



Colonial Terminals Plant #2
May 2014 Semi-Annual Progress Report

Prepared for:
Colonial Terminals, Inc.
Savannah, Georgia

HSI SITE NO. 10098

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Acronyms and Abbreviations

11DCE	1,1-Dichloroethene
12DCE	1,2-Dichloroethene
3D	3-Dimensional
AIDF	Analyte Interval Data File
AR	Anisotropic Ratio
AST	Aboveground Storage Tank
CAP	Corrective Action Plan
Colonial	Colonial Terminals
COPCs	Constituents of Potential Concern
CSR	Compliance Status Report
DNAPL	Dense Non-Aqueous Phase Liquid
ED	Exposure Domain
ENVIRON	ENVIRON International Corporation
EPD	Georgia Environmental Protection Division
ERM	Environmental Resources Management
ft amsl	Feet Above Mean Sea Level
ft bgs	Feet Below Ground Surface
ft/d	Feet per Day
HSI	Hazardous Site Inventory
HSRA	Hazardous Site Response Act
ISWQS	Georgia In-Stream Water Quality Standards
max-gap	Maximum Gap
MeCl	Methylene Chloride
MVS	Mining Visualization System
PCE	Tetrachloroethene
PID	Photoionization Detector
RP's	Responsible Parties
RRS	Risk Reduction Standards
sf	Square Feet
SVE	Soil Vapor Extraction
TCE	Trichloroethene
Test America	Test America Laboratories, Inc
UEC	Uniform Environmental Covenant
ug/l	Micrograms per Liter
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOCs	Volatile organic compounds
VRP	Voluntary Remediation Program

Groundwater Scientist Statement

I certify that I am a qualified groundwater scientist who has received a baccalaureate or post-graduate degree in the natural sciences or engineering, and have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport. I further certify that the groundwater portions of this report were prepared by myself and appropriately qualified subordinates working under my direction.


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1 Introduction

The Colonial Terminals (Colonial) Plant #2 site is listed on the Georgia Environmental Protection Division (EPD) Hazardous Site Inventory (HSI) as Site No. 10098 under the Hazardous Site Response Act (HSRA). The site is located at 373 North Lathrop Avenue, Savannah, Chatham County, Georgia (**Figure 1**). The approximately 78-acre property is comprised of six adjacent parcels of land identified by the Chatham County Board of Assessors as Tax Parcel IDs 1-0549-01-002 (4 parcels maintain this ID), 1-0549-01-002A, and 1-0550-02-004. The highly industrialized property is bordered by the Savannah River and is improved with administrative buildings, warehouses, bulk aboveground storage tanks (ASTs) and silos, shipping docks, truck loading racks, pipe racks, and rail spurs (**Figure 2**).

The site was formerly owned and operated by Virginia-Carolina Chemical Company and Swift Agricultural Chemicals Corporation for the manufacture of fertilizers from the late 1950s through the late 1970s. During that time, the site maintained two sludge-settling ponds and an adjacent sludge pile that have been documented as likely sources of impacts at the site, and historical fertilizer production facilities were present at various locations to the east side of the current rail yard. Since the late 1970s, Colonial has owned and operated the site for use as a bulk storage facility for various chemicals, petroleum, and kaolin clay. According to previous investigations and facility personnel, trichloroethylene (TCE) and tetrachloroethylene (PCE) were transferred from vessels to railcars and then to trucks in the area adjacent to the two former settling ponds and sludge pile from 1981 through 1985. Bulk storage of PCE and TCE at the site occurred in ASTs T-77 and T-78, located near the central northern end of the site, from 1985 through 1990, and in the adjacent ASTs 110 through 113 from 1991 through 2007 (TCE) and 2009 (PCE).

An investigation of the former settling ponds and sludge pile was conducted by the United States Environmental Protection Agency (USEPA) in 1984 and identified the presence of TCE at the site. Following an evaluation by the EPD in June 1994, the site was listed on the HSI for known releases of metals and volatile organic compounds (VOCs) to the soil and groundwater. In addition, methylene chloride (MeCl) and PCE degradation products 1,2-dichloroethene (12DCE); 1,1-dichloroethene (11DCE); and vinyl chloride (VC) were identified in soil and groundwater at the site during subsequent investigations. An initial Compliance Status Report (CSR) was submitted to EPD in 1999, and since that time numerous revised CSRs, Corrective Action Plans (CAPs), and other reports have been submitted for the site. Colonial submitted an application to the Georgia Voluntary Remediation Program (VRP) for the site in November 2012, and the application was approved by EPD in May 2013. A meeting to discuss EPD's comments and the responsible parties' (RPs; BFEL Indemnitor, Inc. and ExxonMobil Corporation) responses to those comments was held at EPD's offices on October 1, 2013.

Per the November 2012 VRP Application (ENVIRON, 2012), corrective action for soil, groundwater, and surface water at the site is not warranted based on current site conditions, the exposure pathways, and the comparison of existing data to site-specific cleanup standards. As agreed upon with EPD, annual groundwater sampling of 7 shallow and 3 deeper monitoring wells will be conducted for 2 years to identify and track potential future changes related to groundwater at the site. In addition, semi-annual surface water sampling will be conducted for 3 years to monitor the concentrations of VOCs in the Savannah River. Additionally, an

environmental covenant will be executed on the site in conformance with O.C.G.A. 44-61-1, et seq., the “Georgia Uniform Environmental Covenants Act.” This covenant will specify that the land use of the site remains industrial, no drinking water wells will be installed on the site, and any future plans for constructing new buildings on the site will be evaluated with respect to potential risks associated with vapor intrusion.

1.1 Meeting with EPD

On October 1, 2013, the RPs and ENVIRON met with representatives of EPD (Derrick Williams, David Brownlee, and Kevin Collins) to discuss EPD’s comments regarding the May 2013 approval of the VRP Application. Specific agreements made between the parties included the following:

- The use of one exposure domain for surface soil and one exposure domain for subsurface soil is appropriate for the site;
- Kriging is an acceptable method for identifying and defining the potential extent of dense non-aqueous phase liquid (DNAPL) at the site. The RPs will work with EPD to ensure that the parameters used to create the final 3-dimensional results are understood and agreed-upon by the Agency;
- Surface water samples will be collected semi-annually for 3 years from locations that are reasonably close to the river bank (taking the health and safety risks of the sampling areas into consideration);
- Sufficient documentation has been provided to EPD regarding the RPs’ attempts to gain offsite access and, as such, additional attempts to contact offsite property owners are not required;
- Development of Type 2 RRS is not necessary provided that the Uniform Environmental Covenant (UEC) for the site indicates non-residential use for the site;
- Trespasser scenarios are not applicable to the site;
- Exposure to groundwater does not constitute a complete exposure pathway with regards to human health. Consequently, leaching to groundwater is not a required component of the Type 4 RRS for soil; and,
- USEPA’s default values for the calculation of vapor intrusion risks are acceptable but may be adjusted based on specific future site development scenarios, if any. The UEC will discuss future building construction scenarios and subsequent evaluation for vapor intrusion risks, as detailed in the VRP Application.

The remainder of this Progress Report presents background site information (Section 2), site activities since the submittal of the November 2013 Status Report (Section 3), characterization of source material (i.e., DNAPL) in groundwater at the site (Section 4), and a summary of expected future site activities (Section 5), as well specific items and information requested by EPD in its May 2013 VRP Application approval letter.

2 Site Background

The Colonial site is located in a highly industrial area of Savannah, Georgia, and is bordered to the north and northeast by the Savannah River (which is in high industrial use and has been altered for that purpose), to the southeast by Georgia Recyclers, to the south by North Lathrop Avenue (on the other side of which is Great Dane Trailers), and to the west by Arboris, LLC and International Paper Company's Savannah Pulp and Paper Mill. With the exception of the earthen berms at the site that surround the ASTs, the surface topography at the site is relatively flat and ranges from approximately 9 feet above mean sea level (ft amsl) at the southern and western property boundaries to approximately 4 ft amsl at the northern property boundary along the Savannah River

According to the Chatham County Board of Assessors, the site is owned and maintained by Colonial, and consists of Tax Parcel IDs 1-0549-01-002, 1-0549-01-002A, and 1-0550-02-004. The previous site owners include Virginia-Carolina Chemical Company (now Exxon Mobil Corporation) and Swift Agricultural Chemicals Corporation (now BFEL Indemnitor, Inc.).

2.1 Site Geology

The site is located in the Barrier Island Sequence District of the Coastal Plain Physiographic Province of Georgia. Regional soils are characterized by Pleistocene and Holocene barrier island deposits and marsh and lagoon deposits. Pleistocene sea levels advanced and retreated several times over the Coastal Plain to form a step-like progression of decreasing elevation toward the sea (Clark and Zisa, 1976). The area during the time of the former, higher sea levels existed as barrier island-salt marsh environments similar to the present coast. The changes in sea level left shoreline deposit complexes parallel to the present coastline, composed predominantly of unconsolidated sand and clayey sand deposited during the former high sea levels.

The regional geology has been characterized as Coastal Plain strata consisting of unconsolidated to semi-consolidated layers of sand and clay, and semi-consolidated to very dense layers of limestone and dolomite (Clarke et al, 1990). These sediments range in age from the late Cretaceous to Holocene periods. The strata generally strike southwest and northeast, and dip and gradually thicken to the southeast.

Based on historical site assessment activities, the site geology from land surface to approximately 2 feet below ground surface (ft bgs) consists of sequences of sands, which are underlain by stiff sandy clays that extend to approximately 8 to 10 ft bgs. Clayey sands with clay stringers are present from approximately 10 ft bgs to 34 ft bgs, below which clay and silt is present to approximately 80 ft bgs.

2.2 Site Hydrogeology

The Coastal Plain is underlain by multiple aquifers. In the vicinity of the site, the surficial aquifer consists of the Satilla Formation (Payne, Ruman, and Clarke, 2005). Beneath the surficial aquifer are the upper and lower Brunswick aquifers, which consist of slightly phosphatic and dolomitic quartz sands and clay confining units. The Brunswick aquifer system is approximately 80 feet thick in the region of the site and has a higher percentage of low permeability, clayey

deposits in the Savannah area. The underlying Upper Floridan aquifer, which consists of the Ocala Limestone, is the principal source of water in the coastal area (Clarke et al, 1990).

Due to the proximity of the site to the Savannah River and Atlantic Ocean, the surficial/shallow groundwater at the site is influenced by tidal activity, and the depth to groundwater at the site typically ranges from approximately 3 to 12 ft bgs. Additionally, the shallow groundwater at the site has a high saline content due to tidal influence and, as such, the groundwater in the shallow surficial aquifer is not potable.

Slug tests were performed in three wells (MW-16, MW-18, and TW-28) on May 25 and 26, 2006, for the purpose of evaluating the hydraulic conductivity of the shallow aquifer. Based on the results of the tests, the average hydraulic conductivity of the shallow surficial aquifer at the site is approximately 3.05×10^{-3} centimeters per second. Based on the site gradient, and assuming an effective porosity of 20 percent, the groundwater flow velocity is estimated to range between 0.1 feet per day (ft/d) and 0.2 ft/d.

2.3 Summary of Corrective Action

Corrective action has been undertaken for soil and groundwater at the site, as discussed in the 2012 VRP Application and the November 2013 Semi-Annual Status Report. Specifically, corrective action has consisted of the following activities:

- Excavation and offsite disposal of:
 - Approximately 23,415 tons of lead and/or arsenic-impacted soil from eight distinct areas of the site between October 2007 and December 2007.
 - Approximately 812 tons of VOC-impacted soil adjacent to Tank T-88 at the southeast portion of the site in December 2007.
 - Approximately 38 tons of soil from the area surrounding historical soil boring GP-07-06 in February and March 2009.
- Operation of a soil vapor extraction (SVE) system from May 2009 through May 2013 for the purpose of addressing VOC impacts in the vicinity of Tank 75 through Tank 78. Following removal of approximately 6,137 pounds of total VOCs and upon meeting the shutdown criteria specified in the Performance Monitoring Plan (Environmental Resources Management [ERM], 2009), the system was discontinued in May 2013.
- Injection of more than 150,000 gallons of a solution containing sodium persulfate, lime, and caustic using 250 injection wells for the purpose of treating metals and VOCs in the groundwater (ERM, 2010). In addition, a network of 34 groundwater monitoring wells were sampled annually from 2008 through 2010 to gauge the effectiveness of the chemical injections.

2.4 Risk Reduction Standards

The site and surrounding properties are used for non-residential purposes and, therefore, Type 4 risk reduction standards (RRS; non-residential, site-specific) for the site were submitted as part of the VRP Application. Specifically, RRS for constituents of potential concern (COPCs) in surface soil were developed to be protective of commercial/industrial, utility, and construction

workers at the site via direct contact, and RRS for COPCs in subsurface soil were developed to be protective of utility and construction workers via direct contact. Based on the RP's meeting with EPD in October 2013, the following conditions were agreed upon regarding the RRS for the site:

- The use of one exposure domain (ED) for surface soil and one ED for subsurface soil at the site is acceptable;
- Development of Type 2 RRS is not necessary provided that the UEC for the site indicates non-residential use for the site;
- The UEC will include language that limits construction worker scenarios to 65 days of exposure to subsurface soil;
- Trespasser scenarios are not applicable to the site; and,
- Exposure to groundwater does not constitute a complete exposure pathway with regards to human health and, therefore, leaching to groundwater is not a required component of the site-specific RRS for soil. As such, and per EPD's request, the soil RRS will be herein referred to as Type 5 RRS.

