Five-Year Review Report

Fourth Five-Year Review Report
for
Palmetto Wood Preserving
EPA ID SCD003362217

Dixiana
Lexington County, South Carolina

July 2012

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For:
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Region 4
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Date: 7/19/12

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Dixiana Road
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List of Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
ARAR	Applicable or Relevant and Appropriate Requirement
AROD	Amendment to the Record of Decision
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CDM	Camp, Dresser and McKee Inc.
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
CM	Centimeter
COC	Contaminant of Concern
Cr	Chromium
CSF	Cancer Slope Factor
DPT	Direct Push Technology
EPA	United States Environmental Protection Agency
EOS	Emulsified Oil Substrate
ESD	Explanation of Significant Differences
EVO	Emulsified Vegetable Oil
EW	Extraction Well
FYR	Five-Year Review
GMW	Ground Water Monitoring Well
GPR	Ground Penetrating Radar
IC	Institutional Control
ID	Intensive Development
ISAB	In-Situ Anaerobic Bioremediation
IUR	Inhalation Unit Risk
MCL	Maximum Contaminant Level
µg/L	Micrograms per Liter
mg/kg	Milligrams per Kilogram
MW	Monitoring Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTU	Nepholometric Turbidity Unit
OHM	OHM Remediation Services Corporation
O&M	Operation and Maintenance
OU	Operable Unit
PA	Preliminary Assessment
PAHs	Polycyclic Aromatic Hydrocarbons
PCP	Pentachlorophenol
POTW	Publicly-Owned Treatment Works
PWP	Palmetto Wood Preserving
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfC	Reference Concentration
RfD	Reference Dose

RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RW	Recovery Well
SB	Soil Boring
SCDHEC	South Carolina Department of Health and Environmental Control
SCE&G	South Carolina Electric and Gas
SI	Site Inspection
SPLP	Synthetic Precipitation Leaching Procedure
TBC	To-Be-Considered
TCLP	Toxicity Characteristic Leaching Procedure

Executive Summary

Introduction

The Palmetto Wood Preserving (PWP) Site (the Site) is located in the rural community of Dixiana in Lexington County, South Carolina. The original PWP facility property covered approximately 7 acres. The original PWP facility is a decommissioned wood preserving facility that operated from 1963 to 1985. The Site includes the original PWP facility as well as all areas that contained contaminated groundwater that emanated from the facility. These include portions of a railroad corridor and approximately four parcels extending east from the original PWP facility. A portion of the original PWP facility property is currently in use as an equipment storage area. Site investigations identified metals in soil and the shallow aquifer at the original PWP facility and in surrounding areas. Contamination in the deep aquifer was later confirmed. The United States Environmental Protection Agency (EPA) proposed the Site for listing on the National Priorities List (NPL) in September 1983 and finalized the Site on the NPL on September 21, 1984.

The remedy for the Site included treatment of contaminated soil followed by on-site solidification/stabilization, and treatment of contaminated ground water followed by disposal at the local publicly-owned treatment works (POTW). EPA initiated the soil remedy in September 1988 and completed it in February 1989. EPA's removal program conducted the soil remedy. During the soil remedial activities, 12,688 cubic yards of contaminated soils were excavated, treated, solidified and replaced into their original excavation cells. Based on EPA information, the remedy resulted in 16 monoliths buried at varying depths across the original PWP facility property.

EPA built a ground water pump-and-treat system approximately 600 feet east of the northeast corner of the original PWP facility. The pump-and-treat system addressed contaminated ground water under the original PWP facility, as well as contaminated ground water that had migrated east and northeast under the railroad corridor and the additional privately-owned properties. The system was operational from October 1996 through July 2004. In 2008, EPA issued a Record of Decision (ROD) Amendment (AROD) to change the ground water remedy from pump-and-treat technology to an in-situ anaerobic bioremediation (ISAB) treatment remedy. EPA performed ISAB ground water injections from January until March 2009. In October 2009, EPA demolished the ground water treatment plant. In October 2010, EPA transferred the Site to the South Carolina Department of Health and Environmental Control (SCDHEC) for operation and maintenance, which primarily consists of ground water monitoring through 2012. No monitoring events beyond 2012 are scheduled.

The triggering action for this FYR was the signing of the previous FYR on September 27, 2007.

Remedial Action Objectives

The original ROD, issued on September 30, 1987, presented final remedies for soil and ground water. The remedial action objectives (RAOs) described in the ROD are:

- Protecting public health and the environment by preventing exposure to contaminated on-site soils through inhalation, direct contact and erosion of soils into surface waters and wetlands.
- Preventing off-site movement of contaminated ground water.

- Restoring contaminated ground water to levels protective of human health and the environment.

After issuing the 1987 ROD to address soil and ground water contamination, EPA divided the Site into two operable units (OUs). OU1 addresses the soil remedial action and OU2 addresses the ground water remedial action.

Technical Assessment

A review of documents, ARARs, risk assumptions and the site inspection indicate that the Site's OU1 remedy is functioning as intended. In order for the remedy to function effectively in the long term, institutional controls are needed in order to inform future purchasers of the presence of the monoliths. Institutional controls might also be needed to limit future use of the original PWP facility property to appropriate commercial and industrial uses.

Currently, the 200 mg/kg cleanup goal for arsenic is not within EPA's acceptable risk range for residential land use. A soil arsenic concentration of 200 mg/kg would not be within the EPA cancer risk range (1×10^{-6} to 1×10^{-4}) for residential exposure based on current EPA default assumptions and toxicity values. This value may also be outside the risk range based on an industrial/commercial scenario, depending on the assumed bioavailability of the ingested soil arsenic. The concentration of arsenic in soil corresponding to a risk of 1×10^{-4} for a standard industrial worker, assuming no adjustment for bioavailability, is 160 mg/kg. Limited soil sampling data collected at the original PWP facility property in 2006, 2007 and 2009 suggest that arsenic in site soil is below the 160 mg/kg level associated with the default bioavailability. If the bioavailability were to be adjusted from 1.0 to 0.8, the concentration corresponding to a risk of 1×10^{-4} would be 200 mg/kg. EPA is currently reviewing whether to apply a default bioavailability adjustment (possibly 0.6) to arsenic in soil for human ingestion exposure. Since the highest concentration of arsenic detected on site was 46 mg/kg, there is no current unacceptable risk at the site based on an industrial/commercial scenario. If the default bioavailability value is finalized, this highest detected level will even be below residential levels.

Currently, only a limited portion of the Site is being used as a storage area by occasional on-site workers and presents only a possible incidental exposure scenario. In addition, in 2009, EPA reevaluated the site risk based upon the sampling that was done as part of the 2009 study examining the durability of the monoliths. EPA's study concluded that the cancer risk for the future construction worker was 2×10^{-6} which is within EPA's target risk range. The study also concluded that the hazard index was 0.2, below the target level of 1.

The exposure assumptions and RAO for OU1 remain valid. There have been no changes to the chromium toxicity values that would affect the protectiveness of the soil cleanup levels.

A review of documents, ARARs, risk assumptions and the site inspection indicate that additional information is needed before it can be determined whether the Site's OU2 ground water remedy is functioning as intended by site decision documents. Sampling performed after the 2009 ground water ISAB injections indicated that the ISAB injections successfully reduced chromium, the only remaining ground water COC, to concentrations below the cleanup goal of 100 µg/L. Sampling conducted in October 2011, indicated that chromium concentrations remained below the cleanup goal for all 11 remaining wells, except GMW-07 and GMW-08, located approximately 100 feet apart. Between June 2010 and October 2011, chromium concentrations increased from 7 µg/L to 730 µg/L in GMW-07 and from 72 µg/L to 220 µg/L in GMW-08.

However, the EPA RPM noted that turbidity levels might have been a factor in the increases. Given the suspect October 2011 sampling results for GMW-07 and GMW-08, all remaining wells should be re-sampled. If results suggest that the exceedances are persistent, SCDHEC should perform the contingency analyses outlined in the current O&M plan, which include analyses for lactate and propionate concentrations, to monitor the degradation and distribution of the injected carbon substrate as well as analysis for select geochemical parameters. Irrespective of the results, additional ground water sampling events should be scheduled beyond the one remaining sampling event required in the current O&M plan (i.e., the sampling event for 2012).

Institutional controls called for in the AROD, to restrict ground water use, are not in place. Based on the most recent (October 2011) ground water monitoring results, ground water below two properties exceeds the chromium cleanup goal. Depending upon results of the reassessment, it may be necessary to place institutional controls on these properties until the cleanup goal for chromium is consistently met. In addition, depending upon the reassessment results, although it has been reported that the area is now served by municipal water, a well survey might need to be conducted around the area of impacted ground water.

Conclusion

The remedy at OU1 currently protects human health and the environment because the monoliths remain stable, leaching of COCs from the monoliths is minor and unlikely to contaminate ground water, and according to a 2009 EPA risk evaluation the threat to a future construction worker from exposure to soil adjacent to the monoliths is minimal. Currently, only a limited portion of the Site is being used as a storage area by occasional on-site workers and presents only a possible incidental exposure scenario. In order for the remedy to function effectively in the long term, institutional controls are needed in order to inform future purchasers of the presence of the monoliths. Institutional controls might also be needed to limit future use of the original PWP facility property to appropriate commercial and industrial uses.

The remedy at OU2 currently protects human health and the environment because properties in the area where chromium exceedances have been identified are on municipal water. However, in order for the remedy to be protective in the long term, institutional controls restricting ground water use may be needed on affected properties until the ground water cleanup goal for chromium is consistently achieved. In addition, a water well survey might be needed to confirm there are no private wells located around the area of impacted ground water. Whether institutional controls and a well survey are needed will depend upon a follow-up evaluation to determine the nature of the recent chromium exceedances.

Because the remedial actions at both OUs are currently protective, the Site's remedy is protective of human health and the environment in the short term.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Palmetto Wood Preserving		
EPA ID: SCD003362217		
Region: 4	**State:** SC	**City/County:** Dixiana/Lexington

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name: Treat Suomi and Eric Marsh, Skeo Solutions Staff Members (reviewed by EPA)
Author affiliation: Skeo Solutions
Review period: 09/01/2011 – 06/01/2012
Date of site inspection: 12/6/2011
Type of review: Statutory
Review number: 4
Triggering action date: 09/21/2007
Due date *(five years after triggering action date)*: 09/21/2012

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Institutional controls are not in place on the original PWP facility property to inform purchasers/developers of the presence of the monoliths or to limit future use of the original PWP facility property to appropriate commercial and industrial uses.			
	Recommendation: Implement institutional controls to inform any future purchasers/developers of the presence of the monoliths. Evaluate the need to implement institutional controls to limit future use of the original PWP facility property to appropriate commercial and industrial uses. Modify the remedy through a decision document to add the institutional control requirements.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	State	EPA/State	01/31/2013

OU(s): 2	Issue Category: Remedy Performance			
	Issue: Chromium concentrations in ground water exceeded the cleanup goal in two wells during the 2011 ground water sampling event.			
	Recommendation: Resample the monitoring wells to analyze the cause of the recent chromium exceedances and, if necessary, take appropriate follow-up steps that may include implementation of the O&M plan. Irrespective of results, annual monitoring should be extended beyond the one remaining sampling event required in the current O&M plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA/State	08/31/2012

OU(s): 2	Issue Category: Institutional Controls
	Issue: Institutional controls called for in the 2008 AROD are not in place to restrict ground water use.
	Recommendation: If, after evaluating the nature of the chromium exceedances, it is determined that ground water is not meeting the

	chromium cleanup goal, implement institutional controls restricting ground water use on those properties that have chromium in ground water above the cleanup goal.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA/State	01/31/2015

OU(s): 2	**Issue Category: Monitoring**			
	Issue: A well survey in the area where chromium concentrations in ground water exceeded the cleanup goal in 2011 may be needed.			
	Recommendation: If, after evaluating the nature of the chromium exceedances, it is determined that ground water is not meeting the chromium cleanup goal, assess the need for a well survey in the affected ground water area.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA/State	01/31/2013

Protectiveness Statement(s)

Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
1	Short-term Protective	Click here to enter date.

Protectiveness Statement:

The remedy at OU1 currently protects human health and the environment because the monoliths remain stable, leaching of COCs from the monoliths is minor and unlikely to contaminate ground water, and according to a 2009 EPA risk evaluation the threat to a future construction worker from exposure to soil adjacent to the monoliths is minimal. Currently, only a limited portion of the Site is being used as a storage area by occasional on-site workers and presents only a possible incidental exposure scenario. In order for the remedy to function effectively in the long term, institutional controls are needed in order to inform future purchasers of the presence of the monoliths. Institutional controls might also be needed to limit future use of the original PWP facility property to appropriate commercial and industrial uses.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
2	Short-term Protective	Click here to enter date.

The remedy at OU2 currently protects human health and the environment because properties in the area where chromium exceedances have been identified are on municipal water. However, in order for the remedy to be protective in the long term, institutional controls restricting ground water use may be needed on affected properties until the ground water cleanup goal for chromium is consistently achieved. In addition, a water well survey might be needed to confirm there are no private wells located around the area of impacted ground water. Whether institutional controls and a well survey are needed will depend upon a follow-up evaluation to determine the nature of the recent chromium exceedances.

Sitewide Protectiveness Statement (if applicable)

For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.

Protectiveness Determination:	*Addendum Due Date (if applicable):*
Short-term Protective	Click here to enter date.

Protectiveness Statement:
Because the remedial actions at both OUs are currently protective, the Site's remedy is protective of human health and the environment in the short term.

Environmental Indicators

- *Current human exposures at the Site are under control.*
- *Current ground water migration is under control.*

Are Necessary Institutional Controls in Place?

☐ All ☐ Some ☒ None

The Site needs to be further evaluated to determine whether or not additional institutional controls are required.

Has the Site Been Designated as Sitewide Ready for Anticipated Use?

☐ Yes ☒ No

Has site been put into reuse?

☒ Yes ☐ No

Fourth Five-Year Review Report
for
Palmetto Wood Preserving Superfund Site

1.0 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."

Skeo Solutions, an EPA Region 4 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Palmetto Wood Preserving (PWP) site (the Site) in Dixiana, Lexington County, South Carolina. This FYR was conducted from September 2011 to June 2012. EPA is the lead agency for developing and implementing the remedy for the Superfund-financed cleanup at the Site. The South Carolina Department of Health and Environmental Control (SCDHEC), as the support agency representing the State of South Carolina, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the previous FYR. This statutory FYR is required due to the fact that hazardous substances, pollutants or

contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of two operable units (OUs), both of which are addressed in this FYR.

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
PWP began operations	1963
SCDHEC received complaints	1981/1982
SCDHEC issued Notice of Violation to PWP	March 1983
SCDHEC issued Consent Order to PWP	May 1983
Site proposed for listing on the National Priorities List (NPL)	September 8, 1983
Preliminary Assessment/Site Inspection (PA/SI)	November 1983
Site finalized on NPL	September 21, 1984
Site inspection conducted	November 1, 1984
PWP ceased operations	1985
Remedial Investigation/Feasibility Study (RI/FS)	June 28, 1985-September 30, 1987
Removal action on site	July 30, 1985-August 23, 1985
OU1 Record of Decision (ROD)	September 30, 1987
Remedial design (RD) for OU1	April 14, 1988-September 29, 1988
Remedial action (RA) for OU1	September 28, 1988-February 8, 1989
RD for OU2	February 8, 1989- June 10, 1994
Explanation of Significant Differences (ESD)	September 21, 1993
RA for OU2 begins	September 25, 1996
Operational and Functional period of OU2 RA begins (pump-and-treat system)	October 15, 1996
Final Inspection and Acceptance of OU2 RA	May 20, 1997
First FYR	June 26, 1997
Preliminary Close Out Report/ Construction Completion	September 30, 1997
Long-term Response Action phase for OU2 RA begins	October 1, 1997
Interim Operation and Maintenance (O&M) Report for OU2 ground water	June 8, 1999
Second FYR	September 18, 2002
Ground water extraction and treatment system shut down	July 1, 2004
Pilot injection test	March-September 2007
Third FYR	September 27, 2007
ROD Amendment	August 15, 2008
ISAB RA Work Plan completed	December 18, 2008
ISAB injections	January 26-March 9, 2009
Water Treatment System Inventory completed	February 26, 2009
Demolition and disposal of water treatment system (buildings/foundations/equipment/supplies)	October 12-20, 2009
Monolith reports completed: *Durability of Solidified/Stabilized (Monolith) Wastes and Recommendations for Handling Disturbed Materials* and *Human Health Risk Evaluation Soil Adjacent to*	October 21, 2009

Event	Date
Monolith Palmetto Wood Preserving Site	
ISAB O&M plan issued	September 2010
Site transferred to SCDHEC	October 2010
RA completion report issued for OU2	January 2011
SCDHEC conducted 2011 ground water sampling	October 25-26, 2011
SCDHEC issued 2011 Annual Performance Monitoring report	January 3, 2012

3.0 Background

3.1 Physical Characteristics

The Site is located in the rural community of Dixiana in Lexington County, South Carolina (Figure 1). The Site is approximately 1.5 miles southeast of West Columbia, four miles south of Cayce, and six miles southwest of Columbia, South Carolina. The Site is located on Coyote Court near Dixiana Road, approximately 0.5 mile northeast of Interstate 26 and just over one mile southeast of Interchange 115. The original PWP facility was approximately seven acres in size and is now divided into two parcels: parcel number 006899-01-028[1] owned by South Carolina Electric & Gas (SCE&G) and parcel number 006899-01-004 owned by George K. Bellinger Jr., Jane B. Wannamaker, and EBM Properties, LLC, (Bellinger et. al.). The Bellinger et. al. property, considered to be the main site property, included the original drip shed, stacking shed, pressure tank building and adjacent narrow gauge rail line, and bulkhead. The Site includes the parcels that make up the original PWP facility as well as all areas that contained contaminated groundwater that emanated from the PWP facility. These include portions of a railroad corridor and approximately four parcels extending east from the original PWP facility. The most recent ground water monitoring reports suggest that contaminated ground water remains underneath a very small area located across two of these parcels east of the original PWP facility.

The original PWP facility is bounded by a road (Coyote Court) to the west, a railroad corridor, operated by CSX Transportation, to the east, and by private property to the north and south (Figure 2). SCE&G maintains facilities on its property to the west of Coyote Court. Low-density homes are located to the northwest of the original PWP facility along Coyote Court and to the east across the railroad track along Pallet Drive. A cemetery is located just north of the original PWP facility. Until recently, a pallet company operated on the property immediately south of the original PWP facility.

Apart from SCE&G's warehouse and storage facilities located immediately west of the original PWP facility, most of the surrounding area, including residential properties, is heavily forested. The nearest residential subdivision is located west of Interstate 26, approximately 0.5 mile northwest of the original PWP facility.

The Site lies in South Carolina's Upper Coastal Plain Physiographic Province. The area is characterized by generally flat to slightly rolling land with low wet areas and slow-moving streams. The topographic elevation changes approximately 20 feet over the Site and slopes downward generally toward the southeast. A wetland area is located southwest of Dixiana Road, approximately 200 feet southwest of the Site. A wetland area is also located east of the Site.

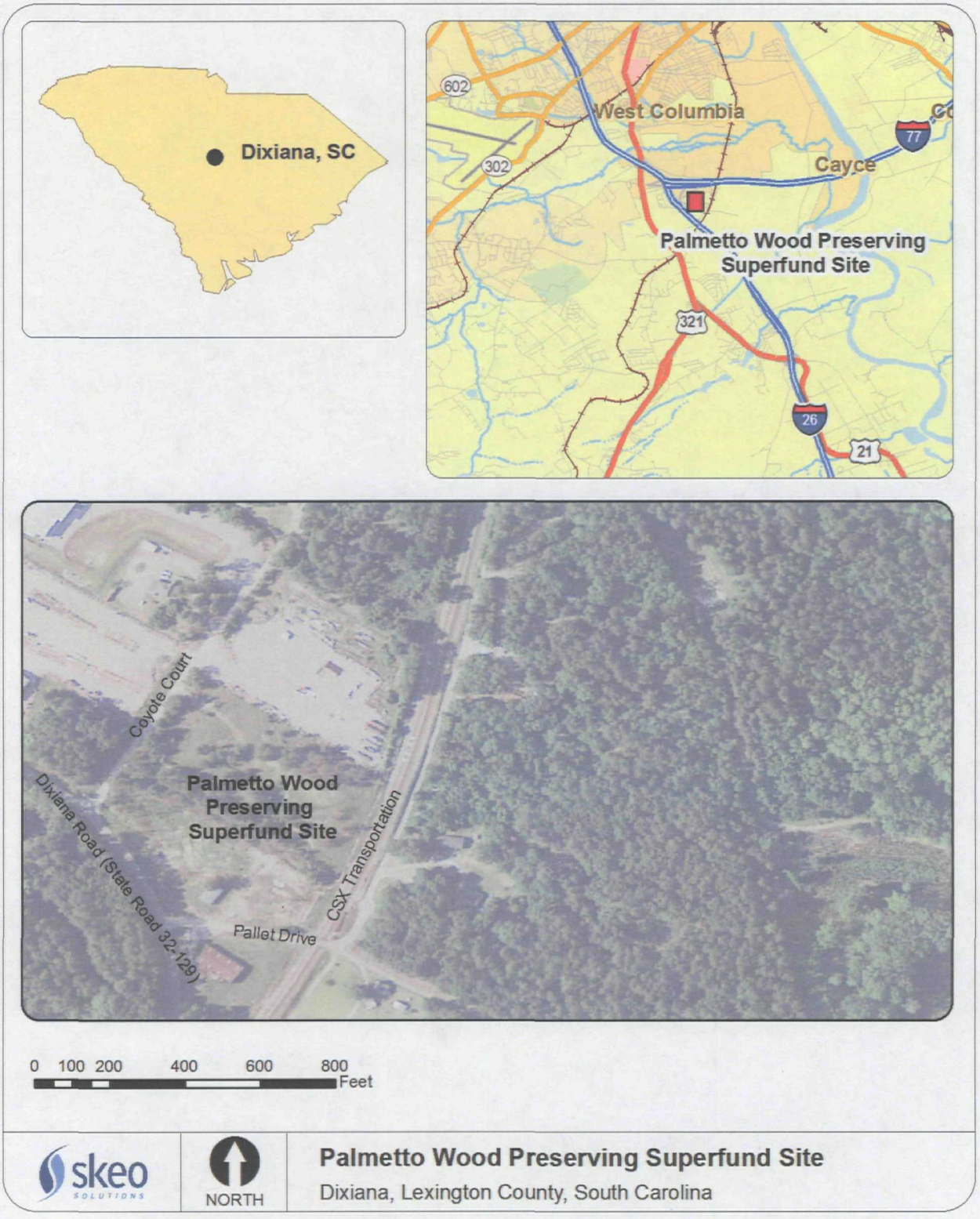
Three geologic units are present at the Site: Recent Congaree Fluvium, Pinehurst Formation and Middendorf Formation. These units form a confined to semi-confined

[1] This parcel also includes land located outside of the original PWP facility area, west of Coyote Court.

hydrogeologic system, in which hydraulic communication between geologic units increases to the east. The shallow and deep aquifers are well-defined upgradient near the Site. Ground water is transmitted through the Pinehurst and Middendorf Formations in the shallow aquifer, and through the Middendorf Formation in the deep aquifer. A clay-rich layer, less than 2 feet thick, separates the shallow and deep aquifer and is identified as the upper aquitard. The depth of this aquitard, and whether it is uniform throughout the Site, remains unknown. The shallow and deep aquifers are truncated at the contact between the Pinehurst Formation and Congaree fluvium, and ground water flows laterally into the unconfined Congaree aquifer. A clay and peat horizon in the Congaree aquifer impedes vertical flow but is not considered an aquitard.

