< 25	< 3.7	
Vinyl acetate	NS	NA	NA	NA	NA	NA	NA	NA	< 16.4	< 1.3	
Vinyl chloride	2	< 2	< 2	< 0.5	< 10	< 40	< 2.5	< 5	< 25	< 4.8	
Xylenes (total)	10000	< 5	< 5	< 1	< 25	< 100	< 5	< 10	< 50	< 4.2	

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Main Building										
	USEPA	TMW-30			TMW-31						
		QG09023-004	SF14078-004	XC01061-001	QG09023-002	SF14078-005	XC01066-004	XG20043-006	XL28017-001	92690805001	92706733001
MCL	07/09/15	06/14/17	03/01/22	07/09/15	06/14/17	03/01/22	07/20/22	12/28/22	09/29/23	01/02/24	
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)											
Iron	0.3 ²	NA									
Manganese	0.05 ²	NA									
Dissolved Iron	0.3 ²	NA									
Dissolved Manganese	0.05 ²	NA									
Ferrous Iron	NS	NA									
Ferric Iron (calculation)	NS	NA									
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)											
Alkalinity	NS	NA									
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)											
Chloride	250 ²	NA	NA	NA	NA	NA	6	5.6	3.2	NA	NA
Nitrate	10	NA	NA	NA	NA	NA	NA	1.3	NA	NA	NA
Nitrite	1	NA	NA	NA	NA	NA	NA	0.011 J	NA	NA	NA
Sulfate	250 ²	NA									
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)											
Sulfide	NS	NA									
Dissolved Gases by USEPA Method AM20GAX (ug/L)											
Ethane	NS	NA									
Methane	NS	NA									
Carbon Dioxide	NS	NA									
Ethene	NS	NA									
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)											
TOC	NS	NA									
Microbial											
Dehalococcoides	NS	NA									
Dehalobacter spp	NS	NA									
BAV1 Vinyl Chloride Reductase	NS	NA									
tceA Reductase	NS	NA									
Vinyl chloride Reductase	NS	NA									
1,1 DCA Reductase	NS	NA									
1,2 DCA Reductase	NS	NA									
cerA Reductase	NS	NA									
Chloroform Reductase	NS	NA									
Dehalobacter DCM	NS	NA									
Dehalobium chloroocercia	NS	NA									
Dehalogenimonas spp	NS	NA									
Desulfotobacterium spp	NS	NA									
Desulfuromonas spp	NS	NA									
Dichloromethane Dehalogenase	NS	NA									
Epoxyalkane Transferase	NS	NA									
Ethene Monooxygenase	NS	NA									
Methanogens	NS	NA									
PCE Reductase 1	NS	NA									
PCE Reductase 2	NS	NA									
Phenol Hydroxylase	NS	NA									
Soluble Methane Monooxygenase	NS	NA									
Sulfate Reducing Bacteria	NS	NA									
Toluene Dioxygenase	NS	NA									
Toluene Monooxygenase	NS	NA									
Toluene Monooxygenase 2	NS	NA									
Total Eubacteria	NS	NA									
trans-1,2-DCE Reductase	NS	NA									
Trichlorobenzene Dioxygenase	NS	NA									

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Pole Winder Building																			
	USEPA	TMW-24				TMW-25				TMW-32		TMW-33								
		QG08070-012	SF13096-008	XB28047-002	92706733005	QG09023-001	SF13096-010	XB28047-004	92706733006	QG08070-011	SF13096-009	QG09023-007	SF13096-007	XB28047-003						
MCL	07/08/15	06/13/17	02/28/22	01/02/24	07/08/15	06/13/17	02/28/22	01/02/24	07/08/15	06/13/17	07/09/15	06/13/17	02/28/22							
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>																				
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	< 0.31	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA						
1,1,1-Trichloroethane	200	< 25	< 25	< 0.5	< 0.33	< 5	< 5	< 0.5	< 0.33	< 5	< 25	< 25	< 25	< 0.5						
1,1,2,2-Tetrachloroethane	NS	< 25	< 25	< 0.5	< 0.22	< 5	< 5	< 0.5	< 0.22	< 5	< 25	< 25	< 25	< 0.5						
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 25	< 25	< 1	NA	< 5	< 5	< 1	NA	< 5	< 25	< 25	< 25	< 1						
1,1,2-Trichloroethane	5	< 25	< 25	< 0.5	< 0.32	< 5	< 5	< 0.5	< 0.32	< 5	< 25	< 25	< 25	< 0.5						
1,1,2-Trichlorotrifluoroethane	NS	NA																		
1,1-Dichloroethane	NS	< 25	< 25	< 0.5	0.61	J	< 5	< 5	< 0.37	< 5	< 25	< 25	< 25	< 0.5						
1,1-Dichloroethene	7	< 25	< 25	< 0.5	< 0.35	< 5	< 5	< 0.5	< 0.35	< 5	< 25	< 25	< 25	< 0.5						
1,1-Dichloropropene	NS	NA	NA	NA	< 0.43	NA	NA	NA	< 0.43	NA	NA	NA	NA	NA						
1,2,3-Trichlorobenzene	NS	NA	NA	NA	< 0.81	NA	NA	NA	< 0.81	NA	NA	NA	NA	NA						
1,2,3-Trichloropropane	NS	NA	NA	NA	< 0.26	NA	NA	NA	< 0.26	NA	NA	NA	NA	NA						
1,2,4-Trichlorobenzene	70	< 25	< 25	< 0.5	< 0.64	< 5	< 5	< 0.5	< 0.64	< 5	< 25	< 25	< 25	< 0.5						
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 25	< 25	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 5	< 25	< 25	< 25	< 0.5						
1,2-Dibromoethane (EDB)	0.05	< 25	< 25	< 0.5	NA	< 5	< 5	< 0.5	NA	< 5	< 25	< 25	< 25	< 0.5						
1,2-Dichlorobenzene	600	< 25	< 25	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 5	< 25	< 25	< 25	< 0.5						
1,2-Dichloroethane	5	< 25	< 25	< 0.5	0.37	J	< 5	< 5	< 0.32	< 5	< 25	< 25	< 25	< 0.5						
1,2-Dichloropropane	5	< 25	< 25	< 0.5	< 0.36	< 5	< 5	< 0.5	< 0.36	< 5	< 25	< 25	< 25	< 0.5						
1,3-Dichlorobenzene	NS	< 25	< 25	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 5	< 25	< 25	< 25	< 0.5						
1,3-Dichloropropane	NS	NA	NA	NA	< 0.28	NA	NA	NA	< 0.28	NA	NA	NA	NA	NA						
1,4-Dichlorobenzene	75	< 25	< 25	< 0.5	< 0.33	< 5	< 5	< 0.5	< 0.33	< 5	< 25	< 25	< 25	< 0.5						
1,4-Dioxane (p-Dioxane)	NS	NA																		
2,2-Dichloropropane	NS	NA	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA						
2-Butanone (MEK)	NS	< 50	< 50	< 10	< 4	< 10	3.7	J//	< 10	< 4	< 10	< 50	< 50	< 10						
2-Chlorotoluene	NS	NA	NA	NA	< 0.32	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA						
2-Hexanone	NS	< 50	< 50	< 10	< 0.48	< 10	< 10	< 10	< 0.48	< 10	< 50	< 50	< 50	< 10						
4-Chlorotoluene	NS	NA	NA	NA	< 0.32	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA						
4-Methyl-2-pentanone	NS	< 50	< 50	< 10	< 2.7	< 10	< 10	< 10	< 2.7	< 10	< 50	< 50	< 50	< 10						
Acetone	NS	58	J//	150	29	5.1	7.5	J//	7.8	J//	5	J//	11	J//	16	J//	< 100	< 100	34	
Benzene	5	< 25	< 25	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 5	< 25	< 25	< 25	< 0.5						
Bromobenzene	NS	NA	NA	NA	< 0.29	NA	NA	NA	< 0.29	NA	NA	NA	NA	NA						
Bromochloromethane	NS	NA	NA	NA	< 0.47	NA	NA	NA	< 0.47	NA	NA	NA	NA	NA						
Bromodichloromethane	80 ¹	< 25	< 25	< 0.5	< 0.31	< 5	< 5	< 0.5	< 0.31	< 5	< 25	< 25	< 25	< 0.5						
Bromoform	80 ¹	< 25	< 25	< 0.5	< 0.34	< 5	< 5	< 0.5	< 0.34	< 5	< 25	< 25	< 25	< 0.5						
Bromomethane (Methyl bromide)	NS	< 25	< 25	< 0.5	< 1.7	< 5	< 5	< 0.5	< 1.7	< 5	< 25	< 25	< 25	< 0.5						
Carbon disulfide	NS	< 25	< 25	< 0.5	NA	< 5	< 5	< 0.5	NA	< 5	< 25	< 25	< 25	< 0.5						
Carbon tetrachloride	5	< 25	< 25	< 0.5	< 0.33	< 5	< 5	< 0.5	< 0.33	< 5	< 25	< 25	< 25	< 0.5						
Chlorobenzene	100	< 25	< 25	< 0.5	< 0.28	< 5	< 5	< 0.5	< 0.28	< 5	< 25	< 25	< 25	< 0.5						
Chloroethane	NS	< 25	< 25	< 0.5	< 0.65	< 5	< 5	< 0.5	< 0.65	< 5	< 25	< 25	< 25	< 0.5						
Chloroform	80 ¹	2.5	J//	2.2	J//	< 0.5	< 0.43	0.32	J//	< 5	< 0.5	< 0.43	0.33	J//	< 25	3.3	J//	< 25	3.3	J//
Chloromethane (Methyl chloride)	NS	< 25	< 25	< 0.5	< 0.54	< 5	< 5	< 0.5	< 0.54	< 5	< 25	< 25	< 25	< 0.5						
cis-1,2-Dichloroethene	70	4	J//	< 25	1.3	18.6	< 5	< 5	< 0.38	3.8	J//	4.2	J//	< 25	< 25	0.74				
cis-1,3-Dichloropropene	NS	< 25	< 25	< 0.5	< 0.36	< 5	< 5	< 0.5	< 0.36	< 5	< 25	< 25	< 25	< 0.5						
Cyclohexane	NS	< 25	< 25	< 0.5	NA	< 5	< 5	< 0.5	NA	< 5	< 25	< 25	< 25	< 0.5						
Dibromochloromethane	80 ¹	< 25	< 25	< 0.5	< 0.36	< 5	< 5	< 0.5	< 0.36	< 5	< 25	< 25	< 25	< 0.5						
Dibromomethane	NS	NA	NA	NA	< 0.39	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA						
Dichlorodifluoromethane	NS	< 25	< 25	< 0.5	< 0.35	< 5	< 5	< 0.5	< 0.35	< 5	< 25	< 25	< 25	< 0.5						
Diisopropyl ether	NS	NA	NA	NA	< 0.31	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA						
Ethylbenzene	700	< 25	< 25	< 0.5	< 0.3	< 5	< 5	< 0.5	< 0.3	< 5	< 25	< 25	< 25	< 0.5						
Hexachloro-1,3-butadiene	NS	NA	NA	NA	< 1.5	NA	NA	NA	< 1.5	NA	NA	NA	NA	NA						
Isopropylbenzene	NS	< 25	< 25	< 0.5	NA	< 5	< 5	< 0.5	NA	< 5	< 25	< 25	< 25	< 0.5						
m&p-Xylene	10,000	NA	NA	NA	< 0.71	NA	NA	NA	< 0.71	NA	NA	NA	NA	NA						
Methyl acetate	NS	< 25	< 25	< 1	NA	< 5	< 5	< 1	NA	< 5	< 25	< 25	< 25	< 1						
Methyl tertiary butyl ether (MTBE)	NS	< 25	< 25	< 0.5	< 0.42	< 5	< 5	< 0.5	< 0.42	< 5	< 25	< 25	< 25	< 0.5						
Methylcyclohexane	NS	< 25	< 25	< 5	NA	< 5	< 5	< 5	NA	< 5	< 25	< 25	< 25	< 5						
Methylene chloride	5	< 25	< 25	< 0.5	< 2	< 5	< 5	< 0.5	< 2	< 5	< 25	< 25	< 25	< 0.5						
Naphthalene	NS	NA	NA	NA	< 0.64	NA	NA	NA	< 0.64	NA	NA	NA	NA	NA						
o-Xylene	10,000	NA	NA	NA	< 0.34	NA	NA	NA	< 0.34	NA	NA	NA	NA	NA						
p-Isopropyltoluene	NS	NA	NA	NA	< 0.41	NA	NA	NA	< 0.41	NA	NA	NA	NA	NA						
Styrene	100	< 25	14	J//	22	0.39	J	2.8	J//	< 5	4.8	13	23	15	J//	< 25	< 25	10		
Tetrachloroethene	5	< 25	< 25	< 0.5	< 0.29	< 5	< 5	< 0.5	< 0.29	< 5	< 25	< 25	< 25	< 0.5						
Toluene	1000	< 25	< 25	< 0.5	< 0.48	< 5	< 5	< 0.5	< 0.48	< 5	< 25	< 25	< 25	< 0.5						
trans-1,2-Dichloroethene	100	< 25	< 25	< 0.5	< 0.4	< 5	< 5	< 0.5	< 0.4	< 5	< 25	< 25	< 25	< 0.5						
trans-1,3-Dichloropropene	NS	< 25	< 25	< 0.5	< 0.36	< 5	< 5	< 0.5	< 0.36	< 5	< 25	< 25	< 25	< 0.5						
Trichloroethene (TCE)	5	1200	320	70	93.8	15	38	45	51.9	200	220	240	120	20						
Trichlorofluoromethane	NS	< 25	< 25	< 0.5	< 0.3	< 5	< 5	< 0.5	< 0.3	< 5	< 25	< 25	< 25	< 0.5						
Vinyl acetate	NS	NA	NA	NA	< 1.3	NA	NA	NA	< 1.3	NA	NA	NA	NA	NA						
Vinyl chloride	2	< 10	< 10	< 0.5	1.2	< 2	< 2	< 0.5	< 0.39	< 2	< 10	< 10	< 10	< 0.5						
Xylenes (total)	10000	< 25	< 25	< 1	< 0.34	< 5	< 5	< 1	< 0.34	< 5	< 25	< 25	< 25	< 1						

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Pole Winder Building													
	USEPA MCL	TMW-24				TMW-25				TMW-32		TMW-33		
		QG08070-012	SF13096-008	XB28047-002	92706733005	QG09023-001	SF13096-010	XB28047-004	92706733006	QG08070-011	SF13096-009	QG09023-007	SF13096-007	XB28047-003
		07/08/15	06/13/17	02/28/22	01/02/24	07/08/15	06/13/17	02/28/22	01/02/24	07/08/15	06/13/17	07/09/15	06/13/17	02/28/22
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)														
Iron	0.3 ²	NA	NA	0.15	NA									
Manganese	0.05 ²	NA												
Dissolved Iron	0.3 ²	NA	NA	< 0.1	NA									
Dissolved Manganese	0.05 ²	NA												
Ferrous Iron	NS	NA	NA	< 0.05	NA									
Ferric Iron (calculation)	NS	NA												
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)														
Alkalinity	NS	NA	NA	< 20	NA									
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)														
Chloride	250 ²	NA												
Nitrate	10	NA	NA	1.2	NA									
Nitrite	1	NA	NA	< 0.02	NA									
Sulfate	250 ²	NA	NA	< 1	NA									
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)														
Sulfide	NS	NA												
Dissolved Gases by USEPA Method AM20GAX (ug/L)														
Ethane	NS	NA	NA	< 10	NA									
Methane	NS	NA	NA	< 10	NA									
Carbon Dioxide	NS	NA												
Ethene	NS	NA	NA	< 10	NA									
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)														
TOC	NS	NA	NA	< 1	NA									
Microbial														
Dehalococcoides	NS	NA	NA	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	NA	NA
Dehalobacter spp	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	NA	NA
tceA Reductase	NS	NA	NA	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	NA	NA
Vinyl chloride Reductase	NS	NA	NA	NA	NA	NA	NA	< 0.5	NA	NA	NA	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Dehalobium chloroocercia	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Desulfobacterium spp	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	5.2	NA	NA	NA	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Methanogens	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	5390	NA	NA	NA	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Dickert Property																
	USEPA MCL	MW-10						MW-10-PDB	MW-11			MW-11-PDB	MW-12			MW-12-PDB	MW-12-PDB
		QH06108-007 08/06/15	SF20036-006 06/19/17	XC08061-004 03/08/22	XG20043-001 07/19/22	XL19029-001 12/19/22		92706733016 01/03/24	QH06108-008 08/06/15	SF16059-004 06/15/17	XC02133-005 03/02/22	XC02133-006 03/02/22	QH11036-001 08/10/15	SF16059-012 06/16/17	XC02133-001 03/02/22	XC02133-002 03/02/22	92706733014 01/03/24
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>																	
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	< 1.2	NA	< 0.31								
1,1,1-Trichloroethane	200	< 25	< 5	< 10	< 25	< 5	< 1.3	< 1.3	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.33
1,1,2,2-Tetrachloroethane	NS	< 25	< 5	< 10	< 25	< 5	< 0.9	< 0.9	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.22
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 25	< 5	< 20	< 50	< 10	NA	NA	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 1	NA
1,1,2-Trichloroethane	5	< 25	< 5	< 10	< 25	< 5	< 1.3	< 1.3	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.32
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	NA	< 1.3	NA									
1,1-Dichloroethane	NS	< 25	< 5	< 10	< 25	< 5	< 1.5	< 1.5	< 5	< 5	< 0.5	< 0.5	< 5	0.5 J//	0.47 J//	0.46 J//	0.38 J
1,1-Dichloroethene	7	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	1 J//	0.61 J//	0.68 J//	0.62 J
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	< 1.7	NA	< 0.43								
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	< 3.2	< 3.2	NA	< 0.81							
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	< 1	NA	< 0.26								
1,2,4-Trichlorobenzene	70	< 25	< 5	< 10	< 25	< 5	< 2.6	< 2.6	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.64
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.34
1,2-Dibromoethane (EDB)	0.05	< 25	< 5	< 10	< 25	< 5	< 1.1	NA	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA
1,2-Dichlorobenzene	600	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.34
1,2-Dichloroethane	5	< 25	0.54 J//	< 10	< 25	5.7 J	3.2 J	3.1 J	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.32
1,2-Dichloropropane	5	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.36
1,3-Dichlorobenzene	NS	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.34
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	< 1.1	NA	< 0.28								
1,4-Dichlorobenzene	75	< 25	< 5	< 10	< 25	< 5	< 1.3	< 1.3	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.33
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	< 155	NA									
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	< 1.6	NA	< 0.39								
2-Butanone (MEK)	NS	< 50	< 10	< 200	< 500	< 100	< 15.8	< 15.8	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 4
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 1.3	NA	< 0.32								
2-Hexanone	NS	< 50	< 10	< 200	< 500	28 J//	< 1.9	< 1.9	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 0.48
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 1.3	NA	< 0.32								
4-Methyl-2-pentanone	NS	< 50	< 10	< 200	< 500	< 100	< 10.8	< 10.8	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 2.7
Acetone	NS	< 100	2.6 J//	< 200	< 500	< 100	< 20.4	< 20.4	< 20	< 20	< 10	9.2 J//	< 20	< 20	< 10	10	47.3
Benzene	5	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.34
Bromobenzene	NS	NA	NA	NA	NA	NA	< 1.2	NA	< 0.29								
Bromochloromethane	NS	NA	NA	NA	NA	NA	< 1.9	< 1.9	NA	< 0.47							
Bromodichloromethane	80 ¹	< 25	< 5	< 10	< 25	< 5	< 1.2	< 1.2	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.31
Bromoform	80 ¹	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.34
Bromomethane (Methyl bromide)	NS	< 25	< 5	< 10	< 25	< 5	< 6.6	6.6 U,IH	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 1.7
Carbon disulfide	NS	< 25	< 5	< 10	< 25	< 5	< 2.9	NA	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA
Carbon tetrachloride	5	< 25	< 5	< 10	< 25	< 5	< 1.3	< 1.3	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.33
Chlorobenzene	100	< 25	< 5	< 10	< 25	< 5	< 1.1	< 1.1	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.28
Chloroethane	NS	< 25	< 5	< 10	< 25	< 5	< 2.6	< 2.6	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.65
Chloroform	80 ¹	< 25	< 5	< 10	< 25	< 5	< 1.7	< 1.7	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.43
Chloromethane (Methyl chloride)	NS	< 25	< 5	< 10	< 25	< 5	< 2.2	< 2.2	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.54
cis-1,2-Dichloroethene	70	< 25	1.5 J//	< 10	< 25	15	13.8	16	< 5	< 5	< 0.5	< 0.5	22	37	29	30	28.3
cis-1,3-Dichloropropene	NS	< 25	< 5	< 10	< 25	< 5	< 1.5	< 1.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.36
Cyclohexane	NS	< 25	< 5	< 10	< 25	< 5	< 1.4	NA	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA
Dibromochloromethane	80 ¹	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.36
Dibromomethane	NS	NA	NA	NA	NA	NA	< 1.6	NA	< 0.39								
Dichlorodifluoromethane	NS	< 25	< 5	< 10	< 25	< 5	< 1.4	< 1.4	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.35
Diisopropyl ether	NS	NA	NA	NA	NA	NA	< 1.2	NA	< 0.31								
Ethylbenzene	700	< 25	< 5	< 10	< 25	< 5	< 1.2	< 1.2	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.3
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	< 6.1	U,IH	NA	< 1.5							
Isopropylbenzene	NS	< 25	< 5	< 10	< 25	< 5	< 1.3	NA	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA
m&p-Xylene	10,000	NA	NA	NA	NA	NA	< 2.8	< 2.8	NA	< 0.71							
Methyl acetate	NS	< 25	< 5	< 20	< 50	< 10	< 9.6	NA	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 1	NA
Methyl tertiary butyl ether (MTBE)	NS	< 25	< 5	< 10	< 25	< 5	< 1.7	< 1.7	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.42
Methylcyclohexane	NS	< 25	< 5	< 100	< 250	< 50	< 6	NA	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	NA
Methylene chloride	5	< 25	< 5	< 10	< 25	< 5	15.1 J,C9	< 7.8	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 2
Naphthalene	NS	NA	NA	NA	NA	NA	< 2.6	NA	< 0.64								
o-Xylene	10,000	NA	NA	NA	NA	NA	< 1.4	< 1.4	NA	< 0.34							
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	< 1.7	NA	< 0.41								
Styrene	100	< 25	< 5	< 10	< 25	< 5	< 1.2	< 1.2	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.29
Tetrachloroethene	5	< 25	< 5	< 10	< 25	< 5	< 1.2	< 1.2	< 5	< 5	< 0.5	< 0.5	0.49 J//	0.67 J//	< 0.5	< 0.5	< 0.29
Toluene	1000	< 25	< 5	< 10	< 25	< 5	< 1.9	< 1.9	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.48
trans-1,2-Dichloroethene	100	< 25	< 5	< 10	< 25	< 5	< 1.6	2.1 J	< 5	< 5	< 0.5	< 0.5	< 5	0.43 J//	< 0.5</		

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Dickert Property																
	USEPA	MW-10						MW-10-PDB	MW-11			MW-11-PDB	MW-12			MW-12-PDB	MW-12-PDB
		QH06108-007	SF20036-006	XC08061-004	XG20043-001	XL19029-001		92706733016	QH06108-008	SF16059-004	XC02133-005	XC02133-006	QH11036-001	SF16059-012	XC02133-001	XC02133-002	92706733014
MCL	08/06/15	06/19/17	03/08/22	07/19/22	12/19/22	06/09/23	01/03/24	08/06/15	06/15/17	03/02/22	03/02/22	08/10/15	06/16/17	03/02/22	03/02/22	01/03/24	
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																	
Iron	0.3 ²	NA	0.14	5.9	31	43	NA	26.7	NA								
Manganese	0.05 ²	NA	0.012 J//	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dissolved Iron	0.3 ²	NA	NA	1.9	11	14	NA	15.5	NA								
Dissolved Manganese	0.05 ²	NA	0.012 J//	0.052	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ferrous Iron	NS	NA	< 0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ferric Iron (calculation)	NS	NA	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																	
Alkalinity	NS	NA	12	NA	330	110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																	
Chloride	250 ²	NA	56	28	25	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Nitrate	10	NA	NA	0.17	< 0.02	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Nitrite	1	NA	NA	0.015 J//	0.72	< 0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sulfate	250 ²	NA	< 1	0.58 J//	1.3	< 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																	
Sulfide	NS	NA	< 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dissolved Gases by USEPA Method AM20GAX (ug/L)																	
Ethane	NS	NA	0.038 Jn	< 10	< 10	< 10	NA	< 5.9	NA								
Methane	NS	NA	2.2 n	2600	9100	7500	NA	4720	NA								
Carbon Dioxide	NS	NA	100000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ethene	NS	NA	0.061 Jn	2.8 J//	8 J	< 10	NA	< 5.7	NA								
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																	
TOC	NS	NA	NA	920	390 H	250	NA	52.2	NA								
Microbial																	
Dehalococcoides	NS	NA	<0.5	NA	NA	< 1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dehalobacter spp	NS	NA	<4.8	NA	NA	< 14.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BAV1 Vinyl Chloride Reductase	NS	NA	<0.5	NA	NA	< 1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
tceA Reductase	NS	NA	<0.5	NA	NA	< 1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Vinyl chloride Reductase	NS	NA	<0.5	NA	NA	< 1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dehalobium chloro-coercia	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Methanogens	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Dickert Property																	
		MW-13			MW-14			MW-14-PDB	MW-14-PDB	MW-15			MW-16			MW-16-PDB	MW-17		
		QH11036-006	SF16059-011	XB24099-002	QH11036-002	SF16059-010	XC02133-003	XC02133-004	92706733015	QH11036-003	SF16059-009	XB22075-005	QH11036-004	SF16059-002	XB22075-002	92706733012	QH11036-005	SF16059-001	XB22075-003
08/10/15	06/16/17	02/22/22	08/10/15	06/16/17	03/02/22	03/02/22	01/03/24	08/10/15	06/16/17	02/22/22	08/10/15	06/15/17	02/22/22	01/03/24	08/10/15	06/15/17	02/22/22		
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>																			
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA	NA	< 0.31	NA	NA	NA	
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.33	< 5	< 5	
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.22	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.22	< 5	< 5	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 5	< 5	< 1	NA	< 5	< 5	< 1	< 5	/M/DM	< 5	< 1	NA	< 5	< 5	
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.32	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.32	< 5	< 5	
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.37	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.37	< 5	< 5	
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.35	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.35	< 5	< 5	
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA	< 0.43	NA	NA	NA	NA	NA	NA	NA	< 0.43	NA	NA	
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA	< 0.81	NA	NA	NA	NA	NA	NA	NA	< 0.81	NA	NA	
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA	< 0.26	NA	NA	NA	NA	NA	NA	NA	< 0.26	NA	NA	
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.64	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.64	< 5	< 5	
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.34	< 5	< 5	
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 5	< 5	< 0.5	NA	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	NA	< 5	< 5	
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.34	< 5	< 5	
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.32	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.32	< 5	< 5	
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.36	< 5	< 5	
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.34	< 5	< 5	
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	< 0.28	NA	NA	NA	NA	NA	NA	NA	< 0.28	NA	NA	
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.33	< 5	< 5	
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 4	< 10	< 10	< 10	< 10	/M/D	< 10	< 10	< 4	< 10	< 10	
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA	NA	NA	< 0.32	NA	NA	
2-Hexanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 0.48	< 10	< 10	< 10	< 10	/M/D	< 10	< 10	< 0.48	< 10	< 10	
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA	NA	NA	< 0.32	NA	NA	
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 2.7	< 10	< 10	< 10	< 10	/M/D	< 10	< 10	< 2.7	< 10	< 10	
Acetone	NS	< 20	< 20	< 10	< 20	< 20	< 10	6.9 J//	259	< 20	< 20	< 10	/M/D	< 20	< 10	92.2	< 20	< 20	
Benzene	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.34	< 5	< 5	
Bromobenzene	NS	NA	NA	NA	NA	NA	NA	< 0.29	NA	NA	NA	NA	NA	NA	NA	< 0.29	NA	NA	
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA	< 0.47	NA	NA	NA	NA	NA	NA	NA	< 0.47	NA	NA	
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.31	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.31	< 5	< 5	
Bromoform	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.34	< 5	< 5	
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 1.7	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 1.7	< 5	< 5	
Carbon disulfide	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	NA	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	NA	< 5	< 5	
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.33	< 5	< 5	
Chlorobenzene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.28	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.28	< 5	< 5	
Chloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.65	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.65	< 5	< 5	
Chloroform	80 ¹	0.59 J//	< 5	< 0.5	1.8 J//	< 5	< 0.5	< 0.43	1.4 J//	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.43	0.53 J//	< 5	
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.54	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.54	< 5	< 5	
cis-1,2-Dichloroethene	70	3.2 J//	3.8 J//	3.1 J//	< 5	< 5	< 0.5	< 0.38	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.38	< 5	0.5 J//	
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.36	< 5	< 5	
Cyclohexane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	NA	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	NA	< 5	< 5	
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.36	< 5	< 5	
Dibromomethane	NS	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA	NA	< 0.39	NA	NA	
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.35	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.35	< 5	< 5	
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA	NA	NA	< 0.31	NA	NA	
Ethylbenzene	700	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.3	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	< 0.3	< 5	< 5	
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA	< 1.5	NA	NA	NA	NA	NA	NA	NA	< 1.5	NA	NA	
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	NA	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	NA	< 5	< 5	
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA	< 0.71	NA	NA	NA	NA	NA	NA	NA	< 0.71	NA	NA	
Methyl acetate	NS	< 5	< 5	< 1	< 5	< 5	< 1	NA	< 5	< 5	< 1	< 5	/M/D	< 5	< 1	NA	< 5	< 5	
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.42	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.42	< 5	< 5	
Methylcyclohexane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	NA	< 5	< 5	< 0.5	< 5	/M/DM	< 5	< 0.5	NA	< 5	< 5	
Methylene chloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 2	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 2	< 5	< 5	
Naphthalene	NS	NA	NA	NA	NA	NA	NA	< 0.64	NA	NA	NA	NA	NA	NA	NA	< 0.64	NA	NA	
o-Xylene	10,000	NA	NA	NA	NA	NA	NA	< 0.34	NA	NA	NA	NA	NA	NA	NA	< 0.34	NA	NA	
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA	< 0.41	NA	NA	NA	NA	NA	NA	NA	< 0.41	NA	NA	
Styrene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.29	< 5	< 5	< 0.5	< 5	/M/D	< 5	< 0.5	< 0.29	< 5	< 5	
Tetrachloroethene	5	< 5	< 5	<															