The exposure conditions at the site have not changed since the submittal of the VRP Application. Because the entire site is considered to comprise one exposure domain (that is, receptors at the site are no more or less likely to be present or exposed to soil at any onsite location than another), an area averaging approach using 95 percent Upper Confidence Levels (UCLs) determined that exposure point concentrations for arsenic and lead in surface and subsurface soil (i.e., the two constituents for which there were individual exceedances of the RRS) do not exceed their respective RRS.

In addition to the RRS presented in the VRP Application, EPD previously approved Type 5 RRS for two conditions at the site, as presented in the 2012 VRP Application and the November 2013 Semi-Annual Status Report:

- Areas within 12 feet of the railroad centerline where excavations could result in a loss of structural integrity of the tracks; and,
- Deep soil adjacent to retaining walls and loading docks along the Savannah River.

The site maintains engineering and institutional controls for these areas, including a Restrictive Covenant on the deeds for the three parcels that comprise the site.

Because there is no reasonable exposure to groundwater at or within 1,000 feet of the site, RRS were not developed for groundwater. .

2.5 Vapor Intrusion

Based on a comparison of the maximum detected and reasonable maximum exposure concentrations of VOCs in soil and groundwater with vapor intrusion criteria (ENVIRON, 2012), there are two locations at the site (GP-07-04 and GP-07-06, as presented in Figure 15 of the VRP Application) that could result in unacceptable risks associated with vapor intrusion exposures, as presented in the 2012 VRP Application and the 2013 Semi-Annual Status Report. However, because these locations are not under or in immediate proximity to current site

structures at which workers might be exposed to indoor air (i.e., the warehouse to the north of Tanks 77 and 78), cleanup standards have not been derived for the vapor intrusion pathway. As agreed upon by EPD in October 2013, location-specific vapor intrusion risks will be assessed and mitigation measures, if necessary, will be implemented prior to or during future construction of habitable structures at the site.

3 Site Activities – Current Period of Performance

In accordance with the VRP Application, and to further assess the groundwater and surface water quality, the following activities were conducted at the site:

- Sampling of 24 existing onsite groundwater monitoring wells in December 2013;
- Collection of surface water samples from three locations along the Savannah River in December 2013 and April 2014; and,
- Installation, development, and sampling of two deep, Type III monitoring wells (MW-101D and MW-102D) in April 2014.

A summary of these activities is presented in the following sections.

3.1 Groundwater and Surface Water Sampling

Per the approved monitoring plan presented in the VRP Application, annual groundwater monitoring and semi-annual surface water monitoring at the site commenced in December 2013, and additional surface water monitoring was conducted in April 2014. In addition to the 7 shallow and 3 deeper monitoring wells identified for sampling in the VRP application (one of which [MW-36D] could not be located), groundwater samples were also collected from 15 additional existing monitoring wells to provide a more comprehensive data set for the source characterization activities.

3.1.1 Groundwater and Surface Water Assessment – December 2013

ENVIRON collected groundwater samples from 24 wells between December 11 and 13, 2013, (**Figure 3**). Prior to sampling, each monitoring well was opened and allowed to equilibrate. Due to access constraints and weather conditions, a standardized measurement of water levels in the wells could not be collected prior to sampling. As such, an updated potentiometric surface map that estimates groundwater flow direction will be included in the November 2014 Semi-Annual Status Report. Based on historical groundwater levels and the adjacent Savannah River, groundwater at the site is expected to flow northeast towards the river.

Commencing on December 11, 2013, the groundwater monitoring wells were purged via low-flow techniques utilizing a peristaltic pump fitted with new, disposable tubing. The monitoring wells were purged in accordance with USEPA guidance and until the pH, specific conductance, temperature, and turbidity of the groundwater stabilized. Following purging, groundwater samples were collected by filling laboratory-provided, appropriately preserved, sample containers. Each sample container was labeled and subsequently placed on ice, and hand-delivered to Test America Laboratories, Inc. (Test America) in Savannah, Georgia for analysis of VOCs by USEPA Method 8260 and/or metals by USEPA Methods 6010 and 7470.

The sample containers for each well were handled using new, disposable Nitrile gloves to prevent cross contamination. Following sampling, the purge water was disposed of in the facility's wastewater collection system. The electronic water level meter was decontaminated prior to its initial use and after being used at each well by cleaning with a Liquinox and distilled water mixture, followed by a distilled water rinse.

The depth-to-groundwater measurements and corresponding groundwater elevations are presented in **Table 1**. The purge logs are included in **Appendix A**.

In addition, ENVIRON collected surface water samples from three locations along the Savannah River on December 13, 2013 (**Figure 3**). Prior to sampling, the surface water was withdrawn for 10 to 15 minutes using a peristaltic pump with new, disposable tubing, after which surface water samples were collected in the manner discussed above and hand-delivered under standard chain-of-custody protocol to Test America in Savannah, Georgia, for analysis of VOCs by USEPA Method 8260. The surface water samples were collected between 11:50 am and 12:45 pm. Low tide for that day occurred at approximately 11:51 am (Savannah, Georgia – Bull Street Monitoring Station).

3.2 Surface Water Assessment – April 2014

On April 19, 2014, ENVIRON collected surface water samples from the same locations along the Savannah River as were sampled in December 2013. Prior to sampling, the surface water was withdrawn via low-flow technique using a peristaltic pump with new, disposable tubing until water quality parameters stabilized, after which surface water samples were collected in the manner discussed above and shipped under standard chain-of-custody protocol via courier to Test America in Savannah, Georgia, for analysis of VOCs by USEPA Method 8260. The surface water samples were collected between 7:44 pm and 8:51 pm. Low tide for that day occurred at approximately 6:47 am, and at 6:49 pm (Savannah, Georgia – Bull Street Monitoring Station).

3.3 New Well Installation – April 2014

To understand the extent of source material at the site, ENVIRON oversaw the installation of two Type III groundwater monitoring wells (MW-101D and MW-102D; **Figure 3**). Both wells were installed near areas with PCE concentrations indicative of the potential presence of DNAPL using a combination of HSA and wash rotary drilling techniques. The outer casings were installed to approximately 35 ft bgs and 55 ft bgs (MW-101D and MW-102D, respectively), and the wells (i.e., inner casings/screens) were installed to approximately 55 ft bgs and 71 ft bgs (MW-101D and MW-102D, respectively). The well construction logs are included in **Appendix B**.

Following installation, the wells were developed with a submersible pump, after which an electronic water level meter was used to record the depth to groundwater for each well. The wells were subsequently purged using low-flow sampling methodology with a peristaltic pump attached to disposable tubing. The samples were shipped under standard chain-of-custody protocol via courier to Test America in Savannah, Georgia, for analysis of VOCs by USEPA Method 8260.

The sample containers at each well were handled using new, disposable Nitrile gloves. The purge water was disposed of in the facility's wastewater collection system, and the soil cuttings were contained in clean, 55-gallon drums for future disposal. The electronic water level meter was decontaminated prior to its initial use and after being used at each well by cleaning it with a mixture of Liquinox and distilled water and then rinsing it with distilled water.

3.4 Analytical Results

The groundwater and surface water samples were analyzed for VOCs by USEPA Method 8260 and RCRA metals (in select wells) by USEPA Methods 6010/7470. The analytical results indicate the presence of chlorinated VOCs in 21 of the 24 monitoring wells sampled, barium in each of the 8 monitoring wells sampled for metals, metals in 3 of the 8 monitoring wells for which they were sampled. In addition, VOCs were not detected in the surface water during the most recent sampling event. In general, the groundwater data indicated the following:

- Concentrations of VOCs were generally significantly less than the results from August 2010 (i.e., the most recent historical sampling event);
- Concentrations of PCE that are indicative of the potential presence of DNAPL (i.e., in excess of 1 percent of its aqueous solubility; that is, 2,000 micrograms per liter [ug/l]) were identified in 5 wells (MW-11R, MW-12R, MW-30, TW-01, and TW-13). In August 2010, eight wells met this condition.
- Concentrations of metals were generally consistent with or less than historical concentrations.
- A low concentration of PCE was detected in surface water sample SW-02 during the December 2013 sampling event, but the concentration did not exceed the Georgia In Stream Water Quality Standard (1.4 ug/l versus the criterion of 3.3 ug/l). No VOCs were detected during the most recent surface water sampling event.

Summaries of the analytical results for VOCs in groundwater and surface water, and metals in groundwater, are presented in **Table 2 and Table 3**, respectively, and in **Figure 4 and Figure 5**, respectively. The laboratory analytical reports are included in **Appendix C**.

4 Source Material Investigation

To characterize the horizontal and vertical extent of potential PCE source material in groundwater at the site (i.e., concentrations representative of the potential presence of DNAPL), ENVIRON conducted 3-dimensional (3D) kriging of measured concentration data using C Tech's Mining Visualization System (MVS) Premier software¹. MVS combines advanced geostatistical analysis with 3D visualization tools to model environmental data. Similar to other interpolation methods, kriging assumes that values at nearby locations are more similar to each other than to more distant points. As such, concentrations at unsampled locations are estimated using a weighted average of the observed data, with higher weights given to values closest to the unsampled location. Unlike other deterministic interpolation methods (e.g., inverse distance weighting), kriging employs a geostatistical approach that includes autocorrelation (i.e., the statistical relationship among measured points) and allows for a characterization of the uncertainty in the predictions.

A description of the interpolation process used to model source material at the site is presented in the following sections.

4.1 Input Data

Concentrations of PCE from the groundwater sampling events in December 2013 (24 wells) and April 2014 (two deep wells) were used to run the model. Additional inputs included the following parameters for each well (**Table 4**):

- Location (latitude and longitude);
- Top and bottom depth of the screen interval; and,
- Depth to groundwater.

The data were converted into an Analyte Interval Data File (AIDV) for use in MVS Premier using C Tech's Data Reduction Tool². The AIDV file translates a screened interval into samples spaced along the screened interval for use in the kriging. The spacing of samples along the well screen, referred to as the 'maximum gap' (max-gap), is a user-defined parameter that is set when the AIDV file is created. A large max-gap value will result in one sample placed at the center of the screened interval, while a small max-gap value may result in multiple samples evenly spaced within the screened interval. To define the geologic framework for the kriging, ENVIRON used a max-gap value of 1; that is, a sample was placed every 1 foot over the screened interval to ensure that the 3D grid covered the maximum extent of the sampled area. During the kriging, a max-gap value of 10 was used (i.e., one sample was placed in the center of each screened interval) to prevent vertically oversampling during the interpolation.

¹ In the November 2012 VRP Application, ENVIRON stated that analysis would be conducted using C Tech's EVS-PRO software. MVS Premier is also a C Tech product and offers the same interpolation and visualization techniques as EVS-PRO, but with expanded program features.

² C Tech's Data Reduction Tool is a utility program that can be downloaded by licensed C Tech customers to convert data in Microsoft Excel or Access into all major C Tech file formats

4.2 Data Visualization and Interpolation

After importing the AIDV file into the 'post samples' module in MVS, samples were color-coded by PCE concentration (2,000 ug/l, 6,000 ug/l and 10,000 ug/l) to further define the predicted concentrations. After the sample data were visualized and reviewed for quality control purposes, the data were gridded and kriged within MVS. The modules used within MVS to interpolate PCE concentrations at the site include the following:

- **Krig 3D Geology.** This module creates the 3D grid that ultimately provides the geologic framework for the kriging, and allows the user to define the parameters for creating the kriging grid. ENVIRON created the 3D grid using a convex hull that limited the kriging area to the space enclosed by measured data points. The default reach distance and number of points used to calculate parameter estimates were used.
- **Krig 3D.** The 3D geologic grid and a max-gap of 10 were used as inputs for the Krig 3D module. In addition, adaptive gridding was used to ensure that nodes of the geologic grid were placed at each measured value to include the original dataset. ENVIRON used the MVS default parameters for resolution and data processing, and the anisotropic ratio (AR) was adjusted from downwards from a default value of 10 to a more conservative AR value of 3 to determine the maximum vertical extent of potential PCE source material in groundwater. Although the subsurface is comprised of clayey sands underlain by clay and silt, the use of a lower AR allows the model to more heavily weigh the vertical migration of constituents in groundwater versus the horizontal migration of those constituents.
- **Explode and Scale.** This module applies a scaling factor to the vertical dimension of the geologic layers. ENVIRON used a scaling factor of five for visualization purposes. The scaling factor is used only for visualization and does not change the kriging output.
- **Plume Volume.** The plume volume module creates a 3D volumetric subset of a 3D input. The output of the Krig 3D module, after being passed through the Explode and Scale module, was used as input. Within this module, ENVIRON subset the PCE concentration to visualize the concentration in groundwater exceeding 2,000 ug/l.