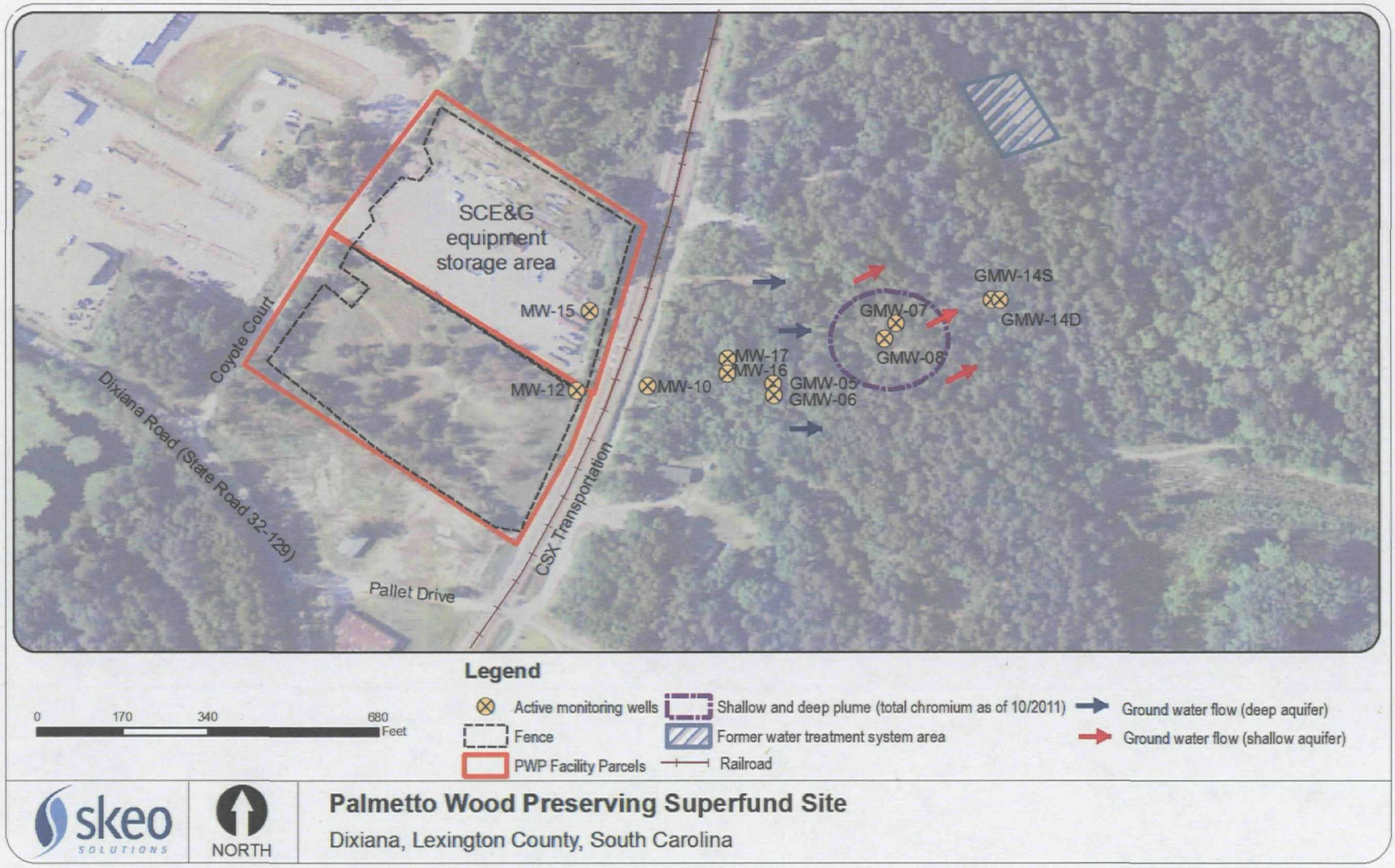
Based on water levels measured in October 25, 2011, by synTerra, SCDHEC's ground water sampling contractor, ground water flow appears to be to the east in the deep aquifer and to the east-northeast in the shallow aquifer.

Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site, and is not intended for any other purpose.

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site, and is not intended for any other purpose.

3.2 Land and Resource Use

From 1963 until 1980, PWP operated a wood preserving facility at the Site. Beginning in 1980, a new owner, Eastern Forest Products, operated the wood preserving facility until 1985. When the company ceased operations in 1985, all equipment (including pressure cells, piping, narrow gauge rail line and above ground storage tanks) was removed from the Site to an unknown location.

The northern portion of the Site, the SCE&G property, is fenced and secured. The property is mostly cleared of vegetation and is used by SCE&G for equipment storage. The 2007 FYR reported that during the cleanup process, some monoliths were buried on the SCE&G property. The 2007 FYR also noted that SCE&G had undertaken digging on this property. SCE&G contractors discovered the monoliths during groundbreaking for a new project, and therefore discontinued the project.

The southern portion of the Site, the Bellinger et. al. property, is fenced and secured and is covered with trees, grasses and shrubs. It is not known whether plans are in place to redevelop the Bellinger et. al. property.

Land use in the surrounding area is a mixture of single-family residential and light industrial. Occupied residences are located immediately to the northwest of the Site (west of Coyote Road), and to the east and southeast of the site (east of the railroad track and Pallet Drive).

Lexington County has zoned the Site and surrounding properties as an "Intensive Development (ID)" district. This cumulative zoning designation permits a full-range of residential-type land uses, as well as childcare and retirement centers. A county zoning map and table from the Lexington County Zoning Ordinance that shows permitted uses by zoning district is included in Appendix F. Since the areas surrounding and including the site parcels are zoned "ID", significant land use changes might occur in the future. Although the Site is zoned to permit a full range of uses, the reasonably anticipated future use of the Site is unclear. The 1987 Record of Decision (ROD) cleanup goal of 200 milligrams per kilogram (mg/kg) for arsenic in soil is intended to be supportive of future residential uses.

In 1987, the drinking water source for the Site's surrounding area was ground water obtained through private wells. According to the 2011 OU2 Remedial Action Completion Report, the area is now served by municipal water; however, there are three private drinking water wells located near the Site. These wells are located south of the plume area. EPA regularly sampled these wells from 2008 until 2010. All samples were non-detect. Based upon FYR interviews, a private well used for drinking water is located north/northwest of the site. This well has reportedly not been sampled, although the well is not located in the vicinity of the plume and is not in the direction of ground water flow.

3.3 History of Contamination

The original PWP facility is a decommissioned wood preserving facility that operated between 1963 and 1985. PWP began operating in 1963, using a fluoride-chromate-arsenate-phenol process and an acid-copper-chromate process. In 1980, Eastern Forest Products took over and switched to a chromate-copper arsenate process. During the treatment process, wood was loaded onto a small, narrow gauge railcar and moved into a pressure vessel where the material was pressure impregnated with the solution. The wood was then removed and allowed to dry, either in a drip shed or in the storage yard areas on nearby properties.

During the period of operation, the PWP facility consisted of the plant structure and equipment, including the pressure vessel, narrow gauge rail line, solution storage tanks, drip shed, storage and office building. When operations ceased in 1985, all equipment (including pressure cells, piping, narrow gauge rail line and above ground storage tanks) was removed from the facility to an unknown location.

In 1981 and 1982, SCDHEC received complaints from residents and adjacent property owners that green liquids were running off site and pooling near the facility. Because of these complaints, SCDHEC inspected the facility and collected soil and private well water samples. Although the water samples showed no evidence of contamination, soil samples indicated high levels of chromium were present.

3.4 Initial Response

Subsequent complaints and investigations led SCDHEC to issue a Notice of Violation in March 1983. Discussions between plant personnel and SCDHEC resulted in plans for improvements to minimize future problems. These plans were never implemented.

In April 1983, a new residential drinking water well was drilled 200 feet from the Site. Initial pumping yielded bright yellow water containing high levels of copper and chromium. PWP subsequently supplied potable water to this residence from a well on site. SCDHEC personnel sampled nearby private wells in May 1983, but did not find contamination in any other well. SCDHEC issued PWP a Consent Order compelling PWP to assess the site contamination.

PWP hired Law Environmental Testing Company (Law) to perform a preliminary assessment (PA) of the suspected contamination. Law completed the PA in 1983.

EPA conducted a PA of the Site in November 1983. The PA indicated that there was soil and water contamination under the main process area of the plant. Subsequently, EPA added the Site to the National Priorities List (NPL) on September 21, 1984, and assumed responsibility for the Site. EPA proceeded to implement the remedial investigation/feasibility study (RI/FS) under the Superfund program in September 1985.

In 1985, EPA also provided a temporary alternative drinking water supply to a residence until a permanent water supply could be provided to the property.

3.5 Basis for Taking Action

EPA completed a RI in July 1986. The results of the RI indicated the presence and extent of contamination in surface water, sediments, soil and ground water on the PWP facility and in the surrounding areas. The RI showed that the contamination was caused by the solution that PWP used to pressure-treat lumber. The solution had dripped onto the soil and percolated into the ground, reaching the water table.

Sampling data from the RI indicated that soil and ground water at the Site contained elevated levels of arsenic, chromium and copper. All of these metals were detected at levels far in excess of background concentrations in soil and ground water, and were known to be associated with former site operations. Therefore, these chemicals were selected as the site indicator chemicals.

In addition to arsenic, chromium, and copper, a small number of organic contaminants were identified at the Site. These contaminants consisted of phenol, dinitrophenol, pentachlorophenol (PCP), a variety of polycyclic aromatic hydrocarbons (PAHs), and several organic solvents (dichloromethane, toluene, and acetone). All of these compounds were detected at low concentrations and at a low frequency; also, only phenol and dinitrophenol had been positively linked to former site operations. Due to their low frequency of detection, low concentrations, and, in the case of PCP, the PAHs, and the organic solvents, their lack of association with site operations, these chemicals were not included as indicator chemicals or evaluated in the Public Health Evaluation.

The RI found that the highest levels of soil contamination were at the surface. In several locations, EPA field investigations detected metal concentrations well above background levels from the ground surface down to a depth of 17 feet. The highest concentrations of metals (arsenic and chromium) in the subsurface soils were associated with the narrow gauge rail line and drip shed areas toward the east of the PWP facility, and along the railroad tracks.

The RI also showed that the ground water beneath the PWP facility was contaminated. Ground water samples taken from 12 monitoring wells and 21 temporary wells contained levels of copper, chromium and arsenic that exceeded applicable standards. The contaminant with the highest concentration in ground water was chromium. Higher concentrations of metals were found in the shallow aquifer, but some leakage from the shallow aquifer into the deeper aquifer was evident. The RI also indicated that the ground water flow in both the shallow and deep aquifers was in an easterly direction toward the wetlands east of the PWP facility, and that it was possible that one or both aquifers discharged to the wetlands area. The 1987 ROD estimated that, at the current estimated flow rates of approximately 4 meters/year in the shallow aquifer, contaminated ground water might reach the wetlands in 100 years.

Risk evaluations for the possible effects of contaminant concentrations indicated that there would be significant cancer risks for children playing on the Site if it was redeveloped. Three exposure pathways for the Site were determined to be potentially "complete" (i.e., involved a source, transport medium, receptor and route of exposure). These pathways included: (1) direct contact with contaminated soils at the Site; (2) ingestion of contaminated ground water in the vicinity of the Site; and (3) inhalation of contaminated dust particles transported from the Site by wind entrainment. For the soil pathway, potential receptors included children living near the Site and inspectors and maintenance workers for the nearby railroad tracks under the current use scenario, and onsite construction and industrial workers under the future use scenario. Potential receptors for the ground-water pathway included nearby residents who used ground water for drinking water supply (current use scenario) and industrial workers (future use scenario). Inhalation of contaminated dust was considered a viable pathway for nearby residents and workers at a nearby pallet company (now no longer operating) under the current use scenario, and construction and industrial workers under the future use scenario. Based on the risk evaluations, EPA determined that the remediation of the soil and ground water was necessary to protect human health and the environment.

An FS was conducted to analyze the remedial alternatives. EPA evaluated each of the alternatives for soil and ground water remediation based on cost, technical feasibility, institutional requirements, and the degree of protection of human health and the environment.

The basis for taking action at the Site was the presence of hazardous substances (i.e., copper, chromium, and arsenic and other metals) detected in site environmental media, primarily soil and groundwater. Several of these contaminants were determined to be present at the Site at levels of significant concern, due to frequency of detection and/or concentration of detected compound. Based on the RI/FS, it was concluded that a remedial action was appropriate to prevent exposure to contamination at the Site, and to prevent migration of contamination.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria include:

1. Overall Protectiveness of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

EPA issued the ROD on September 30, 1987. Based on the results of the Site's RI/FS, EPA determined that remediation of soil and ground water would be required for the protection of human health and the environment. After issuing the 1987 ROD, EPA divided the Site into two OUs. OU1 addresses the soil remedial action and OU2 addresses the ground water remedial action.

OU1

The remedial action objective (RAO) established in the 1987 ROD for soil is:

- Protecting public health and the environment by preventing exposure to contaminated on-site soils through inhalation, direct contact and erosion of soils into surface waters and wetlands.

Components of the soil remedy selected in the 1987 ROD included:

- Soil excavation above cleanup levels summarized in Table 2, and flushing with an acidic solution, followed by placement of treated soil in the original excavation trench where natural aeration would be supplemented by tilling and compaction.

The ROD presented three soil contaminants of concern (COCs): copper, chromium and arsenic. The ROD and the 2008 Amendment to the ROD (AROD) stated that copper in the Site's soil does not pose a health risk. Therefore, a cleanup goal was not established for copper.

The ROD specified a cleanup level of 627 mg/kg for chromium in soil; this was based on a site-specific evaluation of the soil exposure pathway with the most significant risk from chromium (inhalation of dust by nearby residents).

The ROD and 2008 AROD presented two cleanup levels for arsenic in soil. A health-based cleanup level of "less than 1" mg/kg arsenic in soil was based on a risk level of 10^{-6} and a site-specific evaluation of the soil exposure pathway with the most significant risk from arsenic (ingestion of soil by potential future employees at the site). The ROD also presents a cleanup level of 200 mg/kg for arsenic in soil, which was proposed by the Agency for Toxic Substances and Disease Registry (ATSDR) and supported by EPA Headquarters. As stated in the ROD, ATSDR believed that the health-based cleanup goal of less than 1 mg/kg was unrealistic, unachievable and overly conservative, and recommended that the allowable health-based soil cleanup criteria should be approximately 200 mg/kg if the Site is to be considered a potential future residential area.

Table 2: Soil COC Cleanup Goals

Soil COC	ROD Cleanup Goal (mg/kg)
Arsenic	
ATSDR-based cleanup level (mg/kg)	200
Health-based cleanup level (mg/kg)	<1
Chromium	
Health-based cleanup level (mg/kg)	627

The 200 mg/kg goal is the cleanup goal and is consistent with the limited post-remedy soil sampling data available. See Section 6.4 for more information.

On September 21, 1993, EPA issued an Explanation of Significant Differences (ESD) to the 1987 ROD. The 1993 ESD stated that in 1988, EPA conducted national studies that revealed that flushing soils with a solution containing acidic water and sodium metabisulfite would reduce the chromium in soils to a trivalent state. Based on these studies, EPA determined during the remedial design RD stage for OU1 that flushing the soils with an acidic water/sodium metabisulfite solution would be a more effective and cost efficient remedy for OU1 than washing the soils with an acidic water solution alone. The ESD also called for solidification and stabilization of the contaminated soils after chromium was reduced by the acid water/sodium metabisulfite solution. EPA determined that this alternative would save significant time in the design stage.

OU2

The RAOs established in the 1987 ROD for ground water include:

- Preventing off-site movement of contaminated ground water.
- Restoring contaminated ground water to levels protective of human health and the environment.

Components of the ground water remedy selected in the 1987 ROD included:

- Extraction of contaminated ground water above health-based levels summarized in Table 3 below, treatment by filtration and ion exchange on site, and discharge of treated ground water to the City of Cayce's Publicly-Owned Treatment Works (POTW) via a nearby sewer line.

Based on national pilot tests of three treatment plants (with flow rates of 25 gallons per minute) utilizing the ferrous iron method of heavy metal reduction and precipitation, and a pilot study conducted at the Site, EPA issued the 1993 ESD. This ESD determined that the ferrous iron system, rather than the ion exchange system, would be the best system for the reduction and precipitation of heavy metals in the ground water at OU2. The results of the pilot study indicated that discharge of the treated ground water from the ferrous iron system would be in full compliance with provisions of the City of Cayce's Sewer Use Ordinance; the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977; the General Pretreatment Regulations for existing and new sources of pollution; and other applicable regulations promulgated and adopted by SCDHEC and the City of Cayce. The results also indicated that the system allowed identification of waste sludge characteristics.

The 1993 ESD noted that this treatment system produces a nonhazardous sludge. Thus, operating costs for the aquifer remediation system at OU2 should be substantially less over the life of the project for disposal of nonhazardous metal sludge, as opposed to hazardous metal sludge.

The 2008 AROD changed the pump-and-treat ground water remedy to an in-situ anaerobic bioremediation (ISAB) treatment remedy involving the injection of substrate into ground water and treatment of the contamination in place. The AROD also changed the cleanup goals for arsenic, chromium and copper to match current maximum contaminant levels (MCLs), as shown in Table 3. In addition, the AROD required that institutional controls be added to all properties where the site ground water contamination exceeds the cleanup goals as revised through the AROD. EPA determined that restrictions on the use of ground water during implementation of the remedy were necessary because the concentrations of hazardous substances in the ground water would not immediately allow unlimited use and unrestricted exposure.

Table 3: Ground Water COC Cleanup Goals

Ground water COC	ROD Cleanup Goal (µg/L)	ROD Amendment Cleanup Goal (µg/L)[a]
Arsenic	50	10
Chromium	50	100
Copper	1,000	1,300

[a] All values are Federal Safe Drinking Water Act MCLs.

4.2 Remedy Implementation

OU1

EPA began the OU1 remedial design on April 14, 1988, and completed it on September 29, 1988. EPA began the OU1 remedial action on September 28, 1988, and completed it on February 8, 1989. EPA's removal program excavated, treated, solidified and replaced approximately 12,688 cubic yards of soil, eliminating the potential for off-site contaminant migration.

Based upon EPA information, EPA created 16 waste cells or "monoliths" of various shapes and volumes. The depths of the monoliths varied, both between cells and within certain cells, but ranged from 2 - 12 feet below ground surface (bgs). EPA buried the monoliths across the original PWP facility property. A Ground Penetrating Radar (GPR) Survey of monolith locations was performed by GS2 Engineering as part of a 2006 - 2007 EPA study. Appendix G shows the estimated monolith locations.

OU2

EPA began the OU2 remedial design on February 8, 1989, and completed it on June 10, 1994. EPA began the OU2 remedial action on September 25, 1996. The ground water pump-and-treat system consisted of four recovery wells upgradient of the wetland boundary, six extraction wells along the wetland boundary, and eight monitoring wells. The disposal system consisted of the effluent line and the City of Cayce main tie-in. Under subcontract from Camp, Dresser and McKee Inc. (CDM), EPA contractor OHM Remediation Services Corporation (OHM) constructed the pump-and-treat system approximately 600 feet east of the original PWP facility on property currently owned by SCE&G.

The pump-and-treat system's Operational and Functional period began after a 7-day operational performance test, which concluded on October 15, 1996. EPA signed a Preliminary Close Out Report on September 30, 1997. By 2004, the pump-and-treat system had greatly reduced the lateral and vertical extent of ground water contamination. However, routine monitoring of the extraction wells in 2004 revealed that the chromium concentrations had either reached cleanup goals or stabilized near 150 micrograms per liter (µg/L). EPA subsequently shut the system down on July 1, 2004 and began

evaluating alternative approaches for treating total chromium in ground water where concentrations remained above the cleanup goal.

EPA plume maps prepared in 2008 showed a chromium plume in both the shallow and deep ground water zones. At its widest points, the shallow zone plume stretched approximately 350 feet east-west and 200 feet north-south, and the deep zone plume stretched approximately 325 feet east-west and 200 feet north-south. The shallow zone plume extended below the two parcels comprising the original PWP facility to the east underneath the railroad corridor and three private parcels. The deep zone plume extended below two parcels east of the railroad corridor. In addition, an isolated deep zone plume was located near the pump-and-treat system on another parcel located further east – the same parcel where the pump-and-treat system was located. A map showing these plumes is presented in Appendix H.

In 2007, Black & Veatch evaluated ISAB treatment of remaining hexavalent chromium in ground water and in soil where an isolated area of leachable chromium had been identified. Prior to the treatment study Black & Veatch determined that residual hexavalent chromium leaching from soils did not appear to be a significant issue and it was unlikely that a larger scale treatment approach for soil at the Site would be required. However, to address this isolated area of leachable chromium, Black & Veatch targeted the subsurface soil within the soil boring (SB) SB-106 area for treatment via emulsified vegetable oil (EVO) (Emulsified Oil Substrate (EOS)® 600) injections. See Appendix I for the soil boring location. At the conclusion of the test, the solid phase chromium concentration ranged from 32 mg/kg to 97 mg/kg, without a clear trend resulting from the treatment. The synthetic precipitation leaching procedure (SPLP) chromium concentrations did not show significant treatment effects.

The concurrent ground water treatment pilot study indicated that the EOS® 600 injection at MW-10 was very effective at enhancing the biological reduction of hexavalent chromium and achieving the cleanup goal for total chromium. Based on the pilot test results, EPA selected ISAB as the remedy to treat ground water contamination from that point forward. EPA documented this remedy change in the 2008 AROD. Black & Veatch conducted a full-scale treatment using ISAB between January and March of 2009.

The ISAB treatment included the installation of several permeable treatment walls. The permeable treatment walls consist of a carbon solution containing both sodium lactate and EVO. Black & Veatch applied EVO and sodium lactate through the direct injection of a dilute aqueous solution of the amendments into the aquifer. Specific treatment components included the following:

- Injecting the carbon amendment using Direct Push Technology (DPT) in the area east of the railroad tracks that has permeable soils (January 26 to February 4, 2009).
- Distributing the carbon source in the tight soils in the area west of the railroad tracks (Permeable Treatment Wall #1) via pneumatic fracturing (February 23 to March 9, 2009).

See Appendix H for the location of injection points and the distribution of the chromium plume prior to the injections.

Additional activities conducted by Black & Veatch since 2009 include the following:

- Abandoning select monitoring and recovery/extraction wells (Phase 1, April 2009).
- Demolishing the pump-and-treat system, including all buildings, foundations, equipment, and supplies (October 2009).
- Abandoning all influent and effluent collection and distribution piping (October 2009).
- Abandoning select monitoring and recovery/extraction wells (Phase 2, September 2010).

4.3 Operation and Maintenance (O&M)

The Long-Term Response Action phase for the OU2 remedy began on October 1, 1997. Long-term response action is the operation of ground water or surface water treatment systems for a period of up to ten years after the remedy becomes operational and functional. OHM, the constructor, implemented the remedial action under subcontract with CDM. In May 2002, CDM began contracting directly with EA Services for O&M of the treatment system. In the mid-2000s, Black & Veatch assumed the role of EPA's primary contractor for the Site, but EA Services continued as the O&M subcontractor. O&M continued until EPA shut down the ground water pump-and-treat system in 2004.

Following the ISAB injections in 2007, Black & Veatch completed 2-month (May 11-13, 2009), 4-month (July 21-22, 2009), 6-month (September 22-23, 2009), 12-month (March 22-26, 2010), and 15-month (June 14-18, 2010) post-injection ground water sampling events. These events were conducted in compliance with the approved Final Remedial Action Work Plan and measured post-injection ground water conditions at the Site.

In September 2010, Black & Veatch completed the revised ISAB operation and maintenance plan (O&M plan) to detail ISAB performance monitoring at the Site. The O&M plan explains that:

- Site access will be required prior to conducting either routine maintenance or performance monitoring/ground water sampling.
- In general, routine maintenance will consist of well access, road inspection and gate inspection.
- Performance monitoring will consist of ground water sampling of the remaining monitoring wells GMW05, GMW06, GMW07, GMW08, GMW14S, GMWi4D, MWIO, MWI2, MW15, MW16 and MW17.
- Annual ground water performance monitoring sampling events are scheduled for June 2011 and June 2012.

In October 2010, EPA transferred the Site to SCDHEC for O&M. SCHDEC's contractor performed the annual ground water performance monitoring sampling event on October 25-26, 2011.

The 2008 AROD notes that implementation of amended ground water remedy would require approximately six months including the planning phase, with follow-on monitoring for a period of 4.5 years.

The present worth cost for the groundwater remedy O&M for five years, as presented in the Amended ROD, is $215,354. The calculated average annual O&M costs derived are estimated at $43,071 ($215,354/5 = $43,071). SCDHEC took over O&M of the Site in October 2010. The table below reflects O&M costs since that time.

Table 4: State Annual O&M Costs

Date Range	Total Cost (rounded to the nearest $1,000)
October 1, 2010-September 30, 2011	$0
October 1, 2011-December 31, 2011	$6,000 (State)

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2007 FYR for the Site stated the following:

"The remedy at OU 1 is protective of human health and the environment. The remedy at OU 2 is currently protective of human health and the environment, while institutional controls will be needed to ensure the protectiveness of the remedy in the long-term until remediation goals are achieved."

The 2007 FYR included five issues and recommendations. Each recommendation and its status is discussed below.