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Dickert Property																	
		MW-13			MW-14			MW-14-PDB	MW-14-PDB	MW-15			MW-16			MW-16-PDB	MW-17		
		QH11036-006	SF16059-011	XB24099-002	QH11036-002	SF16059-010	XC02133-003	XC02133-004	92706733015	QH11036-003	SF16059-009	XB22075-005	QH11036-004	SF16059-002	XB22075-002	92706733012	QH11036-005	SF16059-001	XB22075-003
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																			
Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																			
Alkalinity	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																			
Chloride	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																			
Sulfide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)																			
Ethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																			
TOC	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Microbial																			
Dehalococoides	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tccA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobium chloroocercia	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfitobacterium spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methanogens	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Dickert Property									Folk Property			
	USEPA	MW-18			MW-28		MW-29		TMW 117	MW-26		MW-27	
		QH06108-006	SF22082-001	XB22075-010	TD03064-002	XB24099-001	TD03064-001	XB22075-009	SF12045-001 (21 - 25 ft)	TD03064-003	XB24099-004	TD03064-004	XB24099-003
MCL	08/06/15	06/20/17	02/22/22	04/03/18	02/22/22	04/03/18	02/22/22	06/12/17	04/03/18	02/23/22	04/03/18	02/23/22	
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>													
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA							
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 5	< 1	< 5	< 1	< 5	< 5	< 1	< 5	< 1
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	NA							
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA							
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA							
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA							
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA							
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA							
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA							
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	2.1 J//	< 10	< 10	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	NA	NA							
2-Hexanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	NA	NA							
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	NS	< 20	< 20	< 10	2.4 J//	< 10	4.1 J//	< 10	35	< 20	< 10	< 20	< 10
Benzene	5	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Bromobenzene	NS	NA	NA	NA	NA	NA							
Bromochloromethane	NS	NA	NA	NA	NA	NA							
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Bromoform	80 ¹	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Carbon disulfide	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Chlorobenzene	100	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Chloroethane	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Chloroform	80 ¹	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	0.4 J//	1.2
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
cis-1,2-Dichloroethene	70	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Cyclohexane	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Dibromomethane	NS	NA	NA	NA	NA	NA							
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	NA	NA							
Ethylbenzene	700	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA							
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
m&p-Xylene	10,000	NA	NA	NA	NA	NA							
Methyl acetate	NS	< 5	< 5	< 1	< 5	< 1	< 5	< 1	< 5	< 5	< 1	< 5	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Methylene chloride	5	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Naphthalene	NS	NA	NA	NA	NA	NA							
o-Xylene	10,000	NA	NA	NA	NA	NA							
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA							
Styrene	100	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Tetrachloroethene	5	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Toluene	1000	< 5	< 5	< 0.5	< 5	< 0.5	2.2 J//	< 0.5	< 5	< 5	< 0.5	0.6 J//	< 0.5
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Trichloroethene (TCE)	5	7.4	7.3	27	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 5	< 0.5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5
Vinyl acetate	NS	NA	NA	NA	NA	NA							
Vinyl chloride	2	< 2	< 2	< 0.5	< 2	< 0.5	< 2	< 0.5	< 2	< 2	< 0.5	< 2	< 0.5
Xylenes (total)	10000	< 5	< 5	< 1	< 5	< 1	< 5	< 1	< 5	< 5	< 1	< 5	< 1

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Dickert Property								Folk Property				
	USEPA	MW-18			MW-28		MW-29		TMW 117	MW-26		MW-27	
		QH06108-006	SF22082-001	XB22075-010	TD03064-002	XB24099-001	TD03064-001	XB22075-009	SF12045-001 (21 - 25 ft)	TD03064-003	XB24099-004	TD03064-004	XB24099-003
MCL	08/06/15	06/20/17	02/22/22	04/03/18	02/22/22	04/03/18	02/22/22	06/12/17	04/03/18	02/23/22	04/03/18	02/23/22	
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)													
Iron	0.3 ²	NA	NA	NA	NA	NA							
Manganese	0.05 ²	NA	NA	NA	NA	NA							
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA							
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA							
Ferrous Iron	NS	NA	NA	NA	NA	NA							
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA							
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)													
Alkalinity	NS	NA	NA	NA	NA	NA							
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)													
Chloride	250 ²	NA	NA	NA	NA	NA							
Nitrate	10	NA	NA	NA	NA	NA							
Nitrite	1	NA	NA	NA	NA	NA							
Sulfate	250 ²	NA	NA	NA	NA	NA							
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)													
Sulfide	NS	NA	NA	NA	NA	NA							
Dissolved Gases by USEPA Method AM20GAX (ug/L)													
Ethane	NS	NA	NA	NA	NA	NA							
Methane	NS	NA	NA	NA	NA	NA							
Carbon Dioxide	NS	NA	NA	NA	NA	NA							
Ethene	NS	NA	NA	NA	NA	NA							
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)													
TOC	NS	NA	NA	NA	NA	NA							
Microbial													
Dehalococcoides	NS	NA	NA	NA	NA	NA							
Dehalobacter spp	NS	NA	NA	NA	NA	NA							
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	NA							
tceA Reductase	NS	NA	NA	NA	NA	NA							
Vinyl chloride Reductase	NS	NA	NA	NA	NA	NA							
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA							
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA							
cerA Reductase	NS	NA	NA	NA	NA	NA							
Chloroform Reductase	NS	NA	NA	NA	NA	NA							
Dehalobacter DCM	NS	NA	NA	NA	NA	NA							
Dehalobium chloroocercia	NS	NA	NA	NA	NA	NA							
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA							
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA							
Desulfuromonas spp	NS	NA	NA	NA	NA	NA							
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA							
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA							
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA							
Methanogens	NS	NA	NA	NA	NA	NA							
PCE Reductase 1	NS	NA	NA	NA	NA	NA							
PCE Reductase 2	NS	NA	NA	NA	NA	NA							
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA							
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA							
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA							
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA							
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA							
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA							
Total Eubacteria	NS	NA	NA	NA	NA	NA							
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA							
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA							

Notes:

- a - Indicates a field duplicate sample.
- MCL - Maximum Contaminant Level (USEPA, March 2018)
- NS - No Standard
- USEPA - United States Environmental Protection Agency
- Bold font indicates the analyte was detected.
- Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Chapman Property				Boazman Property				Ringer Property		
	USEPA	MW-19			MW-20			MW-20-PDB	MW-21		
		QH11036-007	SF13096-003	XB24099-006	QH11036-009	SF20036-009	XC08059-002	XC08059-001	QH11036-008	SF16059-006	XB24099-009
MCL	08/11/15	06/13/17	02/23/22	08/11/15	06/20/17	03/07/22	03/07/22	08/11/15	06/15/17	02/23/22	
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>											
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 1	< 5	< 5	< 1
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	NS	< 20	< 20	< 10	< 20	< 20	4.8 J/J/C	30	< 20	< 20	< 10
Benzene	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Bromobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	0.46 J//	< 5	< 0.5	< 0.5	0.4 J//	< 5	< 0.5
Bromoform	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Carbon disulfide	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Chlorobenzene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Chloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Chloroform	80 ¹	6.8	< 5	< 0.5	7.1	0.46 J//	< 0.5	< 0.5	4.5 J//	< 5	< 0.5
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
cis-1,2-Dichloroethene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Cyclohexane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Dibromomethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 1	< 5	< 5	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Methylene chloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Naphthalene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Tetrachloroethene	5	< 5	< 5	< 0.5	0.64 J//	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Toluene	1000	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Trichloroethene (TCE)	5	< 5	< 5	< 0.5	110	3.9 J//	< 0.5	< 0.5	< 5	< 5	< 0.5
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5
Vinyl acetate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	2	< 2	< 2	< 0.5	< 2	< 2	< 0.5	< 0.5	< 2	< 2	< 0.5
Xylenes (total)	10000	< 5	< 5	< 1	< 5	< 5	< 1	< 1	< 5	< 5	< 1

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Chapman Property				Boazman Property				Ringer Property		
	USEPA	MW-19			MW-20			MW-20-PDB	MW-21		
		QH11036-007	SF13096-003	XB24099-006	QH11036-009	SF20036-009	XC08059-002	XC08059-001	QH11036-008	SF16059-006	XB24099-009
MCL	08/11/15	06/13/17	02/23/22	08/11/15	06/20/17	03/07/22	03/07/22	08/11/15	06/15/17	02/23/22	
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)											
Iron	0.3 ²	NA	NA	NA	NA	0.57	NA	NA	NA	NA	NA
Manganese	0.05 ²	NA	NA	NA	NA	0.02	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	0.016	NA	NA	NA	NA	NA
Ferrous Iron	NS	NA	NA	NA	NA	0.16	NA	NA	NA	NA	NA
Ferric Iron (calculation)	NS	NA	NA	NA	NA	0.42	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)											
Alkalinity	NS	NA	NA	NA	NA	9.4 J//	NA	NA	NA	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)											
Chloride	250 ²	NA	NA	NA	NA	5.1	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	250 ²	NA	NA	NA	NA	0.57 J//	NA	NA	NA	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)											
Sulfide	NS	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)											
Ethane	NS	NA	NA	NA	NA	0.009 Jn	NA	NA	NA	NA	NA
Methane	NS	NA	NA	NA	NA	0.99 n	NA	NA	NA	NA	NA
Carbon Dioxide	NS	NA	NA	NA	NA	66000	NA	NA	NA	NA	NA
Ethene	NS	NA	NA	NA	NA	0.017 Jn	NA	NA	NA	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)											
TOC	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Microbial											
Dehalococcoides	NS	NA	NA	NA	NA	<0.5	NA	NA	NA	NA	NA
Dehalobacter spp	NS	NA	NA	NA	NA	<4.5	NA	NA	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	<0.5	NA	NA	NA	NA	NA
tceA Reductase	NS	NA	NA	NA	NA	<0.5	NA	NA	NA	NA	NA
Vinyl chloride Reductase	NS	NA	NA	NA	NA	<0.5	NA	NA	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobium chloroocercia	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methanogens	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Shealy Property												
	USEPA MCL	MW-23			MW-24			MW-25			MW-25-PDB		
		RA13091-003 01/13/16	SF13096-001 06/13/17	XB22002-003 02/21/22	RA13091-002 01/13/16	SF13096-004 06/13/17	XB22002-004 02/21/22	RB26034-001 2/26/2016	SF13096-011 06/13/17	SF13096-013 (DUP) 06/13/17	XC02133-007 03/02/22	XC02133-011 (Dup) 03/02/22	XC02133-008 03/02/22
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>													
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA						
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 1	< 1	< 1
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,1,2-Trichlorotrifluoroethane	NS	NA	NA	NA	NA	NA	NA						
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA						
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA						
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA						
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA						
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 5	< 5	1.6	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA						
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA						
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA						
2-Hexanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA						
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	NS	< 20	2.3 J//	< 10	< 20	< 20	< 10	< 20	< 20	< 20	< 10	< 10	7.4 J//
Benzene	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Bromobenzene	NS	NA	NA	NA	NA	NA	NA						
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA						
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Bromoform	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Carbon disulfide	NS	1.1 J//	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Chlorobenzene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Chloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Chloroform	80 ¹	< 5	< 5	< 0.5	< 5	< 5	4 J//	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
cis-1,2-Dichloroethene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Cyclohexane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Dibromomethane	NS	NA	NA	NA	NA	NA	NA						
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA						
Ethylbenzene	700	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA						
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA						
Methyl acetate	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 1	< 1	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Methylene chloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Naphthalene	NS	NA	NA	NA	NA	NA	NA						
o-Xylene	10,000	NA	NA	NA	NA	NA	NA						
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA						
Styrene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Tetrachloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Toluene	1000	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Trichloroethene (TCE)	5	1 J//	< 5	< 0.5	< 5	0.65 J//	< 0.5	0.9 J//	2.2 J//	1.9 J//	4.2 J//	4.7 J//	3.1 J//
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5
Vinyl acetate	NS	NA	NA	NA	NA	NA	NA						
Vinyl chloride	2	< 2	< 2	< 0.5	< 2	< 2	< 0.5	< 2	< 2	< 2	< 0.5	< 0.5	< 0.5
Xylenes (total)	10000	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 1	< 1	< 1

Table A-1
Shallow Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Shealy Property												
	USEPA MCL	MW-23			MW-24			MW-25			MW-25-PDB		
		RA13091-003	SF13096-001	XB22002-003	RA13091-002	SF13096-004	XB22002-004	RB26034-001	SF13096-011	SF13096-013 (DUP)	XC02133-007	XC02133-011 (Dup)	XC02133-008
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)													
Iron	0.3 ²	NA	NA	NA	NA								
Manganese	0.05 ²	NA	NA	NA	NA								
Dissolved Iron	0.3 ²	NA	NA	NA	NA								
Dissolved Manganese	0.05 ²	NA	NA	NA	NA								
Ferrous Iron	NS	NA	NA	NA	NA								
Ferric Iron (calculation)	NS	NA	NA	NA	NA								
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)													
Alkalinity	NS	NA	NA	NA	NA								
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)													
Chloride	250 ²	NA	NA	NA	NA								
Nitrate	10	NA	NA	NA	NA								
Nitrite	1	NA	NA	NA	NA								
Sulfate	250 ²	NA	NA	NA	NA								
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)													
Sulfide	NS	NA	NA	NA	NA								
Dissolved Gases by USEPA Method AM20GAX (ug/L)													
Ethane	NS	NA	NA	NA	NA								
Methane	NS	NA	NA	NA	NA								
Carbon Dioxide	NS	NA	NA	NA	NA								
Ethene	NS	NA	NA	NA	NA								
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)													
TOC	NS	NA	NA	NA	NA								
Microbial													
Dehalococcoides	NS	NA	NA	NA	NA								
Dehalobacter spp	NS	NA	NA	NA	NA								
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA								
tceA Reductase	NS	NA	NA	NA	NA								
Vinyl chloride Reductase	NS	NA	NA	NA	NA								
1,1 DCA Reductase	NS	NA	NA	NA	NA								
1,2 DCA Reductase	NS	NA	NA	NA	NA								
cerA Reductase	NS	NA	NA	NA	NA								
Chloroform Reductase	NS	NA	NA	NA	NA								
Dehalobacter DCM	NS	NA	NA	NA	NA								
Dehalobium chloroocercia	NS	NA	NA	NA	NA								
Dehalogenimonas spp	NS	NA	NA	NA	NA								
Desulfobacterium spp	NS	NA	NA	NA	NA								
Desulfuromonas spp	NS	NA	NA	NA	NA								
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA								
Epoxyalkane Transferase	NS	NA	NA	NA	NA								
Ethene Monooxygenase	NS	NA	NA	NA	NA								
Methanogens	NS	NA	NA	NA	NA								
PCE Reductase 1	NS	NA	NA	NA	NA								
PCE Reductase 2	NS	NA	NA	NA	NA								
Phenol Hydroxylase	NS	NA	NA	NA	NA								
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA								
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA								
Toluene Dioxygenase	NS	NA	NA	NA	NA								
Toluene Monooxygenase	NS	NA	NA	NA	NA								
Toluene Monooxygenase 2	NS	NA	NA	NA	NA								
Total Eubacteria	NS	NA	NA	NA	NA								
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA								
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA								

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Facility													
		MW-21			MW-2i-PDB		MW-31				MW-51			MW-5i-PDB	MW-5i-PDB
		QH27050-001	SF22082-006	XC04096-012	XC04096-011	QH13026-002	SF16059-008	XB24099-005	XB24099-012 (Dup)	QH27050-004	SF22082-004	XC03052-006	XC03052-005	92706733007	
		08/26/15	06/21/17	03/04/22	03/04/22	08/12/15	06/15/17	02/23/22	02/23/22	08/27/15	06/21/17	03/03/22	03/03/22	01/02/24	
Volatile Organic Compounds by USEPA Method 8260B (µg/L)															
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.6	
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.1	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 1	< 5	< 25	< 5	< 5	NA	
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.6	
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.8	
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 0.5	< 5	0.6 J//	< 0.5	0.41 J//	< 5	< 25	< 2.5	< 2.5	< 1.7	
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 2.1	
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4	
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.3	
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 3.2	
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	NA	
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	1.1 J//	< 25	4.2	4.5	2.8 J	
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.8	
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.4	
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.9	
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 50	< 50	< 50	< 19.8	
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.6	
2-Hexanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 50	< 50	< 50	< 2.4	
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.6	
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 50	< 50	< 50	< 13.6	
Acetone	NS	< 20	< 20	< 10	21	2.4 J//	2.1 J/B/T	< 10	< 10	2.1 J//	< 100	< 50	< 50	1160	
Benzene	5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
Bromobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.4	
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 2.3	
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.5	
Bromoform	80 ¹	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 8.3	
Carbon disulfide	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	NA	
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
Chlorobenzene	100	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.4	
Chloroethane	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 3.2	
Chloroform	80 ¹	0.75 J/B/K	< 5	< 0.5	< 0.5	2.2 J//	< 5	< 0.5	< 0.5	2.9 J//	< 25	< 2.5	< 2.5	< 2.2	
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 2.7	
cis-1,2-Dichloroethene	70	< 5	< 5	< 0.5	< 0.5	2.3 J//	11	33	35	0.92 J//	5.1 J//	2.2 J//	< 2.5	< 1.9	
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.8	
Cyclohexane	NS	< 5	< 5	< 0.5	0.81	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	NA	
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.8	
Dibromomethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 2	
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.7	
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.5	
Ethylbenzene	700	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.5	
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 7.6	
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	NA	
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 3.5	
Methyl acetate	NS	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 1	< 5	< 25	< 5	< 5	NA	
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 2.1	
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 25	< 25	< 25	NA	
Methylene chloride	5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 9.8	
Naphthalene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 3.2	
o-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.7	
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 2.1	
Styrene	100	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.5	
Tetrachloroethene	5	< 5	< 5	< 0.5	< 0.5	0.25 J//	0.8 J//	0.41 J//	0.49 J//	< 5	< 25	< 2.5	< 2.5	< 1.5	
Toluene	1000	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 2.4	
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 2	
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.8	
Trichloroethene (TCE)	5	17	24	41	18	4.8 J//	8	12	13	430	200	610	550	296	
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 5	< 25	< 2.5	< 2.5	< 1.5	
Vinyl acetate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 6.6	
Vinyl chloride	2	< 2	< 2	< 0.5	< 0.5	< 2	< 2	< 0.5	< 0.5	< 2	< 10	< 2.5	< 2.5	< 1.9	
Xylenes (total)	10000	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 1	< 5	< 25	< 5	< 5	< 1.7	

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Facility												
		MW-21			MW-2i-PDB	MW-31				MW-51			MW-5i-PDB	MW-5I-PDB
		QH27050-001	SF22082-006	XC04096-012	XC04096-011	QH13026-002	SF16059-008	XB24099-005	XB24099-012 (Dup)	QH27050-004	SF22082-004	XC03052-006	XC03052-005	92706733007
		08/26/15	06/21/17	03/04/22	03/04/22	08/12/15	06/15/17	02/23/22	02/23/22	08/27/15	06/21/17	03/03/22	03/03/22	01/02/24
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)														
Iron	0.3 ²	NA	NA	NA	NA	NA	NA							
Manganese	0.05 ²	NA	NA	NA	NA	NA	NA							
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA	NA							
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA	NA							
Ferrous Iron	NS	NA	NA	NA	NA	NA	NA							
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA	NA							
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)														
Alkalinity	NS	NA	NA	NA	NA	30	NA							
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)														
Chloride	250 ²	NA	NA	NA	NA	32	NA							
Nitrate	10	NA	NA	NA	NA	1.1	NA							
Nitrite	1	NA	NA	NA	NA	< 0.02	NA							
Sulfate	250 ²	NA	NA	NA	NA	0.3	NA							
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)														
Sulfide	NS	NA	NA	NA	NA	NA	NA							
Dissolved Gases by USEPA Method AM20GAX (ug/L)														
Ethane	NS	NA	NA	NA	NA	< 10	NA							
Methane	NS	NA	NA	NA	NA	2.5	NA							
Carbon Dioxide	NS	NA	NA	NA	NA	NA	NA							
Ethene	NS	NA	NA	NA	NA	< 10	NA							
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)														
TOC	NS	NA	NA	NA	NA	< 1	NA							
Microbial														
Dehalococoides	NS	NA	NA	NA	NA	< 0.5	NA							
Dehalobacter spp	NS	NA	NA	NA	NA	1110	NA							
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	< 0.5	NA							
tceA Reductase	NS	NA	NA	NA	NA	< 0.5	NA							
Vinyl chloride Reductase	NS	NA	NA	NA	NA	0.2	NA							
1,1 DCA Reductase	NS	NA	NA	NA	NA	< 4.8	NA							
1,2 DCA Reductase	NS	NA	NA	NA	NA	< 4.8	NA							
cerA Reductase	NS	NA	NA	NA	NA	< 4.8	NA							
Chloroform Reductase	NS	NA	NA	NA	NA	< 4.8	NA							
Dehalobacter DCM	NS	NA	NA	NA	NA	< 4.8	NA							
Dehalobium chloroformia	NS	NA	NA	NA	NA	< 4.8	NA							
Dehalogenimonas spp	NS	NA	NA	NA	NA	< 4.8	NA							
Desulfotobacterium spp	NS	NA	NA	NA	NA	< 4.8	NA							
Desulfuromonas spp	NS	NA	NA	NA	NA	< 4.8	NA							
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	< 4.8	NA							
Epoxyalkane Transferase	NS	NA	NA	NA	NA	6790	NA							
Ethene Monooxygenase	NS	NA	NA	NA	NA	1610	NA							
Methanogens	NS	NA	NA	NA	NA	1	NA							
PCE Reductase 1	NS	NA	NA	NA	NA	< 4.8	NA							
PCE Reductase 2	NS	NA	NA	NA	NA	< 4.8	NA							
Phenol Hydroxylase	NS	NA	NA	NA	NA	138	NA							
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	16.1	NA							
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	1200	NA							
Toluene Dioxygenase	NS	NA	NA	NA	NA	< 4.8	NA							
Toluene Monooxygenase	NS	NA	NA	NA	NA	9	NA							
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	238	NA							
Total Eubacteria	NS	NA	NA	NA	NA	103000	NA							
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	< 4.8	NA							
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	< 4.8	NA							

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.
* Vertical profile sampling interval