In addition, a 2-dimensional vector shapefile of the Savannah River shoreline was used to constrain the kriging to the northern property boundary.

4.3 Model Results

The results of a preliminary model based on data from the December 2013 groundwater sampling event identified three distinct areas of the site as having concentrations of PCE in groundwater that indicate the potential presence of DNAPL (**Figure 6**). Of these, the model was able to predict the vertical extent of potential DNAPL in one area (MW-12R) using the results from the nearby deeper monitoring well MW-12D. However, the absence of deeper monitoring wells in the other two areas (MW-11R and MW-30) precluded the model's ability to predict the vertical extent of potential DNAPL surrounding these locations. Consequently, the model was re-run following the installation and sampling of the two new deep wells in April 2014, the results of which indicate the following:

- **MW-12R:** The predicted extent of source material covers approximately 15,800 square feet (sf) that extends primarily to the south-southeast (due to the absence of additional

groundwater samples in that direction). The predicted vertical extent of potential source material extends to a maximum depth of approximately 40 ft bgs (**Figure 7**).

- **MW-11R/MW-30:** Although separate from each other in the shallow groundwater, the model predicted an exceedance of the source material criteria between approximately 20 ft bgs and 35 ft bgs that connects these two areas (**Figure 7**). In the shallow groundwater, the predicted extent of source material covers approximately 700 sf between MW-11R and nearby TW-01, and approximately 39,000 sf that extends primarily west-southwest from MW-30 (due to the absence of additional groundwater samples in that direction). The predicted vertical extent of potential source material extends to a maximum depth of approximately 50 ft bgs in this area.

Based on the results of the model, the extent of potential PCE source material in groundwater has been defined both horizontally and vertically for each area of the site where concentrations indicative of the potential presence of DNAPL were observed during the December 2013 groundwater sampling event.

4.4 Sensitivity Analysis

To ensure that the results of the modeling accurately predict horizontal and vertical delineation, ENVIRON conducted a sensitivity analysis by varying the two parameters that were adjusted within MVS (i.e., the max-gap and the AR). When over-representing the kriged area by using a max-gap value of 1 for the kriging (that is, a modeled sample point is used every 1 foot within the screen interval of each well rather than just once per well), the vertical extent of PCE concentrations that exceed the DNAPL criteria are predicted to extend no greater than approximately 60 ft bgs. In addition, although the use of an AR value of 10 or greater is realistic for the site given the presence of clay stringers and hard silty clay that would likely increase lateral flow, an AR value of 3 was used for the model to provide a highly conservative estimate of vertical migration of groundwater. As discussed in Section 4.3 and illustrated in **Figure 7**, the use of the conservative AR value of 3 results in modeled PCE concentrations less than the DNAPL criteria by approximately 50 ft bgs.

5 Summary

Per the VRP, groundwater sampling was conducted at the site in December 2013, and surface water sampling was conducted in December 2013 and April 2014. The analytical results from the groundwater sampling indicate that concentrations of VOCs and metals are consistent with or are significantly less than concentrations from the previous sampling event in 2010. In addition, the results from the most recent surface water sampling event indicate that VOCs are non-detect in the Savannah River. As previously discussed, the surface water samples were collected as close to low tide as possible to provide for the most conservative data.

Although there is no complete exposure pathway to groundwater at the site, an investigation of potential source material using kriging was conducted per EPD's request (Comment #2 of the May 2013 approval of the VRP application). To supplement this investigation, an additional 15 existing groundwater monitoring wells were sampled during the December 2013 event, the results of which indicated three distinct areas of the site where measured groundwater concentrations of PCE were representative of the potential presence of DNAPL (MW-11R, MW-12R, and MW-30). A preliminary model was run using a 3D grid that defined the horizontal and vertical boundaries for the site, and input parameters that were representative of realistic and/or overly conservative scenarios for predicting PCE concentrations at unsampled locations. Based on the results of the preliminary modeling, the vertical extent of potential source material could not be defined for two of the three areas and, as such, two additional deep wells were installed and sampled in April 2014 to supplement the initial data set (MW-101D and MW-102D). The model was re-run with the updated data set, the results of which indicate that the horizontal and vertical extents of PCE at concentrations representative of DNAPL have been defined.

In accordance with the schedule set forth in the November 2012 VRP Application and based on discussions with EPD in October 2013, annual groundwater sampling and semi-annual surface water sampling will be conducted in the fourth quarter of 2014. Because one of the three deep wells proposed for sampling in the VRP Application could not be located (MW-36D), the recently installed Type III deeper monitoring wells (MW-101D and MW-102D) will be included in the 2014 groundwater sampling matrix to further assess groundwater quality at the site.

The next semi-annual progress report will be submitted in November 2014.

6 References

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Tables

**Table 1 - Groundwater Levels and Elevations
Colonial Terminals Plant #2 (HSI No. 10098)
May 2014**

Well ID	TOC Elevation (feet AMSL)	Date	Depth to Groundwater (feet BTOC)	Groundwater Elevation (feet AMSL)
MW-01	9.64	12/13/2013	6.71	2.93
MW-06R	11.41	12/12/2013	9.63	1.78
MW-08	12.17	12/12/2013	11.52	0.65
MW-09D	11.97	12/11/2013	10.50	1.47
MW-11R	11.64	12/11/2013	12.00	-0.36
MW-12D	12.33	12/12/2013	12.32	0.01
MW-12R	11.80	12/12/2013	10.73	1.07
MW-18	12.64	12/11/2013	6.94	5.70
MW-24	12.71	12/11/2013	11.63	1.08
MW-25	11.21	12/11/2013	10.69	0.52
MW-26	11.26	12/11/2013	10.43	0.83
MW-28	13.08	12/13/2013	12.43	0.65
MW-29	11.93	12/11/2013	11.11	0.82
MW-30	12.77	12/12/2013	11.46	1.31
MW-34	11.23	12/12/2013	9.92	1.31
TW-01	N/A	12/11/2013	11.65	N/A
TW-03	N/A	12/11/2013	12.02	N/A
TW-04	N/A	12/11/2013	11.01	N/A
TW-13	14.15	12/13/2013	--	N/A
TW-25	11.30	12/12/2013	9.69	1.61
TW-27	12.22	12/12/2013	10.39	1.83
TW-29	11.80	12/12/2013	10.19	1.61
TW-31	N/A	12/12/2013	8.91	N/A
TW-32	N/A	12/13/2013	9.73	N/A

Notes:

AMSL - Above mean sea level

BTOC - Below TOC

N/A - Not Available

TOC - top of casing

**Table 2 - Summary of VOCs in Groundwater and Surface Water
Colonial Terminals Plant #2 (HSI No. 10098)
May 2014**

<i>Analyte Type DNAPL Criteria ⁽¹⁾ Units</i>			PCE 2,000 ug/l	TCE 14,720 ug/l	cis-1,2-DCE 35,000 ug/l	trans-1,2-DCE 63,000 ug/l	Vinyl Chloride 88,000 ug/l
Well ID	Depth (ft bgs)	Date Sampled					
MW-01	12.5	8/13/2008	< 1	0.62	13	< 1	8.7
		9/1/2009	3.2	0.42 J	12.4	< 1	< 1
		8/30/2010	< 1	1.4	55.1	< 1	25.2
		12/13/2013	< 5.0	< 5.0	41	< 5.0	10
MW-06R	15.1	8/12/2008	58	60.5	11.6	< 1	0.57
		9/1/2009	2.4	2	0.77	< 1	< 1
		8/31/2010	2.3	1.6	0.5	< 1	< 1
		12/12/2013	2.2	2.7	1.4	< 1.0	< 1.0
MW-08	14.84	5/20/2008	22.8	25.2	2.3	< 1	0.57
		9/1/2009	12.2	15.6	1.4	< 1	< 1
		8/31/2010	9.3	8.4	0.99	< 1	< 1
		12/12/2013	4	2.8	< 1.0	< 1.0	< 1.0
MW-09D	31	8/12/2008	211	31.7	34	< 2	6.6
		9/1/2009	275	26.9	27.5	9.6	5
		9/2/2009	275	26.9	27.5	< 5	5
		9/1/2010	265	36.9	50.5	< 5	6.6
		12/11/2013	180	30	42	< 2.0	4.7
MW-11R	20.1	9/2/2009	17,200	2,420	4,290	693	176
		9/1/2010	18,200	2,900	5,570	< 250	218
		12/11/2013	19,000	3,400	4,900	210	250
MW-12D	35.29	8/11/2008	123	10.8	19	< 0.45	< 1
		9/2/2009	249	6	1.8 J	< 5	< 5
		8/30/2010	142	3.8	1.4	< 2	< 2
		12/12/2013	240	26	6.1	< 5.0	< 5.0
MW-12R (DUP-03)	18.8	8/31/2010	71,700	1,960	< 1000	< 1000	< 1000
		12/12/2013	19,000	540	< 200	< 200	< 200
		12/12/2013	18,000	570	200	< 200	< 200

**Table 2 - Summary of VOCs in Groundwater and Surface Water
Colonial Terminals Plant #2 (HSI No. 10098)
May 2014**

<i>Analyte Type DNAPL Criteria ⁽¹⁾ Units</i>			PCE 2,000 ug/l	TCE 14,720 ug/l	cis-1,2-DCE 35,000 ug/l	trans-1,2-DCE 63,000 ug/l	Vinyl Chloride 88,000 ug/l
Well ID	Depth (ft bgs)	Date Sampled					
MW-18	18.96	5/20/2008	183	28.3	29.2	< 5	3
		9/2/2009	38.1	24	50.5	0.54 J	10.7
		9/1/2010	80.6	34.9	72.2	< 1	8.4
		12/11/2013	11	3	6	< 1.0	< 1.0
MW-24	14.3	5/20/2008	31.7	14.1	35.7	< 1	9.4
		9/3/2009	97.9	28.5	42	< 1	7
		9/1/2010	85.2	27.4	53.4	< 1	11.5
		12/11/2013	120	8.3	19	< 1.0	2.2
MW-25	13.8	5/21/2008	13,300	3,070	194	< 200	< 200
		9/3/2009	18,800	7,970	93.9 J	< 200	< 200
		9/2/2010	12,400	946	193	< 100	< 100
		12/11/2013	95	26	4.3	< 1.0	< 1.0
MW-26	14.46	5/20/2008	9,110	3,880	175	< 100	< 100
		9/2/2009	9.6	5.7	< 1	< 1	< 1
		9/2/2010	14,600	4,340	77.4	< 5	8
		12/11/2013	110	39	< 1.0	< 1.0	< 1.0
MW-28	14.5	12/13/2013	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MW-29	14.5	8/12/2008	10.6	4.8	8.9	< 1	< 1
		9/2/2009	33.1	11.4	19	1.9	< 1
		9/1/2010	6.8	2.1	3.1	< 1	< 1
		12/11/2013	2.8	< 1.0	< 1.0	< 1.0	< 1.0
MW-30	15	8/12/2008	8,330	3,110	6,930	< 100	676
		9/3/2009	6,520	2,550	6,750	120	395
		8/31/2010	26,200	4,200	9,100	< 100	771
		12/12/2013	23,000	3,700	9,300	< 200	570
MW-34	15.41	8/11/2008	829	362	344	< 10	< 10
		8/31/2010	705	327	138	2.5	4.4
		12/12/2013	410	460	140	5.3	< 5.0

**Table 2 - Summary of VOCs in Groundwater and Surface Water
Colonial Terminals Plant #2 (HSI No. 10098)
May 2014**

		<i>Analyte Type DNAPL Criteria ⁽¹⁾ Units</i>	PCE 2,000 ug/l	TCE 14,720 ug/l	cis-1,2-DCE 35,000 ug/l	trans-1,2-DCE 63,000 ug/l	Vinyl Chloride 88,000 ug/l
Well ID	Depth (ft bgs)	Date Sampled					
TW-01 (DUP-01)	37	12/11/2013	5,100	1,500	3,600	150	<50
		12/11/2013	4,800	1,400	4,200	130	< 50
TW-03	22.6	12/11/2013	130	56	2.2	< 1.0	< 1.0
TW-04	16.9	12/11/2013	84	95	69	8.6	< 1.0
TW-13	18	8/12/2008	7,930	1,100	4,190	< 50	498
		9/2/2009	12,800	1,300	4,530	< 100	385
		8/31/2010	6,740	1,300	5,990	< 100	606
		12/13/2013	3,500	1,000	5,000	< 50	630
TW-25	14.6	5/21/2008	27,100	350	301	< 500	< 500
		9/1/2009	17,200	361	279	< 100	< 100
		8/31/2010	8,840	212	161	< 100	< 100
		12/12/2013	140	9.4	5	< 1.0	< 1.0
TW-27	19.45	5/21/2008	3.6	< 1	< 1	< 1	< 1
		9/1/2009	35.1	2	0.89 J	< 1	< 1
		8/31/2010	2.6	< 1	< 1	< 1	< 1
		12/12/2013	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TW-29 (DUP-02)	17.79	5/21/2008	990	1,490	4,360	< 50	269
		9/28/2009	52,300	9,190	6,650	25.8	461
		8/31/2010	40,200	8,160	3,610	< 500	616
		12/12/2013	38	38	610	< 10	< 10
		12/12/2013	62	27	67	< 1.0	5.4
TW-31	18.5	12/12/2013	80	62	180	< 1.0	47
TW-32	10	12/13/2013	66	24	45	4.7	< 2.0
SW-01		9/17/2010	< 1	< 1	< 1	< 1	< 1
		12/13/2013	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
		4/19/2014	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