Table 5: Progress on Recommendations from the 2007 FYR

Section	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
5.1	Determine the ground water remedy at the site – reactivation of the groundwater extraction and treatment system or implementation of the in-situ treatment system.	EPA	October 2009	EPA implemented ISAB ground water injections.	01/26/2009
5.2	Ground water monitoring should be continued.	EPA & SCDHEC	October 2008	EPA conducted a baseline ground water monitoring event prior to ISAB application, and monitoring has since continued.	12/8/2008
5.3	A drinking water well survey should be conducted to determine the current extent of groundwater use in the area.	EPA	October 2008	No official water well survey was conducted; EPA periodically monitored three private drinking water wells throughout the ISAB remedial action (from April 2008 – June 2010) and all results were non-detect. EPA collected samples on the following dates:	4/28/08 05/11/09 07/21/09 09/22/09 03/25/10 06/16/10
5.4	Implement institutional controls to prevent use of contaminated ground water, and to ensure the continued integrity of the soil remedy.	EPA & SC DHEC	October 2009	Institutional controls have not been implemented.	
5.5	Label and lock all remaining monitoring wells on site.	EPA	October 2008	All monitoring wells were labeled and locked.	10/1/2010

5.1 Final Ground Water Remedy

EPA issued an AROD on August 15, 2008, that changed the pump-and-treat remedy to an ISAB treatment remedy. EPA performed the ISAB injections between January 26, 2009 and March 9, 2009.

5.2 Ongoing Ground Water Monitoring

After issuing the 2008 AROD, EPA conducted a baseline ground water monitoring event on December 8, 2008, prior to ISAB application. EPA's contractor then completed 2-month (May 11-13, 2009), 4-month (July 21-22, 2009), 6-month (September 22-23, 2009), 12-month (March 22-26, 2010), and 15-month (June 14-18, 2010) post-injection ground water sampling events to monitor post-injection ground water conditions. In October 2010, EPA transferred the Site to SCDHEC for O&M. SCHDEC's contractor performed the annual ground water performance monitoring sampling event required in the 2010 O&M plan. The O&M plan's next performance monitoring sampling event is scheduled for June 2012.

5.3 Drinking Water Well Survey

EPA did not conduct an official water well survey. However, EPA periodically monitored the three known private drinking water wells located along Pallet Drive, south of the pre-ISAB injection plume area. EPA collected samples on the following dates: 4/28/08; 05/11/09; 07/21/09; 09/22/09; 03/25/10; and 06/16/10. All samples were non-detect. The other residences along Pallet Drive are connected to the public water supply.

5.4 Implementation of Institutional Controls

EPA has not issued institutional controls to prevent use of contaminated ground water and to ensure the continued integrity of the soil remedy. According to a 2009 EPA evaluation examining the risk of exposure to soil adjacent to the monoliths, the risk associated with the soils near the monolith is within the acceptable risk range for a future adult construction worker. Currently two monitoring wells have chromium concentrations above the cleanup goal. Monitoring will continue until cleanup goals for the remaining ground water COCs have been met.

5.5 Labeling and Locking of all Remaining Monitoring Wells

EPA labeled and locked all remaining on-site monitoring wells, prior to transferring the site to the state.

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated the FYR in September 2011 and scheduled its completion for June 2012. The EPA site review team was led by EPA Remedial Project Manager (RPM) Giezelle Bennett and included EPA site attorney Matthew Hicks, EPA Community Involvement Coordinator (CIC) Linda Starks, and contractor support provided to EPA by Skeo Solutions. In November 2011, EPA held a scoping call with the review team to discuss the Site and items of interest as related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In February 2012, a public notice was published in *The State* newspaper announcing the commencement of the FYR process for the Site, providing contact information for Giezelle Bennett, the RPM, and Linda Starks, the CIC, and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of this advertisement.

The FYR Report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated site repository: Lexington Main Library, 5440 Augusta Road (U.S. Highway 1), Lexington, South Carolina 29072.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the ROD, AROD, ESD, remedial action reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. Applicable requirements are those cleanup standards, standards of control,

and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate. To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include MCLs under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated ground water or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with the chemical-specific ARARs identified in the ROD. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Ground Water ARARs

According to the 2008 AROD, cleanup goals for ground water COCs are based on the federal Safe Drinking Water Act National Primary Drinking Water Regulations and South Carolina MCLs in Drinking Water. ARARs from the 2008 AROD were compared to the current federal Primary Drinking Water Regulations and South Carolina MCLs (Table 6). No ground water COC ARARs have changed since the 2008 AROD.

Table 6: ARAR Review for Ground Water COCs

Contaminant of Concern	2008 AROD ARAR (µg/L)	Current ARAR (µg/L)[a]	ARAR Change
Arsenic	10[b]	10	None
Chromium	100	100	None
Copper	1,300	1,300	None

[a] The National Primary Drinking Water Regulations are available at: http://water.epa.gov/drink/contaminants/index.cfm (accessed 1/10/2012). The South Carolina MCLs are available at: http://www.scdhec.gov/environment/water/regs/r61-58.pdf (accessed 1/10/2012). These two sources currently have the same standards for the three ground water COCs.
[b] The 2008 AROD stated that the federal MCL for arsenic was 10 µg/L, and that the South Carolina MCL for arsenic was 50 µg/L. The more stringent (10 µg/L) standard is presented in this table.

Soil ARARs

Cleanup goals for soil were not based on ARARs. The 1987 ROD states that, under the Resource Conservation and Recovery Act (RCRA), "the recommended remedy for soil contamination includes excavation and soil flushing. This is an on-site remedial action which meets the technical requirement of this regulation." The soil remedy at the Site included excavation and soil flushing. No other ARARs for soil are specified in the 1987 ROD or the 2008 AROD.

6.4 Data Review

OU1

EPA conducted studies of the monoliths in 1993 and 2009 to evaluate their durability. Researchers collected monolith core samples and soil samples near monolith/soil interfaces. Between 2006 and 2007, EPA's contractor, Black & Veatch, investigated the feasibility of treating chromium in soil to reduce persistent elevated chromium concentrations in ground water. Black & Veatch collected soil samples for both chromium and arsenic to inform its investigation.

Based on the monolith and soil sampling results, no exceedances of the ROD cleanup goal for chromium (627 mg/kg) in either soil or monolith samples were identified. No exceedances of the ROD cleanup goal for arsenic (200 mg/kg) in soil samples were identified. None of the monolith samples collected as part of the 2009 monolith study exceeded the 200 mg/kg cleanup goal for arsenic. Black & Veatch summarized that arsenic levels reported in the 1993 monolith study ranged between 197 to 217 mg/kg for samples collected from the monolith waste at the soil/monolith interfaces (outer 1 centimeter of the monolith). Sampling results are presented in Appendix J.

The central conclusion of the 2009 monolith study was that the monoliths were durable and that leaching of cement binder and COC metals at the monolith edges was minimal and not expected to affect ground water. Additional information from the 1993 and 2009 monolith studies is presented briefly below.

Monolith Studies (1993 and 2009)

In May 1993, EPA contracted with the University of Cincinnati's Department of Civil and Environmental Engineering to conduct an initial investigation of the durability of the monoliths. In 2009, EPA tasked Black & Veatch to follow up on the work performed by the University of Cincinnati.

The University of Cincinnati collected four 2-inch monolith core samples. Two core samples were collected from the soil/top-of-monolith interface, two core samples were collected from the soil/edge-of-monolith interface, and two surface soil samples were collected from an area of the Site believed to be uncontaminated (S1 and S2). The monolith portions of the cores comprised the top/side 1 centimeter (cm) of the monolith; the soil portions of the cores comprised 1-cm sections above the top/side of the monolith. A map showing the sampling locations was not available for this FYR.

Black & Veatch collected six 2-inch core samples from monolith waste cell #11 and three subsurface soil samples from locations at the interface with the monolith, adjacent to the monolith edge core samples. See Appendix G for sample locations. Black & Veatch also prepared a composite sample of surface soil (collected from above the monolith) and a composite sample of the monolith core samples to create five monolith to soil mixtures at ratios of 1:1, 1:2, 1:4, 1:8, and 1:16 (dry weight). Comparative average concentrations for monolith core samples collected in 1993 and 2009 are presented below.

Table 7: Average Concentrations of COC in Monolith Core Samples

Contaminant of Concern	University of Cincinnati (1993) (mg/kg)	Black & Veatch (2009) (mg/kg)
Arsenic	108.8	133.7
Chromium	157.5	202.0
Copper	108.0	119.0

Regarding the comparisons, Black & Veatch stated that since the COC concentrations are as high (or higher) in the 2009 samples, no depletion of the COCs due to overall leaching of the monoliths is indicated. It is likely that any differences observed are due to variations in the concentrations of the COCs in the treated soils, or in the amounts of cement added between the different monoliths at the Site.

Black & Veatch made the following conclusions and recommendations:

"The durability of the PWP Site solidified/stabilized wastes (monoliths), as emplaced, based on physical measurements (moisture content, bulk and dry density, unconfined compressive strength) indicate that the monoliths have remained stable in the environment during the 20 to 21 year period since their emplacement and/or during the 15 to 16 year period since these measurements were previously made. No evidence indicating any adverse change in physical condition was obtained. Evidence of leaching of cement binder and COC metals at the monolith edges (particularly on the side edges) was indicated; however, the leaching appears to be very minor and not likely to indicate

a possibly adverse condition, either presently or long-term, with regard to groundwater contamination."

Black & Veatch also recommended additional long-term dynamic testing to help predict the long-term leaching, rate of leaching and toxicity behavior of the possible disturbed monolith and monolith/soil mixtures (or both), if they are to be placed at the site surface and not disposed of in a municipal landfill.

OU2

Historical sampling data (through 2007) are presented in Appendix K. After the 2002 FYR, the only COC that continued to exceed the cleanup goal was chromium. In November 2008, EPA's contractor installed three new monitoring wells (MW-15, MW-16 and MW-17) to confirm detections of total chromium identified in June 2006 and to provide additional ground water sampling locations for ISAB performance monitoring. Between 2009 and 2010, EPA's contractor abandoned 26 monitoring and recovery/extraction wells.

EPA's contractor, Black & Veatch, collected ground water sampling data between 2008 and 2011, including baseline ground water samples prior to the ISAB injections that were performed in 2009. Following the ISAB injections, EPA's contractor performed a series of incremental sampling events to monitor the effect of the ISAB injections. O&M sampling required in the updated O&M plan required two additional sampling events: one each in 2011 and 2012.

By March 2010 (12-month sampling event), approximately one year after the ISAB injections, chromium concentrations had reduced to below the chromium cleanup goal for all sampled wells (see Figures 3 - 4). In June 2010 (15-month), chromium concentrations remained below the cleanup goal for all sampled wells. Following the June 2010 sampling event, EPA abandoned recovery wells RW-02, RW-04 and extraction EW-5.

SCDHEC's contractor, synTerra, performed the most recent sampling event in October 2011. The contractor collected ground water samples from the wells using low-flow sampling techniques using either a peristaltic pump or Grundfos submersible pump, depending on the depth to water measured in each well. The contractor submitted the ground water samples to an analytical lab for analysis of total chromium by EPA Method 6010c and other parameters.

In October 2011 (31-month sampling event), chromium concentrations remained below the cleanup goal for all 11 remaining wells, except GMW-07, a shallow monitoring well, and GMW-08, a deep monitoring well. These two wells are located approximately 100 feet apart. Between June 2010 and October 2011, chromium concentrations increased from 7 µg/L to 730 µg/L in GMW-07 and from 72 µg/L to 220 µg/L in GMW-08. Isoconcentration maps based on October 2011 sampling results are presented in Appendix L.

The EPA RPM indicated that turbidity may have been a factor in the increases. EPA's standard Nepholometric Turbidity Unit (NTU) for turbidity is <10. However, on the days of the October 2011 sampling event (October 25-October 26), turbidity NTU readings were marked only as <20 or >20 for all sampled wells. The NTU readings for GMW-07 and GMW-08 were both marked as <20. In the sampling log, turbidity is marked as "CLR" for both wells for each recorded purge increment. The contractor used a peristaltic pump to purge and sample both wells. Approximately 1 gallon was purged from each of the wells. The purge time was 14 minutes for GMW-07 and 20 minutes for GMW-08. Appendix M includes a summary of ground water sampling analytical data for samples collected from 2008 until 2011, including field chemistry results.

Of the remaining nine wells (shallow and deep) with chromium concentrations below the cleanup goal, chromium concentrations decreased slightly between June 2010 and October 2011 for six wells and increased slightly for three wells. Appendix H shows the extent of ground water contamination prior to the ISAB injections; Appendix L shows the extent of ground water contamination based on October 2011 sampling results.

Figure 3: Ground Water Sampling Results for Total Chromium – Shallow Wells (December 2008 – October 2011)

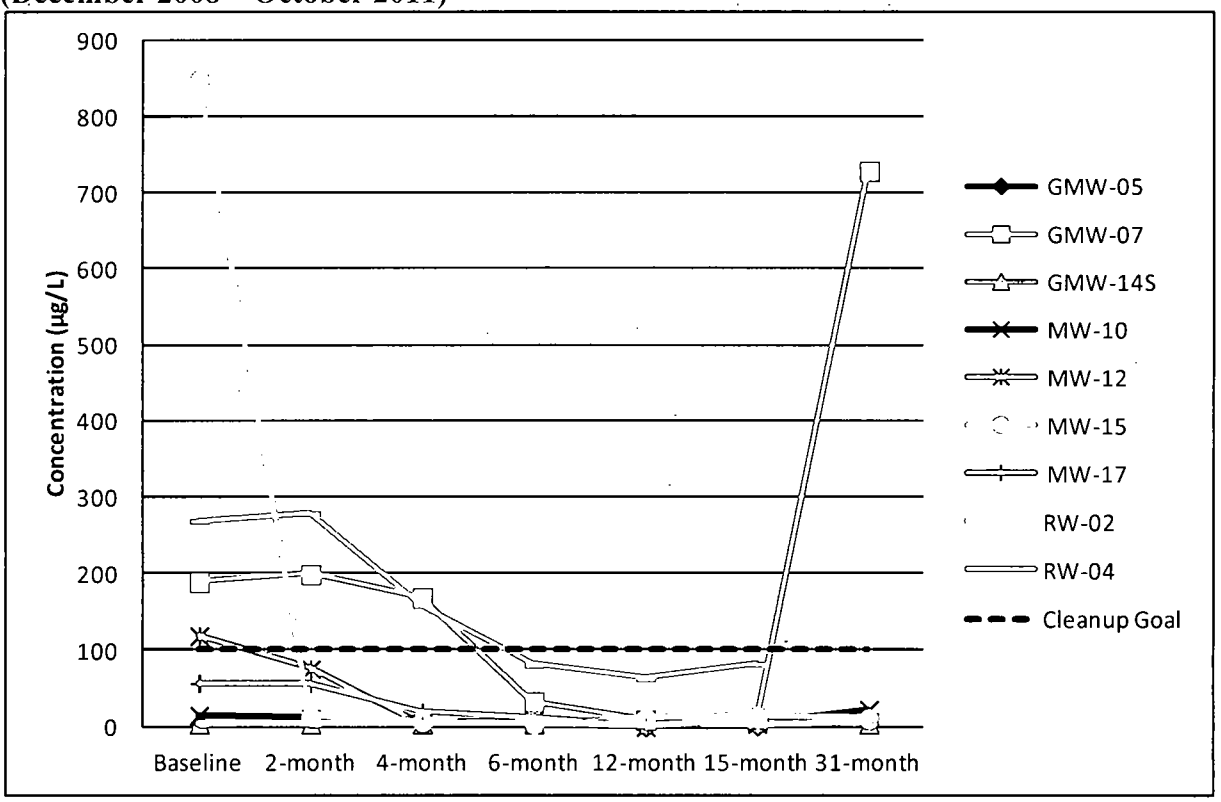
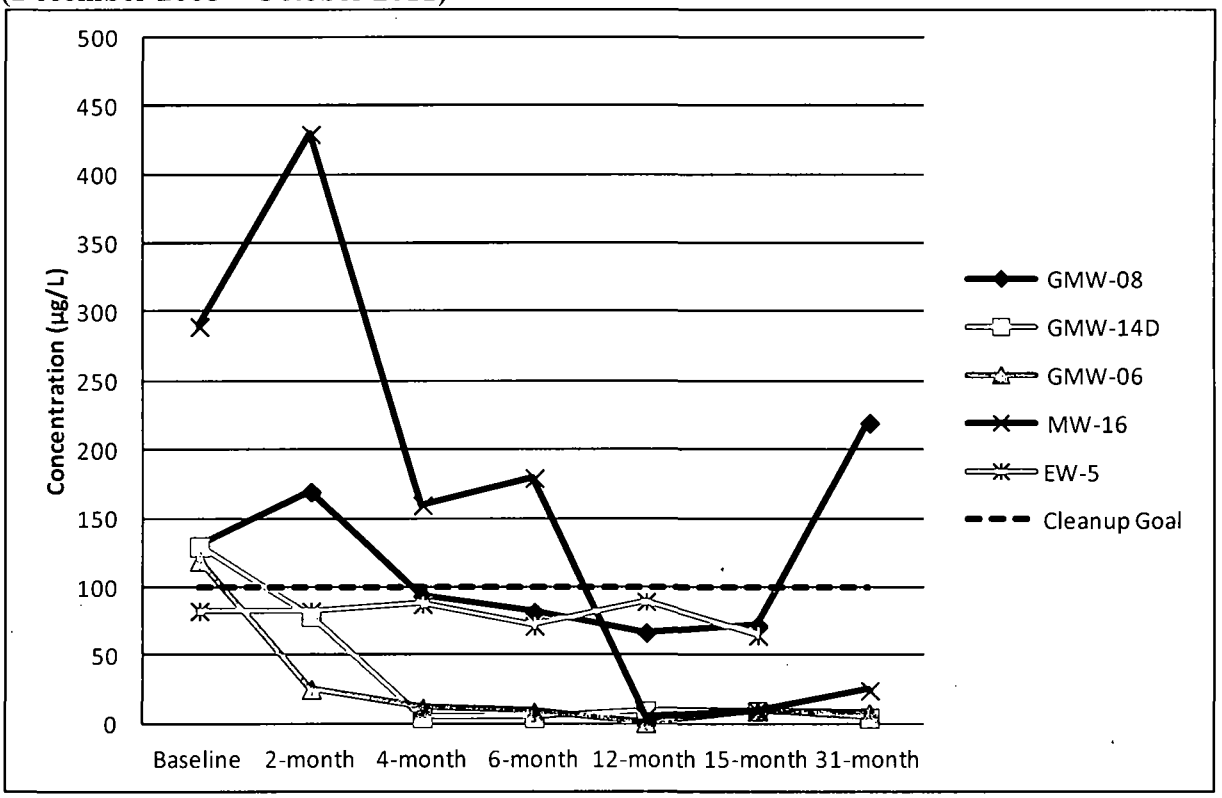


Figure 4: Ground Water Sampling Results for Total Chromium – Deep Wells (December 2008 – October 2011)



Given the suspect October 2011 sampling results for GMW-07 and GMW-08, all remaining wells should be re-sampled. If results from the re-sampling event suggest that the exceedances are persistent, SCDHEC should perform the contingency analyses outlined in the current O&M plan, which include analyses for lactate and propionate concentrations to monitor the degradation and distribution of the injected carbon substrate as well as analysis for select geochemical parameters.

Irrespective of the results, additional ground water sampling events should be scheduled beyond the one remaining sampling event required in the current O&M plan (i.e., the sampling event for 2012).

6.5 Site Inspection

On December 6, 2011, Charles Williams, III and Kayse Jarman, SCDHEC, and Treat Suomi and Eric Marsh, Skeo Solutions, met at the Site. Charles Williams, III and Kayse Jarman, SCDHEC, gave a tour of the Site. The group toured the Site to observe the condition of all remedial components:

- Three active monitoring wells on the original PWP facility property.
- Eight active monitoring wells on three additional nearby properties.
- Access to all active monitoring wells.
- Fencing and signage surrounding the main site property.

- Area where water treatment system had operated until it was shut down in 2004 and then demolished and removed in 2009.
- Abandoned monitoring wells.

The Site was well maintained and the remedy appeared to be in working order. However, at the time of the site inspection the 2011 ground water monitoring event had not been completed. Skeo Solutions staff took photographs of remedial components. For a full list of site inspection activities, see the Site Inspection Checklist in Appendix D. For photographs of the Site, see Appendix E.

As part of the site inspection, Skeo Solutions staff visited the designated site repository, Lexington Main Library. The repository contained one public health report and two CD-ROMs. The first CD-ROM contains numerous documents through October 1993 (although the CD-ROM is dated Nov. 2003). The second CD-ROM (dated August 2008) contains numerous documents from the 2000s and is current up through the 2008 AROD.

Institutional controls for the original PWP facility property or nearby affected properties have not been enacted. Previously, EPA negotiated access agreements with property owners for access to monitoring wells. After EPA transferred the Site to the state, SCDHEC renewed these access agreements with the property owners. Access agreements are in place for four properties. Individual access agreements are discussed in the current O&M plan.

Table 8 describes institutional control issues associated with areas of interest at the Site. The 2008 AROD requires ground water institutional controls until drinking water standards are met. EPA did not place ground water institutional controls on affected properties following the ISAB injections in 2009 because of the treatment's success in reducing chromium concentrations to below the cleanup goal for all sampled wells by March 2010. As discussed in section 6.4, total chromium concentrations remained below the cleanup goal for all sampled wells through the June 2010 (15-month) sampling event. However, during the latest sampling event (October 2011), chromium concentrations in two wells exceeded the chromium cleanup goal and suggest that institutional controls may be needed on affected properties. Further investigation of the chromium exceedances will clarify the issue.

Table 8: Institutional Control (IC) Summary Table

Parcel Number	OU or Area of Interest	Contaminated Media	ICs Needed?	ICs required by ROD?	IC Objective	IC Instrument in Place
006899-01-004	OU1 - Bellinger et al. Property	Monoliths, Soil,	Yes, TBD	No[1]	-Inform any future purchasers/developers of the presence of the monoliths. -Limit future use to appropriate commercial and industrial uses.	None
006899-01-028	OU1 - SCE&G Property	Monoliths, Soil,	Yes, TBD	No[1]	-Inform any future purchasers/developers of the presence of the monoliths -Limit future use to appropriate commercial and industrial uses.	None
006899-01-012	OU2 Captain Property	Ground Water	TBD	Yes, 2008 AROD	Prevent exposure to contaminated ground water during implementation of the remedy.	None
006899-01-011	OU2 Palmer Property	Ground Water	TBD	Yes, 2008 AROD	Prevent exposure to contaminated ground water during implementation of the remedy.	None
006899-01-029 006899-01-005 006899-01-010 006899-01-013 006900-01-10	Surrounding private property	None	No	No	NA	NA

Notes:

[1] Although decision documents do not specify that ICs are required for site soils or monoliths, EPA's FYR IC guidance suggests considering whether current conditions on site now indicate that ICs or other remedial action components are necessary as interim or final measures to help ensure protectiveness. The position that ICs might be required for site soils and monoliths is based upon the following:

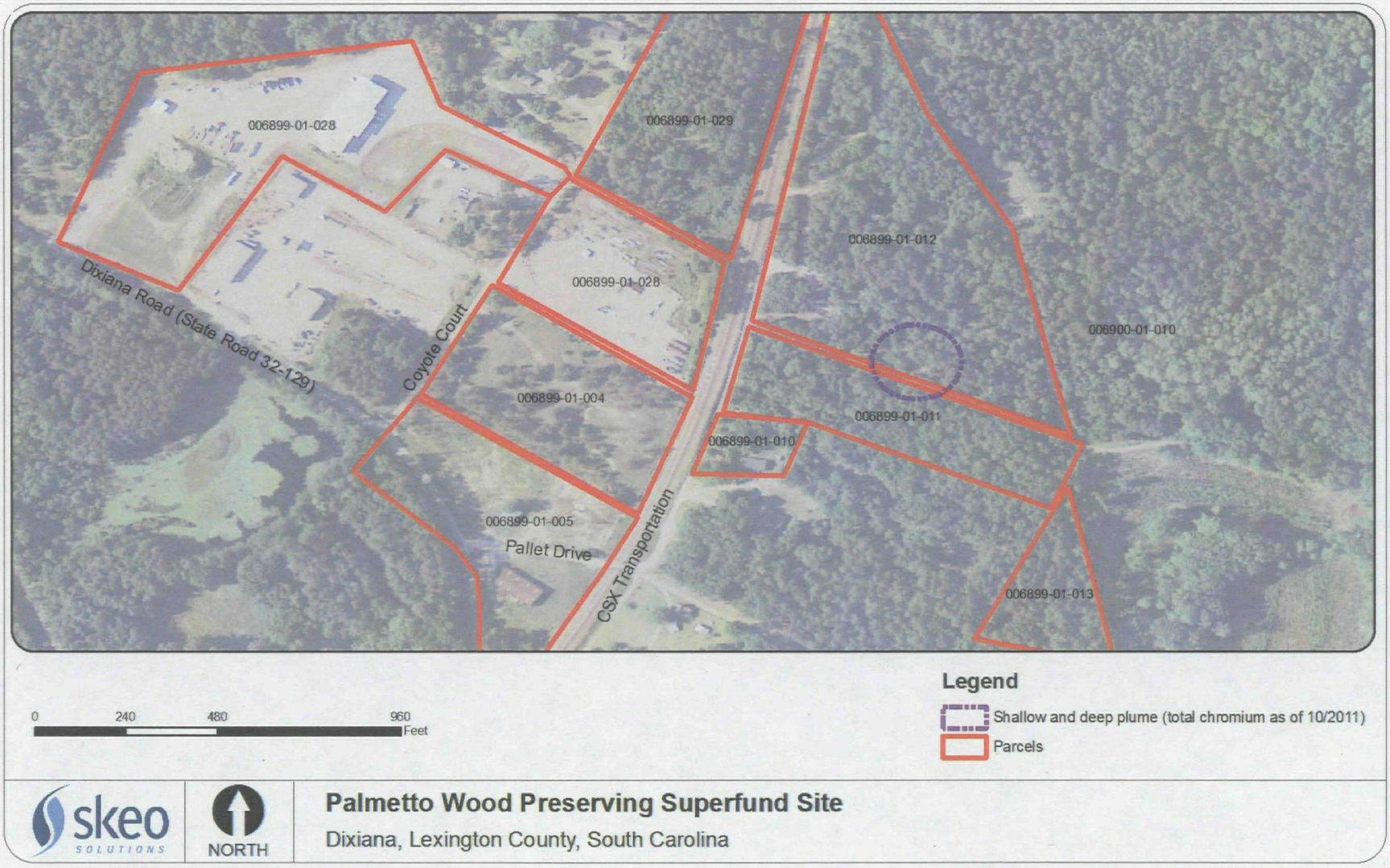
1) The 1997 FYR notes that, "Upon completion of this remedy, hazardous substances will remain on-Site in a state (i.e., a monolith) that precludes unlimited use and unrestricted exposure."