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID	USEPA	Facility															
		MW-6I			MW-6I-PDB	MW-7I			MW-7I-PDB	MW-7I-PDB	MW-9I			MW-9I-PDB			
		QH27050-003	SF16059-003	XB24099-013	92706733010	QH27050-005	SF20036-004	XC03052-002	XC03052-001	92706733009	QH27050-002	SF20036-012	SF20036-013 (Dup)	XB24099-016	92706733020		
Date Collected	MCL	08/26/15	06/15/17	02/24/22	01/02/24	08/27/15	06/19/17	03/03/22	03/03/22	01/02/24	08/26/15	06/20/17	06/20/17	02/24/22	01/03/24		
<i>Volatiles Organic Compounds by USEPA Method 8260B (µg/L)</i>																	
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	< 0.62	NA	NA	NA	NA	< 0.62	NA	NA	NA	NA	< 1.6		
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 0.66	< 25	< 5	< 2.5	< 2.5	< 0.66	< 25	< 5	< 5	< 5	< 1.7		
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 0.45	< 25	< 5	< 2.5	< 2.5	< 0.45	< 25	< 5	< 5	< 5	< 1.1		
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	NA	< 25	< 5	< 5	< 5	NA	< 25	< 5	< 5	< 10	NA		
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 0.65	< 25	< 5	< 2.5	< 2.5	< 0.65	< 25	< 5	< 5	< 5	< 1.6		
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 0.73	1.7	J//	2.4	J//	< 2.5	< 2.5	< 2.1	< 25	< 5	< 1.8		
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 0.7	3.8	J//	5.2	J//	3.7	< 25	< 5	< 5	< 5	< 1.7		
1,1-Dichloropropene	NS	NA	NA	NA	< 0.85	NA	NA	NA	NA	< 0.85	NA	NA	NA	NA	< 2.1		
1,2,3-Trichlorobenzene	NS	NA	NA	NA	< 1.6	NA	NA	NA	NA	< 1.6	NA	NA	NA	NA	< 4		
1,2,3-Trichloropropane	NS	NA	NA	NA	< 0.52	NA	NA	NA	NA	< 0.52	NA	NA	NA	NA	< 1.3		
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 1.3	< 25	< 5	< 2.5	< 2.5	< 1.3	< 25	< 5	< 5	< 5	< 3.2		
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 0.68	< 25	< 5	< 2.5	< 2.5	< 0.68	< 25	< 5	< 5	< 5	< 1.7		
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	NA	< 25	< 5	< 2.5	< 2.5	NA	< 25	< 5	< 5	< 5	NA		
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 0.68	< 25	< 5	< 2.5	< 2.5	< 0.68	< 25	< 5	< 5	< 5	< 1.7		
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 0.64	< 25	< 5	< 2.5	< 2.5	< 0.64	< 25	< 5	< 5	< 5	< 1.6		
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 0.71	< 25	< 5	< 2.5	< 2.5	< 0.71	< 25	< 5	< 5	< 5	< 1.8		
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 0.68	< 25	< 5	< 2.5	< 2.5	< 0.68	< 25	< 5	< 5	< 5	< 1.7		
1,3-Dichloropropane	NS	NA	NA	NA	< 0.57	NA	NA	NA	NA	< 0.57	NA	NA	NA	NA	< 1.4		
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 0.67	< 25	< 5	< 2.5	< 2.5	< 0.67	< 25	< 5	< 5	< 5	< 1.7		
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA													
2,2-Dichloropropane	NS	NA	NA	NA	< 0.78	NA	NA	NA	NA	< 0.78	NA	NA	NA	NA	< 1.9		
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 7.9	< 50	< 10	< 50	< 50	< 7.9	< 50	< 10	< 10	< 100	< 19.8		
2-Chlorotoluene	NS	NA	NA	NA	< 0.64	NA	NA	NA	NA	< 0.64	NA	NA	NA	NA	< 1.6		
2-Hexanone	NS	< 10	< 10	< 10	< 0.95	< 50	< 10	< 50	< 50	< 0.95	< 50	< 10	< 10	< 100	< 2.4		
4-Chlorotoluene	NS	NA	NA	NA	< 0.65	NA	NA	NA	NA	< 0.65	NA	NA	NA	NA	< 1.6		
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 5.4	< 50	< 10	< 50	< 50	< 5.4	< 50	< 10	< 10	< 100	< 13.6		
Acetone	NS	< 20	< 20	< 10	387	< 100	< 20	< 50	< 50	167	< 100	< 20	< 20	< 100	819		
Benzene	5	< 5	< 5	< 0.5	2.1	< 25	0.49	J//	< 2.5	< 0.69	< 25	< 5	< 5	< 5	< 1.7		
Bromobenzene	NS	NA	NA	NA	< 0.58	NA	NA	NA	NA	< 0.58	NA	NA	NA	NA	< 1.4		
Bromochloromethane	NS	NA	NA	NA	< 0.94	NA	NA	NA	NA	< 0.94	NA	NA	NA	NA	< 2.3		
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 0.61	< 25	< 5	< 2.5	< 2.5	< 0.61	< 25	< 5	< 5	< 5	< 1.5		
Bromoform	80 ¹	< 5	< 5	< 0.5	< 0.68	< 25	< 5	< 2.5	< 2.5	< 0.68	< 25	< 5	< 5	< 5	< 1.7		
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 3.3	< 25	< 5	< 2.5	< 2.5	< 3.3	< 25	< 5	< 5	< 5	< 8.3		
Carbon disulfide	NS	< 5	0.93	J//	NA	< 25	0.68	BJ//K	< 2.5	NA	< 25	< 5	< 5	< 5	NA		
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 0.67	< 25	< 5	< 2.5	< 2.5	< 0.67	< 25	< 5	< 5	< 5	< 1.7		
Chlorobenzene	100	< 5	< 5	< 0.5	< 0.57	< 25	< 5	< 2.5	< 2.5	< 0.57	< 25	< 5	< 5	< 5	< 1.4		
Chloroethane	NS	< 5	< 5	< 0.5	< 1.3	< 25	< 5	< 2.5	< 2.5	< 1.3	< 25	< 5	< 5	< 5	< 3.2		
Chloroform	80 ¹	0.89	J//	< 5	< 0.86	1.6	J//	< 5	< 2.5	< 0.86	24	J//	3.4	J//	2.3	J//	
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 1.1	< 25	< 5	< 2.5	< 2.5	< 1.1	< 25	< 5	< 5	< 5	< 2.7		
cis-1,2-Dichloroethene	70	2.6	J//	5.7	0.86	16.1	61	140	84	100	125	21	J//	31	26	43	48.8
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 0.73	< 25	< 5	< 2.5	< 2.5	< 0.73	< 25	< 5	< 5	< 5	< 1.8		
Cyclohexane	NS	< 5	< 5	< 0.5	NA	< 25	< 5	< 2.5	< 2.5	NA	< 25	< 5	< 5	< 5	NA		
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 0.72	< 25	< 5	< 2.5	< 2.5	< 0.72	< 25	< 5	< 5	< 5	< 1.8		
Dibromomethane	NS	NA	NA	NA	< 0.79	NA	NA	NA	NA	< 0.79	NA	NA	NA	NA	< 2		
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 0.69	< 25	< 5	< 2.5	< 2.5	< 0.69	< 25	< 5	< 5	< 5	< 1.7		
Diisopropyl ether	NS	NA	NA	NA	< 0.62	NA	NA	NA	NA	< 0.62	NA	NA	NA	NA	< 1.5		
Ethylbenzene	700	< 5	< 5	< 0.5	< 0.61	< 25	< 5	< 2.5	< 2.5	< 0.61	< 25	< 5	< 5	< 5	< 1.5		
Hexachloro-1,3-butadiene	NS	NA	NA	NA	< 3.1	NA	NA	NA	NA	< 3.1	NA	NA	NA	NA	< 7.6		
Isopropylbenzene	NS	< 5	< 5	< 0.5	NA	< 25	1.1	J//	< 2.5	< 2.5	NA	< 25	< 5	< 5	NA		
m&p-Xylene	10,000	NA	NA	NA	< 1.4	NA	NA	NA	NA	< 1.4	NA	NA	NA	NA	< 3.5		
Methyl acetate	NS	< 5	< 5	< 1	NA	< 25	< 5	< 5	< 5	NA	< 25	< 5	< 5	< 10	NA		
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 0.84	< 25	< 5	< 2.5	< 2.5	< 0.84	< 25	< 5	< 5	< 5	< 2.1		
Methylcyclohexane	NS	< 5	< 5	< 5	NA	< 25	< 5	< 25	< 25	NA	< 25	< 5	< 5	< 50	NA		
Methylene chloride	5	< 5	< 5	< 0.5	< 3.9	< 25	0.41	J//	< 2.5	< 3.9	< 25	< 5	< 5	< 5	< 9.8		
Naphthalene	NS	NA	NA	NA	< 1.3	NA	NA	NA	NA	< 1.3	NA	NA	NA	NA	< 3.2		
o-Xylene	10,000	NA	NA	NA	< 0.68	NA	NA	NA	NA	1.1	J	NA	NA	NA	< 1.7		
p-Isopropyltoluene	NS	NA	NA	NA	< 0.83	NA	NA	NA	NA	< 0.83	NA	NA	NA	NA	< 2.1		
Styrene	100	< 5	1.5	J//	< 0.58	< 25	< 5	< 2.5	< 2.5	< 0.58	< 25	< 5	< 5	< 5	< 1.5		
Tetrachloroethene	5	0.29	J//	< 5	< 0.58	1.3	J//	2.1	J//	< 0.58	1.7	J//	3.1	J//	2.8	J//	
Toluene	1000	< 5	< 5	< 0.5	< 0.97	< 25	< 5	< 2.5	< 2.5	< 0.97	< 25	< 5	< 5	< 5	< 2.4		
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 0.79	< 25	1.4	J//	< 2.5	< 1.1	J	< 25	< 5	< 5	< 2		
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 0.73	< 25	< 5	< 2.5	< 2.5	< 0.73	< 25	< 5	< 5	< 5	< 1.8		
Trichloroethene (TCE)	5	20	10	15	18.2	290	280	300	280	251	380	480	420	850	716		
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 0.6	< 25	< 5	< 2.5	< 2.5	< 0.6	< 25	< 5	< 5	< 5	< 1.5		
Vinyl acetate	NS	NA	NA	NA	< 2.6	NA	NA	NA	NA	< 2.6	NA	NA	NA	NA	< 6.6		
Vinyl chloride	2	< 2	< 2	< 0.5	< 0.77	< 10	< 2	< 2.5	< 2.5	< 0.77	< 10	< 2	< 2	< 5	< 1.9		
Xylenes (total)	10000	< 5	< 5	< 1	< 0.68	< 25	1.8	J//	< 5	< 1.1	J	< 25	< 5	< 5	< 10		

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Facility													
		MW-6I			MW-6I-PDB	MW-7I			MW-7I-PDB	MW-7I-PDB	MW-9I			MW-9I-PDB	
		QH27050-003	SF16059-003	XB24099-013	92706733010	QH27050-005	SF20036-004	XC03052-002	XC03052-001	92706733009	QH27050-002	SF20036-012	SF20036-013 (Dup)	XB24099-016	92706733020
		08/26/15	06/15/17	02/24/22	01/02/24	08/27/15	06/19/17	03/03/22	03/03/22	01/02/24	08/26/15	06/20/17	06/20/17	02/24/22	01/03/24
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)															
Iron	0.3 ²	NA	NA	0.25	NA	NA	1.2	0.23	NA	NA	NA	8.9	NA	4.6	NA
Manganese	0.05 ²	NA	NA	NA	NA	NA	0.2	0.11	NA	NA	NA	0.15	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	< 0.1	NA	NA	NA	0.061 J//	NA	NA	NA	NA	NA	< 0.1	NA
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA	0.18	0.11	NA	NA	NA	0.026	NA	NA	NA
Ferrous Iron	NS	NA	NA	< 0.05	NA	NA	0.15	< 0.05	NA	NA	NA	0.56	NA	2.7	NA
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA	1.1	NA	NA	NA	NA	8.4	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)															
Alkalinity	NS	NA	NA	25	NA	NA	23	23	NA	NA	NA	81	NA	28	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)															
Chloride	250 ²	NA	NA	NA	NA	NA	2.8	5.7	NA	NA	NA	3	NA	NA	NA
Nitrate	10	NA	NA	0.2 B//	NA	NA	NA	0.28	NA	NA	NA	NA	NA	0.9 B//	NA
Nitrite	1	NA	NA	< 0.02	NA	NA	NA	0.013 J//	NA	NA	NA	NA	NA	< 0.02	NA
Sulfate	250 ²	NA	NA	< 1	NA	NA	< 1	1	NA	NA	NA	5	NA	1.8	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)															
Sulfide	NS	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	< 1	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)															
Ethane	NS	NA	NA	< 10	NA	NA	0.018 Jn	< 10	NA	NA	NA	0.23 n	NA	< 10	NA
Methane	NS	NA	NA	4.7 J//	NA	NA	100 n	80 B//	NA	NA	NA	4 n	NA	2.9 J//	NA
Carbon Dioxide	NS	NA	NA	NA	NA	NA	180000	NA	NA	NA	NA	26000 n	NA	NA	NA
Ethene	NS	NA	NA	< 10	NA	NA	0.47 n	< 10	NA	NA	NA	0.49 n	NA	< 10	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)															
TOC	NS	NA	NA	2.5	NA	NA	NA	< 1	NA	NA	NA	NA	NA	< 1	NA
Microbial															
Dehalococcoides	NS	NA	NA	0.2	NA	NA	<0.5	3.7	NA	NA	NA	< 11.1	NA	< 2.4	NA
Dehalobacter spp	NS	NA	NA	5250	NA	NA	<4.6	< 4.5	NA	NA	NA	<11.1	NA	< 23.8	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	< 0.5	NA	NA	<0.5	< 0.5	NA	NA	NA	< 11.1	NA	< 2.4	NA
tceA Reductase	NS	NA	NA	< 0.5	NA	NA	< 0.5	< 0.5	NA	NA	NA	< 11.1	NA	< 2.4	NA
Vinyl chloride Reductase	NS	NA	NA	< 0.5	NA	NA	< 0.5	0.1 J	NA	NA	NA	< 11.1	NA	< 2.4	NA
1,1 DCA Reductase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
1,2 DCA Reductase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
cerA Reductase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Chloroform Reductase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Dehalobacter DCM	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Dehalobium chloroocercia	NS	NA	NA	833	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Dehalogenimonas spp	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Desulfotobacterium spp	NS	NA	NA	6410	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Desulfuromonas spp	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Dichloromethane Dehalogenase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Epoxyalkane Transferase	NS	NA	NA	436	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Ethene Monooxygenase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Methanogens	NS	NA	NA	87.3	NA	NA	NA	0.8 J	NA	NA	NA	NA	NA	< 23.8	NA
PCE Reductase 1	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
PCE Reductase 2	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Phenol Hydroxylase	NS	NA	NA	150	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Soluble Methane Monooxygenase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Sulfate Reducing Bacteria	NS	NA	NA	1790	NA	NA	NA	489	NA	NA	NA	NA	NA	< 23.8	NA
Toluene Dioxygenase	NS	NA	NA	22.4	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Toluene Monooxygenase	NS	NA	NA	5.4	NA	NA	NA	179	NA	NA	NA	NA	NA	< 23.8	NA
Toluene Monooxygenase 2	NS	NA	NA	238	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Total Eubacteria	NS	NA	NA	60700	NA	NA	NA	24600	NA	NA	NA	NA	NA	38 I	NA
trans-1,2-DCE Reductase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	< 4.8	NA	NA	NA	< 4.5	NA	NA	NA	NA	NA	< 23.8	NA

Notes:

- a - Indicates a field duplicate sample.
- MCL - Maximum Contaminant Level (USEPA, March 2018)
- NS - No Standard
- USEPA - United States Environmental Protection Agency
- Bold font indicates the analyte was detected.
- Bold outline indicates an exceedance of the USEPA MCL.
- * Vertical profile sampling interval

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Dickert Property											Chapman Property		
	USEPA	MW-101			MW-101-PDB		MW-121		MW-17D	TMW 118	MW-191			
		QI08038-002	SF20036-010	XC08061-002	XG20043-003	XL19029-003	92706733017	SF22082-011	XB22075-006	SG11048-001 (38-44 ft)*	SF12045-002 (30 - 34 ft)*	SF06080-001 (19 - 23 ft)*	SF23023-001	XB24099-010
MCL	09/08/15	06/20/17	03/08/22	07/19/22	12/19/22	01/03/24	06/22/17	02/22/22	07/11/17	06/12/17	06/06/17	06/23/17	02/23/22	
Volatile Organic Compounds by USEPA Method 8260B (µg/L)														
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	< 1.2	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	200	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.3	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 0.9	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 25	< 25	< 5	< 1	< 1	NA	< 5	< 1	< 5	< 5	< 5	< 5	< 1
1,1,2-Trichloroethane	5	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.3	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1-Dichloroethane	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1-Dichloroethene	7	< 25	< 25	< 2.5	1.4	1.3	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	< 1.7	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	< 3.2	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	70	< 25	< 25	< 2.5	< 0.5	< 0.5	< 2.6	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 25	< 25	< 2.5	< 0.5	< 0.5	NA	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dichlorobenzene	600	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dichloroethane	5	< 25	< 25	< 2.5	1.1	1.1	< 1.3	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dichloropropane	5	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,3-Dichlorobenzene	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	< 1.1	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	75	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.3	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	< 1.6	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NS	< 50	< 50	< 50	< 10	< 10	< 15.8	< 10	< 10	2.5 J//	< 10	< 10	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 1.3	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	< 50	< 50	< 50	< 10	< 10	< 1.9	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 1.3	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NS	< 50	< 50	< 50	< 10	< 10	< 10.8	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	NS	< 100	< 100	< 50	< 10	< 10	< 20.4	< 20	< 10	78 J//	12 J//	6.5 J//	43 J//	< 10
Benzene	5	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Bromobenzene	NS	NA	NA	NA	NA	NA	< 1.2	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NS	NA	NA	NA	NA	NA	< 1.9	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	80 ¹	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.2	< 5	< 0.5	7.9	< 5	< 5	< 5	< 0.5
Bromoform	80 ¹	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Bromomethane (Methyl bromide)	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 6.6	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Carbon disulfide	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	NA	< 5	< 0.5	0.91 J//	< 5	< 5	< 5	< 0.5
Carbon tetrachloride	5	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.3	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Chlorobenzene	100	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.1	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Chloroethane	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 2.6	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Chloroform	80 ¹	2.4 J//	< 25	< 2.5	< 0.5	< 0.5	< 1.7	< 5	< 0.5	42	< 5	< 5	< 5	< 0.5
Chloromethane (Methyl chloride)	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 2.2	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
cis-1,2-Dichloroethene	70	2.1 J//	< 25	690	570	550 H/h	164	2.6 J//	1.2	< 5	< 5	< 5	< 5	< 0.5
cis-1,3-Dichloropropene	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Cyclohexane	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	NA	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Dibromochloromethane	80 ¹	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	1.7 J//	< 5	< 5	< 5	< 0.5
Dibromomethane	NS	NA	NA	NA	NA	NA	< 1.6	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.4	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	NA	NA	< 1.2	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.2	< 5	< 0.5	1.6 J//	< 5	< 5	< 5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	< 6.1	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	NA	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
m&p-Xylene	10,000	NA	NA	NA	NA	NA	< 2.8	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	< 25	< 25	< 5	< 1	< 1	NA	< 5	< 1	< 5	< 5	< 5	< 5	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.7	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Methylcyclohexane	NS	< 25	< 25	< 2.5	< 5	< 5	NA	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Methylene chloride	5	< 25	< 25	< 2.5	0.45 J	< 0.5	< 7.8	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Naphthalene	NS	NA	NA	NA	NA	NA	< 2.6	NA	NA	NA	NA	NA	NA	NA
o-Xylene	10,000	NA	NA	NA	NA	NA	< 1.4	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	< 1.7	NA	NA	NA	NA	NA	NA	NA
Styrene	100	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.2	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Tetrachloroethene	5	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.2	< 5	< 0.5	< 5	< 5	< 5	1.1 J//	< 0.5
Toluene	1000	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.9	< 5	< 0.5	< 5	< 5	< 5	0.54 J//	< 0.5
trans-1,2-Dichloroethene	100	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.6	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
trans-1,3-Dichloropropene	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Trichloroethene (TCE)	5	890	1000	50	57	55	617	1.2 J//	0.5	< 5	< 5	< 5	< 5	< 0.5
Trichlorofluoromethane	NS	< 25	< 25	< 2.5	< 0.5	< 0.5	< 1.2	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Vinyl acetate	NS	NA	NA	NA	NA	NA	< 5.2	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	2	< 10	< 10	< 2.5	0.49 J	< 0.5	< 1.5	< 2	< 0.5	< 2	< 2	< 2	0.4 J//	< 0.5
Xylenes (total)	10000	< 25	< 25	< 5	< 1	< 1	< 1.4	< 5	< 1	< 5	< 5	< 5	< 5	< 1

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Dickert Property										Chapman Property			
	USEPA	MW-101					MW-101-PDB	MW-121		MW-17D	TMW 118	MW-191		
		QI08038-002	SF20036-010	XC08061-002	XG20043-003	XL19029-003	92706733017	SF22082-011	XB22075-006	SG11048-001 (38-44 ft)*	SF12045-002 (30 - 34 ft)*	SF06080-001 (19 - 23 ft)*	SF23023-001	XB24099-010
MCL	09/08/15	06/20/17	03/08/22	07/19/22	12/19/22	01/03/24	06/22/17	02/22/22	07/11/17	06/12/17	06/06/17	06/23/17	02/23/22	
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)														
Iron	0.3 ²	NA	0.21		12	15	12	2.03	NA	NA	NA	NA	NA	NA
Manganese	0.05 ²	NA	0.011 J//		0.98	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA		11	12	12	0.141	NA	NA	NA	NA	NA	NA
Dissolved Manganese	0.05 ²	NA	0.0086 J//		1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NS	NA	0.042 J//		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrie Iron (calculation)	NS	NA	0.17		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)														
Alkalinity	NS	NA	22		NA	39	41	NA	NA	NA	NA	NA	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)														
Chloride	250 ²	NA	6		8.2	8.7	8.4	NA	NA	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	< 0.02	< 0.02	0.07	0.078	NA	NA	NA	NA	NA	NA	NA
Nitrite	1	NA	NA	< 0.02	< 0.02	0.025	< 0.02	NA	NA	NA	NA	NA	NA	NA
Sulfate	250 ²	NA	< 1	< 1	< 1	< 1	< 1	NA	NA	NA	NA	NA	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)														
Sulfide	NS	NA	< 1		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)														
Ethane	NS	NA	0.046 Jn	< 10	< 10	< 10	< 5.9	NA	NA	NA	NA	NA	NA	NA
Methane	NS	NA	0.88 n	1400	1700	1500 B//	257	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	NS	NA	70000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	NA	0.038 Jn	< 10	< 10	< 10	< 5.7	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)														
TOC	NS	NA	NA		16	10 H	3.7	< 1	NA	NA	NA	NA	NA	NA
Microbial														
Dehalococoides	NS	NA	< 0.5	NA	NA	NA	< 0.7	NA	NA	NA	NA	NA	NA	NA
Dehalobacter spp	NS	NA	<4.6	NA	NA	NA	1240	NA	NA	NA	NA	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	<0.5	NA	NA	NA	< 0.7	NA	NA	NA	NA	NA	NA	NA
teeA Reductase	NS	NA	<0.5	NA	NA	NA	< 0.7	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride Reductase	NS	NA	<0.5	NA	NA	NA	< 0.7	NA	NA	NA	NA	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobium chlorocoercia	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methanogens	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.
* Vertical profile sampling interval

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Boazman Property							Ringer Property			Shealy Property		
	USEPA	MW-201		MW-20i-PDB	MW-20l-PDB	MW-20i-PDB	MW-20l-PDB	MW-211		MW24I			
		QH13026-003	QH13026-004	SF20036-011	XC04096-008			XC04096-007	92706733021	QH13026-001	SF16059-007	XB24099-008	RC03069-001
MCL	08/13/15	08/13/15	06/20/17	03/04/22	03/04/22	01/03/24	08/12/15	06/15/17	02/23/22	3/3/2016	06/13/17	02/21/22	
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>													
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	200	< 25	< 25	< 5	< 0.5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.22	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 25	< 25	< 5	< 1	< 1	NA	< 5	< 5	< 1	< 5	< 5	< 1
1,1,2-Trichloroethane	5	< 25	< 25	< 5	< 0.5	< 0.5	< 0.32	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,1-Dichloroethane	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.37	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,1-Dichloroethene	7	< 25	< 25	< 5	< 0.5	< 0.5	< 0.35	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	< 0.43	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	< 0.81	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	< 0.26	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	70	< 25	< 25	< 5	< 0.5	< 0.5	< 0.64	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 25	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 25	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,2-Dichlorobenzene	600	< 25	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,2-Dichloroethane	5	< 25	< 25	< 5	< 0.5	< 0.5	< 0.32	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,2-Dichloropropane	5	< 25	< 25	< 5	< 0.5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,3-Dichlorobenzene	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	< 0.28	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	75	< 25	< 25	< 5	< 0.5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 5	< 5	< 0.5
1,4-Dioxane (p-Dioxane)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NS	< 50	< 50	< 10	< 10	< 10	< 4	< 10	< 10	< 10	< 10	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	< 50	< 50	< 10	< 10	< 10	< 0.48	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	< 0.32	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NS	< 50	< 50	< 10	< 10	< 10	< 2.7	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	NS	< 100	< 100	2.1 J//	< 10	5.5 J//	276 J//	4.9 J//	< 20	< 10	< 20	2.3 J//	< 10
Benzene	5	< 25	< 25	< 5	< 0.5	< 0.5	0.53 J	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Bromobenzene	NS	NA	NA	NA	NA	NA	< 0.29	NA	NA	NA	NA	NA	NA
Bromochloromethane	NS	NA	NA	NA	NA	NA	< 0.47	NA	NA	NA	NA	NA	NA
Bromodichloromethane	80 ¹	< 25	< 25	< 5	< 0.5	< 0.5	< 0.31	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Bromoform	80 ¹	< 25	< 25	< 5	< 0.5	< 0.5	< 0.34	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Bromomethane (Methyl bromide)	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 1.7	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Carbon disulfide	NS	< 25	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Carbon tetrachloride	5	< 25	< 25	< 5	< 0.5	< 0.5	< 0.33	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Chlorobenzene	100	< 25	< 25	< 5	< 0.5	< 0.5	< 0.28	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Chloroethane	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.65	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Chloroform	80 ¹	2.4 J//	2.7 J//	0.48 J//	< 0.5	< 0.5	< 0.43	1.6 J//	< 5	< 0.5	2.1 J//	0.41 J//	< 0.5
Chloromethane (Methyl chloride)	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.54	< 5	< 5	< 0.5	< 5	< 5	< 0.5
cis-1,2-Dichloroethene	70	6.2 J//	5.9 J//	4.5 J//	< 0.5	< 0.5	0.49 J	< 5	< 5	< 0.5	< 5	< 5	< 0.5
cis-1,3-Dichloropropene	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Cyclohexane	NS	< 25	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Dibromochloromethane	80 ¹	< 25	< 25	< 5	< 0.5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Dibromomethane	NS	NA	NA	NA	NA	NA	< 0.39	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.35	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	NA	NA	< 0.31	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	< 25	< 25	< 5	< 0.5	< 0.5	< 0.3	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	< 1.5	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	< 25	< 25	< 5	< 0.5	< 0.5	NA	< 5	< 5	< 0.5	< 5	< 5	< 0.5
m&p-Xylene	10,000	NA	NA	NA	NA	NA	< 0.71	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	< 25	< 25	< 5	< 1	< 1	NA	< 5	< 5	< 1	< 5	< 5	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.42	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Methylcyclohexane	NS	< 25	< 25	< 5	< 5	< 5	NA	< 5	< 5	< 5	< 5	< 5	< 5
Methylene chloride	5	< 25	< 25	< 5	< 0.5	< 0.5	< 2	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Naphthalene	NS	NA	NA	NA	NA	NA	< 0.64	NA	NA	NA	NA	NA	NA
o-Xylene	10,000	NA	NA	NA	NA	NA	< 0.34	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	< 0.41	NA	NA	NA	NA	NA	NA
Styrene	100	< 25	< 25	< 5	< 0.5	< 0.5	< 0.29	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Tetrachloroethene	5	2.4 J//	2.5 J//	2.2 J//	< 0.5	< 0.5	< 0.29	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Toluene	1000	< 25	< 25	< 5	< 0.5	< 0.5	< 0.48	< 5	< 5	< 0.5	< 5	< 5	< 0.5
trans-1,2-Dichloroethene	100	< 25	< 25	< 5	< 0.5	< 0.5	< 0.4	< 5	< 5	< 0.5	< 5	< 5	< 0.5
trans-1,3-Dichloropropene	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.36	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Trichloroethene (TCE)	5	460	460	330	33	40	22.8	< 5	< 5	< 0.5	1.8 J//	< 5	< 0.5
Trichlorofluoromethane	NS	< 25	< 25	< 5	< 0.5	< 0.5	< 0.3	< 5	< 5	< 0.5	< 5	< 5	< 0.5
Vinyl acetate	NS	NA	NA	NA	NA	NA	< 1.3	NA	NA	NA	NA	NA	NA
Vinyl chloride	2	< 10	< 10	< 2	< 0.5	< 0.5	< 0.39	< 2	< 2	< 0.5	< 2	< 2	< 0.5
Xylenes (total)	10000	< 25	< 25	< 5	< 1	< 1	< 0.34	< 5	< 5	< 1	< 5	< 5	< 1

Table A-2
Intermediate Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Boazman Property						Ringer Property			Shealy Property		
	USEPA	MW-201		MW-20i-PDB	MW-20l-PDB	MW-20i-PDB	MW-211		MW24I			
		QH13026-003	QH13026-004	SF20036-011	XC04096-008		XC04096-007	92706733021	QH13026-001	SF16059-007	XB24099-008	RC03069-001
MCL	08/13/15	08/13/15	06/20/17	03/04/22	03/04/22	01/03/24	08/12/15	06/15/17	02/23/22	3/3/2016	06/13/17	02/21/22
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)												
Iron	0.3 ²	NA	NA	0.35	5.4	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05 ²	NA	NA	0.025	0.1	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	0.06 J//	NA	NA	NA	NA	NA	NA	NA
Dissolved Manganese	0.05 ²	NA	NA	0.017	0.006 J//	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NS	NA	NA	0.052	0.057	NA	NA	NA	NA	NA	NA	NA
Ferric Iron (calculation)	NS	NA	NA	0.3	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)												
Alkalinity	NS	NA	NA	22	< 20	NA	NA	NA	NA	NA	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)												
Chloride	250 ²	NA	NA	4.8	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	NA	0.4 B//	NA	NA	NA	NA	NA	NA	NA
Nitrite	1	NA	NA	NA	< 0.02	NA	NA	NA	NA	NA	NA	NA
Sulfate	250 ²	NA	NA	0.59 J//	1.4	NA	NA	NA	NA	NA	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)												
Sulfide	NS	NA	NA	< 1	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)												
Ethane	NS	NA	NA	0.04 Jn	< 10	NA	NA	NA	NA	NA	NA	NA
Methane	NS	NA	NA	0.45 Jn	< 10	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	NS	NA	NA	70000	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	NA	NA	0.017 Jn	< 10	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)												
TOC	NS	NA	NA	NA	< 1	NA	NA	NA	NA	NA	NA	NA
Microbial												
Dehalococoides	NS	NA	NA	< 0.5	2.1	NA	NA	NA	NA	NA	NA	NA
Dehalobacter spp	NS	NA	NA	< 4.6	60.1	NA	NA	NA	NA	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	< 0.5	0.1 J	NA	NA	NA	NA	NA	NA	NA
tceA Reductase	NS	NA	NA	< 0.5	< 0.5	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride Reductase	NS	NA	NA	< 0.5	< 0.5	NA	NA	NA	NA	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Dehalobium chloroocercia	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Desulfotobacterium spp	NS	NA	NA	NA	11900	NA	NA	NA	NA	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	5	NA	NA	NA	NA	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	5060	NA	NA	NA	NA	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	2340	NA	NA	NA	NA	NA	NA	NA
Methanogens	NS	NA	NA	NA	0.4 J	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	3150	NA	NA	NA	NA	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	132	NA	NA	NA	NA	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	1850	NA	NA	NA	NA	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	6	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	2450	NA	NA	NA	NA	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	5E+05	NA	NA	NA	NA	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	< 4.9	NA	NA	NA	NA	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.
* Vertical profile sampling interval