**Table 2 - Summary of VOCs in Groundwater and Surface Water
Colonial Terminals Plant #2 (HSI No. 10098)
May 2014**

<i>Analyte Type DNAPL Criteria ⁽¹⁾ Units</i>			PCE 2,000 ug/l	TCE 14,720 ug/l	cis-1,2-DCE 35,000 ug/l	trans-1,2-DCE 63,000 ug/l	Vinyl Chloride 88,000 ug/l
Well ID	Depth (ft bgs)	Date Sampled					
SW-02		9/17/2010	< 1	< 1	< 1	< 1	< 1
		12/13/2013	1.4	< 1.0	< 1.0	< 1.0	< 1.0
		4/19/2014	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
SW-03		9/17/2010	< 1	< 1	< 1	< 1	< 1
		12/13/2013	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
		4/19/2014	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:

(1) DNAPL Threshold based on 1% Aqueous Solubility (USEPA, 2004)

< -- Analyte was not detected at the laboratory reporting limit indicated

ft bgs -- feet below ground surface

J -- Concentration was greater than the method detection limit but less than the laboratory reporting limit

ug/L -- Micrograms per liter (parts per billion)

Bold and highlighted values indicate an exceedance of the chemical-specific DNAPL threshold

Field Duplicates

	<u>DUP-01</u>	<u>DUP-02</u>	<u>DUP-03</u>
Dec 2013	TW-01	TW-29	MW-12R

**Table 3 - Summary of Metals in Groundwater
Colonial Terminals Plant #2 (HSI No. 10098)
May 2014**

Analyte Units		Total Metals								Dissolved Metals							
		Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Lead mg/L	Mercury mg/L	Selenium mg/L	Silver mg/L	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Lead mg/L	Mercury mg/L	Selenium mg/L	Silver mg/L
Well ID	Date Sampled																
MW-09D	8/12/2008	0.0064 B	--	--	< 0.6	0.005	--	--	--	--	--	--	--	--	--	--	--
	9/2/2009	< 0.0054	--	0.0044 B	< 0.002	< 0.002	--	< 0.0034	--	--	--	--	--	--	--	--	--
	9/1/2010	< 0.002	--	0.0041	< 0.001	< 0.001	--	< 0.002	--	--	--	--	--	--	--	--	--
	12/11/2013	< 0.02	0.029	< 0.0050	< 0.01	< 0.01	< 0.00020	< 0.02	< 0.01	--	--	--	--	--	--	--	--
MW-11R	9/1/2010	< 0.002	--	< 0.0025	0.0049	< 0.001	--	< 0.002	--	--	--	--	--	--	--	--	--
	12/11/2013	< 0.02	0.029	0.005	< 0.01	< 0.01	< 0.00020	< 0.02	< 0.01	--	--	--	--	--	--	--	--
MW-12R	8/31/2010	0.0881	--	--	--	< 0.001	--	--	--	--	--	--	--	--	--	--	--
	12/12/2013	0.11	0.017	< 0.0050	< 0.01	< 0.01	0.00098	< 0.02	< 0.01	0.11	< 0.01	< 0.0050	< 0.01	< 0.01	< 0.00020	< 0.02	< 0.01
MW-12D	8/31/2010	0.088	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/12/2013	< 0.02	0.045	< 0.0050	< 0.01	< 0.01	< 0.00020	< 0.02	< 0.01	--	--	--	--	--	--	--	--
MW-25	5/21/2008	0.0073 B	0.138 B	0.0076	0.0012 B	0.0058	--	< 0.01	--	--	--	--	--	--	--	--	--
	9/3/2009	< 0.0054	--	--	--	< 0.002	--	--	--	--	--	--	--	--	--	--	--
	9/2/2010	0.26	--	--	--	1.36	--	--	--	220	--	--	--	0.937	--	--	--
	12/11/2013	0.058	0.047	< 0.0050	< 0.01	0.38	< 0.00020	< 0.02	< 0.01	--	--	--	--	--	--	--	--
MW-30	8/12/2008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9/3/2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	8/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/12/2013	< 0.02	0.043	< 0.0050	< 0.01	< 0.01	< 0.00020	< 0.02	< 0.01	--	--	--	--	--	--	--	--
TW-25	5/20/2008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9/1/2009	< 0.0054	--	< 0.001	0.0045 B	< 0.002	--	0.0045 B	< 0.01	--	--	--	--	--	--	--	--
	8/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/12/2013	< 0.02	0.042	< 0.0050	< 0.01	< 0.01	< 0.00020	< 0.02	< 0.01	--	--	--	--	--	--	--	--
TW-29	5/20/2008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9/1/2009	< 0.0054	--	--	--	< 0.002	--	--	--	--	--	--	--	--	--	--	--
	8/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/12/2013	< 0.02	0.027	< 0.0050	< 0.01	< 0.01	< 0.00020	< 0.02	< 0.01	--	--	--	--	--	--	--	--

Notes:

- mg/L -- Milligrams per liter (parts per million)
- < -- Analyte was not detected at the laboratory reporting limit indicated
- B -- Analyte was detected in the associated method blank
- Analyte was not sampled for

**Table 4 - Input Data for 3-Dimensional Kriging in MVS
Colonial Terminals Plant #2 (HSI No. 10098)
May 2014**

Well	Top Screen Depth (ft bgs)	Bottom Screen Depth (ft bgs)	Groundwater Depth (ft bgs)	Sample Year	PCE	Units	Detect	Longitude	Latitude
MW-01	3.5	13.5	6.71	2013	5	ug/l	N	-81.11599	32.0997
MW-06R	5.1	15.1	9.63	2013	2.2	ug/l	Y	-81.115862	32.1001
MW-08	9.78	14.78	11.52	2013	4	ug/l	Y	-81.116111	32.1002
MW-09D	26.25	31.25	10.5	2013	180	ug/l	Y	-81.114656	32.1002
MW-11R	10.52	19.9	12	2013	19000	ug/l	Y	-81.115947	32.1012
MW-12R	8	18.8	10.73	2013	19000	ug/l	Y	-81.115474	32.0999
MW-12D	28.1	35.6	12.32	2013	240	ug/l	Y	-81.115356	32.1000
MW-18	8.3	18.3	12.02	2013	11	ug/l	Y	-81.114464	32.1000
MW-24	4.3	14.3	11.63	2013	120	ug/l	Y	-81.11459	32.1000
MW-25	3.8	13.8	10.69	2013	95	ug/l	Y	-81.11497	32.1003
MW-26	4.46	14.46	10.43	2013	110	ug/l	Y	-81.115125	32.1005
MW-28	4.5	14.5	12.43	2013	1	ug/l	N	-81.114211	32.0995
MW-29	4.5	14.5	11.11	2013	2.8	ug/l	Y	-81.116175	32.1014
MW-30	5	15	11.46	2013	23000	ug/l	Y	-81.115991	32.1009
MW-34	5.41	15.41	9.92	2013	410	ug/l	Y	-81.11577	32.0994
TW-01	12	37	11.65	2013	5100	ug/l	Y	-81.11598	32.1013
TW-03	10	25	12.02	2013	130	ug/l	Y	-81.115898	32.1012
TW-04	10	20	11.01	2013	84	ug/l	Y	-81.115998	32.1012
TW-13	7	17	16.54	2013	3500	ug/l	Y	-81.116173	32.1006
TW-25	5	15	9.69	2013	140	ug/l	Y	-81.116491	32.1000
TW-27	8.5	18.5	10.39	2013	1	ug/l	N	-81.117393	32.1003
TW-29	8	18	10.19	2013	62	ug/l	Y	-81.116948	32.1002
TW-31	6.5	16.5	8.91	2013	80	ug/l	Y	-81.117133	32.1002
TW-32	5	10	9.73	2013	66	ug/l	Y	-81.116618	32.0997
MW-101D	40	55	11	2014	33	ug/l	Y	-81.115954	32.1008
MW-102D	61	71	11	2014	1	ug/l	N	-81.115933	32.1013

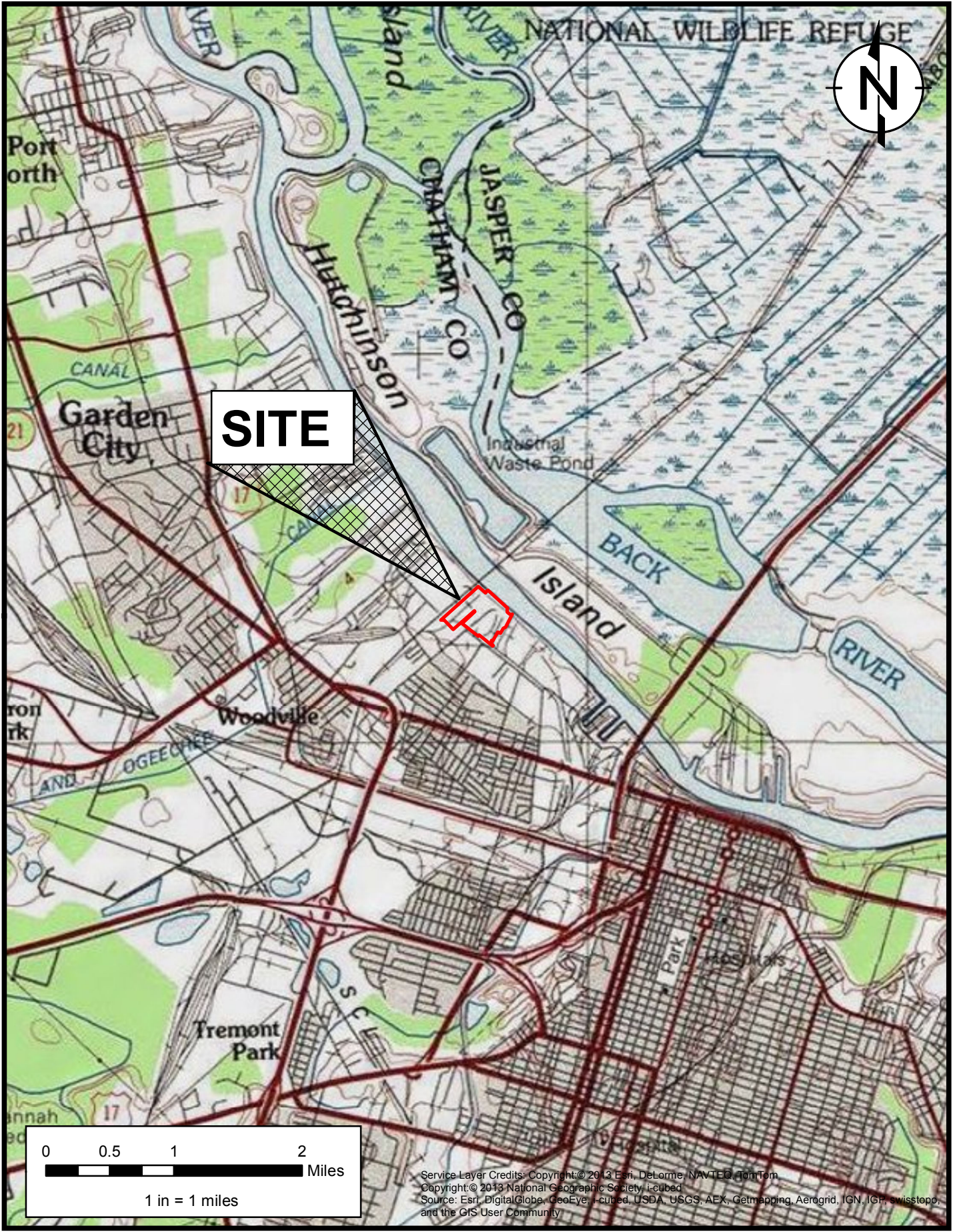
Notes:

ft bgs: Feet below ground surface


PCE: Tetrachloroethylene

ug/l: Micrograms per liter (parts per billion)

Figures



P:\Colonial Terminals\GIS\Figures\Site Location.mxd



ENVIRON

DRAFTED BY: HThompson DATE: 5/9/2014

SITE LOCATION MAP
 COLONIAL TERMINALS, INC.
 373 NORTH LATHROP AVENUE
 SAVANNAH, GEORGIA

FIGURE
1

07-30114F



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- LISTED PARCELS

0 250 500 1,000
 Feet
 1 inch = 500 feet

Service Layer Credits: Copyright © 2013 Esri, DeLorme, NAVTEQ, TomTom
 Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX,
 Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