2) The 2008 AROD notes that, "the site's soil remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure."

3) EPA's 2009 *Human Health Risk Evaluation Soil Adjacent to Monolith, Palmetto Wood Preserving Site, Dixiana, Lexington County South Carolina* concluded that, "The total estimated cancer risk for the future adult construction worker was calculated to be 2×10^{-6} indicating that the calculated cancer risk is within the EPA target cancer risk range of 1×10^{-6} to 1×10^{-4}." The study does not specify that the exposures are protective for all future uses.

4) EPA's 2011 OU2 Remedial Action Completion Report states that, "The PWP Site has been characterized and remediated to levels that are protective of definable uses or reuses. Certain restrictions will be applied to the future use of the PWP property.... In its present state, the PWP property is suitable for commercial/industrial land use. If any other use of the PWP property is considered, SCDHEC should be consulted."

Figure 5: Institutional Control Base Map



This map was created using isoconcentration maps prepared by SCDHEC's O&M contractor, synTerra, and parcel maps made available using the Lexington County website.
Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site, and is not intended for any other purpose.

6.6 Interviews

During the FYR process, interviews were conducted with parties impacted by the Site, including regulatory agencies involved in site activities or aware of the Site. The purpose of the interviews was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy that have been implemented to date. Interviews with residents were conducted during the site inspection on December 6, 2011. SCDHEC and EPA provided written responses to interview questions in January 2012. Interviews are summarized below and complete interviews are included in Appendix C.

Charles Williams, III and Kayse Jarman: Mr. Charles Williams, III and Ms. Kayse Jarman are SCDHEC representatives currently in charge of the Site. EPA transferred the Site to SCDHEC in October 2010 to oversee O&M activities. Mr. Williams, III and Ms. Jarvis remarked that, based on the latest ground water sampling results, the ISAB ground water remedy might not be as effective as originally believed. This was one of the state's major concerns before the O&M of the Site was handed to the state. Rebounding of ground water concentrations might mean additional remedial work is needed to maintain remedial goals. Mr. Williams, III and Ms. Jarman also commented that institutional controls restricting ground water use and additional ground water monitoring were needed. Mr. Williams, III and Ms. Jarman were not aware of any changes to state laws that might affect the protectiveness of the Site's remedy. Similarly, they were not aware of any changes in projected land uses at the Site.

Giezelle Bennett: Ms. Giezelle Bennett is the EPA RPM for the Site. Ms. Bennett noted that the project has exceeded expectations and that the remedy is complete. The ISAB ground water treatment saved a considerable amount of time and money. The landowners surrounding the Site also appreciate the decommissioning of the treatment system. Ms. Bennett is comfortable with the status of the institutional controls at the site. She also remarked that the community can now use the Site for redevelopment.

Resident #1: Resident #1 is aware of the environmental issues at the Site. He feels the Site's cleanup could have been performed in a more efficient manner. He has not observed any problems with emergency response, vandalism or trespassing, but he did witness a fire at the Site recently, which started from outside the site boundary. Resident #1 remarked that a year ago, EPA contacted him via a letter about the fire.[2] Resident #1 uses a private supply well for drinking. His daughter's family, who resides nearby on the same property, also uses a private well. Resident #1 has not had his well tested. Although Resident #1 remarked that ground water underneath his property flows to the east (toward the direction of the Site), Resident #1 believes that EPA should sample his well annually. He added that as the water table drops, the ground water might start flowing in a different direction.

[2] The EPA RPM indicated that the referenced letter came from a source other than EPA.

Resident #2: Resident #2 is aware of the environmental issues at the Site. He does not have concerns regarding the Site's remedy. He has not observed any problems with emergency response, vandalism or trespassing. EPA keeps Resident #2 informed. Resident #2's house and his mother's house (located on the same property) have private drinking water supply wells. Resident #2 indicated that every 3 - 6 months someone from Atlanta checks his well for chromium. Resident #2 did not have any recommendations for improving the project.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

A review of documents, ARARs, risk assumptions and the site inspection indicate that the Site's OU1 remedy is functioning as intended. In order for the remedy to function effectively in the long term, institutional controls are needed in order to inform future purchasers of the presence of the monoliths. Institutional controls might also be needed to limit future use of the original PWP facility property to appropriate commercial and industrial uses. EPA initiated the OU1 soil remedy in September 1988 and completed it in February 1989. During the remedial activities, 12,688 cubic yards of contaminated soils were excavated, treated, solidified and replaced into their original excavation cells. Based on EPA information, the remedy resulted in 16 monoliths buried at varying depths across the original PWP facility property.

EPA commissioned studies in 1993 and 2009 to evaluate monolith durability and whether COCs were leaching from the monoliths. The 2009 monolith study concluded that:

- The monoliths have remained stable in the environment during the 20-21 year period since their emplacement and/or during the 15 - 16 year period since these measurements were previously made.
- Leaching of COCs from the monoliths was minor and unlikely to contaminate ground water.

The 2007 FYR states that SCE&G has performed digging on the SCE&G property on the northern portion of the original PWP facility property. During the groundbreaking for a new project, SCE&G contractors discovered the monoliths and therefore had to discontinue the project.

OU-1 soil cleanup goals were established for arsenic and chromium. The ROD and the 2008 AROD stated that copper in the Site's soil does not pose a health risk. Therefore, a cleanup goal was not established for copper. The ROD specified a cleanup level of 627 mg/kg for chromium in soil; this was based on a site-specific evaluation of the soil exposure pathway with the most significant risk from chromium (inhalation of dust by nearby residents).

The ROD and 2008 AROD presented two cleanup levels for arsenic in soil. A health-based cleanup level of "less than 1" mg/kg arsenic in soil was based on a risk level of 10^{-6} and a site-specific evaluation of the soil exposure pathway with the most significant risk from arsenic (ingestion of soil by potential future employees at the site). The ROD also presents a cleanup level of 200 mg/kg for arsenic in soil, which was proposed by ATSDR and supported by EPA Headquarters. As stated in the ROD, ATSDR believed that the health-based cleanup goal of less than 1 mg/kg was unrealistic, unachievable and overly conservative, and recommended that the allowable health-based soil cleanup criteria should be approximately 200 mg/kg if the Site is to be considered a potential future residential area.

Currently, the 200 mg/kg cleanup goal for arsenic is not within EPA's acceptable risk range for residential land use. A soil arsenic concentration of 200 mg/kg would not be within the EPA cancer risk range (1×10^{-6} to 1×10^{-4}) for residential exposure based on current EPA default assumptions and toxicity values. This value may also be outside the risk range based on an industrial/commercial scenario, depending on the assumed bioavailability of the ingested soil arsenic. The concentration of arsenic in soil corresponding to a risk of 1×10^{-4} for a standard industrial worker, assuming no adjustment for bioavailability, is 160 mg/kg. Limited soil sampling data collected at the original PWP facility property in 2006, 2007 and 2009 suggest that arsenic in site soil is below the 160 mg/kg level associated with the default bioavailability. The highest level of arsenic detected in soil as part of the 2006, 2007 and 2009 sampling efforts were 46 mg/kg (an estimated value), 29 mg/kg (an estimated value), and 22.6 mg/kg respectively. See Appendix J. If the bioavailability were to be adjusted from 1.0 to 0.8, the concentration corresponding to a risk of 1×10^{-4} would be 200 mg/kg. EPA is currently reviewing whether to apply a default bioavailability adjustment (possibly 0.6) to arsenic in soil for human ingestion exposure. Since the highest concentration of arsenic detected on site was 46 mg/kg, there is no current unacceptable risk at the site based on an industrial/commercial scenario. If the default bioavailability value is finalized, this highest detected level will even be below residential levels. Currently, only a limited portion of the Site is being used as a storage area by occasional on-site workers and presents only a possible incidental exposure scenario.

A review of documents, ARARs, risk assumptions and the site inspection indicate that additional information is needed before it can be determined whether the Site's OU2 ground water remedy is functioning as intended by site decision documents. Sampling performed after the 2009 ground water ISAB injections indicated that the ISAB injections successfully reduced chromium, the only remaining ground water COC, in ground water to concentrations below the cleanup goal of 100 µg/L. Sampling conducted in October 2011, indicated that chromium concentrations remained below the cleanup goal for all 11 remaining wells, except GMW-07, a shallow well, and GMW-08, a deep well. These two wells are located approximately 100 feet apart. Between June 2010 and October 2011, chromium concentrations increased from 7 µg/L to 730 µg/L in GMW-07 and from 72 µg/L to 220 µg/L in GMW-08. However, the EPA RPM noted that turbidity levels might have been a factor in the increases.

Given the uncertainty regarding the October 2011 sampling results for GMW-07 and GMW-08, all remaining wells should be re-sampled. If results suggest that the exceedances are persistent, SCDHEC should perform the contingency analyses outlined in the current O&M plan, which include analyses for lactate and propionate concentrations to monitor the degradation and distribution of the injected carbon substrate as well as analysis for select geochemical parameters. Irrespective of the results, additional ground water sampling events should be scheduled beyond the one remaining sampling event required in the current O&M plan (i.e., the sampling event for 2012).

Institutional controls called for in the AROD, to restrict ground water use, are not in place. Based on the most recent (October 2011) ground water monitoring results, ground water below two properties exceeds the chromium cleanup goal. Depending upon the results of the reassessment, it may be necessary to place institutional controls on these properties until the cleanup goal for chromium is consistently met. In addition, depending upon the follow-up analysis, although it has been reported that the area is now served by municipal water, a well survey may be needed around the area of impacted ground water.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

The exposure pathways determined initially to be potentially "complete" in the 1987 Public Health Evaluation included: (1) direct contact with contaminated soils at the site; (2) ingestion of contaminated ground water in the vicinity of the Site; and (3) inhalation of contaminated dust particles transported from the Site by wind entrainment. Completed exposure pathways 1 and 3 apply to OU1 soil and completed exposure pathway 2 applies to OU2 ground water.

The RAO established in the 1987 ROD for OU1 soil includes:

- Protecting public health and the environment by preventing exposure to contaminated on-site soils through inhalation, direct contact and erosion of soils into surface waters and wetlands.

The RAOs established in the 1987 ROD for OU2 ground water include:

- Preventing off-site movement of contaminated ground water.
- Restoring contaminated ground water to levels protective of human health and the environment.

The exposure assumptions and RAO for OU1 remain valid. The Site includes two parcels that are fenced and secured as well as an area of potentially contaminated ground water located east of site. The main site property is vacant and unused. The SCE&G parcel, formerly part of the PWP facility, located directly north of the main site property is used by SCE&G for heavy equipment storage. Although in use, it does not appear that SCE&G staff access the parcel apart from periodically loading and unloading equipment. Any exposure to residual contamination by on-site workers would likely be incidental. Because of soil cleanup actions, it is assumed that exposure to residual site contamination via direct contact or inhalation is unlikely. Similarly, ingestion of contaminated soil is unlikely.

Some toxicity data for OU1 soil contaminants have changed since the 1987 Public Health Evaluation (see Appendix O). The 1987 Public Health Evaluation evaluated risk from copper, chromium and arsenic. The 1987 ROD and 2008 AROD state that copper in the Site's soil does not pose a health risk. The toxicity values indicate that copper is now considered slightly less toxic than was assumed in the 1987 Public Health Evaluation (see

Appendix O). Therefore, the conclusion that copper in the Site's soil does not pose a health risk is still valid. There have been no changes to the chromium toxicity values that would affect the protectiveness of the soil cleanup levels.

The exposure assumptions and RAOs for OU2 remain valid. There have been no changes to OU2 ground water ARARs. Cleanup actions have reduced the contaminated plume to an isolated and very small area. In addition, according to the 2011 OU2 Remedial Action Completion Report, the area is now served by municipal water. There are three private drinking water wells located near the Site, however these wells are located south of the plume area. In addition, a private well used for drinking water is located north/northwest of the site, in the opposite direction of ground water flow.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that could call into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

A review of documents, ARARs, risk assumptions and the site inspection indicate that the Site's OU1 remedy is functioning as intended. In order for the remedy to function effectively in the long term, institutional controls are needed in order to inform future purchasers of the presence of the monoliths. Institutional controls might also be needed to limit future use of the original PWP facility property to appropriate commercial and industrial uses.

Currently, the 200 mg/kg cleanup goal for arsenic is not within EPA's acceptable risk range for residential land use. A soil arsenic concentration of 200 mg/kg would not be within the EPA cancer risk range (1×10^{-6} to 1×10^{-4}) for residential exposure based on current EPA default assumptions and toxicity values. This value may also be outside the risk range based on an industrial/commercial scenario, depending on the assumed bioavailability of the ingested soil arsenic. The concentration of arsenic in soil corresponding to a risk of 1×10^{-4} for a standard industrial worker, assuming no adjustment for bioavailability, is 160 mg/kg. Limited soil sampling data collected at the original PWP facility property in 2006, 2007 and 2009 suggest that arsenic in site soil is below the 160 mg/kg level associated with the default bioavailability. The highest level of arsenic detected in soil as part of the 2006, 2007 and 2009 sampling efforts were 46 mg/kg (an estimated value), 29 mg/kg (an estimated value), and 22.6 mg/kg respectively. See Appendix J. If the bioavailability were to be adjusted from 1.0 to 0.8, the concentration corresponding to a risk of 1×10^{-4} would be 200 mg/kg. EPA is currently reviewing whether to apply a default bioavailability adjustment (possibly 0.6) to arsenic in soil for human ingestion exposure. Since the highest concentration of arsenic detected on site was 46 mg/kg, there is no current unacceptable risk at the site based on an industrial/commercial scenario. If the default bioavailability value is finalized, this highest detected level will even be below residential levels. Currently, only a limited

portion of the Site is being used as a storage area by occasional on-site workers and presents only a possible incidental exposure scenario. In addition, in 2009, EPA reevaluated the site risk based upon the sampling that was done as part of the 2009 study examining the durability of the monoliths. EPA's study concluded that the cancer risk for the future construction worker was $2x10^{-6}$ which is within EPA's target risk range. The study also concluded that the hazard index was 0.2, below the target level of 1.

The exposure assumptions and RAO for OU1 remain valid. There have been no changes to the chromium toxicity values that would affect the protectiveness of the soil cleanup levels.

A review of documents, ARARs, risk assumptions and the site inspection indicate that additional information is needed before it can be determined whether the Site's OU2 ground water remedy is functioning as intended by site decision documents. Sampling performed after the 2009 ground water ISAB injections indicated that the ISAB injections successfully reduced chromium, the only remaining ground water COC, to concentrations below the cleanup goal of 100 µg/L. Sampling conducted in October 2011, indicated that chromium concentrations remained below the cleanup goal for all 11 remaining wells, except GMW-07 and GMW-08, located approximately 100 feet apart. Between June 2010 and October 2011, chromium concentrations increased from 7 µg/L to 730 µg/L in GMW-07 and from 72 µg/L to 220 µg/L in GMW-08. However, the EPA RPM noted that turbidity levels might have been a factor in the increases. Given the suspect October 2011 sampling results for GMW-07 and GMW-08, all remaining wells should be re-sampled. If results suggest that the exceedances are persistent, SCDHEC should perform the contingency analyses outlined in the current O&M plan, which include analyses for lactate and propionate concentrations, to monitor the degradation and distribution of the injected carbon substrate as well as analysis for select geochemical parameters. Irrespective of the results, additional ground water sampling events should be scheduled beyond the one remaining sampling event required in the current O&M plan (i.e., the sampling event for 2012).

Institutional controls called for in the AROD, to restrict ground water use, are not in place. Based on the most recent (October 2011) ground water monitoring results, ground water below two properties exceeds the chromium cleanup goal. Depending upon results of the reassessment, it may be necessary to place institutional controls on these properties until the cleanup goal for chromium is consistently met. In addition, depending upon the reassessment results, although it has been reported that the area is now served by municipal water, a well survey might need to be conducted around the area of impacted ground water. The exposure assumptions and the RAOs for OU2 remain valid. There have been no changes to ground water ARARs.

8.0 Issues

Table 9 summarizes the current site issues.

Table 9: Current Site Issues

Issue	Affects Current Protectiveness (Yes or No)	Affects Future Protectiveness (Yes or No)
Institutional controls are not in place on the original PWP facility property to inform purchasers/developers of the presence of the monoliths or to limit future use of the original PWP facility property to appropriate commercial and industrial uses.	No	No
Chromium concentrations in ground water exceeded the cleanup goal in two wells during the 2011 ground water sampling event.	No	Yes
Institutional controls called for in the 2008 AROD are not in place to restrict ground water use.	No	Yes
A well survey in the area where chromium concentrations in ground water exceeded the cleanup goal in 2011 may be needed.	No	Yes

9.0 Recommendations and Follow-up Actions

Table 10 provides recommendations to address the current site issues.

Table 10: Recommendations to Address Current Site Issues

Issue	Recommendations / Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No)	
					Current	Future
Institutional controls are not in place on the original PWP facility property to inform purchasers/ developers of the presence of the monoliths or to limit future use of the original PWP facility property to appropriate commercial and industrial uses.	Implement institutional controls to inform any future purchasers/developers of the presence of the monoliths. Evaluate the need to implement institutional controls to limit future use of the original PWP facility property to appropriate commercial and industrial uses. Modify the remedy through a decision document to add the institutional control requirements.	SCDHEC	EPA/ SCDHEC	01/31/2013	No	No
Chromium concentrations in ground water exceeded the cleanup goal in two wells during the 2011 ground water sampling event.	Resample the monitoring wells to analyze the cause of the recent chromium exceedances and, if necessary, take appropriate follow-up steps that may include implementation of the O&M plan. Irrespective of results, annual monitoring should be extended beyond the one remaining sampling event required in the current O&M plan.[3]	SCDHEC	EPA/ SCDHEC	08/31/2012	No	Yes
Institutional controls called for in the 2008 AROD are not in place to restrict ground water use.	If, after evaluating the nature of the chromium exceedances, it is determined that ground water is not meeting the chromium cleanup goal, implement institutional	SCDHEC	EPA/ SCDHEC	01/31/2015	No	Yes

[3] The results should be plotted on trend graphs as on Figures 3 and 4, and in map view as in Appendix L Figures 4 and 5, except that water level elevation contours should also be presented on the map views so lateral and vertical groundwater flow directions can be included in the interpretations.

	controls restricting ground water use on those properties that have chromium in ground water above the cleanup goal.					
A well survey in the area where chromium concentrations in ground water exceeded the cleanup goal in 2011 may be needed.	If, after evaluating the nature of the chromium exceedances, it is determined that ground water is not meeting the chromium cleanup goal, assess the need for a well survey in the affected ground water area.	SCDHEC	EPA/ SCDHEC	01/31/2013	No	Yes

10.0 Protectiveness Statements

The remedy at OU1 currently protects human health and the environment because the monoliths remain stable, leaching of COCs from the monoliths is minor and unlikely to contaminate ground water, and according to a 2009 EPA risk evaluation the threat to a future construction worker from exposure to soil adjacent to the monoliths is minimal. Currently, only a limited portion of the Site is being used as a storage area by occasional on-site workers and presents only a possible incidental exposure scenario. In order for the remedy to function effectively in the long term, institutional controls are needed in order to inform future purchasers of the presence of the monoliths. Institutional controls might also be needed to limit future use of the original PWP facility property to appropriate commercial and industrial uses.

The remedy at OU2 currently protects human health and the environment because properties in the area where chromium exceedances have been identified are on municipal water. However, in order for the remedy to be protective in the long term, institutional controls restricting ground water use may be needed on affected properties until the ground water cleanup goal for chromium is consistently achieved. In addition, a water well survey might be needed to confirm there are no private wells located around the area of impacted ground water. Whether institutional controls and a well survey are needed will depend upon a follow-up evaluation to determine the nature of the recent chromium exceedances.

Because the remedial actions at both OUs are currently protective, the Site's remedy is protective of human health and the environment in the short term.

11.0 Next Review

The Site is a statutory site that requires ongoing FYRs as long as waste is left on site that does not allow for unrestricted use and unlimited exposure. The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

Appendix A: List of Documents Reviewed

Agency for Toxic Substances and Disease Registry. Memorandum: Health Consultation for Palmetto Wood Preserving NPL Site, Lexington Co., SC. September 1987.

Black & Veatch Special Projects Corporation. Durability of Solidified/Stabilized (Monolith) Wastes and Recommendations for Handling Disturbed Materials. Draft Report October 21, 2009. Palmetto Wood Preserving Superfund Site, Dixiana, South Carolina.

Black & Veatch Special Projects Corporation. Final In Situ Anaerobic Bioremediation Groundwater Pilot Study and Soil Treatment Report of Findings. January 2008. Palmetto Wood Preserving Superfund Site, Dixiana, South Carolina.

Black & Veatch Special Projects Corporation. Technical Memorandum: Human Health Risk Evaluation Soil Adjacent to Monolith Palmetto Wood Preserving Site Dixiana, Lexington County, South Carolina. Draft Report October 21, 2009. Palmetto Wood Preserving Superfund Site, Dixiana, South Carolina.

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Appendix B: Press Notice

Appendix B: Press Notice

The U. S. Environmental Protection Agency, Region 4
Announces the Five-Year Review for
the Palmetto Wood Preserving Superfund Site,
Columbia, Lexington County, South Carolina

Purpose/Objective: The United States Environmental Protection Agency (EPA) is conducting a Five-Year Review of the remedy for the Palmetto Wood Preserving Superfund site (the Site) located southwest of Columbia, South Carolina. The purpose of the Five-Year Review is to ensure that the selected cleanup actions effectively protect human health and the environment.

Site Background: The Site consists of two adjacent parcels, which are 3.6 acres and 1.3 acres in size, respectively. The Site is located in the rural community of Dixiana, approximately one-and-a-half miles southeast of West Columbia and four miles south of Cayce, South Carolina. The site is located on Dixiana Road, approximately one half-mile northeast of Interstate 26. Land uses in the surrounding area are a mixture of single-family homes and light industrial businesses. The site is a decommissioned wood preserving facility that operated from 1963 to 1985. When the company ceased operations in 1985, all equipment was removed from the site. Site investigations identified contamination in soil and the shallow aquifer at the Site and surrounding areas. Soil and ground water contamination resulted from wood treatment solutions that dripped from drying timbers to the soil, where they percolated into the ground water. EPA proposed the Site for listing on the National Priorities List (NPL) in September 1983; the Site was finalized on the NPL on September 21, 1984.