Table A-3
Bedrock Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	USEPA MCL	Facility																
		MW-2D					MW-3D					MW-6D					MW-6D-PDB	
		PH28036-004	QH04060-001	SF22082-013	SF22082-014 Duplicate	XB25085-005	PH28036-001	QH06108-002	QH06108-003	SF22082-002	SF22082-003 (Dup)	XB25085-002	PH28036-003	QH06108-004	SF20036-003	XC04096-009	XC04096-010 (Dup)	92706733011
		08/28/14	08/03/15	06/22/17	06/22/17	02/25/22	08/28/14	08/06/15	08/06/15	06/21/17	06/21/17	02/25/22	08/28/14	08/06/15	06/19/17	03/04/22	03/04/22	01/02/24
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																		
Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.04 J//	0.15	NA	NA
Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.015	0.0019 J//	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.059 J//	NA	NA
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.015	< 0.015	NA	NA
Ferrous Iron	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.05	< 0.05	NA	NA
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.1	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																		
Alkalinity	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	66	100	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																		
Chloride	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.6	NA	NA	NA
Nitrate	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.9 B//	NA	NA
Nitrite	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.02	NA	NA	NA
Sulfate	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2	2.2	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																		
Sulfide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)																		
Ethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.051 Jn	< 10	NA	NA
Methane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.1 n	2.5 J//	NA	NA
Carbon Dioxide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5000 Un	NA	NA	NA
Ethene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.018 Jn	< 10	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																		
TOC	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA
Microbial																		
Dehalococcoides	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	< 0.5	NA	NA
Dehalobacter spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	551	< 4.6	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	< 0.5	NA	NA
tceA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	< 0.5	NA	NA
Vinyl chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	< 0.5	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.2	NA	NA
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Dehalobium chlorocoercia	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	258	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45.8	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80.4	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	169	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45.7	NA	NA
Methanogens	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.6 J	NA	NA
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2350	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.7	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	570	NA	NA
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	398000	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 4.6	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.
* Vertical profile sampling interval

Table A-3
Bedrock Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Facility									Dickert Property						
	USEPA	MW-7D				MW 9D			MW12D			MW-12D-PDB	MW-12D-PDB	MW-17D		
		PH28036-002	QH06108-005	SF22082-010	XB25085-006	XB25085-007 (Dup)	RD26033-001	SF22082-010	XB24099-018	SG06069-001 (71- 81 ft) *	SG26040-001	XC08059-004	XC08059-003	92706733013	SG26040-002	XB22075-004
MCL	08/28/14	08/06/15	06/24/17	02/25/22	02/25/22	04/25/16	06/22/17	02/24/22	07/06/17	07/24/17	03/08/22	03/08/22	01/03/24	07/25/17	02/22/22	
Volatile Organic Compounds by USEPA Method 8260B (µg/L)																
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.62	NA	NA
1,1,1-Trichloroethane	200	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5	< 0.5	< 0.5	< 0.66	< 5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 0.5	< 0.5	< 0.5	< 0.45	< 5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 5	< 5	< 1	< 1	NA	< 5	< 1
1,1,2-Trichloroethane	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.65	< 5	< 0.5
1,1-Dichloroethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.73	< 5	< 0.5
1,1-Dichloroethene	7	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.7	< 5	< 0.5
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.85	NA	NA
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.6	NA	NA
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.52	NA	NA
1,2,4-Trichlorobenzene	70	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 1.3	< 5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.68	< 5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA	< 5	< 0.5
1,2-Dichlorobenzene	600	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.68	< 5	< 0.5
1,2-Dichloroethane	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.64	< 5	< 0.5
1,2-Dichloropropane	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.71	< 5	< 0.5
1,3-Dichlorobenzene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.68	< 5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.57	NA	NA
1,4-Dichlorobenzene	75	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.67	< 5	< 0.5
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.78	NA	NA
2-Butanone (MEK)	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 7.9	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.64	NA	NA
2-Hexanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 0.95	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.65	NA	NA
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 5.4	< 10	< 10
Acetone	NS	< 20	< 20	< 20	< 10	< 10	2.4 J//	< 20	< 10	2.5 J//	2.2 J/B/T	< 10	9.8 J//	48.7	< 20	< 10
Benzene	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	2.1	< 5	< 0.5
Bromobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.58	NA	NA
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.94	NA	NA
Bromodichloromethane	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	3.8 J//	< 5	< 0.5	< 0.5	< 0.61	< 5	< 0.5
Bromoform	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.68	< 5	< 0.5
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 3.3	< 5	< 0.5
Carbon disulfide	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA	< 5	< 0.5
Carbon tetrachloride	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.67	< 5	< 0.5
Chlorobenzene	100	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.57	< 5	< 0.5
Chloroethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 1.3	< 5	< 0.5
Chloroform	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	2 J//	0.4 J//	< 0.5	16	0.61 J//	< 0.5	< 0.5	< 0.86	2 J//	< 0.5
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 1.1	< 5	< 0.5
cis-1,2-Dichloroethene	70	0.6 J//	0.27 J//	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	2.1 J//	4.2 J//	10	10	9.2	< 5	< 0.5
cis-1,3-Dichloropropene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.73	< 5	< 0.5
Cyclohexane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA	< 5	< 0.5
Dibromochloromethane	80 ¹	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	0.87 J//	< 5	< 0.5	< 0.5	< 0.72	< 5	< 0.5
Dibromomethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.79	NA	NA
Dichlorodifluoromethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.69	< 5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.62	NA	NA
Ethylbenzene	700	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.61	< 5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 3.1	NA	NA
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.4	NA	NA
Isopropylbenzene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	NA	< 5	< 0.5
Methyl acetate	NS	< 5	< 5	< 5	< 1	< 1	< 5	< 5	< 1	< 5	< 5	< 1	< 1	NA	< 5	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.84	< 5	< 0.5
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	NA	< 5	< 5
Methylene chloride	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 3.9	< 5	< 0.5
Naphthalene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.3	NA	NA
o-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.68	NA	NA
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.83	NA	NA
Styrene	100	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.58	< 5	< 0.5
Tetrachloroethene	5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.58	< 5	< 0.5
Toluene	1000	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.97	< 5	< 0.5
trans-1,2-Dichloroethene	100	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.79	< 5	< 0.5
trans-1,3-Dichloropropene	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.73	< 5	< 0.5
Trichloroethene	5	45	15	1.5 J	< 0.5	< 0.5	3.1 J//	2.2 J//	3.6	7.8	12	53	70	53.2	< 5	< 0.5
Trichlorofluoromethane	NS	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 0.5	< 0.6	< 5	< 0.5
Vinyl acetate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 2.6	NA	NA
Vinyl chloride	2	< 2	< 2	< 2	< 0.5	< 0.5	< 2	< 2	< 0.5	< 2	< 2	< 0.5	< 0.5	< 0.77	< 2	< 0.5
Xylenes (total)	10000	< 5	< 5	< 5	<											

Table A-3
Bedrock Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Facility									Dickert Property						
	USEPA	MW-7D				MW 9D			MW12D			MW-12D-PDB	MW-12D-PDB	MW-17D		
		PH28036-002	QH06108-005	SF22082-010	XB25085-006	XB25085-007 (Dup)	RD26033-001	SF22082-010	XB24099-018	SG06069-001 (71- 81 ft) *	SG26040-001	XC08059-004	XC08059-003	92706733013	SG26040-002	XB22075-004
MCL	08/28/14	08/06/15	06/24/17	02/25/22	02/25/22	04/25/16	06/22/17	02/24/22	07/06/17	07/24/17	03/08/22	03/08/22	01/03/24	07/25/17	02/22/22	
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																
Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																
Alkalinity	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																
Chloride	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																
Sulfide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)																
Ethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																
TOC	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Microbial																
Dehalococoides	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tceA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobium chloroocercia	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methanogens	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.
* Vertical profile sampling interval

Table A-3
Bedrock Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID	Dickert Property				Chapman Property			Ringer Property									
	USEPA	MW-18D			MW19D			RDW-1				RDW-1-PDB	RDW-2				
		QI11015-001	SF20036-007	XB22075-007	SF26019-001 (45 feet) *	SG27028-001	XB24099-011	PH27059-001	QH06108-001	SF22082-007	XC04096-006	XC04096-005	PH27059-002	QH04060-002	SF16059-005	XB25085-001	
Date Collected	MCL	09/11/15	06/19/17	02/22/22	06/26/17	07/27/17	02/23/22	08/28/14	08/05/15	06/21/17	03/04/22	03/04/22	08/28/14	08/04/15	06/15/17	02/25/22	
Volatile Organic Compounds by USEPA Method 8260B (µg/L)																	
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 1	< 1	< 5	< 5	< 5	< 1	
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	0.43	J//	0.38	J//	< 0.5	< 0.5	< 5	< 5	< 0.5	
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-Butanone (MEK)	NS	< 10	11	2.2	J//	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-Hexanone	NS	< 10	2.2	J//	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	
Acetone	NS	4.9	J//	73	21	/B/T	< 20	< 20	< 10	< 20	J/E	3	J//	5.4	J/B/T	9.6	J//
Benzene	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Bromobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	0.72	J//	< 5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Bromoform	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Carbon disulfide	NS	0.52	J//	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Chlorobenzene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Chloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Chloroform	80 ¹	0.45	J//	< 5	< 0.5	3.1	J//	< 5	< 5	< 5	< 0.5	< 0.5	2.9	J//	< 5	< 0.5	
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
cis-1,2-Dichloroethene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	3.5	J//	3.3	J//	2.1	J//	< 5	< 5	< 0.5	
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Cyclohexane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	0.51	< 5	< 5	< 5	< 0.5	
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Dibromomethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Ethylbenzene	700	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Methyl acetate	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 1	< 1	< 5	< 5	< 5	< 1	
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	
Methylene chloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Naphthalene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
o-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Styrene	100	< 5	0.5	J//	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Tetrachloroethene	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	1.3	J//	1.1	J//	0.66	J//	< 5	< 5	< 0.5	
Toluene	1000	< 5	0.6	J//	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Trichloroethene	5	74	21	19	< 5	3.1	J//	3.3	190	180	110	10	9.1	< 5	< 5	< 0.5	
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 0.5	< 0.5	< 5	< 5	< 5	< 0.5	
Vinyl acetate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Vinyl chloride	2	< 2	< 2	< 0.5	< 2	< 2	< 0.5	< 2	< 2	< 2	< 0.5	< 0.5	< 2	< 2	< 2	< 0.5	
Xylenes (total)	10000	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 1	< 1	< 5	< 5	< 5	< 1	

Table A-3
Bedrock Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

Sample ID Laboratory ID Date Collected	Dickert Property				Chapman Property			Ringer Property								
	USEPA	MW-18D			MW19D			RDW-1				RDW-1-PDB	RDW-2			
		QI11015-001	SF20036-007	XB22075-007	SF26019-001 (45 feet) *	SG27028-001	XB24099-011	PH27059-001	QH06108-001	SF22082-007	XC04096-006	XC04096-005	PH27059-002	QH04060-002	SF16059-005	XB25085-001
MCL	09/11/15	06/19/17	02/22/22	06/26/17	07/27/17	02/23/22	08/28/14	08/05/15	06/21/17	03/04/22	03/04/22	08/28/14	08/04/15	06/15/17	02/25/22	
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)																
Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)																
Alkalinity	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)																
Chloride	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	250 ²	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)																
Sulfide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases by USEPA Method AM20GAX (ug/L)																
Ethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Dioxide	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)																
TOC	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Microbial																
Dehalococcoides	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tceA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cerA Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter DCM	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobium chloroocercia	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Desulfuromonas spp	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methanogens	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 1	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCE Reductase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Eubacteria	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-a - Indicates a field duplicate sample.
MCL - Maximum Contaminant Level (USEPA, March 2018)
NS - No Standard
USEPA - United States Environmental Protection Agency
Bold font indicates the analyte was detected.
Bold outline indicates an exceedance of the USEPA MCL.
* Vertical profile sampling interval

Table A-3
Bedrock Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC

		Shealy Property										
Sample ID Laboratory ID	USEPA	SDW-1			SDW 2			SDW-3				
		RA13091-001	SF22082-005	XB22075-001	RD26033-003	SF22082-015	XB22075-008	SF29048-001 (56 - 66 ft)*	SF29048-002 (84 ft)*	SG05094-001 (133 ft)*	SG26040-003	XB22002-001
Date Collected	MCL	01/13/16	06/21/17	02/21/22	04/26/16	06/22/17	02/22/22	06/29/17	06/29/17	07/05/17	07/25/17	02/21/22
<i>Volatile Organic Compounds by USEPA Method 8260B (µg/L)</i>												
1,1,1,2-Tetrachloroethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	200	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1,2,2-Tetrachloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 5	< 1
1,1,2-Trichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1-Dichloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1-Dichloroethene	7	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,1-Dichloropropene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	70	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dibromo-3-chloropropane (DBCP)	0.2	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dibromoethane (EDB)	0.05	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dichlorobenzene	600	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dichloroethane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,2-Dichloropropane	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,3-Dichlorobenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
1,3-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	75	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
2,2-Dichloropropane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NS	< 10	< 10	< 10	2.3 J//	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	< 10	< 10	< 10	0.59 J//	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Chlorotoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NS	< 10	< 10	< 10	0.92 J//	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acetone	NS	< 20	< 20	< 10	11 J//	25 /B/T	4.2 J/B/T	14 J//	< 20	5.5 J//	< 20	< 10
Benzene	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Bromobenzene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	2.6 J//	0.98 J//	1.3 J//	< 5	< 0.5
Bromoform	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Bromomethane (Methyl bromide)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Carbon disulfide	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Carbon tetrachloride	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Chlorobenzene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Chloroethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Chloroform	80 ¹	< 5	< 5	< 0.5	5.7	< 5	0.5	17	3.5 J//	5.6	< 5	< 0.5
Chloromethane (Methyl chloride)	NS	< 5	< 5	< 0.5	0.37 J//	0.42 J//	< 0.5	< 5	< 5	< 5	< 5	< 0.5
cis-1,2-Dichloroethene	70	0.96 J//	0.56 J//	1.3	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
cis-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Cyclohexane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Dibromochloromethane	80 ¹	< 5	< 5	< 0.5	< 5	< 5	< 0.5	0.59 J//	< 5	< 5	< 5	< 0.5
Dibromomethane	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Diisopropyl ether	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Hexachloro-1,3-butadiene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m&p-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Methyl acetate	NS	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 5	< 1
Methyl tertiary butyl ether (MTBE)	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Methylcyclohexane	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Methylene chloride	5	< 5	< 5	< 0.5	1.8 J//	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Naphthalene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	10,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Tetrachloroethene	5	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Toluene	1000	< 5	< 5	< 0.5	27	0.85 J//	0.46 J//	0.52 J//	< 5	< 5	< 5	< 0.5
trans-1,2-Dichloroethene	100	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
trans-1,3-Dichloropropene	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Trichloroethene	5	16	10	25	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Trichlorofluoromethane	NS	< 5	< 5	< 0.5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 0.5
Vinyl acetate	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	2	< 2	< 2	< 0.5	< 2	< 2	< 0.5	< 2	< 2	< 2	< 2	< 0.5
Xylenes (total)	10000	< 5	< 5	< 1	< 5	< 5	< 1	< 5	< 5	< 5	< 5	< 1

**Table A-3
Bedrock Monitoring Well Sample Results
2014 to 2024
Shakespeare Composite Structures Site
RP-VCC-14-6271-RP
Newberry, SC**

Shealy Property												
Sample ID Laboratory ID	USEPA	SDW-1			SDW 2			SDW-3				
		RA13091-001	SF22082-005	XB22075-001	RD26033-003	SF22082-015	XB22075-008	SF29048-001 (56 - 66 ft)*	SF29048-002 (84 ft)*	SG05094-001 (133 ft)*	SG26040-003	XB22002-001
Date Collected	MCL	01/13/16	06/21/17	02/21/22	04/26/16	06/22/17	02/22/22	06/29/17	06/29/17	07/05/17	07/25/17	02/21/22
Metals by USEPA Method 6010 and SM 3500-Fe B-2011 (mg/L)												
Iron	0.3 ²	NA	NA	NA	NA	NA						
Manganese	0.05 ²	NA	NA	NA	NA	NA						
Dissolved Iron	0.3 ²	NA	NA	NA	NA	NA						
Dissolved Manganese	0.05 ²	NA	NA	NA	NA	NA						
Ferrous Iron	NS	NA	NA	NA	NA	NA						
Ferric Iron (calculation)	NS	NA	NA	NA	NA	NA						
Alkalinity by USEPA Method SM 2320B-2011 (mg/L)												
Alkalinity	NS	NA	NA	NA	NA	NA						
Chloride, Nitrate, Nitrite, and Sulfate by USEPA Method 300.0 (mg/L)												
Chloride	250 ²	NA	NA	NA	NA	NA						
Nitrate	10	NA	NA	NA	NA	NA						
Nitrite	1	NA	NA	NA	NA	NA						
Sulfate	250 ²	NA	NA	NA	NA	NA						
Sulfide by USEPA Method SM 4500-S2 F-2011 (mg/L)												
Sulfide	NS	NA	NA	NA	NA	NA						
Dissolved Gases by USEPA Method AM20GAX (ug/L)												
Ethane	NS	NA	NA	NA	NA	NA						
Methane	NS	NA	NA	NA	NA	NA						
Carbon Dioxide	NS	NA	NA	NA	NA	NA						
Ethene	NS	NA	NA	NA	NA	NA						
Total Organic Carbon by USEPA Method SM 5310C-2014 (mg/L)												
TOC	NS	NA	NA	NA	NA	NA						
Microbial												
Dehalococoides	NS	NA	NA	NA	NA	NA						
Dehalobacter spp	NS	NA	NA	NA	NA	NA						
BAV1 Vinyl Chloride Reductase	NS	NA	NA	NA	NA	NA						
tceA Reductase	NS	NA	NA	NA	NA	NA						
Vinyl chloride Reductase	NS	NA	NA	NA	NA	NA						
1,1 DCA Reductase	NS	NA	NA	NA	NA	NA						
1,2 DCA Reductase	NS	NA	NA	NA	NA	NA						
cerA Reductase	NS	NA	NA	NA	NA	NA						
Chloroform Reductase	NS	NA	NA	NA	NA	NA						
Dehalobacter DCM	NS	NA	NA	NA	NA	NA						
Dehalobium chlorocoercia	NS	NA	NA	NA	NA	NA						
Dehalogenimonas spp	NS	NA	NA	NA	NA	NA						
Desulfotobacterium spp	NS	NA	NA	NA	NA	NA						
Desulfuromonas spp	NS	NA	NA	NA	NA	NA						
Dichloromethane Dehalogenase	NS	NA	NA	NA	NA	NA						
Epoxyalkane Transferase	NS	NA	NA	NA	NA	NA						
Ethene Monooxygenase	NS	NA	NA	NA	NA	NA						
Methanogens	NS	NA	NA	NA	NA	NA						
PCE Reductase 1	NS	NA	NA	NA	NA	NA						
PCE Reductase 2	NS	NA	NA	NA	NA	NA						
Phenol Hydroxylase	NS	NA	NA	NA	NA	NA						
Soluble Methane Monooxygenase	NS	NA	NA	NA	NA	NA						
Sulfate Reducing Bacteria	NS	NA	NA	NA	NA	NA						
Toluene Dioxygenase	NS	NA	NA	NA	NA	NA						
Toluene Monooxygenase	NS	NA	NA	NA	NA	NA						
Toluene Monooxygenase 2	NS	NA	NA	NA	NA	NA						
Total Eubacteria	NS	NA	NA	NA	NA	NA						
trans-1,2-DCE Reductase	NS	NA	NA	NA	NA	NA						
Trichlorobenzene Dioxygenase	NS	NA	NA	NA	NA	NA						

Notes:

- a - Indicates a field duplicate sample.
- MCL - Maximum Contaminant Level (USEPA, March 2018)
- NS - No Standard
- USEPA - United States Environmental Protection Agency
- Bold font indicates the analyte was detected.
- Bold outline indicates an exceedance of the USEPA MCL.
- * Vertical profile sampling interval

Attachment B

Detailed Cost Estimates for Remedial Action Alternatives

TABLE 6-3
COST ESTIMATE SUMMARY FOR ALTERNATIVE 1
NO ACTION
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Total Cost	Unit	Unit Cost	Cost
No Tasks	1	\$0.00	\$0.00
Total Cost (Years 1 through 30)			\$0.00

Assumptions:

No Action is taken, no monitoring is performed, no ICs are implemented, no well abandonments take place, no remedy review, site visits, or meetings with SC

**TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: MNA Plan	1	\$16,981.00	\$16,981.00
Task 02: Semi-Annual MNA Monitoring, Annual Report (Year 1)	1	\$68,813.00	\$68,813.00
Task 03: Well Abandonments (End of Year 1)	1	\$7,741.00	\$7,741.00
Task 04: Deed Restrictions	1	\$10,881.00	\$10,881.00
Total First Year Estimated Cost			\$104,416.00
Present Value Cost	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$104,416.00	\$105,000.00
Task 05: Semi-Annual MNA Monitoring, Annual Report (Years 2 through 5)	4 Years ²	\$57,000.00	\$198,000.00
Task 06: Well Abandonments (End of Year 5)	1 Year ¹	\$5,000.00	\$5,000.00
Task 07: Semi-Annual MNA Monitoring, Annual Report (Years 6 through 10)	5 Years ²	\$50,000.00	\$214,000.00
Task 08: Well Abandonments (End of Year 10)	1 Year ¹	\$5,000.00	\$5,000.00
Task 09: Annual MNA Monitoring, Annual Report (Years 11 through 15)	5 Years ²	\$36,000.00	\$153,000.00
Task 10: Well Abandonments (End of Year 15)	1 Year ¹	\$6,000.00	\$5,000.00
Task 11: Annual MNA Monitoring, Annual Report (Years 16 through 20)	5 Years ²	\$28,000.00	\$120,000.00
Task 12: Well Abandonments (End of Year 20)	1 Year ¹	\$4,000.00	\$4,000.00
Task 13: Annual MNA Monitoring, Annual Report (Years 21 through 30)	10 Years ²	\$26,000.00	\$198,000.00
Task 14: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	21,000.00	118,000.00
Total Present Value Cost			\$1,125,000.00

Assumptions:

Task 01: Includes labor to generate a Monitored Natural Attenuation (MNA) Plan

Task 02: Includes the following:

Semi-annual groundwater sampling event - First Event (Year 1)

Data validation, evaluation, figure and table development, and preparation of one brief letter report

Number of wells sampled = 16. Sample for VOCs, 16 passive diffusion bags (PDBs)

Number of Events = 1; Field Crew = 2

Semi-annual groundwater sampling event - Second Event (Year 1)

Data validation, evaluation, figure and table development, and preparation of one annual summary report

Number of wells sampled = 72. Sample 72 for VOCs, 20 for MNA parameters. 36 PDBs

Number of Events = 1; Field Crew = 2

Purge Water Disposal; Field Crew = 1

Task 03: Includes the cost to abandon 14 wells and cost of the oversight labor at the end of Year 1

Task 04: Includes the following:

Deed Restrictions

Task 05: Includes the following:

Semi-annual groundwater sampling event - First Event each year (Years 2-5)

Data validation, evaluation, figure and table development, and preparation of one brief letter report

Number of wells sampled = 25. Sample for VOCs, 22 PDBs

Number of Events = 4; Field Crew = 2

Semi-annual groundwater sampling event - Second Event each Year (Years 2-5)

Data validation, evaluation, figure and table development, and preparation of one annual summary report

Number of wells sampled = 58. Sample for 58 for VOCs, 20 for MNA parameters. 25 PDBs

Number of Events = 4; Field Crew = 2

Task 06: Includes the cost to abandon 6 wells and cost of oversight labor at the end of Year 5; Field crew = 1

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task 07: Includes the following:

- Semi-annual groundwater sampling event - First Event each year (Years 6-10)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled = 16. Sample for VOCs, 13 PDBs
- Number of Events - 5; Field Crew = 2
- Semi-annual groundwater sampling event - Second Event each Year (Years 6-10)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 52. Sample for 52 for VOCs, 20 for MNA parameters. 19 PDBs
- Number of Events = 5; Field Crew = 2

Task 08: Includes the cost to abandon 3 wells and cost of oversight labor at the end of Year 10; Field crew = 1

Task 09: Includes the following:

- Annual groundwater sampling event (Years 11-15)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 49. Sample for VOCs, 34 PDBs
- Number of Events - 5; Field Crew = 2

Task 10: Includes the cost to abandon 10 wells and cost of oversight labor at the end of Year 15; Field crew = 1

Task 11: Includes the following:

- Annual groundwater sampling event (Years 16-20)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 39. Sample for VOCs, 28 PDBs
- Number of Events - 5; Field Crew = 2

Task 12: Includes the cost to abandon 2 wells and cost of oversight labor at the end of Year 20; Field crew = 1

Task 13: Includes the following:

- Annual groundwater sampling event (Years 21-30)
- Data validation, evaluation, figure and table development, and preparation of one annual summary report
- Number of wells sampled = 36. Sample for VOCs, 28 PDBs
- Number of Events - 5; Field Crew = 2

Task 14: Includes the following:

- Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
- Five-Year Remedy Review Report
- Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

**TABLE 6-4
 COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
 MNA, ICs, and CONTAINMENT VIA COVER
 SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Cost Estimate for Alternative 2	0002	Task	01			02			03			04			05			06			07			08		
			MNA Plan			Semi-Annual MNA Sampling (two events), Annual Report Year 1 (16 wells, 16 PDBs - 6 mos) (72 Wells, 36/71 = PDB - 1 Yr)			Well Abandonments (Year 1)			Deed Restrictions Year 1			Semi-Annual MNA Sampling, Annual Report Years 2 through 5 (25 wells, 22 PDBs - 1st Event) (58 Wells, 25 PDBs - 2nd Event)			Well Abandonments (Year 5)			Semi-Annual MNA Sampling, Annual Report Years 6 through 10 (16 wells, 13 PDBs - 1st Event) (52 Wells, 19 PDBs - 2nd Event)			Well Abandonments (Year 10)		
			Representative Staff		Year	1			1			1			1			2-5			5			6-10		
Labor Category		Units	Hrs	Rate	Cost	Hrs	Rate	Cost							Hrs	Rate	Cost				Hrs	Rate	Cost			
Senior Project Manager		hr	1	192.00	192.00	2	192.00	384.00	1	192.00	192.00	2	192.00	384.00	2	192.00	384.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00
Project Manager		hr	48	161.00	7,728.00	40	161.00	6,440.00	6	161.00	966.00	54	161.00	8,694.00	32	161.00	5,152.00	6	161.00	966.00	30	161.00	4,830.00	6	161.00	966.00
Senior Project Staff		hr		125.00	-	16	125.00	2,000.00	-	125.00	-		125.00	-	12	125.00	1,500.00	-	125.00	-	12	125.00	1,500.00	-	125.00	-
Senior Consultant		hr	20	166.00	3,320.00	20	166.00	3,320.00	2	166.00	332.00		166.00	-	16	166.00	2,656.00	2	166.00	332.00	12	166.00	1,992.00	2	166.00	332.00
Consultant II		hr		125.00	-	24	125.00	3,000.00	-	125.00	-	8	125.00	1,000.00	20	125.00	2,500.00	-	125.00	-	16	125.00	2,000.00	-	125.00	-
Consultant I		hr	40	109.00	4,360.00	40	109.00	4,360.00	-	109.00	-		109.00	-	32	109.00	3,488.00	-	109.00	-	30	109.00	3,270.00	-	109.00	-
Junior Consultant		hr		94.00	-		94.00	-	2	94.00	188.00		94.00	-		94.00	-	2	94.00	188.00	-	94.00	-	2	94.00	188.00
Senior Field Manager		hr		108.00	-	130	108.00	14,040.00	-	108.00	-		108.00	-	110	108.00	11,880.00	-	108.00	-	100	108.00	10,800.00	-	108.00	-
Technician		hr		78.00	-	136	78.00	10,608.00	20	78.00	1,560.00		78.00	-	116	78.00	9,048.00	10	78.00	780.00	106	78.00	8,268.00	10	78.00	780.00
Senior Assistant/Admin Clerk		hr	16	83.00	1,328.00	24	83.00	1,992.00	-	83.00	-	4	83.00	332.00	24	83.00	1,992.00	-	83.00	-	16	83.00	1,328.00	-	83.00	-
Total Labor			125		16,928.00	432		46,144.00	31		3,238.00	68		10,410.00	364		38,600.00	21		2,458.00	323		34,180.00	21		2,458.00
Travel/Transportation		Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Lodging		day	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-
M & IE		day	-	50.00	-	27	50.00	1,350.00	2	50.00	100.00	2	50.00	100.00	23	50.00	1,150.00	1	50.00	50.00	21	50.00	1,050.00	1	50.00	50.00
Local Mileage (0.67/mile)		mile	-	0.670	-	3,500	0.670	2,345.00	240	0.670	160.80	240	0.670	160.80	2,980	0.670	1,996.60	120	0.670	80.40	2,720	0.670	1,822.40	120	0.670	80.40
Total Travel/Transportation					-			3,695.00			260.80			260.80			3,146.60			130.40			2,872.40			130.40
ODCs/Subcontractor Costs		Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Well Abandonment		each			-	0.00	-	1	4,040.00	4,040.00				-	-	-	1	1,570.00	1,570.00	-	-	-	1	1,565.00	1,565.00	
PDBs		each			52	30.00	1,560.00	-	-	-				47	30.00	1,410.00	-	-	-	32	30.00	960.00	-	-	-	
Analytical Laboratory		LS	-	-	1	10,570.00	10,570.00	-	-	-				1	10,180.00	10,180.00	-	-	-	1	9,075.00	9,075.00	-	-	-	
Sampling Equipment		LS	-	-	1	3,000.00	3,000.00	-	-	-				1	2,500.00	2,500.00	-	-	-	1	2,000.00	2,000.00	-	-	-	
55-Gallon Drums for Purge Water		each	-	-	6	65.00	390.00	-	-	-				5	65.00	325.00	-	-	-	5	65.00	325.00	-	-	-	
Purge Water T&D		each	-	-	6	425.00	2,550.00	-	-	-				5	425.00	2,125.00	-	-	-	5	425.00	2,125.00	-	-	-	
Document Supplies		each	1	50.00	50.00	-	-	-	-	-	4	50.00	200.00	1	50.00	50.00	-	-	-	1	50.00	50.00	-	-	-	
Subtotal ODCs/Subcontractor Costs					50.00		18,070.00			4,040.00			200.00		16,590.00		1,570.00		14,535.00			15,261.75			1,643.25	
Mark-up (ODCs/Subcontractors +5%)		5.0%			2.50		903.50			202.00			10.00		829.50		78.50		726.75			78.25			78.25	
Total ODCs/Subcontractors					52.50		18,973.50			4,242.00			210.00		17,419.50		1,648.50		15,261.75			15,261.75			1,643.25	
TOTAL					16,981.00		68,813.00			7,741.00			10,881.00		59,166.00		4,237.00		52,314.00			52,314.00			4,232.00	