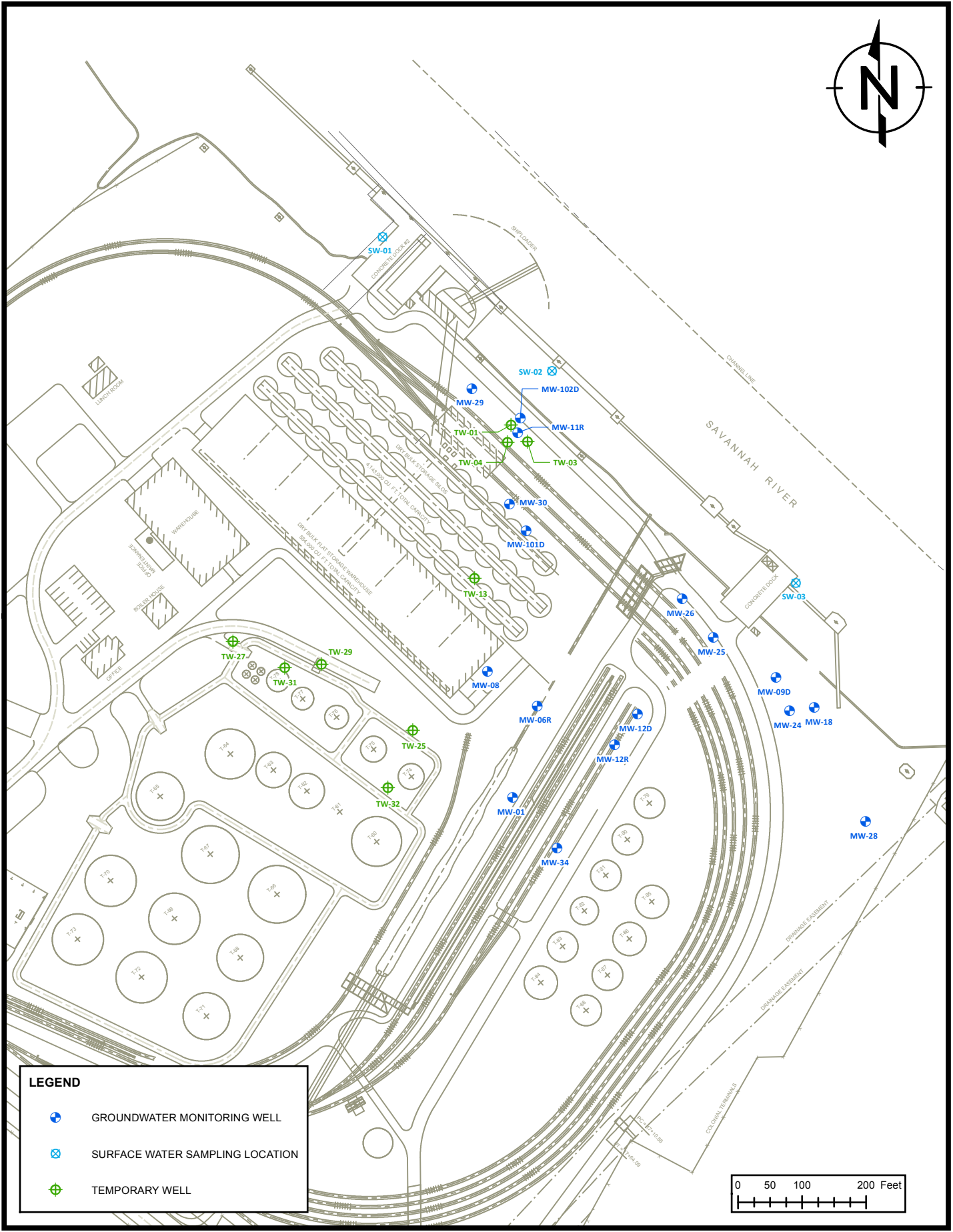
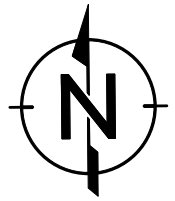
DRAFTED BY: HThompson

DATE: 5/9/2014




SITE LAYOUT
 COLONIAL TERMINALS, INC.
 373 NORTH LATHROP AVENUE
 SAVANNAH, GEORGIA

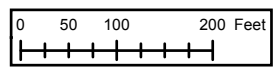
FIGURE
2

07-30114F



LEGEND

-  GROUNDWATER MONITORING WELL
-  SURFACE WATER SAMPLING LOCATION
-  TEMPORARY WELL



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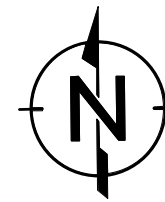


DRAFTED BY: HThompson DATE: 5/9/2014

**GROUNDWATER MONITORING WELL
AND SURFACE WATER SAMPLING LOCATION**
 COLONIAL TERMINALS, INC.
 373 NORTH LATHROP AVENUE
 SAVANNAH, GEORGIA

**FIGURE
3**

07-30114F



SW-01					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/17/2010	<1	<1	<1	<1	<1
12/13/2013	<1.0	<1.0	<1.0	<1.0	<1.0
4/19/2014	<1.0	<1.0	<1.0	<1.0	<1.0

MW-29					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/1/2010	6.8	2.1	3.1	<1	<1
12/11/2013	2.8	<1.0	<1.0	<1.0	<1.0

TW-01					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
12/11/2013	5,100	1,500	4,200	150	<50

MW-11R					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/1/2010	18,200	2,900	5,570	<250	218
12/11/2013	19,000	3,400	4,900	210	250

TW-04					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
12/11/2013	84	95	69	8.6	<1.0

MW-30					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	26,200	4,200	9,100	<100	771
12/12/2013	23,000	3,700	9,300	<200	570

TW-13					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	6,740	1,300	5,990	<100	606
12/13/2013	3,500	1,000	5,000	<50	630

MW-08					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	9.3	8.4	0.99	<1	<1
12/12/2013	4	2.8	<1.0	<1.0	<1.0

TW-27					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	2.6	<1.0	<1.0	<1.0	<1.0
12/13/2013	<1.0	<1.0	<1.0	<1.0	<1.0

TW-29					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	40,200	8,160	3,610	<500	616
12/12/2013	62	38	610	<10	5.4

TW-31					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
12/12/2013	80	62	180	<1.0	47

MW-06R					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	2.3	1.6	0.5	<1	<1
12/12/2013	2.2	2.7	1.4	<1.0	<1.0

TW-25					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	8,840	212	161	<100	<100
12/12/2013	140	9.4	5	<1.0	<1.0

MW-12D					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/30/2010	142	3.8	1.4	<2	<2
12/12/2013	240	26	6.1	<5.0	<5.0

TW-32					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
12/13/2013	66	24	45	4.7	<2.0

MW-12R					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	71,700	1,960	<1000	<1000	<1000
12/12/2013	19,000	570	200	<200	<200

MW-01					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/30/2010	<1	1.4	55.1	<1	25.2
12/13/2013	<5.0	<5.0	41	<5.0	10

MW-34					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
8/31/2010	705	327	138	2.5	4.4
12/12/2013	410	460	140	5.3	<5.0

SW-02					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/17/2010	<1	<1	<1	<1	<1
12/13/2013	1.4	<1.0	<1.0	<1.0	<1.0
4/19/2014	<1.0	<1.0	<1.0	<1.0	<1.0

MW-102D					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
4/19/2014	<1.0	<1.0	<1.0	<1.0	<1.0

TW-03					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
12/11/2013	130	56	2	<1.0	<1.0

MW-101D					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
4/19/2014	33	3.2	3.3	<1.0	<1.0

MW-26					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/2/2010	14,600	4,340	77.4	<5	8
12/11/2013	110	39	<1.0	<1.0	<1.0

SW-03					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/17/2010	<1	<1	<1	<1	<1
12/13/2013	<1.0	<1.0	<1.0	<1.0	<1.0
4/19/2014	<1.0	<1.0	<1.0	<1.0	<1.0

MW-25					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/2/2010	12,400	946	193	<100	<100
12/11/2013	95	26	4.3	<1.0	<1.0

MW-09D					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/1/2010	265	36.9	50.5	<5	6.6
12/11/2013	180	30	42	<2.0	4.7

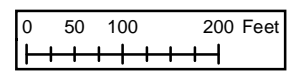
MW-24					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/1/2010	85.2	27.4	53.4	<1	11.5
12/11/2013	120	8.3	19	<1.0	2.2

MW-18					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
9/1/2010	80.6	34.9	72.2	<1	8.4
12/11/2013	11	3	6	<1.0	<1.0

MW-28					
Date	PCE	TCE	cis12DCE	trans12DCE	VC
12/13/2013	<1.0	<1.0	<1.0	<1.0	<1.0

LEGEND

- GROUNDWATER MONITORING WELL
- SURFACE WATER SAMPLING LOCATION
- TEMPORARY WELL



Notes:

- All concentrations are in micrograms per liter (ug/L)
- < Analyte was not detected at the laboratory reporting limit

SUMMARY OF VOC RESULTS IN GROUNDWATER AND SURFACE WATER

COLONIAL TERMINALS, INC.
373 NORTH LATHROP AVENUE
SAVANNAH, GEORGIA

FIGURE 4

DRAFTED BY: HThompson

DATE: 5/27/2014

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MW-11R				
Date	As	Cd	Cr	Pb
9/1/2010	< 0.002	< 0.0025	0.0049	< 0.001
12/11/2013	< 0.02	0.005	< 0.01	< 0.01

MW-30				
Date	As	Cd	Cr	Pb
8/31/2010	--	--	--	--
12/12/2013	< 0.02	< 0.0050	< 0.01	< 0.01

MW-25				
Date	As	Cd	Cr	Pb
9/2/2010	0.26/200	--	--	1.36/0.937
12/11/2013	0.058	< 0.0050	< 0.01	0.38

MW-09D				
Date	As	Cd	Cr	Pb
9/1/2010	< 0.002	0.0041	< 0.001	< 0.001
12/11/2013	< 0.02	< 0.0050	< 0.01	< 0.01

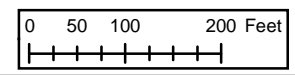
TW-29				
Date	As	Cd	Cr	Pb
9/1/2010	--	--	--	--
12/11/2013	< 0.02	< 0.0050	< 0.01	< 0.01

TW-25				
Date	As	Cd	Cr	Pb
8/31/2010	--	--	--	--
12/12/2013	< 0.02	< 0.0050	< 0.01	< 0.01

MW-12D				
Date	As	Cd	Cr	Pb
8/31/2010	0.088	--	--	--
12/12/2013	< 0.02	< 0.0050	< 0.01	< 0.01

MW-12R				
Date	As	Cd	Cr	Pb
8/31/2010	0.0881	--	--	< 0.001
12/12/2013	0.11	< 0.0050	< 0.01	< 0.01

LEGEND	
	GROUNDWATER MONITORING WELL
	SURFACE WATER SAMPLING LOCATION
	TEMPORARY WELL



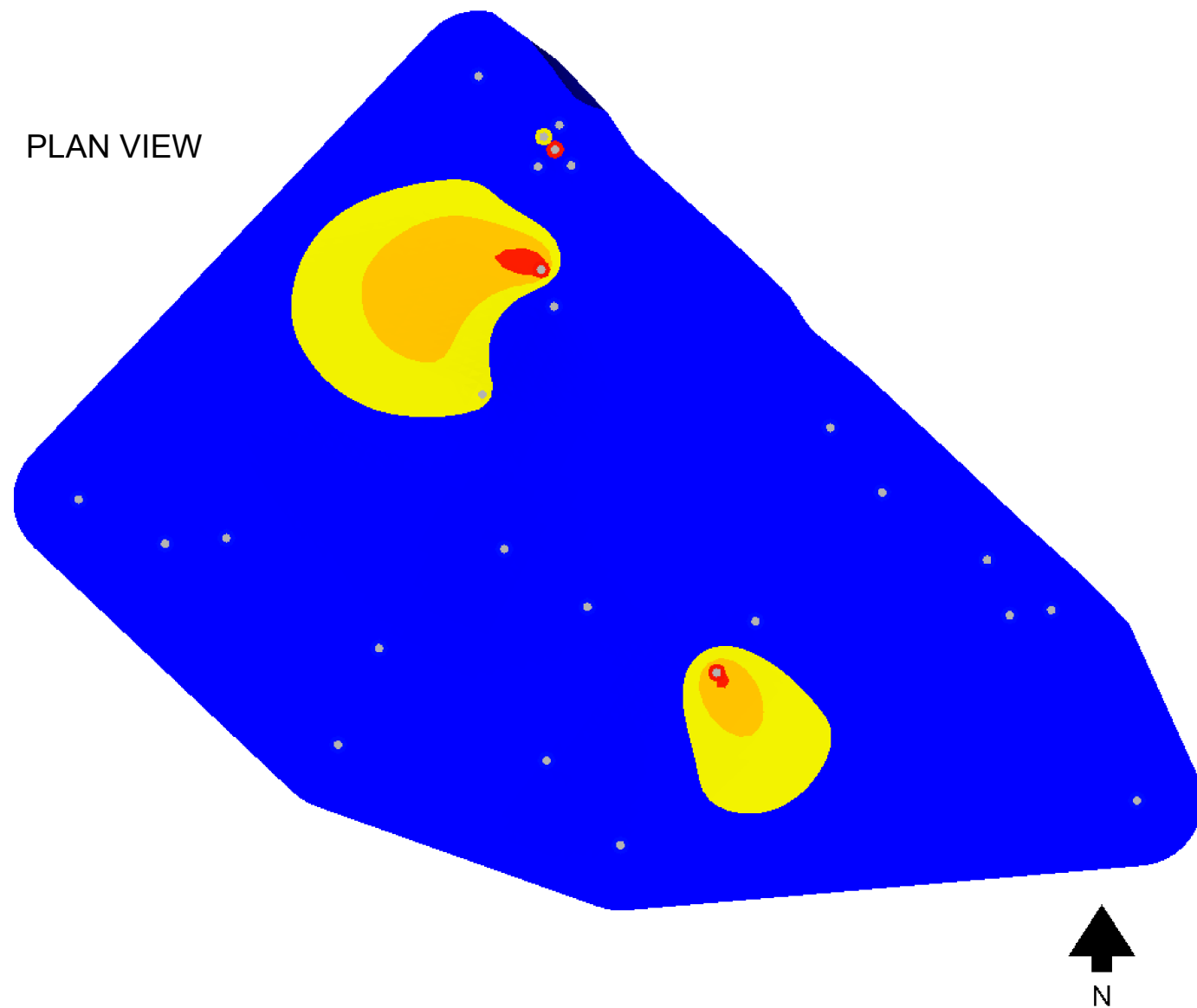
Notes:

- All concentrations are in milligrams per liter (mg/L)
- < Analyte was not detected at the laboratory reporting limit
- **BOLD** values indicate an exceedance of the Type 4 RRS

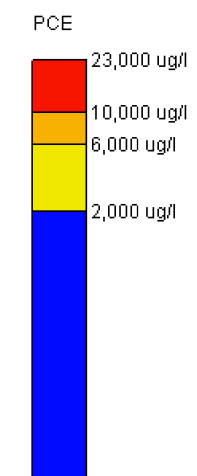
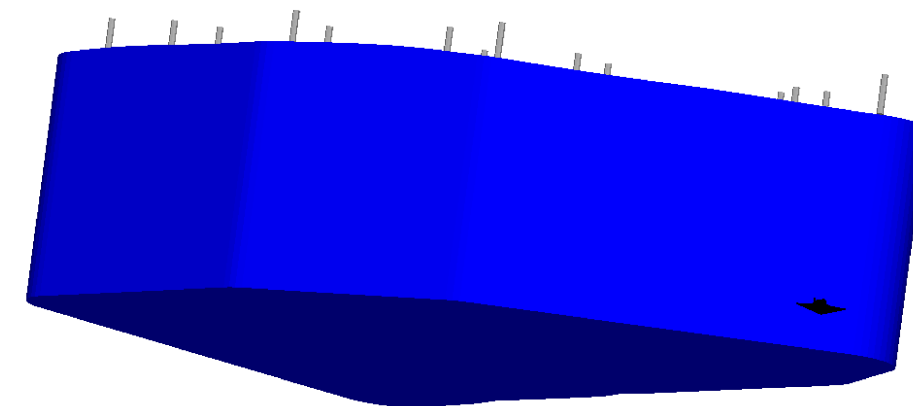
SUMMARY OF METALS RESULTS IN GROUNDWATER	
COLONIAL TERMINALS, INC. 373 NORTH LATHROP AVENUE SAVANNAH, GEORGIA	
	FIGURE 5
DRAFTED BY: HThompson	DATE: 5/27/2014
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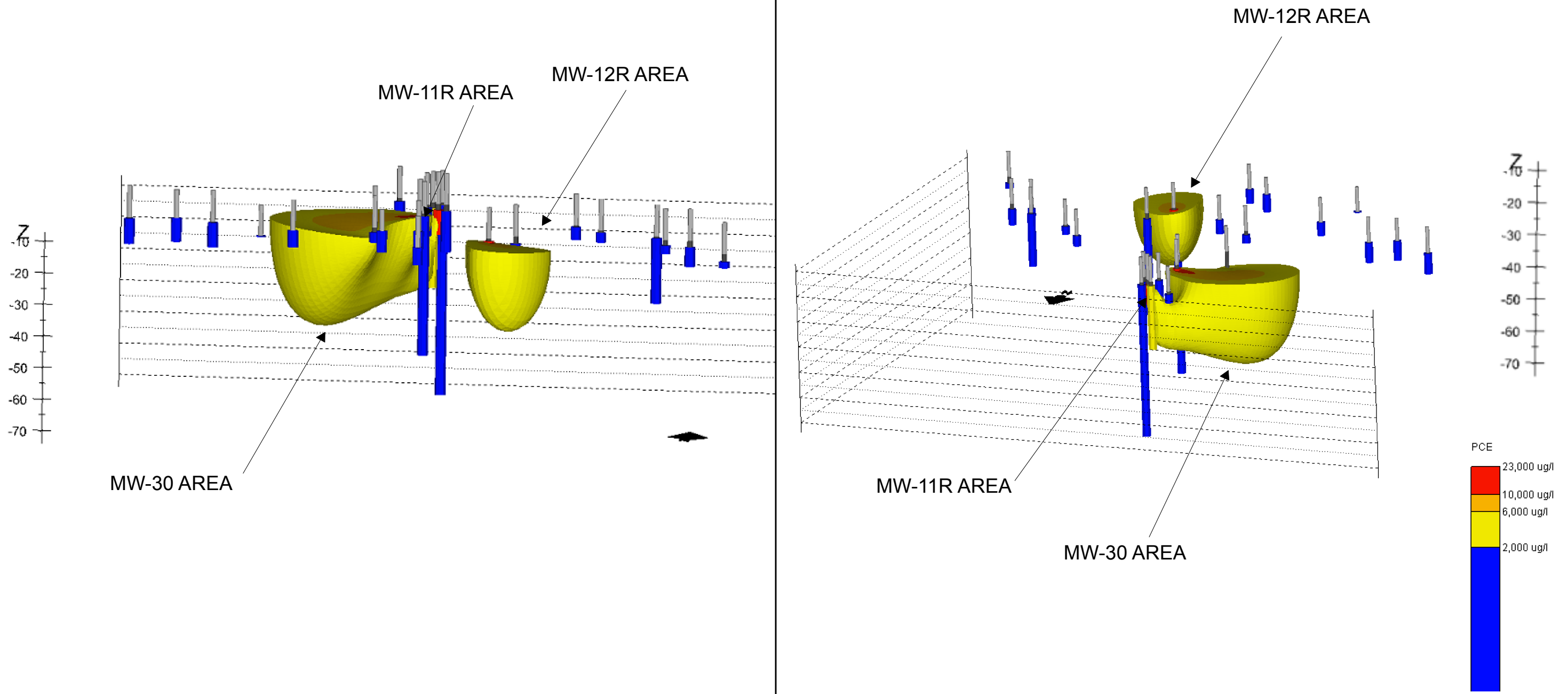
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PLAN VIEW



VERTICAL EXTENT OF
KRIGED AREA (70 FT BGS)





3-Dimensional Model of PCE in Groundwater
 Colonial Terminals, Inc.
 Savannah, Georgia

Figure
 7

Appendix A

Groundwater and Surface Water Purge Logs

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/2013
 Site/Well No. MW-06R Weather Sunny, 39°F
 Site Personnel Kevin Hage, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>15.10</u>	Equipment Used	<u>Peristaltic Pump</u>
Water Level (ft BTOC)	<u>9.63</u>	Type of Tubing Used	<u>LDPE</u>
Water Column in Well (ft)	<u>5.47</u>	Pump Intake Depth	<u>14.1 ft BTOC</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>11.00</u>
Gallons in Well	<u>0.89</u>	Total Gallons Purged	<u>1.6</u>
Well Condition	<u>bolts are broken, buried</u>		

Time		Field Parameters	
Begin Purge	<u>0838</u>	Initial Color	<u>White</u> Final <u>White</u>
End Purge	<u>0918</u>	Odor	<u>none</u> <u>none</u>
Sample Time (as on COC)	<u>0918</u>	Appearance	<u>very turbid</u> <u>turbid</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>0900</u>	<u>11.6</u> <u>11.06</u>	<u>1 gallon</u>	<u>191</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
<u>0905</u>	<u>11.03</u>	<u>1.2</u>	<u>188</u>	<u>16.44</u>	<u>2812</u>	<u>4.93</u>	<u>4.59</u>	<u>243.8</u>
<u>0908</u>	<u>11.00</u>	<u>1.3</u>	<u>304</u>	<u>16.20</u>	<u>2811</u>	<u>4.95</u>	<u>1.76</u>	<u>241.5</u>
<u>0912</u>	<u>11.00</u>	<u>1.4</u>	<u>348</u>	<u>16.07</u>	<u>2809</u>	<u>4.94</u>	<u>1.32</u>	<u>240.6</u>
<u>0915</u>	<u>11.00</u>	<u>1.5</u>	<u>299</u>	<u>16.09</u>	<u>2810</u>	<u>4.95</u>	<u>1.16</u>	<u>239.8</u>
<u>0918</u>	<u>11.00</u>	<u>1.6</u>	<u>706</u>	<u>16.17</u>	<u>2805</u>	<u>4.94</u>	<u>1.01</u>	<u>239.4</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs

	Casing Volume Multipliers				Stabilization Criteria	
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. MW-09D Weather Cloudy, 50°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data

Well Diameter/ Material 2"
 Well Depth (ft BTOC) 31.00
 Water Level (ft BTOC) 10.50
 Water Column in Well (ft) 20.50
 Casing Volume Multiplier 0.16
 Gallons in Well 3.28
 Well Condition 1 broken bolt

Purge Data

Purge Method Low Flow
 Equipment Used Peristaltic Pump
 Type of Tubing Used LDPE
 Pump Intake Depth 30 ft BTOC
 Static Pumping Level 10.78
 Total Gallons Purged 1.3

Time

Begin Purge 1535
 End Purge 1605
 Sample Time (as on COC) 1605

Field Parameters

Initial Color none Final none
 Odor none
 Appearance clear

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
1540	10.69	0.2	1.19	20.70	3767	6.14	1.82	277.6
1550	10.73	0.75	0.42	21.20	3752	6.24	1.38	262.9
1553	10.73	0.9	0.35	21.20	3748	6.25	1.26	258.2
1556	10.78	1	0.48	21.18	3744	6.25	1.23	256.3
1559	10.78	1.1	0.58	21.07	3739	6.25	1.13	253.6
1602	10.78	1.2	0.37	21.20.99	3750	6.25	4.77	247.0
1605	10.78	1.3	0.32	20.89	3751	6.25	0.45	244.1

Stirred flow cell, so D.O. went up

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested Metals, VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%	

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. MW-11R Weather SUNNY, 50's, CLEAR
 Site Personnel Kevin Hade, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>LOW FLOW</u>
Well Depth (ft BTOC)	<u>20.10</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>12.00</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>8.1</u>	Pump Intake Depth	<u>~18.5</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>12.00</u>
Gallons in Well	<u>1.30</u>	Total Gallons Purged	<u>2.0</u>
Well Condition	<u>poor. Bolts are missing</u>		

Time		Field Parameters	
Begin Purge	<u>0920</u>	Initial Color	<u>clear</u> Final <u>clear</u>
End Purge	<u>1009</u>	Odor	<u>None apparent</u> <u>None apparent</u>
Sample Time (as on COC)	<u>1010</u>	Appearance	<u>clear</u> <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (ms/cm)	pH	DO (mg/L)	ORP
0930	12.00	0.2	0.64	18.93	1.220	4.86	9.29	173.9
0935	12.00	0.4	0.76	18.90	1.220	4.86	9.23	204.3
0940	12.00	0.6	0.02	19.17	1.220	4.89	8.83	230.5
0945	12.00	0.8	0.34	19.25	1.219	4.90	8.04	246.9
0950	12.00	1.0	0.43	19.19	1.219	4.90	7.78	260.5
0955	12.00	1.2	0.36	18.99	1.220	4.90	7.71	269.7
1000	12.00	1.4	1.97	19.14	1.218	4.91	7.35	268.1
1003	12.00	1.6	1.92	19.10	1.220	4.90	7.07	261.7
1006	12.00	1.8	1.81	18.96	1.218	4.91	7.03	256.2
1009	12.00	2.0	1.86	19.34	1.216	4.91	6.73	241.8

Laboratory Data

Laboratory Used Test America QA/QC Samples: N/A
 Analysis Requested VOCs, Metals

	Casing Volume Multipliers				Stabilization Criteria	
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/2013
 Site/Well No. MW-12R Weather Sunny, 55°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data