Cleanup Actions: EPA selected a cleanup plan for the Site in September 1987, signing a Record of Decision (ROD) to address site ground water and soil contamination. The soil remedy was initiated in September 1988 and completed in February 1989. The ground water pump-and-treat remedy operated from October 1996 through July 2004. In 2008, EPA issued a ROD Amendment to change the ground water remedy from pump-and-treat technology to an in-situ anaerobic bioremediation (ISAB) treatment remedy. The updated remedy involved the injection of nutrients into ground water to enhance the natural breakdown of remaining contaminants.

Five-Year Review Schedule: The National Contingency Plan requires that remedial actions that result in any hazardous substances, pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure the protection of human health and the environment. The Five-Year Review for the Site will be completed by June 2012.

EPA Invites Community Participation in the Five-Year Review Process: EPA is conducting this Five-Year Review to evaluate the effectiveness of the Site's remedy and to ensure that the remedy remains protective of human health and the environment. As part of the Five-Year Review process, EPA staff members are available to answer any questions about the Site. Community members who have questions about the Site or the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

Giezelle Bennett, EPA Remedial Project Manager
Phone: (404) 562-8824
Email: bennett.giezelle@epa.gov

Linda Starks, EPA Community Involvement Coordinator
Phone: (404) 562-8487
Email: starks.linda@epa.gov

Mailing Address: U.S. EPA Region 4, 61 Forsyth Street, S.W., 11th Floor, Atlanta, GA 30303-8960

Additional site information is available at the Site's local document repository, located at Lexington Main Library, 5440 Augusta Road (U.S. Highway 1), Lexington, SC 29072, and online at:
http://www.epa.gov/region4/waste/npl/nplsc/palmwdsc.htm.

Appendix C: Interview Forms

Appendix C: Interview Forms

Palmetto Wood Preserving Superfund Site **Five-Year Review Interview Form**

Site Name: Palmetto Wood Preserving **EPA ID No.:** SCD003362217
Interviewer Name: Treat Suomi and Eric Marsh **Affiliation:** Skeo Solutions
Subject Name: Resident 1 **Affiliation:** Resident

Time: 11:00 A.M. **Date:** 12/06/2011
Interview Location: Resident's house

Interview Format (circle one): In Person Phone Mail Other:

Interview Category: Residents

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   I am completely aware. I've been living here for 40 years and my wife has been living here for 65 years. I got SCDHEC on those people.

2. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)?

   I think a whole lot of money has been wasted. If SCDHEC and EPA would have went in there when I reported the problem, then there would have been a whole lot of money saved.

3. What have been the effects of this Site on the surrounding community, if any?

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No. There was a fire there recently but that was caused by something from outside the Site, like a cigarette.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

   At one time I got a letter from EPA – to check in and see what it was. I got the letter a year ago.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

   I am on a private well that I use for drinking water; so is the house next to me. I own the house next to me; my daughter and her family live there. I haven't had my well tested.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   I think at least once per year that EPA should sample my well. I am aware that the ground water is running east; but as the water table drops, the ground water may begin flowing in a different direction.

Palmetto Wood Preserving Superfund Site **Five-Year Review Interview Form**

Site Name: Palmetto Wood Preserving **EPA ID No.:** SCD003362217
Interviewer Name: Treat Suomi and Eric Marsh **Affiliation:** Skeo Solutions
Subject Name: Resident 2 **Affiliation:** Resident

Time: 11:30 A.M. **Date:** 12/06/2011
Interview Location: Resident's house

Interview Format (circle one): (In Person) Phone Mail Other:

Interview Category: Residents

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes.

2. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)?

   No issues.

3. What have been the effects of this Site on the surrounding community, if any?

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

   Feel ok. EPA keeps me informed about what is going on.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

   My house and my mother's house (located approximately 200 feet to the north of Resident 2's house) have private wells, which is used for drinking. Every 3-6 months they check our water – someone from Atlanta. They check it for chromium.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   No.

Palmetto Wood Preserving Superfund Site **Five-Year Review Interview Form**

Site Name: Palmetto Wood Preserving **EPA ID No.:** SCD003362217
Interviewer Name: Treat Suomi and Eric Marsh **Affiliation:** Skeo Solutions
Subject Name: Chuck Williams, III, Kayse Jarman **Affiliation:** SCDHEC
Subject Contact Information:
Time: 11:00 A.M. **Date:** 01/11/2012
Interview Location: SCDHEC
Interview Format (circle one): In Person Phone Mail (Other: Email)

Interview Category: State Agency

1. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)?

   The project is moving forward. Based on the last sampling results, the remedy might not be as effective as originally believed. This was one of SCDHEC's major concerns before the O&M of the site was handed to the State. Rebounding of groundwater concentrations may mean additional remedial work is needed to maintain remedial goals.

2. What is your assessment of the current performance of the remedy in place at the Site?

   There was not enough time to evaluate the long-term effectiveness of the remedy after the last round of injections. The State is concerned that there is a possibility we will see rebounding groundwater concentrations which could require additional injections or other remedial actions to maintain groundwater concentrations below remedial goals.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   No.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   Yes. The State has taken over O&M of the site and conducts an Annual Groundwater Sampling Event.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are

the associated outstanding issues?

There should be deed restrictions on groundwater use.

7. Are you aware of any changes in projected land use(s) at the Site?

   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   The Site will need continued monitoring to make sure the remedy is still being effective.

Palmetto Wood Preserving Superfund Site **Five-Year Review Interview Form**

Site Name: Palmetto Wood Preserving **EPA ID No.:** SCD003362217
Interviewer Name: Treat Suomi and Eric Marsh **Affiliation:** Skeo Solutions
Subject Name: Giezelle Bennett **Affiliation:** EPA
Subject Contact Information: 404-562-8824 / bennett.giezelle@epa.gov
Time: 11:00 A.M. **Date:** 01/23/2012
Interview Location: Atlanta, GA

Interview Format (circle one): In Person Phone Mail Other (Email)

Interview Category: EPA Remedial Project Manager

1. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)?

   The project has exceeded expectations. The new in-situ treatment saved a considerable amount of time and money. The landowners surrounding the Site also appreciate the decommissioning of the treatment system.

2. What have been the effects of this Site on the surrounding community, if any?

   Community can use the Site for redevelopment.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities since the implementation of the cleanup?

   No

4. What is your assessment of the current performance of the remedy in place at the Site?

   Complete success!

5. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   Yes

6. Are you aware of any community concerns regarding the Site or the operation and management of its remedy? If so, please provide details.

   No.

7. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   Remedy is complete.

Appendix D: Site Inspection Checklist

Appendix D: Site Inspection Checklist

Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST	
I. SITE INFORMATION	
Site Name: Palmetto Wood Preserving	**Date of Inspection: 12/6/11**
Location and Region: West Columbia, SC, Region 4	**EPA ID:** SCD003362217
Agency, Office or Company Leading the Five-Year Review: Skeo Solutions	**Weather/Temperature: Low 70s and partly cloudy**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls
- ☐ Other: Solidification of contaminated soil into on-site monoliths; ground water pump-and-treat system has been dismantled and removed; 2008 remedy included installation of trenched and direct push permeable treatment walls to treat remaining ground water contamination.

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** — See "3. Local Regulatory Authorities and Response Agencies" (Name) _____ (Title) mm/dd/yyyy (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____
2. **O&M Staff** — _____ (Name) _____ (Title) mm/dd/yyyy (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

Agency SCDHEC
Contact Charles J. Williams, III and Kayse Jarman (Name) | Project Manager (Title) | 06/07/2011 (Date) | 803-896-4162 (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone No.)
Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: Available in SCDHEC file room. Current O&M maintenance activities are detailed in the 2011 Annual Performance Monitoring Report.

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks: Available in SCDHEC file room. Up to date through October 2010.

3. **O&M and OSHA Training Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Available in SCDHEC file room. Up to date through October 2010.

4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
7.	**Ground Water Monitoring Records**	☒ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			

IV. O&M COSTS

1.	**O&M Organization**	
	☒ State in-house	☒ Contractor for state
	☐ PRP in-house	☐ Contractor for PRP
	☐ Federal facility in-house	☐ Contractor for Federal facility
	☒ EPA contractor	

2. **O&M Cost Records**

☒ Readily available ☒ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: $215,354 ☐ Breakdown attached

Total annual cost by year for review period if available

From: 10/01/2007 Date	To: 09/30/2008 Date	NA Total cost	☐ Breakdown attached
From: 10/01/2008 Date	To: 09/30/2009 Date	NA Total cost	☐ Breakdown attached
From: 10/01/2009 Date	To: 09/30/2010 Date	$88.57 Total cost	☐ Breakdown attached
From: 10/01/2010 Date	To: 09/30/2011 Date	$0 Total cost	☐ Breakdown attached
From: 10/01/2011 Date	To: 12/31/2011 Date	$5,501 Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Both properties that have monoliths on site are fenced and secured with locked gates.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

Type of monitoring (e.g., self-reporting, drive by): ICs have not been implemented

Frequency: _____

Responsible party/agency: SC DHEC

Contact _____ _____ mm/dd/yyyy _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A

Remarks: The 2008 AROD calls for ground water institutional controls, which have not yet been implemented for the Site.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: None

3. **Land Use Changes Off Site** ☐ N/A

Remarks: None

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Roads and pathways are suitable to gain access to monitoring wells.

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1.	**Settlement** (low spots)	☐ Location shown on site map	☒ Settlement not evident
	Arial extent: _____		Depth: _____
	Remarks: In 1988, EPA excavated, treated, solidified and replaced 12,688 cubic yards of soil. Sixteen waste cells or "monoliths" of various shapes and volumes were created. All comments in the "Landfill Covers" section are in reference to the on-site buried monoliths.		
2.	**Cracks**	☐ Location shown on site map	☒ Cracking not evident
	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☐ Cover properly established
	☒ No signs of stress	☐ Trees/shrubs (Indicate size and locations on a diagram)	
	Remarks: _____		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☐ N□ evidence of slope instability		
	Arial extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable	☒ N/A
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		

1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
C. Letdown Channels		☐ Applicable	☒ N/A
	(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement** (Low spots)	☐ Location shown on site map	☐ No evidence of settlement
	Arial extent: _____		Depth: _____
	Remarks: _____		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type:_____		Arial extent: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Undercutting**	☐ Location shown on site map	☐ No evidence of undercutting
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Obstructions**	Type: _____	☐ No obstructions
	☐ Location shown on site map	Arial extent: _____	
	Size: _____		
	Remarks: _____		
6.	**Excessive Vegetative Growth**	Type: _____	
	☐ No evidence of excessive growth		
	☐ Vegetation in channels does not obstruct flow		
	☐ Location shown on site map	Arial extent: _____	
	Remarks: _____		
D. Cover Penetrations		☐ Applicable	☒ N/A
1.	**Gas Vents**	☐ Active	☐ Passive
	☐ Properly secured/locked	☐ Functioning	☐ Routinely sampled ☐ Good condition
	☐ Evidence of leakage at penetration		☐ Needs maintenance ☐ N/A
	Remarks: _____		

2. **Gas Monitoring Probes**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Performance Monitoring** Type of monitoring: _____

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground Water Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☒ N/A

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☒ N/A ☐ Good condition ☐ Needs maintenance

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

3. **Tanks, Vaults, Storage Vessels**

☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

4. **Discharge Structure and Appurtenances**

☒ N/A ☐ Good condition ☐ Needs maintenance

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

5. **Treatment Building(s)**

☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: Treatment system, including all buildings, foundations, equipment, and supplies, was demolished in October of 2009.

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☒ N/A

Remarks: As part of the treatment decommissioning, all influent and effluent collection and distribution piping as well as select monitoring and recovery/extraction wells were abandoned. The well abandonment was performed over two phases: Phase 1 during April 2009 and Phase 2 during September 2010.

D. Monitoring Data

1. **Monitoring Data**

☐ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: Comments are in reference to monitoring wells now being used to monitor the ISAB injection remedy. The well identification plate had fallen off one of the monitoring wells and should be re-attached.

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

OU1 (Soil Remedy)

The remedy selected for soil in the ROD consisted of excavation of soil with contaminant concentrations above cleanup levels and flushing with an acidic solution, followed by placement of treated soil in the original excavation trench where natural aeration would be supplemented by tilling and compaction. During remedial design, EPA determined that flushing the soils with an acidic water/sodium metabisulfite solution would be a more effective and cost efficient remedy for the Site than washing the soils with an acidic water solution alone. EPA subsequently issued an ESD that called for solidification and stabilization of the contaminated soils after chromium was reduced by the acid water/sodium metabisulfite solution.

EPA began the remediation for the soil (OU1) on September 30, 1988. EPA's contractor excavated, treated, solidified and replaced 12,688 cubic yards of soil, eliminating the potential for off-site contaminant migration. Based on available information, 16 waste cells or "monoliths" of various shapes and volumes were created. The depths of the monoliths varied, both between cells and within certain cells, ranging from 2 - 12 feet below ground surface (bgs). EPA evaluated the durability of the monoliths and the leachability of chromium in the monoliths in 1993 and 2009. In 2009, EPA also evaluated the risk from exposure to the monoliths to a future adult construction worker.

EPA's October 21, 2009 draft monolith durability report *(Durability Of Solidified/Stabilized (Monolith) Wastes And Recommendations For Handling Disturbed Materials)* concluded that

- The monoliths have remained stable in the environment during the 20-21 year period since their emplacement and/or during the 15 - 16 year period since these measurements were previously made.
- Leaching of COCs from the monoliths was minor and unlikely to contaminate ground water.

EPA's October 19, 2009 *Technical Memorandum: Human Health Risk Evaluation Soil Adjacent to Monolith* made the following conclusion:

The total estimated cancer risk for the future adult construction worker was calculated to be 2×10^{-6} indicating that the calculated cancer risk is within the EPA target cancer risk range of 1×10^{-6} to 1×10^{-4}. The total hazard index for future adult construction worker was calculated to be 0.2, which is below the EPA threshold of 1. This indicates that noncancer health effects will most likely not occur from future adult construction worker exposures at the site.

OU2 (Ground water Remedy)

The remedy selected for ground water in the RQD consisted of extraction of contaminated ground water above health-based levels specified in the ROD, treatment by filtration and ion exchange on site, and discharge of treated ground water to a POTW via a nearby sewer line. EPA prepared and signed an ESD in September 1993, which determined that the ferrous iron system rather than the ion exchange system would be the best system for the reduction and precipitation of heavy metals in the ground water at the Site. In 2008, a ROD Amendment changed the pump and treat remedy to an ISAB treatment remedy where substrate is injected into the ground water and the contamination is treated in place.

The ground water treatment system began operating from October 1996 through July 2004. The system was shut down in July 2004 because hexavalent chromium levels had either reached the ground water remediation goal (i.e., 100 µg/L) or had stabilized above the remediation goal for at least six quarterly events. The ISAB treatment was implemented across the PWP Site through the installation of several permeable treatment walls. The permeable treatment walls consist of a carbon solution containing both sodium lactate and EVO. The application of EVO and sodium lactate was accomplished through the direct injection of a dilute aqueous solution of the amendments into the aquifer. The injections were made in early 2009.

Groundwater samples were collected from all 14 wells from the post-injection at 2-, 4-, 6-, 12-month, and 15-month time intervals. Total chromium results from the 15-month post-injection sampling event were consistent with the 12-month post injection sampling event in that there were no wells above the cleanup goal for total chromium of 100 µg/L. The maximum total chromium concentrations have dropped from 850 J µg/L (MW-15) measured during the baseline sampling event to 83 µg/L (RW-4) measured during the 15-month sampling event.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The September 2010 O&M plan indicates that O&M activities will include: well access, road inspection, gate inspection and ground water sampling of the remaining monitoring wells GMW05, GMW06, GMW07, GMW08, GMW14S, GMW14D, MW10, MW12, MW15, MW16, and MW17. The O&M activities appear adequate. However, the O&M plan annual ground water sampling schedule only requires two rounds of post-ISAB injection sampling: once in June 2011 and once in June 2012. Additional ground water sampling might be necessary.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Site Inspection Participants:
Treat Suomi, Skeo Solutions
Charles Williams, III, SC DHEC
Kayse Jarman, SC DHEC
Eric Marsh, Skeo Solutions

Appendix E: Photographs from Site Inspection Visit

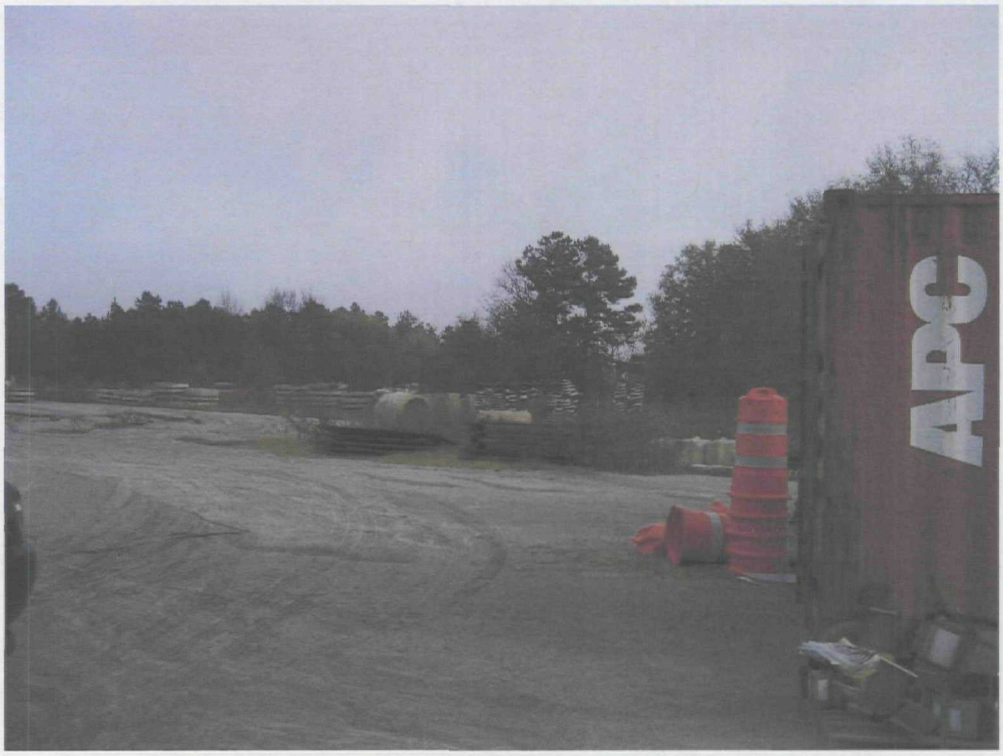
Appendix E: Photographs from Site Inspection Visit

Entrance to the main site property. The property is privately-owned. An active monitoring well and buried concrete monoliths are located on the property.

Eastern side of the main site property. A chain link and barbed-wire fence separates the property from the railroad line.

EPA sign located near the entrance of the main site property.

Entrance to the property located north and adjacent to the main site property. South Carolina Electric & Gas owns the property and uses it for equipment storage. An active monitoring well and buried concrete monoliths are located on the property.

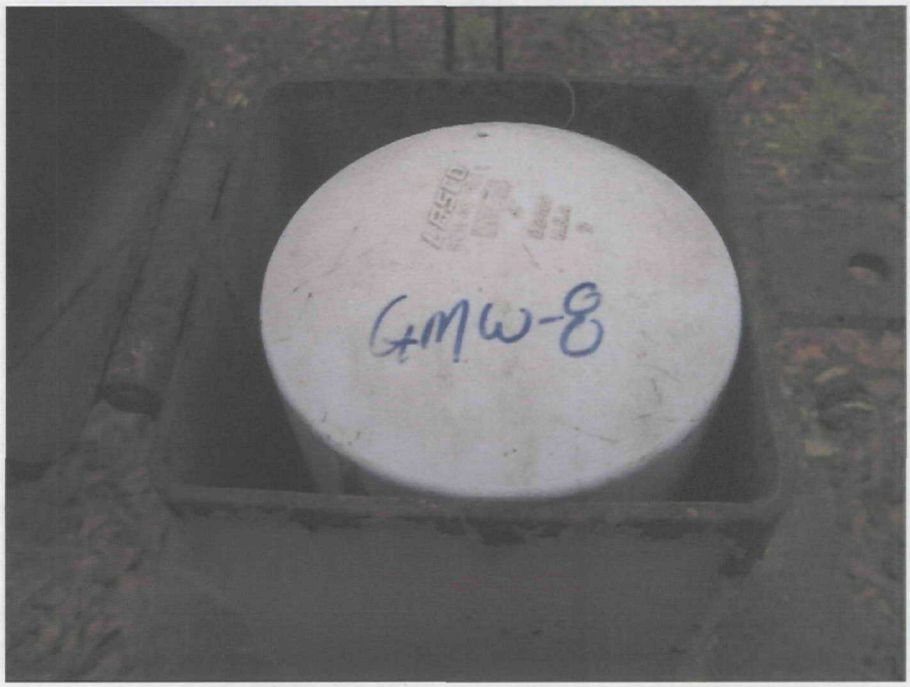


Equipment storage on the South Carolina Electric & Gas property.

Active monitoring well on the South Carolina Electric & Gas property.

Active monitoring wells located on private property east of the main site property.

Active monitoring well located on private property east of the main site property.



Active monitoring well located on private property east of the main site property.

Plugged monitoring well located on private property east of the main site property.

Active monitoring wells located on private property east of the main site property.

Location of the former ground water extraction and treatment system. EPA demolished and removed the system in July 2009. The system was located on private property east of the Site.

Appendix F: Lexington County Zoning Map and Applicable Zoning Ordinance

Appendix F: Lexington County Zoning Map and Applicable Zoning Ordinance

All tan-shaded parcels are zoned Intensive Development, or ID. The original PWP facility proerty consists of the two starred parcels. The large parcel to the east, which formerly housed the ground water treatment system, is shaded in white and is designated Restrictive Development, or RD. This map was downloaded from Lexington County's website on January 17, 2012.

Excerpts from Lexington County Zoning Ordinance
June 15, 2011

http://www.lex-co.com/departments/communitydevelopment/Documents/15JUN2011.pdf

11.40 Establishment of Districts

In order to implement the provisions of this Ordinance, the following districts are hereby established:

11.41 Restrictive Development Districts

R1 - Low Density Residential
R2 - Medium Density Residential
R3 - High Density Residential
D - Development
RA - Recreational/Agricultural
RD - Restrictive Development

11.42 *Intensive Development Districts*

LC - Limited Commercial
C1 - Neighborhood Commercial
C2 - General Commercial
ID - Intensive Development

21.31 Chart of Permitted Activities by District

Those activities that are marked by an asterisk (*) are allowed only when granted a special exception by the Board of Zoning Appeals as outlined in Article 12 of this Ordinance.