**TABLE 6-4
 COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
 MNA, ICS, and CONTAINMENT VIA COVER
 SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Cost Estimate for Alternative 1	0002	Task	09			10			11			12			13			14		
Description	Representative Staff	Year	11-15			15			16-20			20			20-30			5, 10, 15, 20, 25, 30		
			Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost
Senior Project Manager		hr	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	2	192.00	384.00
Project Manager		hr	30	161.00	4,830.00	6	161.00	966.00	24	161.00	3,864.00	6	161.00	966.00	24	161.00	3,864.00	48	161.00	7,728.00
Senior Project Staff		hr	12	125.00	1,500.00	-	125.00	-	8	125.00	1,000.00	-	125.00	-	8	125.00	1,000.00	8	125.00	1,000.00
Senior Consultant		hr	12	166.00	1,992.00	2	166.00	332.00	8	166.00	1,328.00	2	166.00	332.00	8	166.00	1,328.00	16	166.00	2,656.00
Consultant II		hr		125.00	-	-	125.00	-	12	125.00	1,500.00	-	125.00	-	12	125.00	1,500.00	16	125.00	2,000.00
Consultant I		hr	30	109.00	3,270.00	-	109.00	-	24	109.00	2,616.00	-	109.00	-	24	109.00	2,616.00	48	109.00	5,232.00
Junior Consultant		hr	-	94.00	-	2	94.00	188.00	-	94.00	-	2	94.00	188.00	-	94.00	-	-	94.00	-
Senior Field Manager		hr	70	108.00	7,560.00	-	108.00	-	50	108.00	5,400.00	-	108.00	-	40	108.00	4,320.00	-	108.00	-
Technician		hr	76	78.00	5,928.00	12	78.00	936.00	56	78.00	4,368.00	10	78.00	780.00	46	78.00	3,588.00	-	78.00	-
Senior Assistant/Admin Clerk		hr	8	83.00	664.00	-	83.00	-	16	83.00	1,328.00	-	83.00	-	16	83.00	1,328.00	16	83.00	1,328.00
Total Labor			239		25,936.00	23		2,614.00	199		21,596.00	21		2,458.00	179		19,736.00	154		20,328.00
Travel/Transportation		Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Lodging		day	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-
M & IE		day	15	50.00	750.00	1	50.00	50.00	9	50.00	450.00	2	50.00	100.00	9	50.00	450.00	2	50.00	100.00
Local Mileage (0.67/mile)		mile	2,380	0.670	1,594.60	120	0.670	80.40	1,160	0.670	777.20	240	0.670	160.80	1,160	0.670	777.20	200	0.670	134.00
Total Travel/Transportation					2,344.60			130.40			1,227.20			260.80			1,227.20			234.00
ODCs/Subcontractor Costs		Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Well Abandonment		each	-	-	-	1	2,350.00	2,350.00	-	-	-	1	1,090.00	1,090.00	-	-	-	-	-	-
PDBs		each	34	30.00	1,020.00	-	-	-	28	30.00	840.00	-	-	-	28	30.00	840.00	-	-	-
Analytical Laboratory		LS	1	3,640.00	3,640.00	-	-	-	1	2,860.00	2,860.00	-	-	-	1	2,665.00	2,665.00	-	-	-
Sampling Equipment		LS	1	2,000.00	2,000.00	-	-	-	1	1,500.00	1,500.00	-	-	-	1	1,500.00	1,500.00	-	-	-
55-Gallon Drums for Purge Water		each	4	65.00	260.00	-	-	-	2	65.00	130.00	-	-	-	2	65.00	130.00	-	-	-
Purge Water T&D		each	4	425.00	1,700.00	-	-	-	2	425.00	850.00	-	-	-	2	425.00	850.00	-	-	-
Document Supplies		each	1	50.00	50.00	-	-	-	1	50.00	50.00	-	-	-	1	50.00	50.00	1	50.00	50.00
Subtotal ODCs/Subcontractor Costs					8,670.00			2,350.00			6,230.00			1,090.00			6,035.00			50.00
Mark-up (ODCs/Subcontractors +5%)		5.0%			433.50			117.50			311.50			54.50			301.75			2.50
Total ODCs/Subcontractors					9,103.50			2,467.50			6,541.50			1,144.50			6,336.75			52.50
TOTAL					37,384.00			5,212.00			29,365.00			3,863.00			27,300.00			20,615.00

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	16	0
Number of Events	1	1
Total Environmental Samples	16	0
Field Duplicates	2	0
MS/MSD	1	0
Total Samples	19	0
Extended Cost (Groundwater)	\$1,235	\$0
TOTAL ANALYTICAL COST:		\$1,235

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	72	20
Number of Events	1	1
Total Environmental Samples	72	20
Field Duplicates	7	0
MS/MSD	4	0
Total Samples	83	20
Extended Cost (Groundwater)	\$5,395	\$3,940
TOTAL ANALYTICAL COST:		\$9,335

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION (1st event)	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	25	0
Number of Events	1	0
Total Environmental Samples	25	0
Field Duplicates	3	0
MS/MSD	1	0
Total Samples	29	0
Extended Cost (Groundwater)	\$1,885	\$0
TOTAL ANALYTICAL COST:		\$1,885

DESCRIPTION (Second Event)	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Solid Rates:	0	
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	58	20
Number of Events	1	1
Total Environmental Samples	58	20
Field Duplicates	6	0
MS/MSD	3	0
Total Samples	67	20
Extended Cost (Groundwater)	\$4,355	\$3,940
TOTAL ANALYTICAL COST:		\$8,295

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION (1st event)	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	16	0
Number of Events	1	1
Total Environmental Samples	16	0
Field Duplicates	2	0
MS/MSD	1	0
Total Samples	19	0
Extended Cost (Groundwater)	\$1,235	\$0
TOTAL ANALYTICAL COST:		\$1,235

DESCRIPTION (Second Event)	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Solid Rates:	0	
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	52	20
Number of Events	1	1
Total Environmental Samples	52	20
Field Duplicates	5	0
MS/MSD	3	0
Total Samples	60	20
Extended Cost (Groundwater)	\$3,900	\$3,940
TOTAL ANALYTICAL COST:		\$7,840

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION (1st event)	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	49	0
Number of Events	1	0
Total Environmental Samples	49	0
Field Duplicates	5	0
MS/MSD	2	0
Total Samples	56	0
Extended Cost (Groundwater)	\$3,640	\$0
TOTAL ANALYTICAL COST:		\$3,640

No NAPs once annual sampling begins in Year 11

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION (1st event)	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	38	0
Number of Events	1	0
Total Environmental Samples	38	0
Field Duplicates	4	0
MS/MSD	2	0
Total Samples	44	0
Extended Cost (Groundwater)	\$2,860	\$0
TOTAL ANALYTICAL COST:		\$2,860

No NAPs once annual sampling begins in Year 11

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION (1st event)	Groundwater Parameters	
	VOCs (Field & QC) SW-846 8260D	NAPs Varies
Liquid Rates:	\$65	\$197
Groundwater Sampling/Analysis		
Number of GW Samples	35	0
Number of Events	1	0
Total Environmental Samples	35	0
Field Duplicates	4	0
MS/MSD	2	0
Total Samples	41	0
Extended Cost (Groundwater)	\$2,665	\$0
TOTAL ANALYTICAL COST:		\$2,665

No NAPs once annual sampling begins in Year 11

TABLE 6-4
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
MNA, ICs, AND CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Well Abandonment Estimate

		Yr 1	Yr 5	Yr 10	Yr 15	Yr 20	Yr 30
	Rate	Abandonments (feet)	Abandonments (feet)	Abandonments (feet)	Abandonments (feet)	Abandonments (feet)	Abandonments (feet)
Mobilization/ Demobilization	\$750						
Abandon	\$5	658	164	163	320	68	150
Well Abandon Cost		3,290	820	815	1,600	340	750
Total Cost		4,040	1,570	1,565	2,350	1,090	1,500

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: Remedial Design Work Plan, UIC Permit, Health and Safety Plan Update, Flux Meters	1	\$106,417.00	\$106,417.00
Task 02: First ISCO Injection Event and Oversight - 235 Injection Locations	1	\$712,702.00	\$712,702.00
Task 03: Semi-Annual Performance Monitoring - 1st Event of Each Year	1	\$16,856.00	\$16,856.00
Task 04: Semi-Annual Performance Monitoring - 2nd Event of Each Year + Annual MNA Monitoring Event, Annual Report - Year 1	1	58,629.00	\$58,629.00
Total First Year Estimated Cost			\$894,604.00
Present Value Cost			
	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$894,604.00	\$895,000.00
Task 03: Semi-Annual Performance Monitoring - Years 2 through 12	11 Years ²	\$17,000.00	\$131,000.00
Task 05: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 2 through 6	5 Years ²	\$45,000.00	\$192,000.00
Task 06: Deed Restrictions - Year 2	1 Year ¹	\$11,000.00	\$11,000.00
Task 07: Second Injection Event (176 Injection Locations) - Year 4	1 Year ¹	\$372,000.00	\$353,000.00
Task 08: Third Injection Event, Well Abandonments (118 Injection Locations) - Year 7	1 Year ¹	\$247,000.00	\$235,000.00
Task 09: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 7 through 9	3 Years ²	\$42,000.00	\$113,000.00
Task 10: Fourth Injection Event (60 Injection Locations) - Year 10	1 Year ¹	\$127,000.00	\$121,000.00
Task 11: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 10 through 12	3 Years ²	\$42,000.00	\$113,000.00
Task 12: Well Abandonments (Year 12)	1 Year ¹	\$30,000.00	\$28,000.00
Task 13: Long Term Monitoring, Annual Report - Years 13 through 15	3 Years ²	\$27,000.00	\$71,000.00
Task 14: Well Abandonments (Year 15)	1 Year ¹	\$7,000.00	\$6,000.00
Task 15: Long Term Monitoring, Annual Report - Years 16 through 20	5 Years ²	\$23,000.00	\$96,000.00
Task 16: Long Term Monitoring, Annual Report - Years 21 through 30	10 Years ²	\$23,000.00	\$170,000.00
Task 17: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	\$21,000.00	\$118,000.00
Total Present Value Cost			\$2,653,000.00

Assumptions:

Task 01: Includes labor to generate Remedial Design Work Plan including time to finalize design with injection contractor, UIC Permit preparation, and Health and Safety Plan update. Also, labor to deploy/retrieve ten passive flux meters into five locations to better define treatment zones and quantify chemical quantities as well as the installation, development, and survey of 11 shallow zone monitoring wells for the west portion of the main building.

Task 02: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, Injection Contractor, and Driller.
- Installation of Permanent Injection Wells for Intermediate Zone (63 total)
- First Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (235 injection locations) - Year 1
- 38 days to complete injection + 2 days for setup/break down. Field Crew = 3 people + 1 person for oversight.
- Survey of Injection Locations, Soil Cuttings Disposal for Permanent Injection Wells; Field Crew = 1

Task 03: Includes the following:

- Semi-annual groundwater sampling event - First event each year (Years 2-12)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled per event = 29. Sample 29 wells for VOCs and 18 wells for Total Dissolved Solids (TDS), and Chloride (Cl)
- Number of events = 11; Field Crew = 2

Task 04: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Year 1)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 83. Sample 83 wells for VOCs, 18 wells for TDS and Cl, 8 wells for MNA parameters. 33 PDBs.
- Number of Events = 1; Field Crew = 2
- Purge Water Disposal, Abandon 14 wells; Field Crew = 1

Task 05: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 2-6)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 69. Sample 69 wells for VOCs, 18 wells for TDS and Cl, 11 wells for MNA parameters. 22 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 06: Includes the following:

- Deed Restrictions

Task 07: Includes the following:

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task 08: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant and Injection Contractor
- Third Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (118 injection locations) - Year 7
- Oversight of Injection Event = 19 days; Field Crew = 3 people + 1 oversight person
- Survey of Injection Locations, Abandon 6 wells; Field Crew = 1

Task 09: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 7-9)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 63. Sample 63 for VOCs, 18 for TDS and Cl, 19 for MNA parameters. 16 PDBs
- Number of Events = 3; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 10: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant and Injection Contractor
- Fourth Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (60 injection locations) - Year 10
- Oversight of Injection Event = 9 days; Field Crew = 3 people + 1 oversight person
- Survey of Injection Locations; Field Crew = 1

Task 11: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 10-12)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 63. Sample 63 wells for VOCs, 18 wells for TDS and Cl, 11 wells for MNA parameters. 16 PDBs
- Number of Events = 3; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 12: Includes the cost to abandon 28 monitoring wells and 63 injection wells plus cost of oversight labor at the end of Year 12; Field crew = 1

Task 13: Includes the following:

- Annual groundwater sampling event (Years 13-15)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 35. Sample 35 wells for VOCs. 21 PDBs
- Number of Events = 3; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 14: Includes the cost to abandon 13 wells and cost of oversight labor at the end of Year 15; Field crew = 1

Task 15: Includes the following:

- Annual groundwater sampling event (Years 16-20)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 16: Includes the following:

- Annual groundwater sampling event (Years 21-30)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
- Number of Events = 10; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 17: Includes the following:

- Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
- Five-Year Remedy Review Report
- Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

**TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Cost Estimate for Alternative 3	Task	01				02			03			04			05			06			07			08		
Description	Year	Remedial Design Work Plan UIC Permit HASP Update Flux Meters Well Installation				First ISCO Injection and Oversight Year 1 (235 Points)			Semi-Annual Performance GW Monitoring - First Event Each Year (Years 1 - 12, 29 Wells)			Combined Semi-Annual Performance Sampling & Annual Sitewide MNA GW Sampling Annual Reporting (Year 1 - 83 Wells, 33 PDBs) Well Abandonment			Combined Semi-Annual Performance Sampling & Annual Sitewide MNA GW Sampling Annual Reporting (Years 2-6 - 69 Wells, 22 PDBs)			Deed Restrictions Year 2			Second ISCO Injection Event Year 4 (176 Points)			Third ISCO Injection Event Year 7 (118 Points) Well Abandonment		
		Units	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost
Senior Project Manager	hr	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	2	192.00	384.00	1	192.00	192.00	1	192.00	192.00	
Project Manager	hr	56	161.00	9,016.00	12	161.00	1,932.00	10	161.00	1,610.00	16	161.00	2,576.00	16	161.00	2,576.00	54	161.00	8,694.00	12	161.00	1,932.00	12	161.00	1,932.00	
Senior Project Staff	hr		125.00	-		125.00	-	12	125.00	1,500.00	24	125.00	3,000.00	20	125.00	2,500.00		125.00	-		125.00	-		125.00	-	
Senior Consultant	hr	44	166.00	7,304.00	18	166.00	2,988.00	2	166.00	332.00	8	166.00	1,328.00	8	166.00	1,328.00		166.00	-	8	166.00	1,328.00	8	166.00	1,328.00	
Consultant II	hr	24	125.00	3,000.00	-	125.00	-	8	125.00	1,000.00	8	125.00	1,000.00	8	125.00	1,000.00	8	125.00	1,000.00	-	125.00	-	-	125.00	-	
Consultant I	hr	44	109.00	4,796.00	-	109.00	-	3	109.00	327.00	44	109.00	4,796.00	40	109.00	4,360.00		109.00	-	-	109.00	-	-	109.00	-	
Junior Consultant	hr		94.00	-	12	94.00	1,128.00	-	94.00	-	-	94.00	-	-	94.00	-		94.00	-	8	94.00	752.00	8	94.00	752.00	
Senior Field Manager	hr	40	108.00	4,320.00	486	108.00	52,488.00	42	108.00	4,536.00	100	108.00	10,800.00	90	108.00	9,720.00		108.00	-	374	108.00	40,392.00	234	108.00	25,272.00	
Technician	hr	16	78.00	1,248.00	24	78.00	1,872.00	42	78.00	3,276.00	126	78.00	9,828.00	96	78.00	7,488.00		78.00	-	8	78.00	624.00	16	78.00	1,248.00	
Senior Assistant/Admin Clerk	hr	16	83.00	1,328.00	-	83.00	-	6	83.00	498.00	16	83.00	1,328.00	16	83.00	1,328.00	4	83.00	332.00	-	83.00	-	-	83.00	-	
Total Labor		241		31,204.00	553		60,600.00	126		13,271.00	343		34,848.00	295		30,492.00	68		10,410.00	411		45,220.00	279		30,724.00	
Travel/Transportation	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	
Lodging and Per Diem	day	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	
M & I E	day	5	50.00	250.00	44	50.00	2,200.00	6	50.00	300.00	23	50.00	1,150.00	19	50.00	950.00	2	50.00	100.00	32	50.00	1,600.00	22	50.00	1,100.00	
Local Mileage (0.67/mile)	mile	600	0.670	402.00	####	0.670	3,537.60	260	0.670	174.20	2,960	0.670	1,983.20	2,460	0.670	1,648.20	240	0.670	160.80	3,840	0.670	2,572.80	2,640	0.670	1,768.80	
Total Travel/Transportation				652.00			5,737.60			474.20			3,133.20			2,598.20			260.80			4,172.80			2,868.80	
ODCs/Subcontractor Costs	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	
Passive Flux Meters & Analysis (four u	LS	10	4,500.00	45,000.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Private Utility Locator	LS	-	-	-	1	800.00	800.00	-	-	-	-	-	-	-	-	-	-	-	-	1	800.00	800.00	1	800.00	800.00	
Driller/Injection Contractor	LS	-	-	-	1	\$405,700	405,700.00	-	-	-	-	-	-	-	-	-	-	-	-	1	\$150,730	150,730.00	1	\$96,090	96,090.00	
ISCO Chemicals	LS	-	-	-	1	\$202,785	202,785.00	-	-	-	-	-	-	-	-	-	-	-	-	1	\$153,756	153,756.00	1	\$103,058	103,058.00	
Survey (New MW, Injection Wells)	day	1	1,400.00	1,400.00	2	1,400.00	2,800.00	-	-	-	-	-	-	-	-	-	-	-	-	1	1,400.00	1,400.00	1	1,400.00	1,400.00	
Well Abandonment	each			-			-			-	1	4,025.00	4,025.00										1	\$1,545	1,545.00	
PDBs	each			-			-			-	33	30.00	990.00	22	30.00	660.00										
Analytical Laboratory	LS	-	-	-	-	-	-	1	1,833.00	1,833.00	1	8,810.00	8,810.00	1	7,770.00	7,770.00	-	-	-	-	-	-	-	-	-	
Sampling Equipment	LS	-	-	-	-	-	-	1	1,000.00	1,000.00	1	2,000.00	2,000.00	1	1,500.00	1,500.00										
55-gallon Drums	each	4	65.00	260.00				2	65.00	130.00	6	65.00	390.00	5	65.00	325.00										
Purge Water T&D	each	1	425.00	425.00	-	-	-				8	425.00	3,400.00	7	425.00	2,975.00										
Soil Cuttings T&D	LS	3	425.00	1,275.00	1	3,500.00	3,500.00																			
Document Supplies	each	3	50.00	150.00	-	-	-	-	-	-	1	50.00	50.00	1	50.00	50.00	4	50.00	200.00	-	-	-	-	-	-	
Well Installation	LS	1	22,500.00	22,500.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Subtotal ODCs/Subcontractor Costs				71,010.00			615,585.00			2,963.00			19,665.00			13,280.00			200.00			306,686.00			202,893.00	
Mark-up (ODCs/Subcontractors +5%)				3,550.50			30,779.25			148.15			983.25			664.00			10.00			15,334.30			10,144.65	
Total ODCs/Subcontractors				74,560.50			646,364.25			3,111.15			20,648.25			13,944.00			210.00			322,020.30			213,037.65	
TOTAL				106,417.00			712,702.00			16,856.00			58,629.00			47,034.00			10,881.00			371,413.00			246,630.00	

**TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Cost Estimate for Alternative 3 Description	Task	09 Combined Semi-Annual Performance Sampling & Annual Sitewide MNA GW Sampling Performance Reporting (Years 7 - 9, 63 Wells, 16 PDBs)				10 Fourth ISCO Injection Event Year 10 (60 Points)			11 Annual Sitewide MNA GW Sampling Annual Reporting (Years 10-12, 63 Wells, 16 PDBs)			12 Well Abandonments (Year 12)			13 LTM, Annual Report (Years 13-15, 35 Wells, 21 PDBs)			14 Well Abandonment (Year 15)			15 LTM, Annual Report Year 16-20 (22 Wells, 16 PDBs)			16 LTM, Annual Report Year 21-30 (22 wells, 16 PDBs)			17 Five Year Remedy Review Years 5, 10, 15, 20, 25, 30		
	Year	7-9				10			10-12			10			13-15			15			16-20			21-30			5, 10, 15, 20, 25, 30		
	Labor Category	Units	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost
Senior Project Manager	hr	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	2	192.00	384.00	
Project Manager	hr	16	161.00	2,576.00	12	161.00	1,932.00	16	161.00	2,576.00	6	161.00	966.00	16	161.00	2,576.00	6	161.00	966.00	12	161.00	1,932.00	12	161.00	1,932.00	48	161.00	7,728.00	
Senior Project Staff	hr	20	125.00	2,500.00	-	125.00	-	20	125.00	2,500.00	-	125.00	-	16	125.00	2,000.00	-	125.00	-	16	125.00	2,000.00	16	125.00	2,000.00	8	125.00	1,000.00	
Senior Consultant	hr	8	166.00	1,328.00	8	166.00	1,328.00	8	166.00	1,328.00	2	166.00	332.00	8	166.00	1,328.00	2	166.00	332.00	8	166.00	1,328.00	8	166.00	1,328.00	16	166.00	2,656.00	
Consultant II	hr	8	125.00	1,000.00	-	125.00	-	8	125.00	1,000.00	-	125.00	-	8	125.00	1,000.00	-	125.00	-	8	125.00	1,000.00	8	125.00	1,000.00	16	125.00	2,000.00	
Consultant I	hr	40	109.00	4,360.00	-	109.00	-	40	109.00	4,360.00	-	109.00	-	40	109.00	4,360.00	-	109.00	-	40	109.00	4,360.00	40	109.00	4,360.00	48	109.00	5,232.00	
Junior Consultant	hr	-	94.00	-	8	94.00	752.00	-	94.00	-	2	94.00	188.00	-	94.00	-	2	94.00	188.00	-	94.00	-	-	94.00	-	-	94.00	-	
Senior Field Manager	hr	80	108.00	8,640.00	96	108.00	10,368.00	80	108.00	8,640.00	-	108.00	-	40	108.00	4,320.00	-	108.00	-	30	108.00	3,240.00	30	108.00	3,240.00	-	108.00	-	
Technician	hr	86	78.00	6,708.00	8	78.00	624.00	86	78.00	6,708.00	60	78.00	4,680.00	46	78.00	3,588.00	20	78.00	1,560.00	36	78.00	2,808.00	36	78.00	2,808.00	-	78.00	-	
Senior Assistant/Admin Clerk	hr	16	83.00	1,328.00	-	83.00	-	16	83.00	1,328.00	-	83.00	-	16	83.00	1,328.00	-	83.00	-	16	83.00	1,328.00	16	83.00	1,328.00	16	83.00	1,328.00	
Total Labor		275		28,632.00	133		15,196.00	275		28,632.00	71		6,358.00	191		20,692.00	31		3,238.00	167		18,188.00	167		18,188.00	154		20,328.00	
Travel/Transportation	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	
Lodging	day	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	-	-	
M & I E	day	17	50.00	850.00	11	50.00	550.00	17	50.00	850.00	5	50.00	250.00	9	50.00	450.00	2	50.00	100.00	7	50.00	350.00	7	50.00	350.00	2	50.00	100.00	
Local Mileage (0.67/mile)	mile	2,200	0.670	1,474.00	1,320	0.670	884.40	2,200	0.670	1,474.00	600	0.670	402.00	1,160	0.670	777.20	240	0.670	160.80	900	0.670	603.00	900	0.670	603.00	200	0.670	134.00	
Total Travel/Transportation				2,324.00			1,434.40			2,324.00			652.00			1,227.20			260.80			953.00			953.00			234.00	
ODCs/Subcontractor Costs	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	
MW/IW Abandonment	each	-	-	-	-	-	-	-	-	-	1	20,980.00	20,980.00	-	-	-	1	2,535	2,535.00	-	-	-	-	-	-	-	-	-	
PDBs	each	16	30.00	480.00	-	-	-	16	30.00	480.00	-	-	-	21	30.00	630.00	-	-	-	16	30.00	480.00	16	30.00	480.00	-	-	-	
Analytical Laboratory	LS	1	7,315.00	7,315.00	-	-	-	1	7,315.00	7,315.00	-	-	-	1	2,665.00	2,665.00	-	-	-	1	1,625.00	1,625.00	1	1,625.00	1,625.00	-	-	-	
Sampling Equipment	LS	1	1,500.00	1,500.00	-	-	-	1	1,500.00	1,500.00	-	-	-	1	1,000.00	1,000.00	-	-	-	1	1,000.00	1,000.00	1	1,000.00	1,000.00	-	-	-	
55-Gallon Drums for Purge Water	each	4	65.00	260.00	-	-	-	4	65.00	260.00	-	-	-	2	65.00	130.00	-	-	-	2	65.00	130.00	2	65.00	130.00	-	-	-	
Purge Water Management and Disposal	each	6	425.00	2,550.00	-	-	-	6	425.00	2,550.00	-	-	-	2	425.00	850.00	-	-	-	2	425.00	850.00	2	425.00	850.00	-	-	-	
Document Supplies	each	1	50.00	50.00	-	-	-	1	50.00	50.00	-	-	-	1	50.00	50.00	-	-	-	1	50.00	50.00	1	50.00	50.00	1	50.00	50.00	
Subtotal ODCs/Subcontractor Costs		-	-	12,155.00	-	-	104,810.00	-	-	12,155.00	-	-	20,980.00	-	-	5,325.00	-	-	2,535.00	-	-	4,135.00	-	-	4,135.00	-	-	50.00	
Mark-up (ODCs/Subcontractors +5%)				607.75			5,240.50			607.75			1,049.00			266.25			126.75			206.75			206.75			2.50	
Total ODCs/Subcontractors				12,762.75			110,050.50			12,762.75			22,029.00			5,591.25			2,661.75			4,341.75			4,341.75			52.50	
TOTAL				43,719.00			126,681.00			43,719.00			29,039.00			27,510.00			6,161.00			23,483.00			23,483.00			20,615.00	