Well Diameter/ Material 2"
 Well Depth (ft BTOC) 18.80
 Water Level (ft BTOC) 10.73
 Water Column in Well (ft) 8.07
 Casing Volume Multiplier 0.16
 Gallons in Well 1.29
 Well Condition good

Purge Data

Purge Method Low Flow
 Equipment Used Peristaltic Pump
 Type of Tubing Used LDPE
 Pump Intake Depth 29.75 ft ~ 18 ft
 Static Pumping Level 10.75
 Total Gallons Purged 2.5

Time

Begin Purge 1504
 End Purge 1600
 Sample Time (as on COC) 1600

Field Parameters

Initial Color White Final turbid (K) none
 Odor none none
 Appearance Very turbid, opaque turbid, cloudy, opaque (K)

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
1530	10.79	1.5	478	18.53	2485	5.95	2.00	164.4
1533	10.75	1.6	987	18.83	2526	5.91	1.77	166.5
1536	10.75	1.7	out of range	18.04	2514	5.83	1.89	169.4
1539	10.75	1.8	out of range	18.10	2508	5.83	1.94	169.7
1542	10.75	1.9	out of range	18.34	2472	5.74	2.21.95	174.7
1545	10.75	2.0	out of range	18.80	2460	5.70	1.92	174.9
1548	10.75	2.1	" "	18.57	2488	5.76	1.92	174.5
1551	10.75	2.2	" "	18.55	2479	5.76	1.88	173.3
1554	10.75	2.3	" "	18.33	2493	5.78	1.97	173.2
1557	10.75	2.4	" "	18.49	2488	5.75	1.96	172.5
1600	10.75	2.5	" "	18.23	2480	5.72	1.96	174.8

* Water cleared as filling sample bottles. Final turbidity was 152 NTU

Laboratory Data

Laboratory Used Test America QA/QC Samples: DUP-03
 Analysis Requested VOCs, Metals (dissolved and total)

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%	

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/13
 Site/Well No. mw-120 Weather Sunny, 50's, clear
 Site Personnel Kevin Hade, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>35.29</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>12.32</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>22.97</u>	Pump Intake Depth	<u>~ 33</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>12.34</u>
Gallons in Well	<u>3.68</u>	Total Gallons Purged	<u>1.70</u>
Well Condition	<u>Bots are stripped</u>		

Time		Field Parameters	
Begin Purge	<u>1500</u>	Initial Color	<u>clear</u> Final <u>clear</u>
End Purge	<u>1539</u>	Odor	<u>none apparent</u> Final <u>none apparent</u>
Sample Time (as on COC)	<u>1540</u>	Appearance	<u>clear</u> Final <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (mS/cm)	pH	DO (mg/L)	ORP
<u>1510</u>	<u>12.32</u>	<u>0.4</u>	<u>0.00</u>	<u>19.10</u>	<u>5.325</u>	<u>6.41</u>	<u>0.84</u>	<u>22.2</u>
<u>1515</u>	<u>12.32</u>	<u>0.6</u>	<u>0.00</u>	<u>19.15</u>	<u>5.316</u>	<u>6.41</u>	<u>0.63</u>	<u>2.2</u>
<u>1520</u>	<u>12.34</u>	<u>0.8</u>	<u>0.00</u>	<u>19.03</u>	<u>5.318</u>	<u>6.41</u>	<u>0.50</u>	<u>-45.3</u>
<u>1525</u>	<u>12.34</u>	<u>1.0</u>	<u>0.00</u>	<u>19.03</u>	<u>5.324</u>	<u>6.41</u>	<u>0.45</u>	<u>-69.5</u>
<u>1530</u>	<u>12.34</u>	<u>1.2</u>	<u>0.00</u>	<u>19.03</u>	<u>5.320</u>	<u>6.41</u>	<u>0.41</u>	<u>-95.1</u>
<u>1533</u>	<u>12.34</u>	<u>1.4</u>	<u>0.00</u>	<u>18.65</u>	<u>5.317</u>	<u>6.41</u>	<u>0.39</u>	<u>-123.8</u>
<u>1536</u>	<u>12.34</u>	<u>1.5</u>	<u>0.00</u>	<u>18.76</u>	<u>5.315</u>	<u>6.41</u>	<u>0.37</u>	<u>-142.0</u>
<u>1539</u>	<u>12.34</u>	<u>1.7</u>	<u>0.00</u>	<u>18.79</u>	<u>5.315</u>	<u>6.41</u>	<u>0.36</u>	<u>-151.2</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: N/A
 Analysis Requested VOCs, metals

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. mw-18 Weather Cloudy, Windy, 50s
 Site Personnel Kevin Hade, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>18.96</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>12.02</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>6.94</u>	Pump Intake Depth	<u>~ 16</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>12.02</u>
Gallons in Well	<u>1.11</u>	Total Gallons Purged	<u>1.80</u>
Well Condition	<u>Poor, cover Busted, missing Bolts</u>		

Time		Field Parameters	
Begin Purge	<u>1620</u>	Initial Color	<u>clear</u> Final <u>clear</u>
End Purge	<u>1704</u>	Odor	<u>none apparent</u> <u>none apparent</u>
Sample Time (as on COC)	<u>1705</u>	Appearance	<u>clear</u> <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µs/cm)	pH	DO (mg/L)	ORP
<u>1635</u>	<u>12.02</u>	<u>0.5</u>	<u>0.62</u>	<u>18.15</u>	<u>6.113</u>	<u>3.08</u>	<u>0.97</u>	<u>348.7</u>
<u>1640</u>	<u>12.02</u>	<u>0.7</u>	<u>0.27</u>	<u>18.07</u>	<u>6.124</u>	<u>3.08</u>	<u>0.68</u>	<u>350.0</u>
<u>1645</u>	<u>12.02</u>	<u>0.9</u>	<u>0.00</u>	<u>17.93</u>	<u>6.124</u>	<u>3.07</u>	<u>0.63</u>	<u>349.3</u>
<u>1650</u>	<u>12.02</u>	<u>1.0</u>	<u>0.42</u>	<u>18.00</u>	<u>6.138</u>	<u>3.08</u>	<u>0.51</u>	<u>348.5</u>
<u>1655</u>	<u>12.02</u>	<u>1.2</u>	<u>0.00</u>	<u>18.03</u>	<u>6.151</u>	<u>3.08</u>	<u>0.42</u>	<u>348.0</u>
<u>1658</u>	<u>12.02</u>	<u>1.4</u>	<u>0.00</u>	<u>18.00</u>	<u>6.156</u>	<u>3.08</u>	<u>0.39</u>	<u>347.2</u>
<u>1701</u>	<u>12.02</u>	<u>1.6</u>	<u>0.00</u>	<u>18.04</u>	<u>6.160</u>	<u>3.09</u>	<u>0.38</u>	<u>347.0</u>
<u>1704</u>	<u>12.02</u>	<u>1.8</u>	<u>0.00</u>	<u>18.02</u>	<u>6.162</u>	<u>3.09</u>	<u>0.37</u>	<u>346.7</u>

Laboratory Data

Laboratory Used Test America QAQC Samples: NIA

Analysis Requested VOC's

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. MW-2A Weather Cloudy, 50°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>14.3</u>	Equipment Used	<u>Peristaltic Pump</u>
Water Level (ft BTOC)	<u>10.63 11.63</u>	Type of Tubing Used	<u>LDPE</u>
Water Column in Well (ft)	<u>2.67</u>	Pump Intake Depth	<u>13.5 ft BTOC</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>11.70</u>
Gallons in Well	<u>0.43</u>	Total Gallons Purged	<u>1.75</u>
Well Condition	<u>good</u>		

Time		Field Parameters	
Begin Purge	<u>1632</u>	Initial Color	<u>white</u> Final <u>none</u>
End Purge	<u>1702</u>	Odor	<u>none</u> Final <u>none</u>
Sample Time (as on COC)	<u>1702</u>	Appearance	<u>cloudy</u> Final <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>1640</u>	<u>11.70</u>	<u>0.25</u>	<u>36.7</u>	<u>19.61</u>	<u>4253</u>	<u>4.65</u>	<u>1.56</u>	<u>258.6</u>
<u>1646</u>	<u>11.70</u>	<u>0.75 0.5</u>	<u>7.82</u>	<u>19.58</u>	<u>4232</u>	<u>4.63</u>	<u>1.05</u>	<u>220.1</u>
<u>1649</u>	<u>11.70</u>	<u>0.75</u>	<u>11.7</u>	<u>19.59</u>	<u>4223</u>	<u>4.64</u>	<u>1.36</u>	<u>215.7</u>
<u>1652</u>	<u>11.70</u>	<u>1</u>	<u>15.2</u>	<u>19.63</u>	<u>4261</u>	<u>4.64</u>	<u>1.50</u>	<u>215.7</u>
<u>1655</u>	<u>11.70</u>	<u>1.25</u>	<u>5.31</u>	<u>19.70</u>	<u>4220</u>	<u>4.64</u>	<u>1.16</u>	<u>206.1</u>
<u>1658</u>	<u>11.70</u>	<u>1.5</u>	<u>3.56</u>	<u>19.74</u>	<u>4226</u>	<u>4.64</u>	<u>1.30</u>	<u>203.2</u>
<u>1701</u>	<u>11.70</u>	<u>1.75</u>	<u>2.14</u>	<u>19.58</u>	<u>4220</u>	<u>4.64</u>	<u>1.08</u>	<u>199.7</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs

	Casing Volume Multipliers				Stabilization Criteria	
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. MW-25 Weather overcast, 60's
 Site Personnel Kevin Hade, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>LOW FLOW</u>
Well Depth (ft BTOC)	<u>13.80</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>10.69</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>3.11</u>	Pump Intake Depth	<u>~ 12</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>10.61</u>
Gallons in Well	<u>0.50</u>	Total Gallons Purged	<u>3.40</u>
Well Condition	<u>Well Buried, Bolts have Rusted and Broke off- need to be Replaced</u>		

Time		Field Parameters	
Begin Purge	<u>1430</u>	Initial Color	<u>VERY turbid, murky</u> Final <u>clear</u>
End Purge	<u>1604</u>	Odor	<u>none apparent</u> <u>none apparent</u>
Sample Time (as on COC)	<u>1605</u>	Appearance	<u>particulates</u> <u>fine particulates</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
1440	10.69	0.4	699 AU	17.13	1.332	6.33	7.56	52.8
1455	10.69	0.6	216 NTU	16.79	1.306	6.29	2.82	-2.4
1505	10.71	0.9	27.4	17.10	1.261	6.25	2.40	-5.3
1510	10.61	1.1	16.4	16.87	1.277	6.24	2.31	-4.5
1520	10.61	1.3	35.9	16.23	1.300	6.24	2.19	-6.2
1525	10.61	1.5	43.3	16.57	1.284	6.23	2.40	2.0
1535	10.61	1.7	26.3	17.34	1.260	6.23	2.32	4.6
1540	10.61	1.8	25.0	17.26	1.264	6.22	2.14	5.2
1543	10.61	2.0	18.8	17.43	1.261	6.21	2.12	5.5
1546	10.61	2.2	17.9	17.31	1.265	6.21	2.03	6.0
1549	10.61	2.6	16.5	17.19	1.264	6.20	2.06	7.9
1552	10.61	2.8	13.7	17.34	1.261	6.20	2.05	8.3
1555	10.61	3.0	12.8	17.34	1.249	6.20	2.13	10.4
1558	10.61	3.2	9.31	17.06	1.249	6.20	2.12	11.2
1601	10.61	3.3	7.74	17.11	1.244	6.20	2.19	12.7
1604	10.61	3.4	7.76	17.13	1.245	6.20	2.17	13.4

Laboratory Data

Laboratory Used Test America QA/QC Samples: N/A
 Analysis Requested Metals, VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%	

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/2013
 Site/Well No. MW-26 Weather Cloudy 50°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>14.46</u>	Equipment Used	<u>Peristaltic Pump</u>
Water Level (ft BTOC)	<u>10.43</u>	Type of Tubing Used	<u>LDPE</u>
Water Column in Well (ft)	<u>40.16 403</u>	Pump Intake Depth	<u>13.5 ft BTOC</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>10.23</u>
Gallons in Well	<u>0.64</u>	Total Gallons Purged	<u>1.8</u>
Well Condition	<u>1 broken bolt, buried</u>		