R1	R2	R3	D	RA	RD	LC	C1	C2	ID	LR	ACTIVITIES
					✓	✓	✓	✓	✓	✓	Administrative Offices
					✓		✓	✓	✓	✓	Advertising Signs
				✓	✓	✓	✓	✓	✓	✓	Airports
			✓	✓	✓				✓	✓	Animal Operations
		✓		✓	✓		✓	✓	✓	✓	Boat Docks
					✓				✓	✓	Bus and Transit Terminals
					✓			✓	✓	✓	Business Services
	✓	✓	✓	✓	✓			✓	✓	✓	Cemeteries
☑	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Child or Adult Day Care
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Churches
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Communication Towers (Limited)
					✓				✓	✓	Communication Towers (Extensive)
✓	✓	✓	✓	✓	✓			✓	✓	✓	Community Education
					✓			✓	✓	✓	Construction Services
			✓	✓	✓				✓	✓	Crops
					✓				✓	✓	Detention Centers
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Essential Services (Limited)
	✓	✓	✓	✓	✓			✓	✓	✓	Essential Services (Extensive)
✓			✓	✓	✓			✓	✓	✓	Fancier's Kennel/Cattery
				✓	✓			✓	✓	✓	Food Services
					✓			✓	✓	✓	General Repair and Maintenance Services
					✓		✓	✓	✓	✓	General Retail (Limited)
					✓			✓	✓	✓	General Retail (Extensive)
✓##	✓##	✓##	✓##	✓	✓	✓	✓	✓	✓	✓	Golf Courses
✓#	✓#	✓#	✓#	✓	✓		✓	✓	✓	✓	Group Assembly (Limited)
				✓	✓			✓	✓	✓	Group Assembly (Intermediate)
					✓			✓	✓	✓	Group Assembly (Extensive)
		✓	✓	✓	✓	✓	✓	✓	✓	✓	Group Housing
					✓		✓	✓	✓	✓	Hospitals
			✓	✓	✓			✓	✓	✓	Kennels, Catteries, and Stables
					✓				✓	✓	Landfills (Limited)
					✓				✓	✓	Landfills (Intermediate)
					✓				✓	✓	Landfills (Extensive)
					✓			✓	✓	✓	Manufacturing (Light Assembly)
					✓				✓	✓	Manufacturing (Limited)
					✓				✓	✓	Manufacturing (Intermediate)
					✓				✓	✓	Manufacturing (Extensive)
					✓			✓	✓	✓	Marinas
					✓	✓	✓	✓	✓	✓	Medical Services
					✓				✓	✓	Military Installations

R1	R2	R3	D	RA	RD	LC	C1	C2	ID	LR	ACTIVITIES	
			✓		✓			✓	✓	✓	Mining (Limited)	
					✓				✓	✓	Mining (Intermediate)	
					✓				✓	✓	Mining (Extensive)	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Mini-Parks	
					✓			✓	✓	✓	Mini-Warehouses	
	✓	✓	✓	✓	✓		✓	✓	✓	✓	Mobile Homes	
		✓			✓			✓	✓	✓	Mobile Home Parks (Limited)*	
		✓			✓			✓	✓	✓	Mobile Home Parks (Extensive)*	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Natural Reserves	
				✓	✓	✓	✓	✓	✓	✓	Non-Assembly Cultural	
☑	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Nursing Homes	
					✓		✓	✓	✓	✓	Personal Convenience Services	
			✓	✓	✓	✓	✓	✓	✓	✓	Plant Nurseries	
					✓				✓	✓	Power Plants	
					✓	✓	✓	✓	✓	✓	Professional Services	
					✓				✓	✓	Radioactive Materials Handling	
					✓				✓	✓	Railroad	
					✓				✓	✓	Recycling Centers	
					✓			✓	✓	✓	Research Services	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Residential Detached	
	✓	✓			✓	✓	✓	✓	✓	✓	Residential Attached (2 dwelling units)	
		✓			✓			✓	✓	✓	Residential Attached (3 or more dwelling units)	
☑	☑	✓	☑	☑	✓	✓	✓	✓	✓	✓	Retirement Centers/Assisted Living	
					✓				✓	✓	Salvage/Wrecking Yard	
					✓				✓	✓	Scrap Operations	
					✓		✓	✓	✓	✓	Business Parks	Speculative Development
					✓			✓	✓	✓	Shopping Centers	
					✓				✓	✓	Industrial Parks	
					✓			✓	✓	✓	Towing and Impoundment Lot	
					✓			✓	✓	✓	Trade Enterprises	
					✓			✓	✓	✓	Transient Habitation	
					✓			✓	✓	✓	Transport and Warehousing (Limited)	
					✓				✓	✓	Transport and Warehousing (Extensive)	
					✓		✓	✓	✓	✓	Transport Services	
					✓			✓	✓	✓	Undertaking	
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Utilities	
					✓			✓	✓	✓	Vehicle Parking	
					✓			✓	✓	✓	Vehicle Repair	
					✓			✓	✓	✓	Vehicle Sales	
					✓		✓	✓	✓	✓	Vehicle Servicing (Limited)	
					✓			✓	✓	✓	Vehicle Servicing (Extensive)	
				✓	✓			✓	✓	✓	Veterinarian Services	
				✓	✓				✓	✓	Zoos	

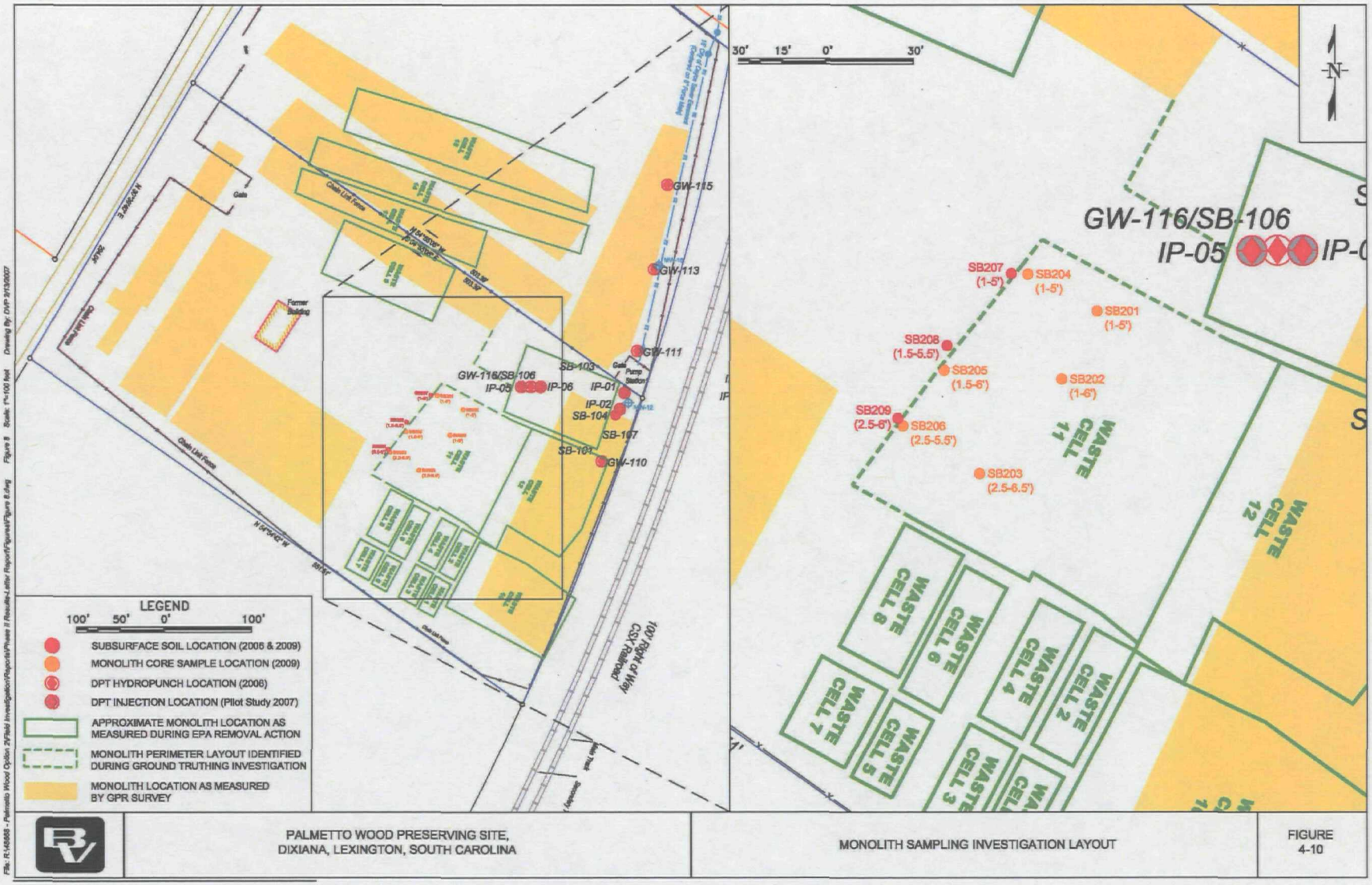
The permitting of this activity in this district is allowed only if the Group Assembly (Limited) activity is a membership facility owned, operated, and used by the property owners in the surrounding residential area for which the facility is being established.

The permitting of this activity in this district is allowed only if the Golf Course activity is part of a planned development that includes residential development as a part of its design.

☑ The permitting of this activity in this district is allowed only if the access to the activity is by an Arterial (A) or Collector (C) street.

Appendix G: Monolith Locations

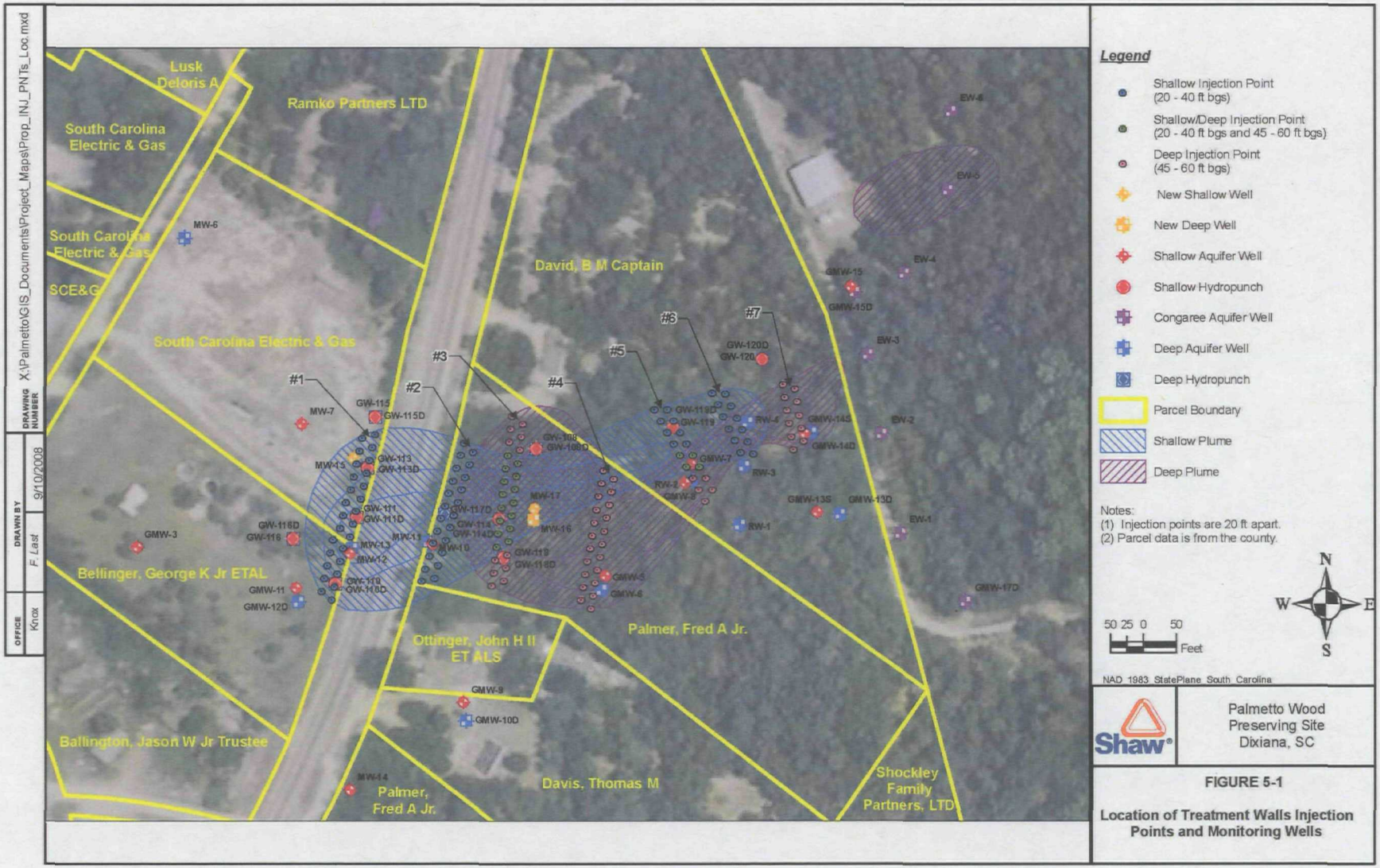
Appendix G: Monolith Locations[1]



[1] Note: A Ground Penetrating Radar (GPR) Survey of monolith locations was performed by GS2 Engineering as part of a 2006 - 2007 EPA study.

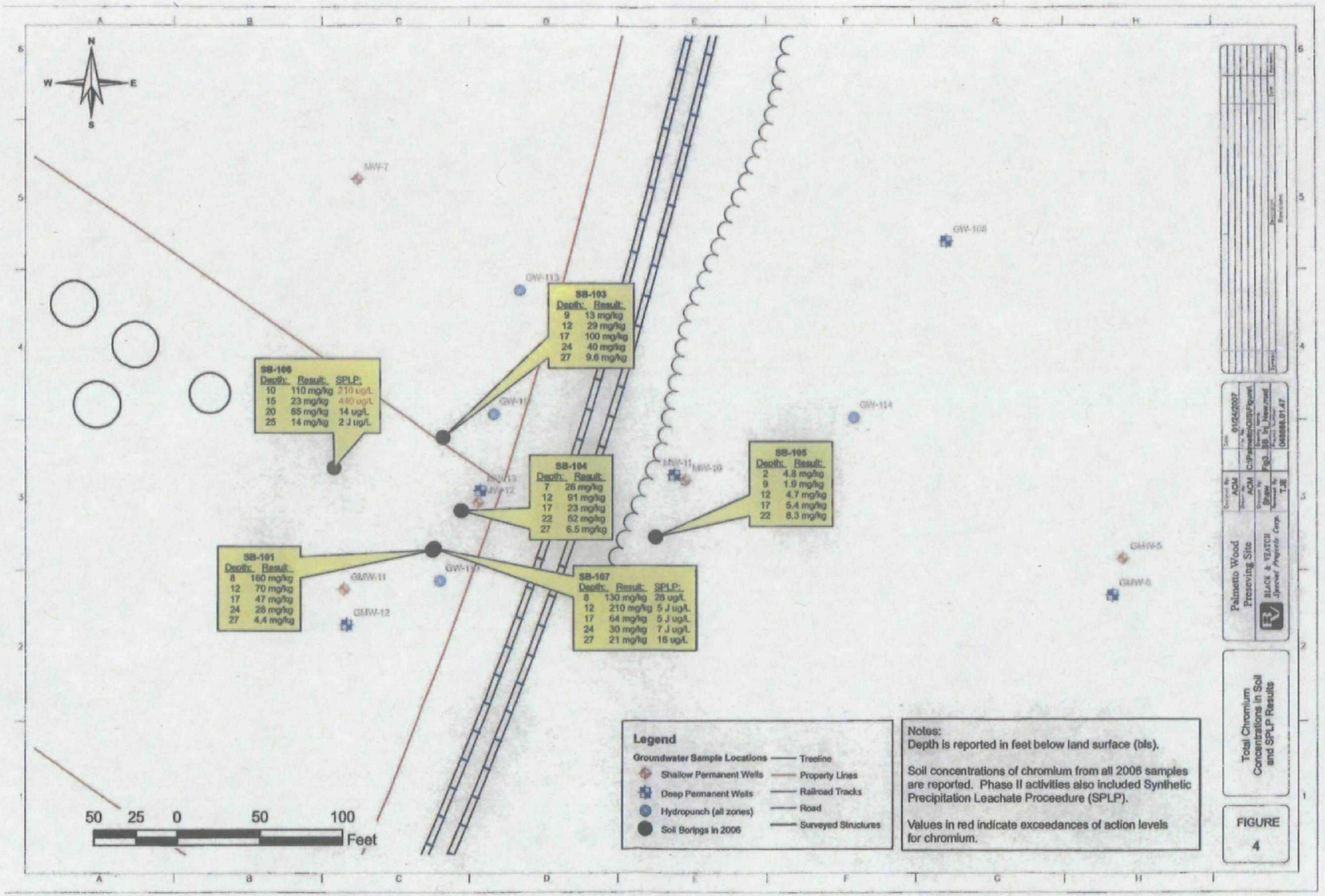
Appendix H: ISAB Injection Points and Distribution of Total Chromium Plumes Prior to ISAB Injections

Appendix H: ISAB Injection Points and Distribution of Total Chromium Plumes Prior to ISAB Injections



Appendix I: Soil Borehole Locations

Appendix I: Soil Borehole Locations



Appendix J: Monolith and Soil Sampling Data

Appendix J: Monolith and Soil Sampling Data

Monolith Studies – Soil and Monolith Sampling

In the 2009 monolith study, Black & Veatch reported summarized findings from the 1993 University of Cincinnati monolith study. Applicable parts of this summary are included below.

The University of Cincinnati measured chromium, copper, and arsenic concentrations from an area of the site believed to be uncontaminated. All concentrations were below analytical detection limits (<55 mg/kg for chromium, <22 mg/kg for copper, and <0.66 mg/kg for arsenic).

For the soils at the top edge monolith/soil interface, the University of Cincinnati measured <55 to 179 mg/kg chromium (average of <121 mg/kg), <22 to 114 mg/kg copper (average of <55.9 mg/kg), and 7 to 174 mg/kg arsenic (average of 72.1 mg/kg). For the soils at the side edge monolith/soil interface, the University of Cincinnati measured <55 to 157 mg/kg chromium (average of <86.6 mg/kg), <22 to 116 mg/kg copper (average of <53.5 mg/kg), and 2 to 194 mg/kg arsenic (average of 56.4 mg/kg).

The University of Cincinnati also measured chromium, copper and arsenic concentrations in the monolith waste itself at the soil/monolith interfaces (outer 1 cm of the monolith). Chromium ranged between 290 to 304 mg/kg for the top edge and 65 to 182 mg/kg for the side edge. Likewise, copper ranged between 141 to 159 mg/kg for the top edge and 31 to 139 mg/kg for the side edge, and arsenic ranged between 197 to 217 mg/kg for the top edge and 38 to 148 mg/kg for the side edge.

The results from monolith core and soil samples collected by Black & Veatch in 2009 are presented in the table below.

Table 1. Black & Veatch 2009 Summary of Analytical Results – Monolith Core and Soil Evaluation

Sample Number	Sample Date	Sample Type and Depth	Arsenic (ROD Goal = 200 mg/kg)	Chromium (ROD Goal = 627 mg/kg)	Copper (ROD Goal = not a health threat)
SB201_071509	7/8/2009	Monolith Core 1-5 ft bgs	134	189	115
SB202_071509	7/8/2009	Monolith Core 1-6 ft bgs	145	218	122
SB203_071509	7/8/2009	Monolith Core 2.5-6.5 ft bgs	140	218	133
SB204_071509	7/7/2009	Monolith Core 1-5 ft bgs	125	187	118
SB205_071509	7/8/2009	Monolith Core 1.5-5.5 ft bgs	127	199	112
SB206_071509	7/8/2009	Monolith Core 2.5-5.5 ft bgs	131	201	114
SB207_071509	7/7/2009	Subsurface Soil 1-5 ft bgs	6.13	65.1	8.82

Sample Number	Sample Date	Sample Type and Depth	Arsenic (ROD Goal = 200 mg/kg)	Chromium (ROD Goal = 627 mg/kg)	Copper (ROD Goal = not a health threat)
SB208_071509	7/7/2009	Subsurface Soil 1.5-5.5 ft bgs	22.6	43.2	1.98
SB209_071509	7/7/2009	Subsurface Soil 2.5-6 ft bgs	12.1	30.1	8.87
Notes -Monolith/Soil Mix samples for arsenic, chromium and copper were not analyzed. -ft/bgs indicates feet below ground surface.					

Soil Sampling from EPA's 2006 - 2007 Study Examining Treatment of Chromium in Soil as a Means to Reduce Persistent Elevated Chromium Concentrations in Ground Water

Between 2006 and 2007, EPA's contractor, Black & Veatch, also collected limited soil samples to investigate the feasibility of treating chromium in soil as a means to reduce persistent elevated chromium concentrations in ground water.

In 2006, Black & Veatch Special Projects Corporation collected samples as part of a Phase II Field Investigation. Sampling results for the three soil COCs are presented below. Soil boring (SB) locations are presented in Appendix I.

Table 2: December 5, 2006 Soil Analytical Results (Detects Only), Phase II Field Investigation (mg/kg)

Sample	Arsenic (ROD Goal = 200 mg/kg)	Chromium (ROD Goal = 627 mg/kg)	Copper (ROD Goal = not a health risk)
SB 106-10	46 J	120 J	40
SB 106-15	0.81 J	23 J	2.8 UJ
SB 106-20	2.1 J	65 J	4.8
SB 106-25	1.8 J	14 J	2.5 UJ
SB 107-12	22 J	210 J	5.3
SB 107-17	2.2 J	64 J	3.3
SB 107-24	2.1 J	30 J	13
SB 107-27	1 J	21 J	7.2
SB 107-8	27 J	130 J	3.2
SB9 107-17	2.6 J	31 J	3.2
Notes -J – indicates value estimated -UJ – analyte not detected at or above reporting limit. Reporting limit is an estimate.			

Black & Veatch completed a pilot study in 2007 that evaluated ISAB treatment of hexavalent chromium in soil and ground water. Soil sampling results collected before and after the pilot test are presented below.

Table 3: Bioremediation Soil Treatment Results – for Soil COCs

	Sample	Arsenic (ROD Goal = 200 mg/kg)	Chromium (ROD Goal = 627 mg/kg)	Copper (not a health risk)
SB106 Upgradient,	3/27/2007, baseline	29 J	90 J	29 J

	Sample	Arsenic (ROD Goal = 200 mg/kg)	Chromium (ROD Goal = 627 mg/kg)	Copper (not a health risk)
10 feet bgs	4/30/2007, 1st month post injection	5.3	60 J	7.8
	5/30/2007, 2nd month post injection	1.1 R	49 J	8.3
	6/25/2007, 3rd month post injection	24 J	75 J	26 J
SB106 Upgradient, 10 feet bgs, duplicate	3/27/2007, baseline	15 J	72 J	19 J
	4/30/2007, 1st month post injection	2.5	35 J	4.6
	5/30/2007, 2nd month post injection	1.4	38 J	3.5
	6/25/2007, 3rd month post injection	14 J	56 J	16 J
Notes -J indicates value is estimated -R – not defined in report.				

Appendix K: Historical Ground Water Sampling Data

Appendix K: Historical Ground Water Sampling Data

Second Five-Year Review Ground Water Sampling Results (April 2002) for COCs (µg/L)

Well Type	Well Number	Arsenic (Goal = 10)	Chromium (Goal = 100)	Copper (Goal = 1300)
Water Treatment System Recovery/ Extraction Wells	RW01DP	3.0U	**200**	1.4U
	RW06 DP (DUP OF RWOIDP)	3.0U	**210**	1.4U
	RW02SH	3.0U	**200**	1.4U
	RW03DP	3.0U	**430**	1.9U
	RW04SH	3.0U	**180**	2.2U
	EW02DP	3.0U	**170**	1.4U
	EW03DP	3.0U	**220**	1.4U
	EW04DP	3.0U	**140**	1.4U
	EW05DP	3.0U	**140**	1.4U
	EW06DP	3.0U	**160**	1.4U
WTS Monitor Wells	GMW13SH	3.0U	.80U	1.4U
	GMW43S (DUP OF GMW13SH)	3.0U	.80U	1.4U
	GMW13DP	3.0U	.80U	1.4U
	GMW14SH	3.0U	.80U	1.4U
	GMW14DP	3.0U	**130**	1.4U
	GMW15SH	3.0U	.86R	1.4U
	GMW15DP	3.0U	50	1.4U
	GMW16DP	3.0U	5.6	1.4U
	GMW17DP	3.0U	.80U	1.4U

Notes
-The cleanup goal presented in Table 1 of the 2002 FYR, the table used to prepare this table, was 50 µg/L. The cleanup goal of 50 µg/L was based on the 1993 MCL and has since been changed to 10 µg/L. Only the current cleanup goal for arsenic is presented here.
-U indicates material was analyzed for but not detected. The number is the minimum quantitation limit.
-**Bold** indicates exceedances.
-R was not defined.

Third Five-Year Review Ground Water Sampling Results (July 2007) for COCs (µg/L)

Well	Arsenic (Goal = 10)	Chromium (Goal = 100)	Copper (Goal = 1300)
EW-3	<10	75.	10
EW-4	<10	27	25
EW-5	<10	**110**	35
EW-6	<10	62	8.4
RW-4	<10	**270**	15
RW-9	<10	**260**	<5

1. < = indicates analyte was not detected above the detection limit identified.
2. **Bold** indicates exceedances.

Results from EPA ERT Study of Chromium Concentrations in Ground Water (December 1996 – August 2007) (µg/L) (Cleanup Goal = 100)

	Well	Dec 96	Dec 97	Oct 00	Oct 02	Feb 04	Mar 05	Aug 07
Water Treatment System Recovery/ Extraction Wells	RW01DP	**880**	**520J**	**270**	**190**	**160**	ND	48
	RW02SH	**880**	**480J**	**340**	**190**	**270**	ND	ND
	RW03DP	**1300**	**900J**	**580**	**360**	**280**	5.9	28J
	RW04SH	**160**	**160**	**160**	**170**	**120**	**240**	**270J**
	EW01DP	6J	NA	NA	NA	NA	ND	NS
	EW02DP	**890**	**530J**	**210**	**140**	**120**	22	12J
	EW03DP	**1600**	**1100J**	**310**	**180**	**160**	97	73J
	EW04DP	**1100**	**610J**	**220**	**120**	100	38	33J
	EW05DP	**830**	**410J**	**230**	**130**	**110**	**210**	**110J**
	EW06DP	**460**	**340J**	**210**	**150**	**110**	34	59J
Water Treatment System Monitoring Wells	GMW13SH	ND	ND	ND	ND	ND	NS	2.8J
	GMW13DP	3J	ND	ND	ND	ND	ND	2.6J
	GMW14SH	2J	ND	ND	ND	ND	NS	ND
	GMW14DP	**950**	**320J**	**110**	**120**	57	53	210J
	GMW15SH	1J	ND	ND	ND	0.48J	NS	3.7J
	GMW15DP	6J	10J	**110**	100	23	12	12J
	GMW16DP	ND	ND	3.2	6.4	6.9J	ND	ND
	GMW17DP	ND	ND	ND	ND	ND	NS	ND

Notes
-**Bold** indicates exceedances.
-None of the abbreviations in the original table were defined. The original table is from the 2007 FYR.