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
FIRST EVENT - 235 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$7,650	\$7,650
Setup and Breakdown	2	\$2,400	\$4,800
Injection Service, 3-man Crew	38	\$3,370	\$128,060
Rentals	8	\$1,700	\$13,600
Per Diem - 3-man crew	40	\$750	\$30,000
Concrete Core Equipment	1	\$575	\$575
Concrete Patching	87	\$15	\$1,305
Replacement Tooling	4	\$3,740	\$14,960
1.5" PVC well materials (100') with 10 feet of 0.020-inch-slot - 63 Intermediate Inj. Wells	3,150	\$65	\$204,750
TOTAL ANALYTICAL COST			\$405,700

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
PROTECT-OX2	235	\$831	\$195,285
Freight	1	\$7,500	\$7,500
TOTAL CHEMICAL COST			\$202,785

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SECOND EVENT - 176 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$7,650	\$7,650
Setup and Breakdown	2	\$2,400	\$4,800
Injection Service, 3-man Crew	28	\$3,370	\$94,360
Rentals	6	\$1,700	\$10,200
Per Diem - 3-man crew	30	\$750	\$22,500
Replacement Tooling	3	\$3,740	\$11,220
TOTAL ANALYTICAL COST			\$150,730

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
PROTECT-OX2	176	\$831	\$146,256
Freight	1	\$7,500	\$7,500
TOTAL CHEMICAL COST			\$153,756

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
THIRD EVENT - 118 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$4,500	\$4,500
Setup and Breakdown	1	\$2,400	\$2,400
Injection Service, 3-man Crew	18	\$3,370	\$60,660
Rentals	4	\$1,700	\$6,800
Per Diem - 3-man crew	19	\$750	\$14,250
Replacement Tooling	2	\$3,740	\$7,480
TOTAL ANALYTICAL COST			\$96,090

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
PROTECT-OX2	118	\$831	\$98,058
Freight	1	\$5,000	\$5,000
TOTAL CHEMICAL COST			\$103,058

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
FOURTH EVENT - 60 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$4,500	\$4,500
Setup and Breakdown	1	\$2,400	\$2,400
Injection Service, 3-man Crew	8	\$3,370	\$26,960
Rentals	2	\$1,700	\$3,400
Per Diem - 3-man crew	9	\$750	\$6,750
Replacement Tooling	1	\$3,740	\$3,740
TOTAL ANALYTICAL COST			\$47,750

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
PROTECT-OX2	60	\$831	\$49,860
Freight	1	\$5,000	\$5,000
TOTAL CHEMICAL COST			\$54,860

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
SEMI-ANNUAL PERFORMANCE MONITORING (FIRST EVENT OF EACH YEAR)
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters	
	VOCs (Field & QC)	TDS + Cl
	SW-846 8260D	SM 2540C 300.0
Liquid Rates:	\$65	\$26
Groundwater Sampling/Analysis		
Number of GW Samples	18	18
Number of Events	1	1
Total Environmental Samples	18	18
Field Duplicates	2	0
MS/MSD	1	0
Total Samples	21	18
Extended Cost (Groundwater)	\$1,365	\$468
TOTAL ANALYTICAL COST		\$1,833

For first semi-annual event each year following completion of injection
 First Year = Sampling at 3 months post-injection

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
PERFORMANCE AND MNA MONITORING
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	83	18	11
Number of Events	1	1	1
Total Environmental Samples	83	18	11
Field Duplicates	8	0	0
MS/MSD	4	0	0
Total Samples	95	18	11
Extended Cost (Groundwater)	\$6,175	\$468	\$2,167
TOTAL ANALYTICAL COST:		\$8,810	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
PERFORMANCE AND MNA MONITORING (YEARS 2 - 6)
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	69	18	11
Number of Events	1	1	1
Total Environmental Samples	69	18	11
Field Duplicates	7	0	0
MS/MSD	3	0	0
Total Samples	79	18	11
Extended Cost (Groundwater)	\$5,135	\$468	\$2,167
TOTAL ANALYTICAL COST:		\$7,770	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
PERFORMANCE AND MNA MONITORING (YEARS 7-9 YEARS 10-12)
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	63	18	11
Number of Events	1	1	1
Total Environmental Samples	63	18	11
Field Duplicates	6	0	0
MS/MSD	3	0	0
Total Samples	72	18	11
Extended Cost (Groundwater)	\$4,680	\$468	\$2,167
TOTAL ANALYTICAL COST:		\$7,315	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 2
PERFORMANCE AND MNA MONITORING (YEARS 13-15)
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	35	0	0
Number of Events	1	0	0
Total Environmental Samples	35	0	0
Field Duplicates	4	0	0
MS/MSD	2	0	0
Total Samples	41	0	0
Extended Cost (Groundwater)	\$2,665	\$0	\$0
TOTAL ANALYTICAL COST:		\$2,665	

No MNA sampling after completion of performance monitoring.

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
PERFORMANCE AND MNA MONITORING (YEARS 16-20 and YEARS 21-30)
ISCO, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	22	0	0
Number of Events	1	0	0
Total Environmental Samples	22	0	0
Field Duplicates	2	0	0
MS/MSD	1	0	0
Total Samples	25	0	0
Extended Cost (Groundwater)	\$1,625	\$0	\$0
TOTAL ANALYTICAL COST:		\$1,625	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-5
 COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
 PERFORMANCE AND MNA MONITORING (YEARS 16-20 and YEARS 21-30)
 ISCO, MNA, ICs, and CONTAINMENT VIA COVER
 SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Well Abandonment Estimate

	Rate	Yr 1 Abandonments (feet)	Yr 7 Abandonments (feet)	Yr 12 Abandonments (feet)	Yr 15 Abandonments (feet)
Mobilization/ Demobilization	\$750				
Abandon (MW)	\$5	655	159	621	357
Abandon (New MW)*				275	
Abandon (Iws)				3150	
Well Abandon Cost		3,275	795	20,230	1,785
Total Cost		4,025	1,545	20,980	2,535

TABLE 6-5
COST ESTIMATE SUMMARY FOR ALTERNATIVE 3
PERFORMANCE AND MNA MONITORING (YEARS 16-20 and YEARS 21-30) ISCO, MNA, ICs, and
CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Well Installation

Rate

11 - 1"-diameter PVC wells with 10 feet of screen to 25 ft bgs

Scott Ross estimate = 22,500 Email dated 11/16/23

**TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: Remedial Design Work Plan, UIC Permit, Health and Safety Plan Update, Flux Meters	1	\$106,417.00	\$106,417.00
Task 02: First ISCO and ERD Injection Event and Oversight - 235 Injection Locations	1	\$1,041,162.00	\$1,041,162.00
Task 03: Semi-Annual Performance Monitoring - 1st Event of Each Year	1	\$20,244.00	\$20,244.00
Task 04: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Year 1	1	61,995.00	\$61,995.00
Total First Year Estimated Cost			\$1,229,818.00
Present Value Cost	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$1,229,818.00	\$1,230,000.00
Task 03: Semi-Annual Performance Monitoring - Years 2 through 9	8 Years ²	\$20,000.00	\$123,000.00
Task 05: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 2 through 6	5 Years ²	\$48,000.00	\$206,000.00
Task 06: Deed Restrictions (Year 2)	1 Year ¹	\$11,000.00	\$11,000.00
Task 07: Second Injection Event (Year 4)	1 Year ¹	\$557,000.00	\$529,000.00
Task 08: Third Injection Event, Well Abandonments (Year 7)	1 Year ¹	\$296,000.00	\$281,000.00
Task 09: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 7 through 9	3 Years ²	\$45,000.00	\$122,000.00
Task 10: Well Abandonments (Year 9)	1 Year ¹	\$30,000.00	\$28,000.00
Task 11: Long Term Monitoring - Years 10 through 15	6 Years ²	\$27,000.00	\$132,000.00
Task 12: Well Abandonments (Year 15)	1 Year ¹	\$7,000.00	\$6,000.00
Task 13: Long Term Monitoring - Years 16 through 20	5 Years ²	\$23,000.00	\$96,000.00
Task 14: Long Term Monitoring - Years 21 through 30	10 Years ²	\$23,000.00	\$170,000.00
Task 15: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	\$21,000.00	\$118,000.00
Total Present Value Cost			\$3,052,000.00

Assumptions:

Task 01: Includes labor to generate Remedial Design Work Plan including time to finalize design with injection contractor, UIC Permit preparation, and Health and Safety Plan update. Also, labor to deploy/retrieve ten passive flux meters into five locations to better define treatment zones and quantify chemical quantities as well as the installation, development, and survey of 11 shallow zone monitoring wells for the west portion of the main building.

Task 02: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant and ERD Chemicals, Injection Contractor, and Driller
- Installation of Permanent Injection Wells for Intermediate Zone (63 total)
- First Injection Event of Chemical Oxidant and ERD Chemicals into Shallow Zone and Intermediate Zone (235 injection locations) - Year 1
- 38 days to complete injection + 2 days for setup/break down. Field Crew = 3 people + 1 person for oversight.
- Survey of Injection Locations, Soil Cuttings Disposal for Permanent Injection Wells; Field Crew = 1

Task 03: Includes the following:

- Semi-annual groundwater sampling event - First event each year (Years 2-9)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled per event = 29. Sample 29 wells for VOCs, 6 wells for Total Dissolved Solids (TDS), and Chloride (Cl), and 14 wells for MNA parameters
- Number of events = 8; Field Crew = 2

Task 04: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Year 1)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 83. Sample 83 wells for VOCs, 6 wells for TDS and Cl, 22 wells for MNA, 3 wells for qPCR. 33 PDBs
- Number of Events = 1; Field Crew = 2
- Purge Water Disposal, Abandon 14 wells; Field Crew = 1

Task 05: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 2-6)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 69. Sample 69 wells for VOCs, 6 wells for TDS and Cl, 22 wells for MNA, 3 wells for qPCR. 22 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 06: Includes the following:

- Deed Restrictions

Task 07: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, ERD Chemicals, and Injection Contractor
- Second Injection Event of Chemical Oxidant and ERD Chemicals into Shallow Zone and Intermediate Zone (160 injection locations) - Year 4
- Oversight of Injection Event = 27 days; Field Crew = 1
- Survey of Injection Locations; Field Crew = 1

**TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Task 08: Includes the following:

Private Utility Locate, Procure Chemical Oxidant, ERD Chemicals, and Injection Contractor
Third Injection Event of Chemical Oxidant into Shallow Zone and Intermediate Zone (85 injection locations) - Year 7
Oversight of Injection Event = 15 days; Field Crew = 1
Survey of Injection Locations, Abandon 6 wells; Field Crew = 1

Task 09: Includes the following:

Semi-annual groundwater sampling event - Second event each year (Years 7-9)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 63. Sample 63 wells for VOCs, 6 wells for TDS and Cl, 22 wells for MNA, 3 wells for qPCR. 16 PDBs
Number of Events = 3; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 10: Includes the cost to abandon 28 monitoring wells and 63 injection wells plus cost of oversight labor at the end of Year 9; Field crew = 1

Task 11: Includes the following:

Annual groundwater sampling event (Years 10-15)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 35. Sample 35 wells for VOCs. 21 PDBs
Number of Events = 6; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 12: Includes the cost to abandon 13 wells and cost of oversight labor in Year 15; Field crew = 1

Task 13: Includes the following:

Annual groundwater sampling event (Years 16-20)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
Number of Events = 5; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 14: Includes the following:

Annual groundwater sampling event (Years 21-30)
Data validation, evaluation, figure and table development, and preparation of annual summary report
Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
Number of Events = 10; Field Crew = 2
Purge Water Disposal; Field Crew = 1

Task 15: Includes the following:

Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
Five-Year Remedy Review Report
Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$ Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.1% = 5.4%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$ Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.1% = 5.4%.

n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

**TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Cost Estimate for Alternative 4	Task	01			02			04		05			06			07			08		
Description	Year	Remedial Design Work Plan UIC Permit HASP Update Flux Meters Well Installation			First ISCO + ISERD/ISA Injection and Oversight Year 1 (235 Points)			Combined Semi-Annual Performance Sampling & Annual Sitewide MNA GW Sampling Performance Reporting (Year 1 - 83 Wells, 33 PDBs)		Combined Semi-Annual Performance Sampling & Annual Sitewide MNA GW Sampling Performance Reporting (Years 2-6 - 69 Wells, 22 PDBs)			Deed Restrictions Year 2			Second ISCO & ISERD/ISA Injection Event Year 4 (150 Points)			Third ISCO & ISERD/ISA Injection Event Year 7 (85 Points) Well Abandonment		
		Units	Hrs	Rate	Cost	Hrs	Rate	Cost	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate
Senior Project Manager	hr	1	192.00	192.00	1	192.00	192.00	192.00	192.00	1	192.00	192.00	2	192.00	384.00	1	192.00	192.00	1	192.00	192.00
Project Manager	hr	56	161.00	9,016.00	12	161.00	1,932.00	161.00	2,576.00	16	161.00	2,576.00	54	161.00	8,694.00	12	161.00	1,932.00	12	161.00	1,932.00
Senior Project Staff	hr		125.00	-	-	125.00	-	125.00	3,000.00	20	125.00	2,500.00		125.00	-	-	125.00	-	-	125.00	-
Senior Consultant	hr	44	166.00	7,304.00	18	166.00	2,988.00	166.00	1,328.00	8	166.00	1,328.00		166.00	-	8	166.00	1,328.00	8	166.00	1,328.00
Consultant II	hr	24	125.00	3,000.00	-	125.00	-	125.00	1,000.00	8	125.00	1,000.00	8	125.00	1,000.00	-	125.00	-	-	125.00	-
Consultant I	hr	44	109.00	4,796.00	-	109.00	-	109.00	4,796.00	40	109.00	4,360.00		109.00	-	-	109.00	-	-	109.00	-
Junior Consultant	hr		94.00	-	12	94.00	1,128.00	94.00	-	-	94.00	-		94.00	-	8	94.00	752.00	8	94.00	752.00
Senior Field Manager	hr	40	108.00	4,320.00	462	108.00	49,896.00	108.00	10,800.00	90	108.00	9,720.00		108.00	-	330	108.00	35,640.00	186	108.00	20,088.00
Technician	hr	16	78.00	1,248.00	16	78.00	1,248.00	78.00	9,828.00	96	78.00	7,488.00		78.00	-	8	78.00	624.00	16	78.00	1,248.00
Senior Assistant/Admin Clerk	hr	16	83.00	1,328.00	-	83.00	-	83.00	1,328.00	16	83.00	1,328.00	4	83.00	332.00	-	83.00	-	-	83.00	-
Total Labor		241		31,204.00	521		57,384.00		34,848.00	295		30,492.00	68		10,410.00	367		40,468.00	231		25,540.00
Travel/Transportation	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Lodging and Per Diem	day	-	150.00	-	-	150.00	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-
Per Diem	day	5	50.00	250.00	42	50.00	2,100.00	50.00	1,150.00	19	50.00	950.00	2	50.00	100.00	29	50.00	1,450.00	18	50.00	900.00
Local Mileage (0.67/mile)	mile	600	0.670	402.00	5,040	0.670	3,376.80	0.670	1,983.20	2,460	0.670	1,648.20	240	0.670	160.80	3,480	0.670	2,331.60	2,160	0.670	1,447.20
Total Travel/Transportation				652.00			5,476.80		3,133.20			2,598.20			260.80			3,781.60			2,347.20
ODCs/Subcontractor Costs	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Passive Flux Meters & Analysis (four u	LS	10	4,500.00	45,000.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Private Utility Locator	LS	-	-	-	1	800.00	800.00	-	-	-	-	-	-	-	-	1	800.00	800.00	1	800.00	800.00
Driller/Injection Contractor	LS	-	-	-	1	\$394,480	394,480.00	-	-	-	-	-	-	-	-	1	\$129,190	129,190.00	1	\$67,760	67,760.00
ISCO + ISERD/ISA Chemicals	LS	-	-	-	1	\$529,835	529,835.00	-	-	-	-	-	-	-	-	1	\$356,610	356,610.00	1	\$183,385	183,385.00
Survey (New MWs, Injection Wells)	day	1	1,400.00	1,400.00	2	1,400.00	2,800.00	-	-	-	-	-	-	-	-	1	1,400.00	1,400.00	1	1,400.00	1,400.00
Well Abandonment	each			-				4,025.00	4,025.00	-	-	-	-	-	-	-	-	-	1	\$1,545	1,545.00
PDBs	each			-				30.00	990.00	22	30.00	660.00	-	-	-	-	-	-	-	-	-
Analytical Laboratory	LS	-	-	-	1	300.00	300.00	12,015.00	12,015.00	1	10,975.00	10,975.00	-	-	-	-	-	-	-	-	-
Sampling Equipment	LS	-	-	-				2,000.00	2,000.00	1	1,500.00	1,500.00	-	-	-	-	-	-	-	-	-
55-gallon Drums	each	4	65.00	260.00				65.00	390.00	5	65.00	325.00	-	-	-	-	-	-	-	-	-
Purge Water T&D	each	1	425.00	425.00	-	-	-	425.00	3,400.00	7	425.00	2,975.00	-	-	-	-	-	-	-	-	-
Soil Cuttings T&D	LS	3	425.00	1,275.00	1	3,500.00	3,500.00						-	-	-	-	-	-	-	-	-
Document Supplies	each	3	50.00	150.00	-	-	-	50.00	50.00	1	50.00	50.00	4	50.00	200.00	-	-	-	-	-	-
Well Installation	each	1	22,500.00	22,500.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal ODCs/Subcontractor Costs				71,010.00			931,715.00		22,870.00			16,485.00			200.00			488,000.00			254,890.00
Mark-up (ODCs/Subcontractors +5%)				3,550.50			46,585.75		1,143.50			824.25			10.00			24,400.00			12,744.50
Total ODCs/Subcontractors				74,560.50			978,300.75		24,013.50			17,309.25			210.00			512,400.00			267,634.50
TOTAL				106,417.00			1,041,162.00		61,995.00			50,399.00			10,881.00			556,650.00			295,522.00

**TABLE 6-6
 COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
 ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
 SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Cost Estimate for Alternative 4	Task	09			10			12		13			14			15		
Description	Year	Combined Semi-Annual Performance Sampling & Annual Sitewide MNA GW Sampling Performance Reporting (Years 7-9 - 63 Wells, 16 PDBs)			Well Abandonment (Year 9)			Well Abandonment (Year 15)		LTM, Annual Report Year 16-20 (22 Wells, 16 PDBs)			LTM, Annual Report Year 21-30 (22 wells, 16 PDBs)			Five Year Remedy Review Years 5, 10, 15, 20, 25, 30		
		7-9			9			15		16-20			21-30			5, 10, 15, 20, 25, 30		
Labor Category	Units	Hrs	Rate	Cost	Hrs	Rate	Cost			Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost
Senior Project Manager	hr	1	192.00	192.00	1	192.00	192.00	192.00	192.00	1	192.00	192.00	1	192.00	192.00	2	192.00	384.00
Project Manager	hr	16	161.00	2,576.00	6	161.00	966.00	161.00	966.00	12	161.00	1,932.00	12	161.00	1,932.00	48	161.00	7,728.00
Senior Project Staff	hr	20	125.00	2,500.00	-	125.00	-	125.00	-	16	125.00	2,000.00	16	125.00	2,000.00	8	125.00	1,000.00
Senior Consultant	hr	8	166.00	1,328.00	2	166.00	332.00	166.00	332.00	8	166.00	1,328.00	8	166.00	1,328.00	16	166.00	2,656.00
Consultant II	hr	8	125.00	1,000.00	-	125.00	-	125.00	-	8	125.00	1,000.00	8	125.00	1,000.00	16	125.00	2,000.00
Consultant I	hr	40	109.00	4,360.00	-	109.00	-	109.00	-	40	109.00	4,360.00	40	109.00	4,360.00	48	109.00	5,232.00
Junior Consultant	hr	-	94.00	-	2	94.00	188.00	94.00	188.00	-	94.00	-	-	94.00	-	-	94.00	-
Senior Field Manager	hr	80	108.00	8,640.00	-	108.00	-	108.00	-	30	108.00	3,240.00	30	108.00	3,240.00	-	108.00	-
Technician	hr	86	78.00	6,708.00	60	78.00	4,680.00	78.00	1,560.00	36	78.00	2,808.00	36	78.00	2,808.00	-	78.00	-
Senior Assistant/Admin Clerk	hr	16	83.00	1,328.00	-	83.00	-	83.00	-	16	83.00	1,328.00	16	83.00	1,328.00	16	83.00	1,328.00
Total Labor		275		28,632.00	71		6,358.00		3,238.00	167		18,188.00	167		18,188.00	154		20,328.00
Travel/Transportation	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Lodging	day	-	150.00	-	-	150.00	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-
M & IE	day	17	50.00	850.00	5	50.00	250.00	50.00	100.00	7	50.00	350.00	7	50.00	350.00	2	50.00	100.00
Local Mileage (0.67/mile)	mile	2,200	0.670	1,474.00	600	0.670	402.00	0.670	160.80	900	0.670	603.00	900	0.670	603.00	200	0.670	134.00
Total Travel/Transportation				2,324.00			652.00		260.80			953.00			953.00			234.00
ODCs/Subcontractor Costs	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Private Utility Locator	LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Injection Contractor	LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ISCO + ISERD/ISA Chemicals	LS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Survey (Injection Wells)	day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Well Abandonment	each	-	-	-	1	20,980.00	20,980.00	\$2,535	2,535.00	-	-	-	-	-	-	-	-	-
PDBs	each	16	30.00	480.00	-	-	-	-	-	16	30.00	480.00	16	30.00	480.00	-	-	-
Analytical Laboratory	LS	1	10,520.00	10,520.00	-	-	-	-	-	1	1,625.00	1,625.00	1	1,625.00	1,625.00	-	-	-
Sampling Equipment	LS	1	1,500.00	1,500.00	-	-	-	-	-	1	1,000.00	1,000.00	1	1,000.00	1,000.00	-	-	-
55-Gallon Drums for Purge Water	each	4	65.00	260.00	-	-	-	-	-	2	65.00	130.00	2	65.00	130.00	-	-	-
Purge Water Management and Disposal	each	6	425.00	2,550.00	-	-	-	-	-	2	425.00	850.00	2	425.00	850.00	-	-	-
Document Supplies	each	1	50.00	50.00	-	-	-	-	-	1	50.00	50.00	1	50.00	50.00	1	50.00	50.00
Subtotal ODCs/Subcontractor Costs		-	-	15,360.00			20,980.00		2,535.00			4,135.00			4,135.00			50.00
Mark-up (ODCs/Subcontractors +5%)				768.00			1,049.00	-	126.75			206.75			206.75			2.50
Total ODCs/Subcontractors				16,128.00			22,029.00		2,661.75			4,341.75			4,341.75			52.50
TOTAL				47,084.00			29,039.00		6,161.00			23,483.00			23,483.00			20,615.00

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
FIRST EVENT - 235 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$7,650	\$7,650
Setup and Breakdown	2	\$2,400	\$4,800
Injection Service, 3-man Crew	38	\$3,370	\$128,060
Rentals	8	\$1,700	\$13,600
Per Diem - 3-man crew	40	\$750	\$30,000
Concrete Core Equipment	1	\$575	\$575
Concrete Patching	87	\$15	\$1,305
Replacement Tooling	1	\$3,740	\$3,740
1.5" PVC well materials (root) with 10 feet of 0.020-inch-slot - 63 Intermediate Inj. Wells	3,150	\$65	\$204,750
TOTAL ANALYTICAL COST			\$394,480

Task (Units)	No. of Units	Unit Cost	Extended Cost
ISCO Chemical			
PROTECT-OX2	10	\$831	\$8,310
Shipping to site	1	\$1,850	\$1,850
TOTAL CHEMICAL COST			\$10,160

Task (Units)	No. of Units	Unit Cost	Extended Cost
ERD Chemicals			
EHC+, Bio, Buffer - MW-5	17	\$2,283	\$38,811
EHC+, Bio, Buffer - MW-10	18	\$2,283	\$41,094
EHC+, Bio, Buffer - MW-8	35	\$2,283	\$79,905
EHC+, Bio, Buffer - MW-9	7	\$2,283	\$15,981
EHC+, Bio, Buffer - MW-5I	21	\$2,283	\$47,943
EHC+, Bio, Buffer - MW-7I	21	\$2,283	\$47,943
EHC+, Bio, Buffer - MW-9I	21	\$2,283	\$47,943
EHC+, Bio, Buffer - MW-6	4	\$2,283	\$9,132
EHC+, Bio, Buffer - Area 2B	81	\$2,283	\$184,923
Shipping to site	1	\$6,000	\$6,000

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
FIRST EVENT - 235 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

TOTAL CHEMICAL COST	\$519,675
----------------------------	------------------

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SECOND EVENT - 160 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$7,650	\$7,650
Setup and Breakdown	2	\$2,400	\$4,800
Injection Service, 3-man Crew	25	\$3,370	\$84,250
Rentals	5	\$1,700	\$8,500
Per Diem - 3-man crew	27	\$750	\$20,250
Replacement Tooling	1	\$3,740	\$3,740
TOTAL ANALYTICAL COST			\$129,190

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
PROVECT-OX2	10	\$831	\$8,310
Freight	1	\$1,850	\$1,850
TOTAL CHEMICAL COST			\$10,160

Task (Units)	No. of Units	Unit Cost	Extended Cost
ERD_ISCR_BIO_BUFFER Chemicals			
All Locations	150	\$2,283	\$342,450
Shipping to site	1	\$4,000	\$4,000
TOTAL CHEMICAL COST			\$346,450

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
THIRD EVENT - 85 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$4,500	\$4,500
Setup and Breakdown	2	\$2,400	\$4,800
Injection Service, 3-man Crew	13	\$3,370	\$43,810
Rentals	2	\$1,700	\$3,400
Per Diem - 3-man crew	15	\$750	\$11,250
TOTAL ANALYTICAL COST			\$67,760

Task (Units)			
	No. of Units	Unit Cost	Extended Cost
Field Activities			
PROTECT-OX2	10	\$831	\$8,310
Freight	1	\$1,850	\$1,850
TOTAL CHEMICAL COST			\$10,160

Task (Units)	No. of Units	Unit Cost	Extended Cost
ERD_ISCR_BIO_BUFFER Chemicals			
All Locations	75	\$2,283	\$171,225
Shipping to site	1	\$2,000	\$2,000
TOTAL CHEMICAL COST			\$173,225

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
SEMI-ANNUAL PERFORMANCE MONITORING (FIRST EVENT OF EACH YEAR)
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters			
	VOCs (Field & QC) SW-846 8260D	TDS + Cl SM 2540C 300.0	NAPs Varies	qPCR Microbial Insights
Liquid Rates:	\$65	\$26	\$197	\$450
Groundwater Sampling/Analysis				
Number of GW Samples	29	6	14	0
Number of Events	1	1	1	1
Total Environmental Samples	29	6	14	0
Field Duplicates	3	0	0	0
MS/MSD	1	0	0	0
Total Samples	33	6	14	0
Extended Cost (Groundwater)	\$2,145	\$156	\$2,758	\$0
TOTAL ANALYTICAL COST			\$5,059	

For first semi-annual event each year following completion of injection
 First Year = Sampling at 3 months post-injection

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

qPCR for DHC, DHB, VC reductases

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
PERFORMANCE AND MNA MONITORING (SECOND EVENT - YEAR 1)
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters			
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies	qPCR Microbial Insights
Liquid Rates:	\$65	\$26	\$197	\$450
Groundwater Sampling/Analysis				
Number of GW Samples	83	6	22	3
Number of Events	1	1	1	1
Total Environmental Samples	83	6	22	3
Field Duplicates	8	0	0	0
MS/MSD	4	0	0	0
Total Samples	95	6	22	3
Extended Cost (Groundwater)	\$6,175	\$156	\$4,334	\$1,350
TOTAL ANALYTICAL COST			\$12,015	

For first semi-annual event each year following completion of injection
 First Year = Sampling at 3 months post-injection

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.
 qPCR for DHC, DHB, VC reductases

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
PERFORMANCE AND MNA MONITORING (SECOND EVENT EACH YEAR - YEARS 2 - 6)
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters			
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies	qPCR Microbial Insights
Liquid Rates:	\$65	\$26	\$197	\$450
Groundwater Sampling/Analysis				
Number of GW Samples	69	6	22	3
Number of Events	1	1	1	1
Total Environmental Samples	69	6	22	3
Field Duplicates	7	0	0	0
MS/MSD	3	0	0	0
Total Samples	79	6	22	3
Extended Cost (Groundwater)	\$5,135	\$156	\$4,334	\$1,350
TOTAL ANALYTICAL COST			\$10,975	

For first semi-annual event each year following completion of injection
 First Year = Sampling at 3 months post-injection

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.
 qPCR for DHC, DHB, VC reductases

**TABLE 6-6
 COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
 PERFORMANCE AND MNA MONITORING (YEARS 7-9)
 ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
 SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

DESCRIPTION	Groundwater Parameters			
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies	qPCR Microbial Insights
Liquid Rates:	\$65	\$26	\$197	\$450
Groundwater Sampling/Analysis				
Number of GW Samples	63	6	22	3
Number of Events	1	1	1	1
Total Environmental Samples	63	6	22	3
Field Duplicates	6	0	0	0
MS/MSD	3	0	0	0
Total Samples	72	6	22	3
Extended Cost (Groundwater)	\$4,680	\$156	\$4,334	\$1,350
TOTAL ANALYTICAL COST			\$10,520	

For first semi-annual event each year following completion of injection
 First Year = Sampling at 3 months post-injection

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.
 qPCR for DHC, DHB, VC reductases

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
LONG-TERM MONITORING (YEARS 10-15)
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	35	0	0
Number of Events	1	0	0
Total Environmental Samples	35	0	0
Field Duplicates	4	0	0
MS/MSD	2	0	0
Total Samples	41	0	0
Extended Cost (Groundwater)	\$2,665	\$0	\$0
TOTAL ANALYTICAL COST:		\$2,665	

No MNA sampling after completion of performance monitoring.

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
LONG-TERM MONITORING (YEARS 16-20)
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	22	0	0
Number of Events	1	0	0
Total Environmental Samples	22	0	0
Field Duplicates	2	0	0
MS/MSD	1	0	0
Total Samples	25	0	0
Extended Cost (Groundwater)	\$1,625	\$0	\$0
TOTAL ANALYTICAL COST:		\$1,625	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
LONG-TERM MONITORING (YEARS 21-30)
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	TDS + CL SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$26	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	22	0	0
Number of Events	1	0	0
Total Environmental Samples	22	0	0
Field Duplicates	2	0	0
MS/MSD	1	0	0
Total Samples	25	0	0
Extended Cost (Groundwater)	\$1,625	\$0	\$0
TOTAL ANALYTICAL COST:		\$1,625	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
THIRD EVENT - 85 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Well Abandonment Estimate

	Rate	Yr 1 Abandonments (feet)	Yr 6 Abandonments (feet)	Yr 9 Abandonments (feet)	Yr 15 Abandonments (feet)
Mobilization/ Demobilization	\$750				
Abandon (MW)	\$5	655	159	621	357
Abandon (New MW)*				275	
Abandon (MWs)				3150	
Well Abandon Cost		3,275	795	20,230	1,785
Total Cost		4,025	1,545	20,980	2,535

TABLE 6-6
COST ESTIMATE SUMMARY FOR ALTERNATIVE 4
ISCO, ISERD, ISA, MNA, ICs, and CONTAINMENT VIA COVER
THIRD EVENT - 85 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Well Installation

Rate

11 - 1"-diameter PVC wells with 10 feet of screen to 25 ft bgs

Scott Ross estimate = 22,500 Email dated 11/16/23

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Total First Year Capital Cost	Unit	Unit Cost	Cost
Task 01: Remedial Design Work Plan, UIC Permit, Health and Safety Plan Update, Flux Meters	1	\$105,637.00	\$105,637.00
Task 02: First ISCO + ISCR/ISA Injection Event and Oversight - 235 Injection Locations	1	\$1,041,252.00	\$1,041,252.00
Task 03: Semi-Annual Performance Monitoring - 1st Event of Each Year	1	\$18,256.00	\$18,256.00
Task 04: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Year 1	1	58,739.00	\$58,739.00
Total First Year Estimated Cost			\$1,223,884.00
Present Value Cost	Unit	Unit Cost	Cost
Includes:			
Present Value Discount Rate	5.3%		
Total First Year Cost	1	\$1,223,884.00	\$1,224,000.00
Task 03: Semi-Annual Performance Monitoring - Years 2 through 10	9 Years ²	\$18,000.00	\$122,000.00
Task 05: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 2 through 5	4 Years ²	\$46,000.00	\$160,000.00
Task 06: Deed Restrictions (Year 2)	1 Year ¹	\$11,000.00	\$11,000.00
Task 07: Second ISCO + ISCR/ISA Injection Event (85 locations) - Year 6	1 Year ¹	\$374,000.00	\$355,000.00
Task 08: Semi-Annual Performance Monitoring - 2nd Event + Annual MNA Monitoring Event, Annual Report - Years 6 through 10	5 Years ²	\$42,000.00	\$179,000.00
Task 09: Well Abandonment - Year 10	1 Year ¹	\$10,000.00	\$9,000.00
Task 10: Long Term Monitoring, Annual Report - Years 11 through 15	5 Years ²	\$27,000.00	\$113,000.00
Task 11: Well Abandonment - Year 15	1 Year ¹	\$7,000.00	\$6,000.00
Task 12: Long Term Monitoring, Annual Report - Years 16 through 20	5 Years ²	\$23,000.00	\$96,000.00
Task 13: Long Term Monitoring, Annual Report - Years 21 through 30	10 Years ²	17,000.00	\$125,000.00
Task 14: Five-Year Remedy Review (Years 5, 10, 15, 20, 25, 30)	1 Year ^{1,3}	\$21,000.00	\$118,000.00
Total Present Value Cost			\$2,393,000.00

Assumptions:

Task 01: Includes labor to generate Remedial Design Work Plan including time to finalize design with injection contractor, UIC Permit preparation, and Health and Safety Plan update. Also, labor to deploy/retrieve ten passive flux meters into five locations to better define treatment zones and quantify chemical quantities as well as the installation, development, and survey of 11 shallow zone monitoring wells for the west portion of the main building.

Task 02: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, CAC, ZVI, Injection Contractor, and Driller
- First Injection Event of Chemical Oxidant and CAC/ZVI into Shallow Zone and Intermediate Zone (235 injection locations)
- 38 days to complete injection + 2 days for setup/break down. Field Crew = 3 people + 1 person for oversight
- Survey of Injection Locations

Task 03: Includes the following:

- Semi-annual groundwater sampling event - First event each year (Years 2-10)
- Data validation, evaluation, figure and table development, and preparation of one brief letter report
- Number of wells sampled per event = 29. Sample 29 wells for VOCs, 13 wells for Total Iron and Dissolved Iron, and 7 wells for TDS and Cl.
- Number of Events = 9, Field Crew = 2

Task 04: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Year 1)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- MNA.
- 33 PDBs
- Number of Events = 1; Field Crew = 2
- Soil Cuttings and Purge Water Disposal, Abandon 14 wells; Field Crew = 1

Task 05: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 2-5)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- MNA.
- 22 PDBs
- Number of Events = 4; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 06: Includes the following:

- Deed Restrictions

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task 07: Includes the following:

- Private Utility Locate, Procure Chemical Oxidant, PAC, ZVI, and Injection Contractor
- Second Injection Event of Chemical Oxidant and PAC/ZVI (85 injection locations)
- Field Crew = 1; 13 days to complete injection + 2 days for setup/break down
- Survey of Injection Locations
- Abandon 6 wells; Field Crew = 1

Task 08: Includes the following:

- Semi-annual groundwater sampling event - Second event each year (Years 6-10)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 63. Sample 63 wells for VOCs, 7 wells for TDS and Cl, 10 wells for Total Iron and Dissolved Iron, 11 wells for MNA. 16 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 09: Includes the cost to abandon 28 wells and cost of oversight labor in Year 10; Field crew = 1

Task 10: Includes the following:

- Annual groundwater sampling event (Years 11-15)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 35. Sample 35 wells for VOCs. 21 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 11: Includes the cost to abandon 12 wells and cost of oversight labor in Year 15; Field crew = 1

Task 12: Includes the following:

- Annual groundwater sampling event (Years 16-20)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
- Number of Events = 5; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 13: Includes the following:

- Annual groundwater sampling event (Years 21-30)
- Data validation, evaluation, figure and table development, and preparation of annual summary report
- Number of wells sampled = 22. Sample 22 wells for VOCs. 16 PDBs
- Number of Events = 10; Field Crew = 2
- Purge Water Disposal; Field Crew = 1

Task 14: Includes the following:

- Five-Year Remedy Review Site visit . Assume 8 hours with travel. Field Crew = 1
- Five-Year Remedy Review Report
- Meeting with SCDHEC to Discuss Five-Year Remedy Review. Assume 8 hours with travel. 2 people

¹PWF = Present Worth Factor for a periodic cost calculated as a single series amount $1/(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

²PWF = Present Worth Factor for a recurring cost calculated as a uniform series amount $[(1+i)^n - 1]/i(1+i)^n$. Where:

i = interest/discount rate, defined as the "real discount rate", an interest rate that has been adjusted to account for the effect of expected or actual inflation (escalation). Therefore, the nominal discount/interest rate of 8.5% - inflation rate of 3.2% = 5.3%.

n = number of years

³ Cost shown is for 6 events (Year 5, 10, 15, 20, 25, 30).

Present worth value costs were only calculated for cost that would be incurred for more than one year.

**TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA**

Cost Estimate for Alternative 5	Task	01			02			03			04			05			06			07			08		
Description	Year	1			1			1 - 5			1			2 - 5			2			6			6-10		
		Units	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate
Senior Project Manager	hr	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	2	192.00	384.00	1	192.00	192.00	1	192.00	192.00
Project Manager	hr	56	161.00	9,016.00	12	161.00	1,932.00	10	161.00	1,610.00	16	161.00	2,576.00	16	161.00	2,576.00	54	161.00	8,694.00	12	161.00	1,932.00	16	161.00	2,576.00
Senior Project Staff	hr		125.00	-	-	125.00	-	12	125.00	1,500.00	24	125.00	3,000.00	20	125.00	2,500.00		125.00	-	-	125.00	-	20	125.00	2,500.00
Senior Consultant	hr	44	166.00	7,304.00	18	166.00	2,988.00	2	166.00	332.00	8	166.00	1,328.00	8	166.00	1,328.00		166.00	-	8	166.00	1,328.00	8	166.00	1,328.00
Consultant II	hr	24	125.00	3,000.00	-	125.00	-	8	125.00	1,000.00	8	125.00	1,000.00	8	125.00	1,000.00	8	125.00	1,000.00	-	125.00	-	8	125.00	1,000.00
Consultant I	hr	44	109.00	4,796.00	-	109.00	-	3	109.00	327.00	44	109.00	4,796.00	40	109.00	4,360.00		109.00	-	-	109.00	-	40	109.00	4,360.00
Junior Consultant	hr		94.00	-	12	94.00	1,128.00	-	94.00	-	-	94.00	-	-	94.00	-		94.00	-	8	94.00	752.00	-	94.00	-
Senior Field Manager	hr	40	108.00	4,320.00	486	108.00	52,488.00	42	108.00	4,536.00	100	108.00	10,800.00	90	108.00	9,720.00		108.00	-	186	108.00	20,088.00	80	108.00	8,640.00
Technician	hr	6	78.00	468.00	24	78.00	1,872.00	42	78.00	3,276.00	126	78.00	9,828.00	96	78.00	7,488.00		78.00	-	20	78.00	1,560.00	86	78.00	6,708.00
Senior Assistant/Admin Clerk	hr	16	83.00	1,328.00	-	83.00	-	6	83.00	498.00	16	83.00	1,328.00	16	83.00	1,328.00	4	83.00	332.00	-	83.00	-	16	83.00	1,328.00
Total Labor		231		30,424.00	553		60,600.00	126		13,271.00	343		34,848.00	295		30,492.00	68		10,410.00	235		25,852.00	275		28,632.00
Travel/Transportation	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Lodging	day	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-
M & I E	day	5	50.00	250.00	44	50.00	2,200.00	6	50.00	300.00	23	50.00	1,150.00	19	50.00	950.00	2	50.00	100.00	18	50.00	900.00	17	50.00	850.00
Local Mileage (0.67/mile)	mile	600	0.670	402.00	5,280	0.670	3,537.60	780	0.670	522.60	2,960	0.670	1,983.20	2,460	0.670	1,648.20	240	0.670	160.80	2,160	0.670	1,447.20	2,200	0.670	1,474.00
Total Travel/Transportation				652.00			5,737.60			822.60			3,133.20			2,598.20			260.80			2,347.20			2,324.00
ODCs/Subcontractor Costs	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost
Passive Flux Meters & Analysis (four u	LS	10	4,500.00	45,000.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Private Utility Locator	LS	-	-	-	1	800.00	800.00	-	-	-	-	-	-	-	-	-	-	-	-	1	800.00	800.00	-	-	-
Driller	LS	-	-	-	1	189,730.00	189,730.00	-	-	-	-	-	-	-	-	-	-	-	-	1	\$73,200	73,200.00	-	-	-
Injection Contractor and Chemicals					1	735,160.00	735,160.00	-	-	-	-	-	-	-	-	-	-	-	-	1	\$251,885	251,885.00	-	-	-
Survey (New MWs, Injection Wells)	day	1	1,400.00	1,400.00	2	1,400.00	2,800.00	-	-	-	-	-	-	-	-	-	-	-	-	1	1,400.00	1,400.00	-	-	-
Well Abandonment	each			-			-			-	1	4,025.00	4,025.00			-			-	1	1,570.00	1,570.00			-
PDBs	each			-			-				33	30.00	990.00	22	30.00	660.00			-				16	30.00	480.00
Analytical Laboratory	LS	-	-	-	-	-	-	1	2,834.00	2,834.00	1	8,914.00	8,914.00	1	7,874.00	7,874.00	-	-	-	-	-	-	1	7,419.00	7,419.00
Sampling Equipment	LS	-	-	-	-	-	-	1	1,000.00	1,000.00	1	2,000.00	2,000.00	1	1,500.00	1,500.00			-			-	1	1,500.00	1,500.00
55-gallon Drums	each	4	65.00	260.00				2	65.00	130.00	6	65.00	390.00	5	65.00	325.00			-			-	4	65.00	260.00
Soil or Purge Water T&D	each	4	425.00	1,700.00	-	-	-	-	-	-	8	425.00	3,400.00	8	425.00	3,400.00	-	-	-	-	-	-	6	425.00	2,550.00
Document Supplies	each	3	50.00	150.00	-	-	-	-	-	-	1	50.00	50.00	1	50.00	50.00	4	50.00	200.00	-	-	-	1	50.00	50.00
Well Installation	LS	1	22,500.00	22,500.00																					
Subtotal ODCs/Subcontractor Costs				71,010.00			928,490.00			3,964.00			19,769.00			13,809.00			200.00			328,855.00			12,259.00
Mark-up (ODCs/Subcontractors +5%)				3,550.50			46,424.50			198.20			988.45			690.45			10.00			16,442.75			612.95
Total ODCs/Subcontractors				74,560.50			974,914.50			4,162.20			20,757.45			14,499.45			210.00			345,297.75			12,871.95
TOTAL				105,637.00			1,041,252.00			18,256.00			58,739.00			47,590.00			10,881.00			373,497.00			43,828.00

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Cost Estimate for Alternative 5	Task	09			10			11			12			13			14			
Description	Year	Well Abandonment (Year 10)			LTM, Annual Report Year 11 - 15 (34 Wells, 21 PDBs)			Well Abandonment (Year 15)			LTM, Annual Report Year 16 -20 (22 Wells, 16 PDBs)			LTM, Annual Report Year 21 -30 (22 Wells, 16 PDBs)			Five Year Remedy Review Years 5, 10, 15, 20, 25, 30			
		10			11-15			15			16-20			21-30			5, 10, 15, 20, 25, 30			
Labor Category	Units	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	Hrs	Rate	Cost	
Senior Project Manager	hr	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	1	192.00	192.00	2	192.00	384.00	
Project Manager	hr	6	161.00	966.00	16	161.00	2,576.00	6	161.00	966.00	12	161.00	1,932.00	12	161.00	1,932.00	48	161.00	7,728.00	
Senior Project Staff	hr	-	125.00	-	16	125.00	2,000.00	-	125.00	-	16	125.00	2,000.00	16	125.00	2,000.00	8	125.00	1,000.00	
Senior Consultant	hr	2	166.00	332.00	8	166.00	1,328.00	2	166.00	332.00	8	166.00	1,328.00	8	166.00	1,328.00	16	166.00	2,656.00	
Consultant II	hr	-	125.00	-	8	125.00	1,000.00	-	125.00	-	8	125.00	1,000.00	8	125.00	1,000.00	16	125.00	2,000.00	
Consultant I	hr	-	109.00	-	40	109.00	4,360.00	-	109.00	-	40	109.00	4,360.00	40	109.00	4,360.00	48	109.00	5,232.00	
Junior Consultant	hr	2	94.00	188.00	-	94.00	-	2	94.00	188.00	-	94.00	-	-	94.00	-	-	94.00	-	
Senior Field Manager	hr	-	108.00	-	40	108.00	4,320.00	-	108.00	-	30	108.00	3,240.00	30	108.00	3,240.00	-	108.00	-	
Technician	hr	24	78.00	1,872.00	46	78.00	3,588.00	20	78.00	1,560.00	36	78.00	2,808.00	36	78.00	2,808.00	-	78.00	-	
Senior Assistant/Admin Clerk	hr	-	83.00	-	16	83.00	1,328.00	-	83.00	-	16	83.00	1,328.00	16	83.00	1,328.00	16	83.00	1,328.00	
Total Labor		35		3,550.00	191		20,692.00	31		3,238.00	167		18,188.00	167		18,188.00	154		20,328.00	
Travel/Transportation	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	
Lodging	day	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	150.00	-	-	-	-	-
M & IE	day	2	50.00	100.00	9	50.00	450.00	2	50.00	100.00	7	50.00	350.00	7	50.00	350.00	2	50.00	100.00	
Local Mileage (0.67/mile)	mile	240	0.670	160.80	1,160	0.670	777.20	240	0.670	160.80	900	0.670	603.00	900	0.670	603.00	200	0.670	134.00	
Total Travel/Transportation				260.80			1,227.20			260.80			953.00			953.00			234.00	
ODCs/Subcontractor Costs	Unit	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	Qty	Rate	Cost	
Well Abandonment	each	1	5,230.00	5,230.00	-	-	-	1	2,535.00	2,535.00	-	-	-	-	-	-	-	-	-	
PDBs	each	-	-	-	21	30.00	630.00	-	-	-	16	30.00	480.00	16	30.00	480.00	-	-	-	
Analytical Laboratory	LS	-	-	-	1	2,665.00	2,665.00	-	-	-	1	1,625.00	1,625.00	1	1,625.00	1,625.00	-	-	-	
Sampling Equipment	LS	-	-	-	1	1,000.00	1,000.00	-	-	-	1	1,000.00	1,000.00	1	1,000.00	1,000.00	-	-	-	
55-Gallon Drums for Purge Water	each	-	-	-	2	65.00	130.00	-	-	-	2	65.00	130.00	2	65.00	130.00	-	-	-	
Purge Water Management and Disposal	each	-	-	-	2	425.00	850.00	-	-	-	2	425.00	850.00	2	425.00	850.00	-	-	-	
Document Supplies	each	-	-	-	1	50.00	50.00	-	-	-	1	50.00	50.00	1	50.00	50.00	1	50.00	50.00	
Subtotal ODCs/Subcontractor Costs				5,230.00			5,325.00			2,535.00			4,135.00			4,135.00			50.00	
Mark-up (ODCs/Subcontractors +5%)				261.50			266.25			126.75			206.75			206.75			2.50	
Total ODCs/Subcontractors				5,491.50			5,591.25			2,661.75			4,341.75			4,341.75			52.50	
TOTAL				9,302.00			27,510.00			6,161.00			23,483.00			23,483.00			20,615.00	

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ADSORPTION, MNA, and LUCs
FIRST EVENT - 235 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$7,650	\$7,650
Setup and Breakdown	2	\$2,400	\$4,800
3-man Crew	38	\$3,370	\$128,060
Rentals	8	\$1,700	\$13,600
Per Diem - 3-man crew	40	\$750	\$30,000
Concrete Core Equipment	1	\$575	\$575
Concrete Patching	87	\$15	\$1,305
Replacement Tooling (ISCO Points)	1	\$3,740	\$3,740
1.5"-PVC Well Materials (foot) with 10 feet of 0.020-inch-slot - 63 Intermediate Inj. Wells	0	\$65	\$0
TOTAL INJECTION COST			\$189,730

*Can inject PlumeStop and sMZVI through permanent wells; however, no permanent wells installed for flexibility

Task (Units)	No. of Units	Unit Cost	Extended Cost
ISCO Chemical			
PROTECT-OX2	10	\$831	\$8,310
Shipping to site	1	\$1,850	\$1,850
TOTAL CHEMICAL COST*			\$10,160
Task (Units)	No. of Units	Unit Cost	Extended Cost
PlumeStop, ZVI, 2-Man Inj Crew, Trailer	1	\$725,000	\$725,000
TOTAL CHEMICAL COST			\$725,000

** 225 points for PlumeStop and sMicroZVI

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SECOND EVENT - 85 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Task (Units)	No. of Units	Unit Cost	Extended Cost
Field Activities			
Mobilization/Demobilization	1	\$4,500	\$4,500
Setup and Breakdown	2	\$2,400	\$4,800
Injection Service, 3-man Crew	13	\$3,370	\$43,810
Rentals	3	\$1,700	\$5,100
Per Diem - 3-man crew	15	\$750	\$11,250
Concrete Core Equipment		\$575	\$0
Concrete Patching		\$15	\$0
Replacement Tooling	1	\$3,740	\$3,740
TOTAL INJECTION COST			\$73,200

Task (Units)	No. of Units	Unit Cost	Extended Cost
ISCO Chemical			
PROTECT-OX2	10	\$831	\$8,310
Shipping to site	1	\$1,850	\$1,850
TOTAL CHEMICAL COST*			\$10,160

Task (Units)	No. of Units	Unit Cost	Extended Cost
PAC/ZVI Chemicals and Inj Crew			
PlumeStop, ZVI, 2-Man Inj Crew, Trailer	75	\$3,223	\$241,725
TOTAL CHEMICAL COST*			8 \$241,725

DPT Injection only

Regenesis does provided drilling capability

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
SEMI-ANNUAL PERFORMANCE MONITORING (FIRST EVENT OF EACH YEAR)
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	Total Fe and Dissolved Fe SW-846 6010B	TDS + Cl SM 2540C 300.0
Liquid Rates:	\$65	\$39	\$26
Groundwater Sampling/Analysis			
Number of GW Samples	29	13	7
Number of Events	1	1	1
Total Environmental Samples	29	13	7
Field Duplicates	3	0	0
MS/MSD	1	0	0
Total Samples	33	13	7
Extended Cost (Groundwater)	\$2,145	\$507	\$182
TOTAL ANALYTICAL COST		\$2,834	

For first semi-annual event each year following completion of injection
 First Year = Sampling at 3 months post-injection

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
PERFORMANCE AND MNA MONITORING (YEAR 1)
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters			
	VOCs (Field & QC) SW-846 8260D	Total Fe and Dissolved Fe SW-846 6010B	TDS + Cl SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$39	\$26	\$197
Groundwater Sampling/Analysis				
Number of GW Samples	83	10	7	11
Number of Events	1	1	1	1
Total Environmental Samples	83	10	7	11
Field Duplicates	8	0	0	0
MS/MSD	4	0	0	0
Total Samples	95	10	7	11
Extended Cost (Groundwater)	\$6,175	\$390	\$182	\$2,167
TOTAL ANALYTICAL COST:		\$8,914		

First Year = Sampling at 9 months post-injection

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
PERFORMANCE AND MNA MONITORING (YEARS 2-5)
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters			
	VOCs (Field & QC) SW-846 8260D	Total Fe and Dissolved Fe SW-846 6010B	TDS + Cl SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$39	\$26	\$197
Groundwater Sampling/Analysis				
Number of GW Samples	69	10	7	11
Number of Events	1	1	1	1
Total Environmental Samples	69	10	7	11
Field Duplicates	7	0	0	0
MS/MSD	3	0	0	0
Total Samples	79	10	7	11
Extended Cost (Groundwater)	\$5,135	\$390	\$182	\$2,167
TOTAL ANALYTICAL COST:		\$7,874		

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
PERFORMANCE AND MNA MONITORING (YEARS 6-10)
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters			
	VOCs (Field & QC) SW-846 8260D	Total Fe and Dissolved Fe SW-846 6010B	TDS + Cl SM 2540C 300.0	NAPs Varies
Liquid Rates:	\$65	\$39	\$26	\$197
Groundwater Sampling/Analysis				
Number of GW Samples	63	10	7	11
Number of Events	1	1	1	1
Total Environmental Samples	63	10	7	11
Field Duplicates	6	0	0	0
MS/MSD	3	0	0	0
Total Samples	72	10	7	11
Extended Cost (Groundwater)	\$4,680	\$390	\$182	\$2,167
TOTAL ANALYTICAL COST:		\$7,419		

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
PERFORMANCE AND MNA MONITORING (YEARS 10-15)
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	Total Fe and Dissolved Fe	NAPs Varies
Liquid Rates:	\$65	\$39	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	35	0	0
Number of Events	1	0	0
Total Environmental Samples	35	0	0
Field Duplicates	4	0	0
MS/MSD	2	0	0
Total Samples	41	0	0
Extended Cost (Groundwater)	\$2,665	\$0	\$0
TOTAL ANALYTICAL COST:		\$2,665	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
PERFORMANCE AND MNA MONITORING (YEARS 16-20 and YEARS 21-30)
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

DESCRIPTION	Groundwater Parameters		
	VOCs (Field & QC) SW-846 8260D	Total Fe and Dissolved Fe	NAPs Varies
Liquid Rates:	\$65	\$39	\$197
Groundwater Sampling/Analysis			
Number of GW Samples	22	0	0
Number of Events	1	0	0
Total Environmental Samples	22	0	0
Field Duplicates	2	0	0
MS/MSD	1	0	0
Total Samples	25	0	0
Extended Cost (Groundwater)	\$1,625	\$0	\$0
TOTAL ANALYTICAL COST:		\$1,625	

NAPs include TOC, Alkalinity, Nitrate/Nitrite, Total Fe, Dissolved Fe, Sulfate, and MEE.

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SECOND EVENT - 85 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Well Installation

Rate

11 - 1"-diameter PVC wells with 10 feet of screen to 25 ft bgs

Scott Ross estimate = 22,500 Email dated 11/16/23

TABLE 6-7
COST ESTIMATE SUMMARY FOR ALTERNATIVE 5
ISCO, ISCR, ISA, MNA, ICs, and CONTAINMENT VIA COVER
SECOND EVENT - 85 POINTS
SHAKESPEARE COMPOSITE STRUCTURES: NEWBERRY, SOUTH CAROLINA

Well Abandonment Estimate

		Yr 1	Yr 6	Yr 10	Yr 15	Yr 20
	Rate	Abandonments (feet)	Abandonments (feet)	Abandonments (feet)	Abandonments (feet)	
Mobilization/ Demobilization	\$750					
Abandon (Existing)	\$5	655	164	621	357	
Abandon (New)*				275		
Well Abandon Cost		3,275	820	4,480	1,785	
Total Cost		4,025	1,570	5,230	2,535	

* Eleven (11) new wells installed to monitor plume for west end of Main Building (each well is 25 feet deep)

Attachment C

Technical Data Sheets for Potential Chemical Injectants

Provect-OX2™

Self-Activating, Extended Release ISCO + Enhanced Bioremediation Reagent

TECHNOLOGY DESCRIPTION

Provect-OX2™ is an *in situ* chemical oxidation (ISCO) + enhanced bioremediation reagent that integrates an extended release source of potassium persulfate into the modern Provect-OX® formula. Ferric iron (Fe III) activation is used as a safe and effective means of activating the potassium and sodium persulfates (US Patent No. 9,126,245; patents pending). Similar to our original Provect-OX® technology, Provect-OX2™ oxidizes a wide variety of organic compounds present in impacted soil, sediment and groundwater, including chlorinated solvents, petroleum hydrocarbons, and pesticides. However, Provect-OX2™ ensures extended release of oxidant throughout the treatment media. The ferric oxide iron, along with the residual sulfate, will provide enhanced bioremediation components following the chemical oxidation processes. Provect-OX2™ will also include Terr-OR™ ferrate stabilizer and pH buffer to offset the sulfuric acid produced during breakdown of the persulfates.