Results for Select Monitoring Wells Presented in EPA's 2011 Remedial Action Report (April 1996 – August 2007) (µg/L) (Cleanup Goal = 100)

Table 3-1
Water Treatment System - Aquifer Cleanup Goal Monitoring for Select Wells 1996 - 2007
Palmetto Wood Preserving Site,
Cayce, Lexington County, South Carolina

Wells	APR 1996	SEPT 1996	DEC 1996	JUN 1997	DEC 1997	JUL 1998	JAN 1999	APR 2000	OCT 2000	APR 2001	OCT 2001	APR 2002	OCT 2002	APR 2003	SEPT 2003	OCT 2003	FEB 2004	JUL 2004	MAR 2005	AUG 2007
Recovery/Extraction																				
RW01DP	***740***	***1,000***	***865***	***680***	***520***	***450***	***400***	***410***	***270***	***270***	***240***	***200***	***190***	***170***	***170***	76	***160***	***150***	ND	48
RW02SH	***710***	***210***	***880***	***710***	***480***	***560***	***460***	***340***	***340***	***300***	***270***	***200***	***190***	***160***	***250***	100	***270***	***240***	ND	ND
RW03DP	***840***	***690***	***1,300***	***1,200***	***900***	***830***	***680***	***650***	***580***	***600***	***470***	***430***	***360***	***320***	***300***	***110***	***280***	***250***	5.9	28
RW04SH	37	6	***160***	***120***	***165***	***210***	***170***	***180***	***160***	***190***	***180***	***180***	***170***	***150***	***130***	***140***	***120***	***120***	***240***	***270***
EW02DP	***870***	***1,000***	***890***	***760***	***530***	***450***	***340***	***220***	***210***	***220***	***190***	***170***	***140***	***130***	***130***	57	***120***	***110***	22	12
EW03DP	***1,800***	***1,700***	***1,600***	***1,300***	***1,100***	***760***	***590***	***460***	***310***	***310***	***280***	***220***	***180***	***180***	***170***	***190***	***160***	***140***	97	73
EW04DP	***520***	***1,100***	***1,100***	***840***	***610***	***490***	***330***	***420***	***220***	***200***	***170***	***140***	***120***	***110***	100	81	100	83	38	33
EW05DP	***980***	***1,200***	***830***	***600***	***410***	***480***	***280***	***340***	***230***	***220***	***180***	***140***	***130***	***130***	***140***	***150***	***110***	***110***	***210***	***110***
EW06DP	***175***	***580***	***460***	***355***	***340***	***220***	***210***	***320***	***210***	***230***	***180***	***160***	***150***	***140***	***120***	72	***110***	***110***	34	59
Monitoring																				
GMW14DP	***1,300***	***1,100***	***950***	***420***	***320***	***210***	***170***	***140***	***110***	***200***	94	***130***	***120***	82	59	39	57	56	53	21

Notes:

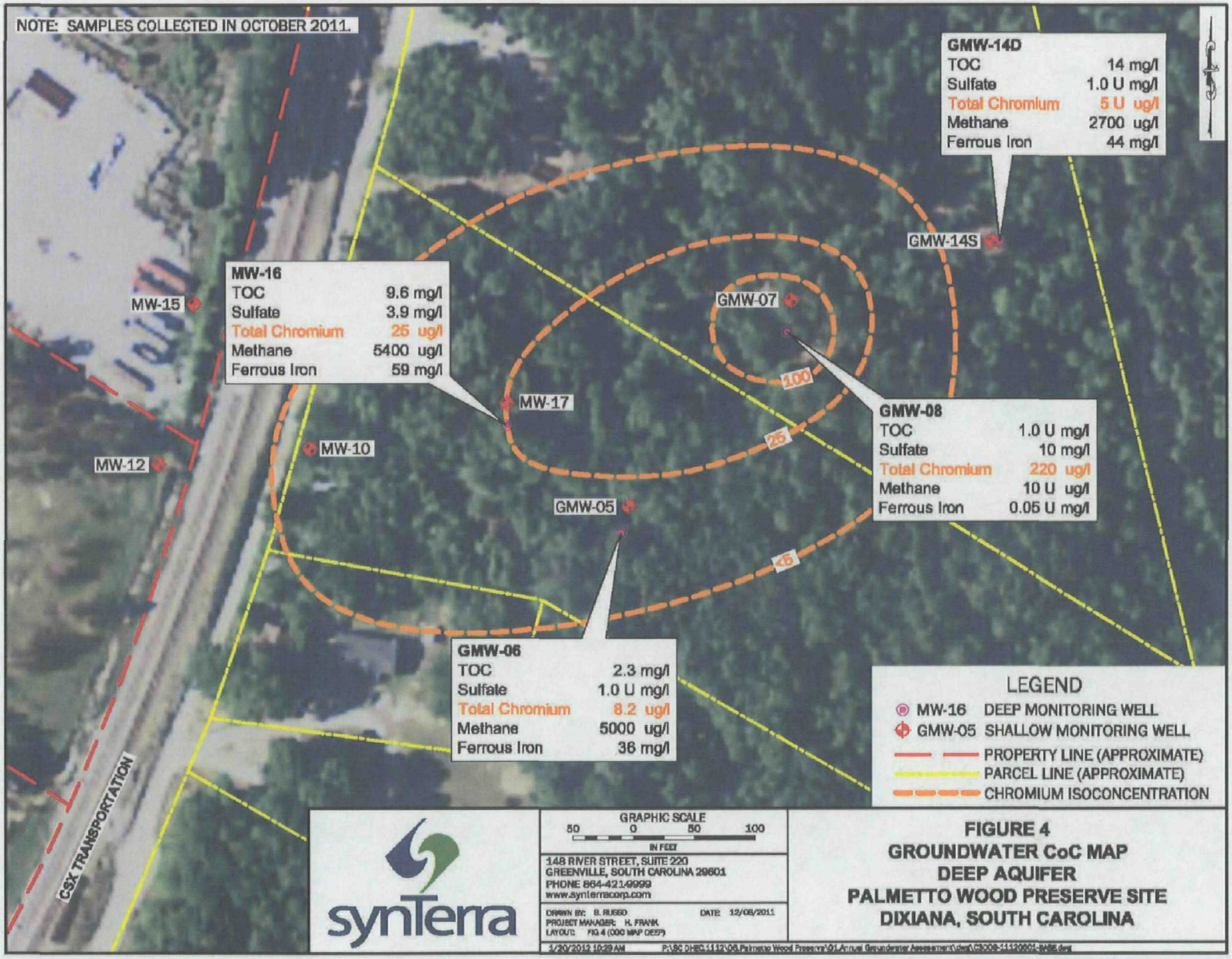
All units are microgram per liter (ug/L).

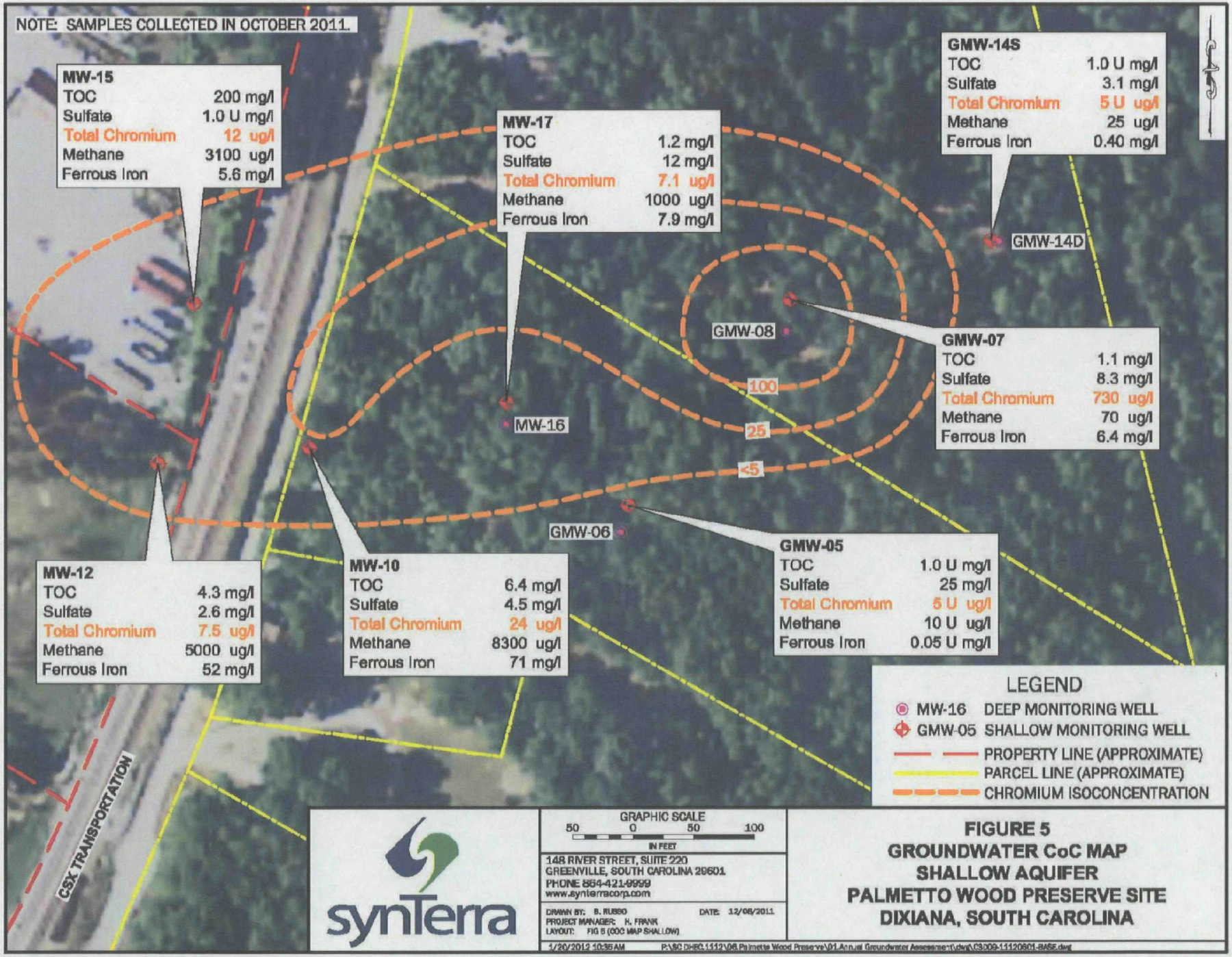
Bold/Italic indicates total chromium exceeds the cleanup goal of 100 ug/L.

ND - Not Detected - Analytes not detected at or above the laboratory reporting limit.

Appendix L: Ground Water Isoconcentration Maps (based on October 2011 Sampling Data

Appendix L: Ground Water Isoconcentration Maps (based on October 2011 Sampling Data)




NOTE: SAMPLES COLLECTED IN OCTOBER 2011.
MW-15
TOC 200 mg/l
Sulfate 1.0 U mg/l
Total Chromium 12 ug/l
Methane 3100 ug/l
Ferrous Iron 5.6 mg/l
MW-17
TOC 1.2 mg/l
Sulfate 12 mg/l
Total Chromium 7.1 ug/l
Methane 1000 ug/l
Ferrous Iron 7.9 mg/l
GMW-14S
TOC 1.0 U mg/l
Sulfate 3.1 mg/l
Total Chromium 5 U ug/l
Methane 25 ug/l
Ferrous Iron 0.40 mg/l
GMW-14D
GMW-08
GMW-07
TOC 1.1 mg/l
Sulfate 8.3 mg/l
Total Chromium 730 ug/l
Methane 70 ug/l
Ferrous Iron 6.4 mg/l
100
25
<5
MW-16
GMW-06
MW-12
TOC 4.3 mg/l
Sulfate 2.6 mg/l
Total Chromium 7.5 ug/l
Methane 5000 ug/l
Ferrous Iron 52 mg/l
MW-10
TOC 6.4 mg/l
Sulfate 4.5 mg/l
Total Chromium 24 ug/l
Methane 8300 ug/l
Ferrous Iron 71 mg/l
GMW-05
TOC 1.0 U mg/l
Sulfate 25 mg/l
Total Chromium 5 U ug/l
Methane 10 U ug/l
Ferrous Iron 0.05 U mg/l
CSX TRANSPORTATION
LEGEND
MW-16 DEEP MONITORING WELL
GMW-05 SHALLOW MONITORING WELL
PROPERTY LINE (APPROXIMATE)
PARCEL LINE (APPROXIMATE)
CHROMIUM ISOCONCENTRATION
GRAPHIC SCALE
50 0 50 100
IN FEET
148 RIVER STREET, SUITE 220
GREENVILLE, SOUTH CAROLINA 29601
PHONE 864-421-9999
www.synterracorp.com
DRAWN BY: B. RUSSO DATE: 12/06/2011
PROJECT MANAGER: K. FRANK
LAYOUT: FIG 5 (COC MAP SHALLOW)
1/20/2012 10:35 AM
P:\SC DHEC\1112\06 Palmetto Wood Preserve\01 Annual Groundwater Assessment\dwg\03009-11120601-BASE.dwg
FIGURE 5
GROUNDWATER CoC MAP
SHALLOW AQUIFER
PALMETTO WOOD PRESERVE SITE
DIXIANA, SOUTH CAROLINA

Appendix M: Summary of Ground Water Sampling Analytical Data (2008 – 2011)

Appendix M: Summary of Ground Water Sampling Analytical Data (2008 – 2011)

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		GMW-05							GMW-06						
Well Type		Monitor							Monitor						
Aquifer		Shallow							Deep						
Total Well Depth (Feet BGS)		30							62						
Sample Date		12/8/2008	5/12/2009	7/22/2009	9/23/2009	3/24/2010	6/17/2010	10/25/2011	12/8/2008	5/12/2009	7/22/2009	9/23/2009	3/24/2010	6/17/2010	10/25/2011
Sampling Schedule		Baseline	2-month	4-month	6-month	12-month	15-month	31-month	Baseline	2-month	4-month	6-month	12-month	15-month	31-month
Classical/Nutrients, mg/L															
	Total Organic Carbon	1 U	1.2	1 U	1.2	1 0 U	0.53 J	1.0 U	1 U	130.0	37	17	2	1.72	2.3
	Sulfate	8.4	8.3	8.5 J	8.6	8.1 J	12.7	25	1.9	0.52	0.27 J	0.16	0.1	5.0 U	1.0 U
Total Metals, ug/L															
	Total Chromium	5 UJ	5 U	5 U	5 U	0.34 UJ	2.2 J	5 U	*120 J*	26	12	9	1.1 UJ	10 UJ	8.2
	Hexavalent Chromium	10 UJ	NA	NA	NA	NA	NA	NA	10 UJ	NA	NA	NA	NA	NA	NA
	Iron	20 UJ	100 U	100 U	100 U	100 U	26 J	NA	130 J	4300	4200	4700	8400 J	11000 J	NA
	Manganese	39 J	43	41	37	40	40 J	NA	14 J	84	74	62	28	20 J	NA
Dissolved Gases, ug/L															
	Methane	1.4 U	1 4 U	1.4 U	1.4 U	1.4 U	1.4 U	10 U	1.4 U	1.4 U	240 J	860 J	1100	1700	5000
Field Parameters															
	Temperature (°C)	18.7	16	17.8	18.7	16.9	18.3	19.6	18.8	17.8	18.6	18.6	18.9	18.1	19.9
	pH	4.5	4.6	4.7	5.9	4.6	4.1	4.69	5.1	5.9	6.1	6.7	5.9	5.5	6.43
	Specific Conductivity (mS/cm)	68	70	0.08	0.08	0.07	0.07	0 062	51	40	0.20	0.13	0 09	0.16	0.221
	Turbidity (NTU)	<1.0	<1.0	1	1	<1.0	3	<20	18	11	1	2	<1.0	<1 0	<20
	ORP (mV)	430	377	148	123	270	357	4.8	393	18	-200	-51	27	51	-125.9
	DO (mg/L)	9.3	8.9	7.9	9.3	4.1	5 5	4.98	6.1	1.7	1 6	4 5	0.3	2 1	0.31
	Ferrous Iron (mg/L)	0	0	0	0	0	0	0.05 U	0	6	5	5	4	>3.3	36
	Hexavalent Chromium (mg/L)	NA	0	0	0	0	0	NA	NA	0	0	0	0	0	NA

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L
* MW-10 sampled with a teflon bailer on 03/27/2010
** MW-10 went dry during purging, sample collected following recharge
*** The RPD for the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate
NA - Not Analyzed
mg/L - milligrams per liter
ug/L - micrograms per liter
mS/cm - milliSiemens per centimeter
mV - millivolt
NTU - Nepholometric Turbidity Unit
U - Analyte not detected at or above reported limit.
K - Sample re-analyzed outside of holding time
J - indicates value is estimated
°C - degree Celsius

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		GMW-07							GMW-08						
Well Type		Monitor							Monitor						
Aquifer		Shallow							Deep						
Total Well Depth (Feet BGS)		30							60						
Sample Date		12/8/2008	5/12/2009	7/22/2009	9/23/2009	3/23/2010	6/15/2010	10/26/2011	12/8/2008	5/12/2009	7/22/2009	9/23/2009	3/23/2010	6/15/2010	10/26/2011
Sampling Schedule		Baseline	2-month	4-month	6-month	12-month	15-month	31-month	Baseline	2-month	4-month	6-month	12-month	15-month	31-month
Classical/Nutrients, mg/L															
	Total Organic Carbon	1 U	11.0	12	20	12	1.69	1.1	1 U	2.1	4.5	3.1	1.0 U	0.568 J	1.0 U
	Sulfate	6.2	12.0	30 J	12.0	3.9 J	4.06 J	8.3	6.7	8.0	9.5 J	11.0	7.2 J	592.0	10
Total Metals, ug/L															
	Total Chromium	***190 J***	***200***	***170***	34	9.9 J	7.0 J	***730***	***130 J***	***170***	94	82	67	72 J	***220***
	Hexavalent Chromium	10 UJ	NA	NA	NA	NA	NA	NA	11 J	NA	NA	NA	NA	NA	NA
	Iron	20 UJ	5700	5100	5100	19000 J	19000 J	NA	45 J	100 U	200	780	52 J	1100 J	NA
	Manganese	30 J	78	69	100	380	260 J	NA	13 J	13	15	16	13 J	15 UJ	NA
Dissolved Gases, ug/L															
	Methane	1.4 U	1.4 U	1.4 U	1.4 U	1.5	39	70	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	18	10 U
Field Parameters															
	Temperature (°C)	18.7	16.3	17.3	18.0	17.9	18.1	16.5	18.3	17.4	18.0	18.1	18.8	17.4	16.1
	pH	5.1	5.8	6.0	7.1	6.2	5.7	5.89	5.2	5.4	5.6	6.7	5.3	5.2	5.47
	Specific Conductivity (mS/cm)	58	11	0.18	0.14	0.15	0.13	0.069	106	110	0.12	0.12	0.12	0.21	0.118
	Turbidity (NTU)	<1.0	4	0	1	<1.0	1	<20	8	1	0	5	<1.0	<1.0	<20
	ORP (mV)	398	157	-128	-100	-64	-83	-172.5	347	280	-121	102	273	214	-34.1
	DO (mg/L)	6.8	2.2	1.0	2.3	0.4	0.2	0.68	7.2	4.5	1.1	2.3	1.8	2.0	3.79
	Ferrous Iron (mg/L)	0	7	6	7	3	>3.3	6.4	0	0	0.3	1.0	0.1	0.6	0.05 U
	Hexavalent Chromium (mg/L)	NA	0	0	0	0	0	NA	NA	0.4	0.2	0.05	0.08	0.01	NA

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L.
* MW-10 sampled with a teflon bailer on 03/27/2010
** MW-10 went dry during purging, sample collected following recharge
*** The RPD for the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
mS/cm - milliSiemens per centimeter
mV - millivolt
NTU - Nepholometric Turbidity Unit
U - Analyte not detected at or above reported limit.
K - Sample re-analyzed outside of holding time
J - indicates value is estimated
°C - degree Celsius

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		MW-10							MW-12						
Well Type		Monitor							Monitor						
Aquifer		Shallow							Shallow						
Total Well Depth (Feet BGS)		46							40						
Sample Date		12/8/2008	5/12/2009	7/21/2009	9/22/2009	3/24/2010*	6/16/2010**	10/25/2011	12/8/2008	5/11/2009	7/21/2009	9/22/2009	3/22/2010	6/16/2010	10/25/2011
Sampling Schedule		Baseline	2-month	4-month	6-month	12-month	15-month	31-month	Baseline	2-month	4-month	6-month	12-month	15-month	31-month
Classical/Nutrients, mg/L															
	Total Organic Carbon	61	74	19	34	34	11.3	6.4	1 U	790	44	25	43	47.5	4.3
	Sulfate	0.12	NA	0.01 UJ	0.1	0.16	709	4.5	1.7	NA	2.5 J	0.99	6.5 J	3.40 J	2.6
Total Metals, ug/L															
	Total Chromium	16 J	12	5.5	10	1.0 UJ	4.9 J	24	*120 J*	77	5 U	5 U	0.59 UJ	10 UJ	7.5
	Hexavalent Chromium	10 UJ	NA	NA	NA	NA	NA	NA	10 UJ	NA	NA	NA	NA	NA	NA
	Iron	90000 J	83000	74000	74000	57000 J	62000 J	NA	1100 J	3900	27000	20000	34000 J	51000 J	NA
	Manganese	720 J	550	520	540	460	500 J	NA	37 J	610	5800	7900	5800	6500 J	NA
Dissolved Gases, ug/L															
	Methane	13000	8500	12000	4600 J	4400	31000 J	8300	1.4 U	4.7	6.2	39J	2300	9100	5000
Field Parameters															
	Temperature (°C)	19.1	17	18.8	20.1	19.7	19.1	21.8	19.3	17.6	18.6	20.1	23.8	18.8	24.1
	pH	6.1	6.5	6.4	7.1	6.4	6.0	5.99	5.3	6.1	6.7	7.7	6.9	6.5	6.34
	Specific Conductivity (mS/cm)	355	750	0.72	0.61	0.40	0.42	0.352	706	890	0.45	0.33	0.45	0.55	0.259
	Turbidity (NTU)	46	44	13	43	12	76	>20	518	1169	44	5	<1.0	1	>20
	ORP (mV)	-84	-72	-205	-96	-53	-76	-66.2	340	-142	-257	-50	10	-120	-135.5
	DO (mg/L)	0.9	2.3	1.2	2.6	0.4	0.2	0.11	7	0.7	0.7	1.6	0.4	0.2	0.3
	Ferrous Iron (mg/L)	>10	>10	>10	>10	NA	3.3	71	0	4	>10	11.0	3.3	3	52
	Hexavalent Chromium (mg/L)	NA	0	0	0	NA	0	NA	NA	0	0	0	0	0	NA

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L.
* MW-10 sampled with a teflon bailer on 03/27/2010
** MW-10 went dry during purging, sample collected following recharge
*** The RPD for the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
mS/cm - milliSiemens per centimeter
mV - millivolt
NTU - Nepholometric Turbidity Unit
U - Analyte not detected at or above reported limit.
K - Sample re-analyzed outside of holding time
J - indicates value is estimated
°C - degree Celsius