Provect-OX® and Provect-OX2™ are the only ISCO technologies designed to actively manage rebound. The advanced activation catalyst is further unique considering its ability to enhance bioremediation processes. This is accomplished via the subsequent utilization of sulfate and iron as terminal electron acceptors for facultative reductive processes. Degradation intermediates generated during pollutant oxidation may act as electron shuttles, allowing the reduction of Fe(III) to Fe(II) in the redox cycling of iron and continued activation of persulfate. This combined remedy provides supplemental treatment mechanisms thereby allowing for more cost-efficient dosing of the product.

Like all Provectus products, Provect-OX2™ was developed by experienced practitioners who understand real-world field applications. For example, the oxidants (potassium and sodium persulfate) and its activator (ferric oxide) are conveniently packaged in a single, pre-mixed bag for ease of use and safe handling. Moreover, due to its safe and non-extreme activation chemistry, Provect-OX2™ will not generate excessive heat / off-gases, nor will it mobilize heavy metals or lead to the generation of secondary impact issues, such as elevated arsenic, chromium, or pH.

TRADITIONAL ACTIVATION CHEMISTRIES

Heretofore, sodium persulfate has been activated via heat, chelated metals, hydrogen peroxide, ZVI/surface catalysis, and/or pH extremes in order to generate sulfate radicals, hydroxyl radicals, etc. (Tsitonaki *et al.*, 2010). Not only do these systems require the addition of other products or energy, they tend to disregard the many biologically mediated processes possible as a consequence of the decomposition products of persulfate.

Divalent metal activation: The utilization of ferrous iron, usually as a chelated cation consumes the oxidant (persulfate) in a conversion of the ferrous iron to ferric iron. Additionally, the presence of the chelator



inhibits biological utilization of the generated ferric species as a biological terminal electron acceptor and consumes oxidant. Over dosing of the chelated ferrous iron further consumes the oxidant.

Caustic Activation: The utilization of caustic (high pH) activation of persulfate presents inherent health and safety issues while creating an unsuitably high pH environment for biological attenuation. Further, within this activation mechanism is a self-limiting biological attenuation process once the pH returns to suitable levels. The sulfate, when used as a biological terminal electron acceptor, transitions to sulfite and finally sulfide. This final product forms hydrogen sulfide which inhibits further biological activity.

Heat Activation: The utilization of heat as an activation mechanism is generally difficult to implement, and it incurs high implementation costs while not addressing the hydrogen sulfide issue.

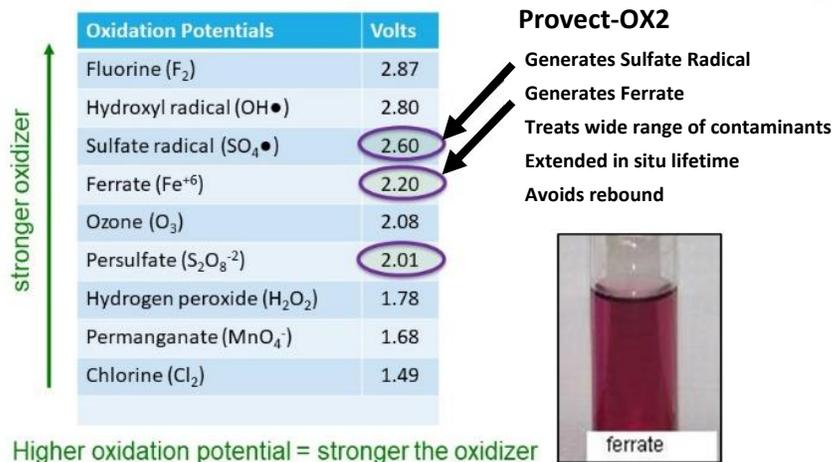
Hydrogen Peroxide Activation: The use of peroxide as an activating mechanism again does not address the hydrogen sulfide generation problem while having limited efficacy on many targeted compounds.

MODE OF ACTION

ISCO: Under the Provectus approach, potassium and sodium persulfate are activated by Fe III (pre-mixed formulation) which requires a lower activation energy than alternative mechanisms while not consuming the persulfate oxidant. The mechanism is believed to elevate the oxidation state of the iron transiently to a supercharged iron ion which in itself may act as an oxidant. As this supercharged iron cation is consumed, the resulting ferric species can act as a terminal electron acceptor for biological attenuation. Coincidentally, the generated sulfate ion from the decomposition of the persulfate provides a terminal electron acceptor for sulfate reducers which may further remediate the targeted compounds in the groundwater and soils. The reactions that occur in the chemical oxidation include persulfate radicals and ferrate, as summarized below (Equation 1):



Provect-OX2 Oxidation Potentials



SECONDARY ATTENUATION PROCESS (Biologically Mediated):

1) Sulfate Residual

After dissolved oxygen has been depleted in the treatment area, sulfate (a by-product of the persulfate oxidation) may be used as an electron acceptor for anaerobic biodegradation by indigenous microbes. This process is termed sulfidogenesis and results in the production of sulfide. Stoichiometrically, each 1.0 mg/L of sulfate consumed by microbes results in the destruction of approximately 0.21 mg/L of BTEX compounds. Sulfate can play an important role in bioremediation of petroleum products, acting as an electron acceptor in co-metabolic processes as well. For example, the basic reactions for the mineralization of benzene and toluene under sulfate reducing conditions are presented in equations 2 and 3:



2) Ferric Iron:

Ferric iron is also used as an electron acceptor during anaerobic biodegradation of many contaminants, sometimes in conjunction with sulfate. During this process, ferric iron is reduced to ferrous iron, which is soluble in water. Hence, ferrous iron may be used as an indicator of anaerobic activity. As an example, Stoichiometrically, the degradation of 1 mg/L of BTEX results in the average consumption of approximately 22 mg/L of ferric iron (or “production” of ferrous iron) as shown below (equations 4-6).



3) Pyrite Formation:

While ferrous iron is formed as a result of the use of the ferric species as a terminal electron acceptor, residual sulfate is utilized as a terminal electron acceptor by facultative organisms thereby generating sulfide under these same conditions. Together, the ferrous iron and the sulfide promote the formation of pyrite as a remedial byproduct (equation 7). This reaction combats the toxic effects of sulfide and hydrogen sulfide accumulation on the facultative bacteria, while also providing a means of removing targeted organic and inorganic COIs via precipitation reactions. Moreover, pyrite possesses a high number of reactive sites that are directly proportional to both its reductive capacity and the rate of decay for the target organics.



PRIMARY FEATURES:

The combination of potassium and sodium persulfates provide a short and long-term oxidant release that will be effective for many different treatment matrices. The combined persulfates and activation methodology maximizes the synergy between coupled oxidation and enhanced bioremediation: i) sulfate is

generated from persulfate, i) ferric iron (Fe III) is microbiologically reduced to ferrous iron (Fe II) readily supplying electrons to exchange and react with sulfide. Together, sulfide and iron form pyrite, an iron bearing soil mineral with a favorable reductive capacity.

- ◆ **Effective:** Promotes multiple oxidation pathways of a wide-range of organic contaminants for an extended time compared to traditional persulfate options. Also provides a unique microbiological component for multiple accelerated attenuation processes.
- ◆ **Efficient:** Significantly lower costs as a result of sub-stoichiometric dosing requirements.
- ◆ **Safe:** Fewer health and safety concerns as compared with use of traditional activation methods such as heat, chelated metals, hydrogen peroxide or pH extremes. Contains built-in activation, which eliminates the need for additional and potentially hazardous chemicals required to achieve traditional persulfate activation.
- ◆ **Ease of Use:** Single component product with integrated activator results in simplified logistics and application. No additional containers or multi-step mixing ratios required prior to application. Fewer material compatibility issues.
- ◆ **Improved Performance:** Combined remedy prevents “rebound” which is often seen in other oxidation processes. Maximizes the inherent geochemistry of a “post-oxidation” environment for biologically based attenuation.
- ◆ **Eliminates Secondary Groundwater Issues:** Includes Terr-OR™ ferrate stabilizer and pH buffer to offset the sulfuric acid produced during breakdown of the persulfates and limits the mobilization of pH sensitive heavy metals (e.g., arsenic).
- ◆ **Patented Technology:** US Patent No. 9,126,245 (international filings in EU, Australia, Brazil, Canada, China, Colombia, Japan and Mexico) and others pending allow us to freely market this advanced persulfate-based ISCO technology globally, using our choice of suppliers.

LITERATURE CITED:

Rodriguez S, L. Vasquez, D. Costa D, A. Romero and A. Santos. 2014. Oxidation of Orange G by Persulfate activated by Fe(II), Fe(III) and zero valent iron (ZVI). *Chemosphere* 101:86-92.

Scalzi, M. and A. Karachalios. 2013. Chemical Oxidation and Biological Attenuation Process for the Treatment of Contaminated Media. US PTO 9,126,245.

Tsitonaki, A., B.Petri, M. Crimi, H.Mosbaek, R. Siegrist and P. Berg. 2010. *In Situ* Chemical Oxidation of Contaminated Soil and Groundwater using Persulfate: A Review. *Critical Rev. Environ. Sci and Technol.* 40: 55-91.

PROVEN POWER OF EHC® REAGENT PLUS ACTIVATED CARBON

EHC® PLUS is a combination of EHC® REAGENT plus powdered activated carbon (PAC). This combined remedy approach can be used for the treatment of groundwater and saturated soil impacted by persistent halogenated compounds, including chlorinated solvents, pesticides, and organic explosives. EHC® PLUS is a synergistic mixture that stimulates both abiotic and biotic de-chlorination mechanisms and provides an adsorption pathway to help to achieve low remedial goals for difficult to treat contaminants.

KEY BENEFITS

- Multiple and dynamic reaction pathways → abiotic, biotic, and adsorption
- Abiotic and biotic pathways destroy contaminants including those with lower adsorption affinity for activated carbon, such as vinyl chloride, chloroethanes, and dichloroethanes
- Synergistic organic carbon and ZVI mixture creates a reactive halo in the Downgradient Zone by the volatile fatty acids and soluble iron corrosion products
- Solid PAC stays in the Injection Zone and does not migrate with groundwater flow cutting off contaminant plumes and helping to achieve low remedial goals

THE SOUND SCIENCE OF EHC® PLUS

Following an application of EHC® PLUS, the PAC results in an immediate reduction in aqueous concentrations of contaminants via adsorption and allows time for EHC® PLUS to create strong reducing conditions via biotic and abiotic mechanisms. This creates a powerful two-step treatment process and allows time for reductive treatment to be established.

As the bacteria ferment the organic component of EHC® PLUS, a variety of volatile fatty acids (VFAs) diffuse into the groundwater to serve as electron donors while corroding iron is released into the groundwater forming ferric and ferrous precipitates.

In addition, the PAC can serve as media to support both abiotic and biotic reactions on its surface with CVOCS (Nath and Bhakhar, 2011, Gamal et al., 2018, Aktas, Tang et al. 2011 and Cecen, 2007)

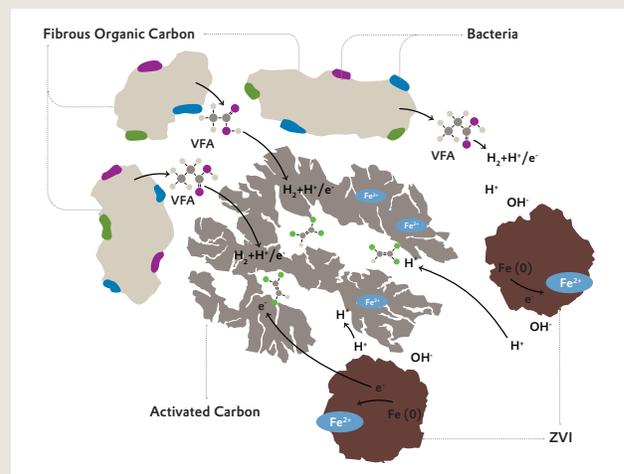


Figure 1 Mechanisms of reductive dechlorination of trichloroethylene adsorbed in the micropores of activated carbon. Activated carbon serves as the conductor for electrons and/or atomic hydrogen. H⁺ represents adsorbed atomic hydrogen.

EHC® PLUS APPLICATIONS

- Permeable Reactive Barriers (PRBs) for Plume Control: EHC® PLUS has an estimated lifetime of 5 to 10 years in the subsurface which makes it ideal for placement into PRBs to promote CVOC removal under flow-through conditions.
- Source Areas: EHC® PLUS can also be used for hot-spot treatment and the product's adsorptive capability and longevity allows for continued treatment of contaminants as they slowly back diffuse from the solid matrix to groundwater at sites with high concentrations of sorbed mass/NAPL.
- Plume Treatment: A remedial design with multiple injection areas or reactive zone provides cost effective treatment approach for large dilute plumes.

INSTALLATION METHODS

- Injection of slurry via direct push technology (DPT)
- Hydraulic or Pneumatic Fracturing (applied to fine-grain formations including weathered and fractured bedrock)
- Direct placement into open excavations or trench PRBs
- Deep soil mixing

For more information and detailed case studies, please visit our website.

REFERENCES

- Maisa El Gamal, Hussein A.Mousa, Muftah H.El-Naas, Renju Zacharia, and Simon Judd. (2018). Bio-regeneration of activated carbon: A comprehensive review. Separation and Purification Technology, Volume 197, 31 May 2018, Pages 345-359
- Kaushik Nath, Mathurkumar S. Bhakhar (2011). Microbial regeneration of spent activated carbon dispersed with organic contaminants: mechanism, efficiency, and kinetic models Environmental Science and Pollution Research, 2011, Volume 18, Number 4, Page 534
- Özgür Aktaş and Ferhan Çeçen (2007), Bioregeneration of activated carbon: A review. International Biodeterioration & Biodegradation, Volume 59, Issue 4, June 2007, Pages 257-272
- Kruti Sodha, Suresh Panchani and Kaushik Nath. Feasibility study of microbial regeneration of spent activated carbon sorbed with phenol using mixed bacterial culture. Indian Journal of Chemical Technology, Vol 20, Jan 2013, pp 33-39.
- Tang, Hao, Zhu, Dongqiang, Li, Tielong, Kong, Haonan and Chen, Wei. (2011). Reductive Dechlorination of Activated Carbon-Adsorbed Trichloroethylene by Zero-Valent Iron: Carbon as Electron Shuttle. Journal of environmental quality. 40. 1878-85.

Disclaimer This information and any recommendations, technical or otherwise, are presented in good faith and believed to be correct as of the date prepared. Recipients of this information and recommendations must make their own determination as to its suitability for their purposes. In no event shall Evonik assume liability for damages or losses of any kind or nature that result from the use of or reliance upon this information and recommendations. EVONIK EXPRESSLY DISCLAIMS ANY REPRESENTATIONS AND WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, AS TO THE ACCURACY, COMPLETENESS, NON-INFRINGEMENT, MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE (EVEN IF EVONIK IS AWARE OF SUCH PURPOSE) WITH RESPECT TO ANY INFORMATION AND RECOMMENDATIONS PROVIDED. Reference to any trade names used by other companies is neither a recommendation nor an endorsement of the corresponding product, and does not imply that similar products could not be used. Evonik reserves the right to make any changes to the information and/or recommendations at any time, without prior or subsequent notice.

EVONIK INDUSTRIES AG
Active Oxygens
 remediation@evonik.com
www.evonik.com/remediation



Shaw's 4000-L Fermentor and Cell Concentrator

Simply Available

Shaw maintains the largest and most advanced fermentation facility in the environmental industry and is staffed with the industry's most experienced fermentation scientists. SDC-9™ cultures can be produced in volumes up to 4000 L per batch for treatment of even the largest contaminated sites. Typical lead times for large cultures (>200 L) are only 2 weeks, and smaller cultures are often available on even shorter notice.

About Shaw Environmental, Inc.

From restoring contaminated sites like the Fernald Closure Project in Ohio, a former uranium processing facility, to devising innovative solutions to complex environmental issues, such as the removal of MTBE and perchlorate, to designing modern, safe solid waste landfills, Shaw is a worldwide leader in environmental protection and remediation.

Using our engineering, design, and construction expertise, we work with our clients to:

- Remediate contamination and restore land to a usable state
- Safely dispose of hazardous and toxic waste, including high-level waste
- Develop modern solid waste landfills and transfer stations
- Keep the air and water contaminant-free
- Respond quickly and efficiently to emergency situations

Shaw's broad experience and multidisciplinary approach provide the expertise and flexibility to meet your environmental project needs.

Contact

Robert J. Steffan, PhD

Director, Biotechnology Applications

17 Princess Road

Lawrenceville, NJ 08648

Phone: 609.895.5350

rob.steffan@shawgrp.com

www.shawgrp.com/bioaugmentation

33M032006D_3
04.17.08



The Simple Choice
for Bioaugmentation™
Shaw's Dechlorinating Culture, SDC-9™

 **Shaw**® a world of **Solutions**™

Shaw's Dechlorinating Culture—SDC-9™

The Simple Choice for Bioaugmentation™

Simply Better

- Degrades mixed chlorinated solvents (PCE, TCE, cDCE, VC, TCA, CT, CF)
- Not inhibited by Chloroform like other commercially available cultures
- Rapid and complete degradation of cDCE and Vinyl Chloride
- Degrades high concentrations of contaminants

Simply More for Your Money

- Lowest per-liter prices
- Highest DHC concentrations
- 10-fold cell concentration available to reduce shipping costs
- SDC-9 delivery kegs allow inexpensive and flexible culture injection
- No requirement for a Shaw technician to be on-site for injection

Simply Available

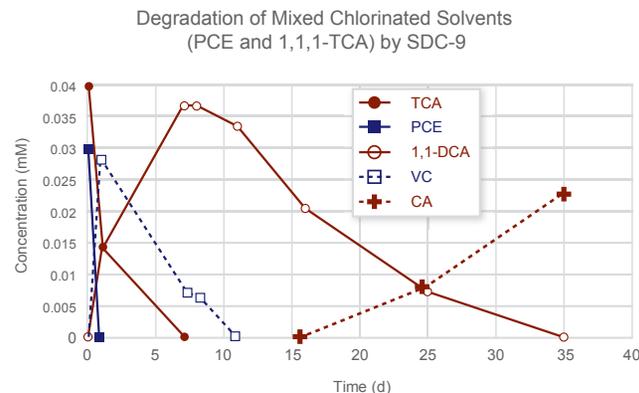
- 4000 L fermentation capacity
- Typical lead times only 2 weeks
- Affordable overnight UPS shipping

Simply Guaranteed

- Guaranteed lowest price!
- Guaranteed DHC concentrations
- Guaranteed highest activity
- Guaranteed lowest overnight shipping cost
- Cell concentration guarantees lowest culture impurities

Simply Better

Shaw Environmental, Inc., a Shaw Group Company (Shaw) developed SDC-9™ specifically to treat chlorinated solvent contaminated aquifers. The culture contains Dehalococcoides sp. (DHC) bacteria that degrade a wide range of chlorinated contaminants via dehalorespiration. In addition to degrading highly chlorinated ethenes like PCE and TCE, the culture rapidly dechlorinates cDCE and vinyl chloride to non-toxic ethene, making it well suited for treating sites where remediation of PCE and TCE has stalled at these intermediates. In addition, SDC-9™ contains microbes capable of dehalogenating halomethanes (e.g., carbon tetrachloride and chloroform) and haloethanes (e.g. 1,1,1-TCA and 1,1-DCA), as well as mixtures of these halogenated contaminants. SDC-9™ is not inhibited by chloroform like other commercially available cultures. The culture has been successfully applied at sites throughout the United States, including some of the largest in situ bioaugmentation projects performed to date. The culture works effectively with any electron donor known to support reductive dehalogenation (e.g., vegetable oil, lactate, molasses, whey, etc.).

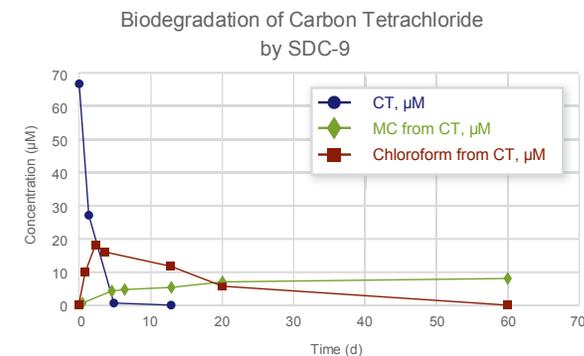


Simply More for Your Money

Shaw is the only company that concentrates its bacterial cultures before shipment to your site. The cell concentration process removes >90% of the fermentation by-products that accumulate during the fermentation process. This ensures that injection of SDC-9™ does not create unnecessary water quality issues. It also reduces shipping volume to ensure rapid and cost-effective delivery of SDC-9™ cultures. 180 L of SDC-9™ can be shipped overnight to your site in a single cooler. Overnight shipping allows your cultures to have their greatest activity when they arrive at your site.



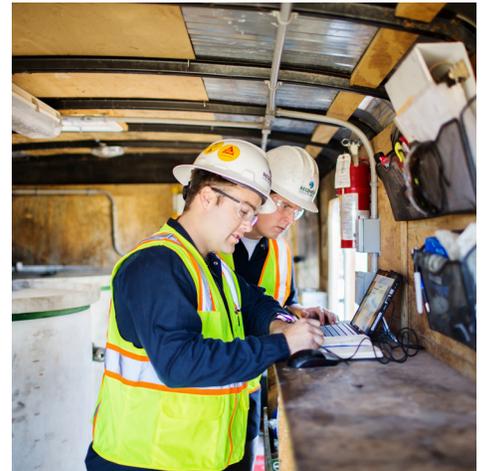
Kegs are shipped on ice in coolers and supplied with 2 quick connects (one for gas and one for liquid) that are fitted with hose barbs for attaching 1/4" ID tubing.



S-MicroZVI Specification Sheet

S-MicroZVI Technical Description

S-MicroZVI™ is an *In Situ* Chemical Reduction (ISCR) reagent that promotes the destruction of many organic pollutants and is most commonly used with chlorinated hydrocarbons. It is engineered to provide an optimal source of micro-scale zero valent iron (ZVI) that is both easy to use and delivers enhanced reactivity with the target contaminants via multiple pathways. S-MicroZVI can destroy many chlorinated contaminants through a direct chemical reaction (see Figure 1). S-MicroZVI will also stimulate anaerobic biological degradation by rapidly creating a reducing environment that is favorable for reductive dechlorination.



Sulfidated ZVI

S-MicroZVI is composed of colloidal, sulfidated zero-valent iron particles suspended in glycerol using proprietary environmentally acceptable dispersants. The passivation technique of sulfidation, completed using proprietary processing methods, provides unparalleled reactivity with chlorinated hydrocarbons like PCE and TCE and increases its stability and longevity by minimizing undesirable side reactions.

S-MicroZVI is Best in Class For

- Longevity
- Reactivity
- Transport

In addition to superior reactivity, S-MicroZVI is designed for easy handling that is unmatched by any ZVI product on the market. Shipped as a liquid suspension, S-MicroZVI requires no powder feeders, no thickening with guar, and pneumatic or hydraulic fracturing is not mandatory. When diluted with water prior to application, the resulting suspension is easy to inject using either direct push or permanent injection wells.

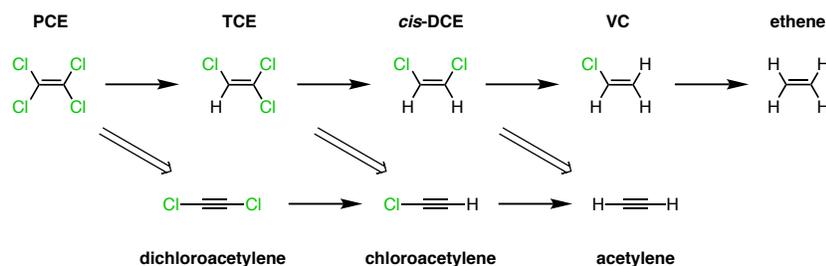


Figure 1: Chlorinated ethene degradation pathways and products. The top pathway with single line arrows represent the reductive dechlorination (hydrogenolysis) pathway. The lower pathway with downward facing double line arrows represent the beta-elimination pathway.

To see a list of treatable contaminants, view the S-MicroZVI treatable contaminants guide.

S-MicroZVI Specification Sheet

Chemical Composition

Iron, powders CAS 7439-89-6
Iron (II) sulfide CAS 1317-37-9
Glycerol CAS 56-81-8

Properties

Physical State: Liquid
Form: Viscous metallic suspension
Color: Dark gray
Odor: Slight
pH: Typically 7-9 as applied
Density: 15 lb/gal

Storage and Handling Guidelines

Storage:

- Use within four weeks of delivery
- Store in original containers
- Store at temperatures below 95F°
- Store away from incompatible materials

Handling:

- Never mix with oxidants or acids
- Wear appropriate personal protective equipment
- Do not taste or swallow
- Observe good industrial hygiene practices

Applications

S-MicroZVI is diluted with water on site and easily applied into the subsurface through low-pressure injections. S-MicroZVI can also be mixed with products like 3-D Microemulsion[®] or PlumeStop[®] prior to injection.

Health and Safety

The material is relatively safe to handle; however, avoid contact with eyes, skin and clothing. OSHA Level D personal protection equipment including: vinyl or rubber gloves and eye protection are recommended when handling this product. Please review the Safety Data Sheet for additional storage, and handling requirements here: S-MicroZVI SDS.



www.regensis.com

Corporate Headquarters
1011 Calle Sombra, San Clemente CA 92673 USA
Tel: +1 949.366.8000

European Offices (UK, Ireland, Belgium and Italy)
Email: europe@regensis.com
Tel: +44 (0)1225 61 81 61

PlumeStop® Liquid Activated Carbon™ Technical Description

PlumeStop Liquid Activated Carbon is an innovative groundwater remediation technology designed to rapidly remove and permanently degrade groundwater contaminants. PlumeStop is composed of very fine particles of activated carbon (1-2µm) suspended in water through the use of unique organic polymer dispersion chemistry. Once in the subsurface, the material behaves as a colloidal biomatrix, binding to the aquifer matrix, rapidly removing contaminants from groundwater, and expediting permanent contaminant biodegradation.

This unique remediation technology accomplishes treatment with the use of highly dispersible, fast-acting, sorption-based technology, capturing and concentrating dissolved-phase contaminants within its matrix-like structure. Once contaminants are sorbed onto the regenerative matrix, biodegradation processes achieve complete remediation at an accelerated rate.



Distribution of PlumeStop in water

To see a list of treatable contaminants with the use of PlumeStop, view the [Range of Treatable Contaminants Guide](#).

Chemical Composition

- Water - CAS# 7732-18-5
- Colloidal Activated Carbon ≤2.5 - CAS# µm 7440-44-0
- Proprietary Additives

Properties

- Physical state: Liquid
- Form: Aqueous suspension
- Color: Black
- Odor: Odorless
- pH: 8 - 10

Storage and Handling Guidelines

Storage

Store in original tightly closed container
Store away from incompatible materials
Protect from freezing

Handling

Avoid contact with skin and eyes
Avoid prolonged exposure
Observe good industrial hygiene practices
Wash thoroughly after handling
Wear appropriate personal protective equipment

PlumeStop® Liquid Activated Carbon™ Technical Description

Applications

PlumeStop is easily applied into the subsurface through gravity-feed or low-pressure injection.

Health and Safety

Wash hands after handling. Dispose of waste and residues in accordance with local authority requirements. Please review the Material Safety Data Sheet for additional storage, usage, and handling requirements here: [PlumeStop SDS](#).



www.regenesis.com
1011 Calle Sombra, San Clemente CA 92673
949.366.8000

Attachment D

PDF Copies of Three Previous Shakespeare Reports

Shakespeare Composite Structures Site, Newberry, SC
PDF Copies of Three Previous Shakespeare Reports

PDF copies of the following previous reports are included on a DVD in Attachment D of the hard copy of this FS Report:

- AECOM, 2023a. Site-Wide Groundwater Monitoring Report. AECOM, May 2023.
- AECOM, 2023b. Pilot Study Report. AECOM, May 2023.
- AECOM, 2024. Feasibility Study Technical Memorandum. AECOM, February 2024.