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		GMW-14S							GMW-14D							GMW-14D (Dup)
Well Type		Monitor							Monitor							Monitor
Aquifer		Deep							Deep							Deep
Total Well Depth (Feet BGS)		43							70							70
Sample Date		12/8/2008	5/13/2009	7/22/2009	9/23/2009	3/24/2010	6/14/2010	10/25/2011	12/8/2008	5/13/2009	7/22/2009	9/23/2009	3/24/2010	6/14/2010	10/25/2011	10/25/2011
Sampling Schedule		Baseline	2-month	4-month	6-month	12-month	15-month	31-month	Baseline	2-month	4-month	6-month	12-month	15-month	31-month	31-month
Classical/Nutrients, mg/L																
	Total Organic Carbon	1 U	1 U	1 U	1.1	1.0 U	1.0 U	1.0 U	1 U	94.0	46	46	39	37	14	14
	Sulfate	1.2	4.3	2.3 J	2.5	1.6	5.0 UK	3.1	1.6	4.1	0.01 UJ	0.10 U	0.10 U	625 K	1.0 U	1.0 U
Total Metals, ug/L																
	Total Chromium	5 UJ	5 U	5 U	5 U	10 U	10 UJ	5 U	*130 J*	79	5 U	5 U	10 U	10 UJ	5 U	5 U
	Hexavalent Chromium	10 UJ	NA	NA	NA	NA	NA	NA	10 UJ	NA	NA	NA	NA	NA	NA	NA
	Iron	66 J	9800	4800	2400	760 J	870 J	NA	20 UJ	6600	43000	46000	60000 J	67000 J	NA	NA
	Manganese	6.1 J	2100	1800	1600	1100	880 J	NA	5 UJ	32	45	52	48	44 J	NA	NA
Dissolved Gases, ug/L																
	Methane	1.4 U	1.4 U	1.4 U	1.6 J	5.3	2.3	25	1.4 U	1.4 U	1.4 U	17	2900	6800	2700	2700
Field Parameters																
	Temperature (°C)	18.2	16.9	17.6	17.8	18.8	17.9	19.6	18.4	17.4	18.0	18.1	18.6	17.8	18.4	18.4
	pH	5.2	5.8	6.1	6.7	5.6	3.9	5.63	4.7	5.8	6.8	7.6	6.7	5.6	6.61	6.61
	Specific Conductivity (mS/cm)	41	100	0.09	0.08	0.06	0.06	0.054	44	300	0.38	0.37	0.29	0.43	0.225	0.225
	Turbidity (NTU)	5	1	1	2	<1.0	<1.0	<20	<1.0	<1.0	0	1	<1.0	<1.0	<20	<20
	ORP (mV)	327	113	-122	17	106	194	13.9	410	49	-238	-143	-149	-122	-139.1	-139.1
	DO (mg/L)	1.0	0.4	0.4	1.5	0.7	0.5	0.5	7.4	0.2	0.4	1.8	0.5	0.2	0.3	0.3
	Ferrous Iron (mg/L)	0	10	3	2	1	3	0.40	0	8	>10	10.0	8.5	>3.3	44	44
	Hexavalent Chromium (mg/L)	NA	*0*	*0*	*0*	*0*	*0*	NA	NA	*0*	*0*	*0*	*0*	*0*	NA	NA

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L
* MW-10 sampled with a teflon bailer on 03/27/2010
** MW-10 went dry during purging, sample collected following recharge
*** The RPD tor the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
mS/cm - milliSiemens per centimeter
mV - millivolt
NTU - Nepholometric Turbidity Unit
U - Analyte not detected at or above reported limit.
K - Sample re-analyzed outside of holding time
J - indicates value is estimated
°C - degree Celsius

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		MW-15							MW-16						
Well Type		Monitor							Monitor						
Aquifer		Shallow							Deep						
Total Well Depth (Feet BGS)		32							59.5						
Sample Date		12/8/2008	5/11/2009	7/21/2009	9/22/2009	3/25/2010	6/16/2010	10/25/2011	12/8/2008	5/12/2009	7/22/2009	9/22/2009	3/24/2010	6/16/2010	10/26/2011
Sampling Schedule		Baseline	2-month	4-month	6-month	12-month	15-month	31-month	Baseline	2-month	4-month	6-month	12-month	15-month	31-month
Classical/Nutrients, mg/L															
	Total Organic Carbon	1 U	700	600	560	650	872	200	1.1	120	380	400	200	51.9	9.6
	Sulfate	5.3	NA	2.1 J	0.61	7.9	8.78	1.0 U	5.0 J	14.0	6.4 J	19.0	0.8	5.0 U	3.9
Total Metals, ug/L															
	Total Chromium	***850 J***	15	7.9	5 U	13	16 J	12	***290 J***	***430***	***160***	***180***	5.3 UJ	10 UJ	25
	Hexavalent Chromium	15 J	NA	NA	NA	NA	NA	NA	10 UJ	NA	NA	NA	NA	NA	NA
	Iron	2200 J	200 U	7500	68000	30000 J	37000 J	NA	20 UJ	5000	20000	34000	51000 J	35000 J	NA
	Manganese	150 J	140	2300	7200	4700	5900 J	NA	16 J	190	220	180	240	210J	NA
Dissolved Gases, ug/L															
	Methane	1.4 U	2.0 J	5.7	1100	3400	5600	3100	1.4 U	2.2	8.4	120	3800	7100	5400
Field Parameters															
	Temperature (°C)	18.4	18.1	20.7	NA	25.7	21.4	23.3	18.6	17.8	18.4	18.4	27.4	18.2	20
	pH	5.3	9.5	6.4	NA	6.5	5.3	6.27	5.2	5.9	6.0	7.3	6.6	6.2	6.61
	Specific Conductivity (mS/cm)	62	2020	2.05	NA	0.88	0.14	0.608	63	430	1.21	1.25	0.80	0.42	0.267
	Turbidity (NTU)	1391	1174	1114	NA	7	2	<20	<1.0	2	1	1	<1.0	<1.0	<20
	ORP (mV)	360	-46	-76	NA	3	12	-53	369	-11	-248	-173	-135	-115	-164
	DO (mg/L)	9.2	1.8	0.9	NA	1.0	0.9	1.04	5.1	0.4	0.5	3.9	0.9	0.3	0.15
	Ferrous Iron (mg/L)	0.1	0	8	>10	6.8	3	5.6	0	5	>10	>10	5.6	>3.3	59
	Hexavalent Chromium (mg/L)	NA	0	0	0	0	0	NA	NA	0	0	0	0	0	NA

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L.
* MW-10 sampled with a teflon bailer on 03/27/2010
** MW-10 went dry during purging, sample collected following recharge
*** The RPD for the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate
NA - Not Analyzed
mg/L - milligrams per liter
ug/L - micrograms per liter
mS/cm - milliSiemens per centimeter
mV - millivolt
NTU - Nepholometric Turbidity Unit
U - Analyte not detected at or above reported limit.
K - Sample re-analyzed outside of holding time
J - indicates value is estimated
°C - degree Celsius

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		MW-17							RW-02					
Well Type		Monitor							Recovery					
Aquifer		Shallow							Shallow					
Total Well Depth (Feet BGS)		34.5							38					
Sample Date		12/8/2008	5/12/2009	7/22/2009	9/22/2009	3/24/2010	6/17/2010	10/26/2011	12/8/2008	5/11/2009	7/21/2009	9/22/2009	3/23/2010	6/15/2010
Sampling Schedule		Baseline	2-month	4-month	6-month	12-month	15-month	31-month	Baseline	2-month	4-month	6-month	12-month	15-month
Classical/Nutrients, mg/L														
	Total Organic Carbon	*1 U*	*97*	*36*	*52*	*28*	*10.4*	*1.2*	*1 U*	*1.2*	*1*	*1.6*	*1.0 U*	*0.475 J*
	Sulfate	11	12	5.5 J	4	6	879.0	12	9.5	9	9.4 J	11	10 J	1870
Total Metals, ug/L														
	Total Chromium	58 J	58	21	11	0.95 UJ	1.9 J	7.1	5 UJ	5 U	5 U	5 U	2.1 UJ	10 UJ
	Hexavalent Chromium	10 UJ	NA	NA	NA	NA	NA	NA	10 UJ	NA	NA	NA	NA	NA
	Iron	44 J	8200	15000	31000	25000 J	6300 J	NA	20 UJ	100 U	100 U	100 U	150 J	42 J
	Manganese	16 J	33.0	35	30	31	22 J	NA	30 J	36	33	33	30	29 J
Dissolved Gases, ug/l.														
	Methane	1.4 U	1.4 U	3.3	8.3	400	1000	1000	1.4 U	1.4 U	1.8	3.7 J	1.4 U	1.4 U
Field Parameters														
	Temperature (°C)	18.8	16.7	17.6	18.1	23.5	17.6	20.7	18.1	16.4	18.4	19.2	14.8	NA
	pH	4.7	5.6	6.2	7.7	6.2	5.1	5.78	4.8	4.9	5.2	5.7	5.3	NA
	Specific Conductivity (mS/cm)	71	280	0.23	0.3	0.22	0.17	97	62	80	0.09	0.11	0.07	NA
	Turbidity (NTU)	6	4	1	7	<1.0	1	<20	3	7.6	166	53	7	NA
	ORP (mV)	415	26	-190	-187	-149	5	-187.1	325	277	271	105	378	NA
	DO (mg/L)	10.2	3.3	2.1	3.3	0.4	0.3	0.15	9	9.2	9.1	9.1	8.6	NA
	Ferrous Iron (mg/L)	0	9	10	>10	7	>3.3	7.9	0	0	0	0	0	0
	Hexavalent Chromium (mg/L)	NA	0	0	0	0	0	NA	NA	0	0	0	0	0

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L
* MW-10 sampled with a teflon bailer on 03/27/2010
** MW-10 went dry during purging, sample collected following recharge
*** The RPD for the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
mS/cm - milliSiemens per centimeter
mV - millivolt
NTU - Nepholometric Turbidity Unit
U - Analyte not detected at or above reported limit.
K - Sample re-analyzed outside of holding time
J - indicates value is estimated
°C - degree Celsius

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		RW-92 (RW-2 Dup)			RW-04						RW-94 (RW-4 Dup)	
Well Type		Recovery			Recovery						Recovery	
Aquifer		Shallow			Shallow						Shallow	
Total Well Depth (Feet BGS)		38			33						33	
Sample Date		5/11/2009	7/21/2009	9/22/2009	12/8/2008	5/11/2009	7/21/2009	9/23/2009	3/23/2010	6/15/2010	3/23/2010	6/15/2010***
Sampling Schedule		2-month	4-month	6-month	Baseline	2-month	4-month	6-month	12-month	15-month	12-month	15-Month
Classical/Nutrients, mg/L												
	Total Organic Carbon	1.2	1.1	1.5	1 U	10	7.3	16	1.5	1.33	1.0 U	1.2
	Sulfate	9	9.2 J	11	9.4	15	12 J	11	22 J	12.8 J	21 J	1600
Total Metals, ug/L												
	Total Chromium	6.1	6.1	5 U	*270 J*	*280*	*160*	82	64	83 J	66	64 J
	Hexavalent Chromium	NA	NA	NA	10 UJ	NA	NA	NA	NA	NA	NA	NA
	Iron	100 U	1200	100 U	130 J	130	2000	11000	9600 J	9800 J	9500 J	9200 J
	Manganese	35	34	34	24 J	23	67	310	800	850 J	810	870 J
Dissolved Gases, ug/L												
	Methane	1.4 U	1.6	1.4 U	1.4 U	1.4 U	1.5	1.4 U	1.4 U	11	1.4 U	29
Field Parameters												
	Temperature (°C)	16 A	18.4	19.2	18.2	17	19	19.3	15.2	NA	15.2	NA
	pH	4.9	5.2	5.7	5.0	5.1	5.6	6.6	6.0	NA	6	NA
	Specific Conductivity (mS/cm)	80	0	0.11	50	105	0.115	0.360	0.142	NA	0.142	NA
	Turbidity (NTU)	7.6	166	53	8	5	18	12	21	NA	21	NA
	ORP (mV)	277	271	105	345	259	112	69	9	NA	9	NA
	DO (mg/L)	9.2	9.1	9.1	9.1	6.2	5.4	5.8	4.3	NA	4.3	NA
	Ferrous Iron (mg/L)	0	0	0	0.2	0	2	>10	3	>3.3	3	>3.3
	Hexavalent Chromium (mg/L)	0	0	0	NA	0.8	0.1	0	0.01	0	0.01	0

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L

* MW-10 sampled with a teflon bailer on 03/27/2010

** MW-10 went dry during purging, sample collected following recharge

*** The RPD for the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate

NA - Not Analyzed

mg/L - milligrams per liter

µg/L - micrograms per liter

mS/cm - milliSiemens per centimeter

mV - millivolt

NTU - Nepholometric Turbidity Unit

U - Analyte not detected at or above reported limit.

K - Sample re-analyzed outside of holding time

J - indicates value is estimated

°C - degree Celsius

Table 2
Summary of Analytical Data
Palmetto Wood Preserve Site
Dixiana, South Carolina
EPA Site #SCD003362217, BLWM File #50958

Well ID		EW-5						EW-95 (EW-5 Dup)				
Well Type		Extraction						Extraction				
Aquifer		Congaree						Congaree				
Total Well Depth (Feet BGS)		69						69				
Sample Date		12/8/2008	5/11/2009	7/21/2009	9/22/2009	3/29/2010	6/15/2010	5/11/2009	7/21/2009	9/22/2009	3/25/2010	6/15/2010
Sampling Schedule		Baseline	2-month	4-month	6-month	12-month	15-month	2-month	4-month	6-month	12-month	15-month
Classical/Nutrients, mg/L												
	Total Organic Carbon	1 U	1 U	1.1	1.1	1.0 U	0.314 J	1 U	1.0	1.0	1.0 U	0.601 J
	Sulfate	0.69 J	0.81	1.5 J	1.2	2.3 J	2.57 J	0.75	1.5 J	1.3	2.4 J	5.0 U
Total Metals, ug/L												
	Total Chromium	83 J	83	88	72	90	65 J	97	97	69	85	67 J
	Hexavalent Chromium	10 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Iron	26 J	100 U	100 U	100 U	1400 J	2600 J	100 U	100 U	100 U	1400 J	2600 J
	Manganese	5 UJ	5 U	5 U	7.9	58	48 J	5 U	5 U	8.3	59	51 J
Dissolved Gases, ug/L												
	Methane	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	29	1.4 U	1.4 U	1.4 U	1.5	27
Field Parameters												
	Temperature (°C)	17.4	18.2	19.4	18.8	17	NA	18.2	19.4	18.8	17.0	NA
	pH	5.9	5.0	5.3	5.1	5.7	NA	5.0	5.3	5.1	5.7	NA
	Specific Conductivity (mS/cm)	57	87	0.05	0.12	0.05	NA	87	0	0	0	NA
	Turbidity (NTU)	<1 0	2.5	7	6	2	NA	2.5	7	6	2	NA
	ORP (mV)	277	253	236	114	124	NA	253	236	114	124	NA
	DO (mg/L)	8.3	7.4	7.8	8.5	7.8	NA	7.4	7.8	8.5	7.8	NA
	Ferrous Iron (mg/L)	0	0	0	0	1	2.0	0	0	0	1	2.0
	Hexavalent Chromium (mg/L)	NA	0.2	0.2	0.2	0 01	0	NA	0.2	0.2	0.01	0

Prepared By: HJF Checked By: SDA

Bold/Italic Indicates Total Chromium exceeding the Maximum Contaminant Level of 100 ug/L
* MW-10 sampled with a teflon bailer on 03/27/2010
** MW-10 went dry during purging, sample collected following recharge
*** The RPD for the sulfate duplicate at RW-04 was greater than 20%, the sample should not be considered a duplicate
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
mS/cm - milliSiemens per centimeter
mV - millivolt
NTU - Nepholometric Turbidity Unit
U - Analyte not detected at or above reported limit.
K - Sample re-analyzed outside of holding time
J - indicates value is estimated
°C - degree Celsius

Appendix N: Sampling Logs for GMW-07 and GMW-08 (October 26, 2011)

Appendix N: Sampling Logs for GMW-07 and GMW-08 (October 26, 2011)

LOW FLOW SAMPLING LOG

synTerra
148 River Street, Suite 220
Greenville, South Carolina 29601
(864) 421-9999 • (864) 421-9909 Fax
www.synTerracorp.com

CLIENT/PROJECT NO.: SC DHEC Palmetto Wood Preserve 1112.06.01
LOCATION: Dixiana, SC
FIELD PERSONNEL: BA, MA
WEATHER: [x] SUNNY [ ] OVERCAST [ ] RAIN TEMPERATURE (APPROX): 50 °F
SAMPLE DATE: 10/26/11
SAMPLE TIME: 845

WELL ID: GMW-07
MEASURING POINT: TOC
CASING TYPE: PVC
WELL DIAMETER: 4 (IN)

TOTAL WELL DEPTH: 39.74 (FT)
DEPTH TO WATER: 23.14 (FT)
WATER COLUMN: 16.60 (FT)
PUMP/TUBING INTAKE DEPTH: ≈38 (FT)
TOTAL VOLUME PURGED: ≈1 (GAL)

PURGE START — DATE: 10/26/11 TIME: 831
PURGE STOP — DATE: 10/26/11 TIME: 895

PURGE METHOD: [ ] Grundfos Pump [ ] 12 Volt Pump [x] Peristaltic Pump [ ] Dedicated Pump [ ] Teflon Bailer [ ] Polyethylene Bailer
SAMPLE METHOD: [ ] Grundfos Pump [ ] 12 Volt Pump [x] Peristaltic Pump [ ] Dedicated Pump [ ] Teflon Bailer [ ] Polyethylene Bailer

TIME	WATER LEVEL	FLOW RATE (mL/min)	TEMPERATURE* (° Celsius)	pH* (su)	SPECIFIC CONDUCTANCE* (µS/cm)	DO* (mg/L)	Eh* (mV)	TURBIDITY (RELATIVE)	COMMENTS
835	23.17		15.8	5.81	68	2.31	-156.4	CLR	Red & Black Silt coming thru tubing
838	23.17		16.2	5.84	68	1.50	-166.8	"	"
841	23.17		16.2	5.87	69	0.63	-169.6	"	CLR
844	23.17		16.5	5.83	69	0.70	-171.8	CLR	CLR
845	23.17		16.5	5.89	63	0.68	-172.5	CLR	CLR

* Field Parameters collected from flow through cell unless otherwise noted.

COMMENTS:

CONSTITUENTS SAMPLED	125 ml POLY	250 mL POLY	500 mL POLY	1/2 GALLON	40 ml VOA	1 L AMBER	PRESERVATIVE	CONSTITUENTS SAMPLED	125 ml POLY	250 mL POLY	500 mL POLY	1/2 GALLON	40 ml VOA	1 L AMBER	PRESERVATIVE
TOTAL CHROMIUM		1													
SULFATE		1													
TOTAL ORGANIC CARBON		1													
FERROUS IRON					2										
METHANE					2										

(Column groups 125 ml POLY through 1 L AMBER are under NUMBER OF CONTAINERS.)

PROTECTIVE CASING:			WELL PAD:			LOCK:			WELL TAG:			VEGITATION:		
[x] GOOD	[ ] BAD	[ ] NA	[x] GOOD	[ ] BAD	[ ] NA	[ ] GOOD	[ ] BAD	[x] NA	[x] GOOD	[ ] BAD	[ ] NA	[x] GOOD	[ ] BAD	[ ] NA

COMMENTS: Replaced Lock

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LOW FLOW SAMPLING LOG

synTerra
148 River Street, Suite 220
Greenville, South Carolina 29601
(864) 421-9999 • (864) 421-9909 Fax
www.synTerracorp.com

CLIENT/PROJECT NO.: SC DHEC Palmetto Wood Preserve 1112.06.01
LOCATION: Dixiana, SC
FIELD PERSONNEL: BL, MR
WEATHER: ☒ SUNNY ☐ OVERCAST ☐ RAIN TEMPERATURE (APPROX): 50°F
SAMPLE DATE: 10/26/11
SAMPLE TIME: 820

WELL ID: GMW-08
MEASURING POINT: TOC
CASING TYPE: PVC
WELL DIAMETER: 4 (IN)

TOTAL WELL DEPTH: 64.50 (FT)
DEPTH TO WATER: 25.14 (FT)
WATER COLUMN: 39.26 (FT)
PUMP/TUBING INTAKE DEPTH: ≈63 (FT)
TOTAL VOLUME PURGED: ≈1 (GAL)

PURGE START — DATE: 10/26/11 TIME: 800
PURGE STOP — DATE: 10/26/11 TIME: 820

PURGE METHOD: ☐ Grundfos Pump ☐ 12 Volt Pump ☒ Peristaltic Pump ☐ Dedicated Pump ☐ Teflon Bailer ☐ Polyethylene Bailer
SAMPLE METHOD: ☐ Grundfos Pump ☐ 12 Volt Pump ☒ Peristaltic Pump ☐ Dedicated Pump ☐ Teflon Bailer ☐ Polyethylene Bailer

TIME	WATER LEVEL	FLOW RATE (mL/min)	TEMPERATURE* (° Celsius)	pH* (su)	SPECIFIC CONDUCTANCE* (µS/cm)	DO* (mg/L)	Eh* (mV)	TURBIDITY (RELATIVE)	COMMENTS
806	25.16		15.4	5.74	121	5.60	-9.7	CLR	CLR
809	25.16		15.9	5.50	118	3.91	-25.9	CLR	CLR
812	25.18		16.1	5.49	118	3.82	-29.6	CLR	CLR
815	25.18		16.1	5.48	119	3.63	-32.3	CLR	CLR
818	25.18		16.1	5.47	118	3.86	-33.1	CLR	CLR
820	25.18		16.1	5.47	118	3.79	-34.1	CLR	CLR

* Field Parameters collected from flow through cell unless otherwise noted.

COMMENTS:

CONSTITUENTS SAMPLED	NUMBER OF CONTAINERS: 125 ml POLY	250 mL POLY	500 mL POLY	1/2 GALLON	40 ml VOA	1 L AMBER	PRESERVATIVE	CONSTITUENTS SAMPLED	NUMBER OF CONTAINERS: 125 ml POLY	250 mL POLY	500 mL POLY	1/2 GALLON	40 ml VOA	1 L AMBER	PRESERVATIVE
TOTAL CHROMIUM		1													
SULFATE		1													
TOTAL ORGANIC CARBON		1													
FERROUS IRON					2										
METHANE					2										

PROTECTIVE CASING:			WELL PAD:			LOCK:			WELL TAG:			VEGITATION:		
☒ GOOD	☐ BAD	☐ NA	☐ GOOD	☒ BAD	☐ NA	☐ GOOD	☐ BAD	☒ NA	☒ GOOD	☐ BAD	☐ NA	☒ GOOD	☐ BAD	☐ NA

COMMENTS: Replaced Lock

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Appendix O: Toxicity Changes for Arsenic, Chromium and Copper

Appendix O: Toxicity Changes for Arsenic, Chromium and Copper

Contaminants	Carcinogenic toxicity changes					
	Oral Cancer Slope Factor			*Inhalation Unit Risk*		
	1987 PHE Potency Factor $(mg/kg\text{-}day)^{-1}$	**2012 Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$**	**Change in Oral CSF**	**1987 PHE Inhalation Unit Risk Value $(\mu g/m^3)^{-1}$**	**2012 Inhalation Unit Risk Value $(\mu g/m^3)^{-1}$**	**Change in IUR**
Arsenic	15	1.5	less toxic	N/A	4.3×10^{-3}	Updated IUR
Chromium	41	0.5[a]	less toxic	1.2×10^{-2}	1.2×10^{-2}	No change
Copper	N/A	N/A	N/A	N/A	N/A	N/A
	Non-carcinogenic toxicity changes					
	Oral Reference Dose			*Inhalation RfC*		
Contaminants	1987 PHE Oral Acceptable Chronic Intake (mg/kg-d)	2012 Oral RfD Value (mg/kg-d)	Change in Oral RfD	1987 PHE Acceptable Daily Inhalation Intake (mg/m^3)	2012 Inhalation RfC Value (mg/m^3)	Change in Inhalation RfC
Arsenic	6.7×10^{-8}	3.0×10^{-4}	less toxic	N/A	1.5×10^{-5}	Updated IUR
Chromium	5×10^{-3}	3.0×10^{-3}	more toxic	8.4×10^{-8}	1×10^{-4} [b]	Less toxic
Copper	3.7×10^{-2}	3.7×10^{-2}	no change	3.6×10^{-2}	N/A	N/A

[a] EPA currently has no verified oral slope for chromium (IRIS 2012). In IRIS, there is currently a draft assessment underway regarding carcinogenicity from ingested chromium, but the current IRIS schedule estimates that it will not be completed before FY2015. The state of New Jersey has a recommended value of 0.5 per mg/kg-day, but this value, while a tier 3 value on the EPA RSL table, is not an EPA verified value.
[b] This value is for the particulate form of hexavalent chromium.

PHE – Public Health Evaluation
CSF – Cancer Slope Factor
IUR – Inhalation Unit Risk
RfC – Reference Concentration
RfD – Reference Dose
IRIS – Integrated Risk Information System