Time		Field Parameters	
Begin Purge	<u>1425</u>	Initial Color	<u>None</u>
End Purge	<u>1512</u>	Odor	<u>None</u>
Sample Time (as on COC)	<u>1512</u>	Appearance	<u>clear</u>
		Final Color	<u>None</u>
		Final Odor	<u>None</u>
		Final Appearance	<u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>1430</u>	<u>10.43</u>	<u>0.25</u>	<u>10.00</u>	<u>19.04</u>	<u>3564</u>	<u>3.89</u>	<u>7.3</u>	<u>305.9</u>
<u>1446</u>	<u>10.29</u>	<u>0.25 1</u>	<u>2.30</u>	<u>19.77</u>	<u>3260</u>	<u>3.85</u>	<u>4.92</u>	<u>334.9</u>
<u>1450</u>	<u>10.29</u>	<u>1.25</u>	<u>1.06</u>	<u>19.68</u>	<u>3254</u>	<u>3.84</u>	<u>4.51</u>	<u>338.4</u>
<u>1500</u>	<u>10.25</u>	<u>1.51.4</u>	<u>1.03</u>	<u>19.37</u>	<u>3234</u>	<u>3.83</u>	<u>4.12</u>	<u>345.6</u>
<u>1503</u>	<u>10.23</u>	<u>1.5</u>	<u>1.08</u>	<u>19.66</u>	<u>3212</u>	<u>3.83</u>	<u>4.13</u>	<u>350.2</u>
<u>1506</u>	<u>10.23</u>	<u>1.6</u>	<u>0.74</u>	<u>19.73</u>	<u>3222</u>	<u>3.84</u>	<u>3.96</u>	<u>352.6</u>
<u>1509</u>	<u>10.23</u>	<u>1.7</u>	<u>0.68</u>	<u>19.75</u>	<u>3231</u>	<u>3.83</u>	<u>3.88</u>	<u>354.7</u>
<u>1512</u>	<u>10.23</u>	<u>1.8</u>	<u>0.59</u>	<u>19.21</u>	<u>4023 3212</u>	<u>3.82</u>	<u>3.89</u>	<u>357.7</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs

	Casing Volume Multipliers				Stabilization Criteria	
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/13/2013
 Site/Well No. MW-28 Weather Sunny, 80° F
 Site Personnel Kevin Hade, Heather Thompson

Well Data	Purge Data
Well Diameter/ Material <u>2"</u>	Purge Method <u>Low Flow</u>
Well Depth (ft BTOC) <u>14.5</u> <u>14.5</u>	Equipment Used <u>Peristaltic Pump</u>
Water Level (ft BTOC) <u>12.43</u>	Type of Tubing Used <u>LDPE</u>
Water Column in Well (ft) <u>2.07</u>	Pump Intake Depth <u>13.5</u>
Casing Volume Multiplier <u>0.16</u>	Static Pumping Level <u>12.55</u>
Gallons in Well <u>0.33</u>	Total Gallons Purged <u>1.40</u>
Well Condition <u>buried, rusted bolts</u>	

Time	Field Parameters
Begin Purge <u>1400</u>	Initial Color <u>none</u> Final <u>none</u>
End Purge <u>1429</u>	Odor <u>none</u> <u>none</u>
Sample Time (as on COC) <u>1430</u>	Appearance <u>clear</u> <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>1405</u>	<u>12.52</u>	<u>0.2</u>	<u>25.0</u>	<u>18.91</u>	<u>5161</u>	<u>2.72</u>	<u>131</u>	<u>279.8</u>
<u>1410</u>	<u>12.54</u>	<u>0.4</u>	<u>5.59</u>	<u>19.20</u>	<u>5169</u>	<u>2.72</u>	<u>7.9</u>	<u>277.3</u>
<u>1415</u>	<u>12.56</u>	<u>0.6</u>	<u>1.96</u>	<u>19.13</u>	<u>5188</u>	<u>2.72</u>	<u>7.3</u>	<u>277.4</u>
<u>1420</u>	<u>12.55</u>	<u>0.8</u>	<u>1.51</u>	<u>18.79</u>	<u>5202</u>	<u>2.72</u>	<u>4.7</u>	<u>277.0</u>
<u>1423</u>	<u>12.55</u>	<u>1.0</u>	<u>2.41</u>	<u>18.66</u>	<u>5205</u>	<u>2.72</u>	<u>4.5</u>	<u>276.4</u>
<u>1426</u>	<u>12.55</u>	<u>1.2</u>	<u>2.12</u>	<u>18.86</u>	<u>5209</u>	<u>2.72</u>	<u>4.0</u>	<u>276.1</u>
<u>1429</u>	<u>12.55</u>	<u>1.4</u>	<u>2.07</u>	<u>18.68</u>	<u>5209</u>	<u>2.72</u>	<u>3.3</u>	<u>275.6</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%	

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/2013
 Site/Well No. MW-29 Weather Partly Cloudy, 45°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data

Well Diameter/ Material 2"
 Well Depth (ft BTOC) 11.50
 Water Level (ft BTOC) 11.11
 Water Column in Well (ft) 3.39
 Casing Volume Multiplier 0.16
 Gallons in Well 0.54
 Well Condition good

Purge Data

Purge Method Low Flow
 Equipment Used Peristaltic Pump
 Type of Tubing Used LDPE
 Pump Intake Depth ~13 ft btoC
 Static Pumping Level 11.35
 Total Gallons Purged 3.5

Time

Begin Purge 0917
 End Purge 1024 1030
 Sample Time (as on COC) 1024 1030

Field Parameters

Initial Color clear Final clear
 Odor none
 Appearance clear

Field Measurements (note units)

Calibrating VSI

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
0925	11.26	0.5	6.46	-	-	-	-	-
1012	11.35	2.75	2.53	18.57	763	6.13	8.86	173.3
1015	11.35	3	1.86	17.94	647	6.24	7.15	173.1
1018	11.35	3.1	1.89	17.64	648	6.28	6.93	173.1
1021	11.35	3.2	1.82	17.63	640	6.29	7.95-8.06	173.6
1024	11.35	3.3	1.66	17.75	640	6.29	7.94	174.1
1027	11.35	3.4	1.62	17.27	640	6.30	8.13	174.8
1030	11.35	3.5	1.60	17.45	638	6.30	7.90	175.6

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%	

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/13
 Site/Well No. mw-30 Weather clear, 40's
 Site Personnel Kevin Hade (Heather Thompson)

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>15.11</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>11.46</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>3.65</u>	Pump Intake Depth	<u>14.5</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>11.46</u>
Gallons in Well	<u>0.58</u>	Total Gallons Purged	<u>1.6</u>
Well Condition	<u>missing Bolt</u>		

Time		Field Parameters	
Begin Purge	<u>1710</u>	Initial Color	<u>clear</u> Final <u>clear</u>
End Purge	<u>1744</u>	Odor	<u>None apparent</u> <u>none</u>
Sample Time (as on COC)	<u>1745</u>	Appearance	<u>clear</u> <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (mS/cm)	pH	DO (mg/L)	ORP
<u>1720</u>	<u>11.46</u>	<u>0.4</u>	<u>4.93</u>	<u>16.27</u>	<u>0.812</u>	<u>5.56</u>	<u>1.80</u>	<u>-48.5</u>
<u>1725</u>	<u>11.46</u>	<u>0.6</u>	<u>2.20</u>	<u>16.50</u>	<u>0.814</u>	<u>5.56</u>	<u>0.95</u>	<u>-155.8</u>
<u>1730</u>	<u>11.46</u>	<u>0.8</u>	<u>0.62</u>	<u>16.64</u>	<u>0.813</u>	<u>5.57</u>	<u>0.75</u>	<u>-178.5</u>
<u>1735</u>	<u>11.46</u>	<u>1.0</u>	<u>0.00</u>	<u>16.59</u>	<u>0.814</u>	<u>5.56</u>	<u>0.64</u>	<u>-189.2</u>
<u>1738</u>	<u>11.46</u>	<u>1.2</u>	<u>0.00</u>	<u>16.66</u>	<u>0.813</u>	<u>5.56</u>	<u>0.57</u>	<u>-195.3</u>
<u>1741</u>	<u>11.46</u>	<u>1.4</u>	<u>0.00</u>	<u>16.56</u>	<u>0.813</u>	<u>5.57</u>	<u>0.53</u>	<u>-197.7</u>
<u>1744</u>	<u>11.46</u>	<u>1.6</u>	<u>0.00</u>	<u>16.67</u>	<u>0.813</u>	<u>5.56</u>	<u>0.48</u>	<u>-190.9</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: N/A
 Analysis Requested VOCs, metals

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/13
 Site/Well No. mw-34 Weather sunny, 50's, clear
 Site Personnel Kevin Hade (Heather Thompson)

Well Data		Purge Data	
Well Diameter/ Material	<u>2"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>15.41</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>9.92</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>5.49</u>	Pump Intake Depth	<u>15</u>
Casing Volume Multiplier	<u>0.16</u>	Static Pumping Level	<u>9.92</u>
Gallons in Well	<u>0.88</u>	Total Gallons Purged	<u>1.80</u>
Well Condition	<u>good</u>		

Time		Field Parameters	
Begin Purge	<u>1555</u>	Initial Color	<u>clear</u> Final <u>clear</u>
End Purge	<u>1634</u>	Odor	<u>none apparent</u> <u>none apparent</u>
Sample Time (as on COC)	<u>1635</u>	Appearance	<u>fine particulates</u> <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µs/cm)	pH	DO (mg/L)	ORP
<u>1600</u>	<u>9.92</u>	<u>0.2</u>	<u>13.71</u>	<u>17.61</u>	<u>0.651</u>	<u>5.47</u>	<u>1.86</u>	<u>52.6</u>
<u>1615</u>	<u>9.92</u>	<u>0.8</u>	<u>9.52</u>	<u>17.71</u>	<u>0.530</u>	<u>5.33</u>	<u>0.59</u>	<u>-23.7</u>
<u>1620</u>	<u>9.92</u>	<u>1.0</u>	<u>8.72</u>	<u>17.45</u>	<u>0.530</u>	<u>5.33</u>	<u>0.56</u>	<u>-31.2</u>
<u>1625</u>	<u>9.92</u>	<u>1.2</u>	<u>7.30</u>	<u>17.50</u>	<u>0.525</u>	<u>5.32</u>	<u>0.49</u>	<u>-18.8</u>
<u>1628</u>	<u>9.92</u>	<u>1.4</u>	<u>7.78</u>	<u>17.49</u>	<u>0.523</u>	<u>5.32</u>	<u>0.47</u>	<u>-10.4</u>
<u>1631</u>	<u>9.92</u>	<u>1.6</u>	<u>7.82</u>	<u>17.56</u>	<u>0.522</u>	<u>5.32</u>	<u>0.45</u>	<u>-8.1</u>
<u>1634</u>	<u>9.92</u>	<u>1.8</u>	<u>7.69</u>	<u>17.60</u>	<u>0.523</u>	<u>5.32</u>	<u>0.44</u>	<u>-4.1</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: NIA

Analysis Requested VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. TW-01 Weather Partly Cloudy 55°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data	Purge Data
Well Diameter/ Material <u>1" inner diameter</u>	Purge Method <u>Low Flow</u>
Well Depth (ft BTOC) <u>37.00</u>	Equipment Used <u>Peristaltic Pump</u>
Water Level (ft BTOC) <u>11.65</u>	Type of Tubing Used <u>LDPE</u>
Water Column in Well (ft) <u>25.35</u>	Pump Intake Depth <u>~ 36 ft btoc</u>
Casing Volume Multiplier <u>0.04</u>	Static Pumping Level <u>11.70</u>
Gallons in Well <u>1.01</u>	Total Gallons Purged <u>1.1</u>
Well Condition <u>good</u>	

Time	Field Parameters
	Initial Final
Begin Purge <u>1055</u>	Color <u>none</u> <u>none</u>
End Purge <u>1125</u>	Odor <u>none</u> <u>none</u>
Sample Time (as on COC) <u>1125</u>	Appearance <u>clear</u> <u>clear</u>

Field Measurements (note units) * DO% > 100 after recalibration. Possibly a faulty D.O. probe/membrane.

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO* (mg/L)	ORP
<u>1100</u>	<u>11.74</u>	<u>0.25</u>	<u>4.26</u>	<u>18.18</u>	<u>729</u>	<u>4.72</u>	<u>—</u>	<u>215.9</u>
<u>1110</u>	<u>11.70</u>	<u>0.6</u>	<u>3.09</u>	<u>17.89</u>	<u>730</u>	<u>4.70</u>	<u>10.08</u>	<u>245.3</u>
<u>1113</u>	<u>11.70</u>	<u>0.75</u>	<u>1.64</u>	<u>17.80</u>	<u>731</u>	<u>4.69</u>	<u>10.01</u>	<u>257.0</u>
<u>1116</u>	<u>11.70</u>	<u>0.8</u>	<u>1.19</u>	<u>17.81</u>	<u>731</u>	<u>4.68</u>	<u>9.99</u>	<u>260.5</u>
<u>1119</u>	<u>11.70</u>	<u>0.9</u>	<u>0.97</u>	<u>18.08</u>	<u>731</u>	<u>4.68</u>	<u>9.80</u>	<u>266.2</u>
<u>1122</u>	<u>11.70</u>	<u>1</u>	<u>0.83</u>	<u>18.02</u>	<u>732</u>	<u>4.68</u>	<u>9.88</u>	<u>271.4</u>
<u>1125</u>	<u>11.70</u>	<u>1.1</u>	<u>0.63</u>	<u>18.01</u>	<u>733</u>	<u>4.68</u>	<u>9.86</u>	<u>273.8</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: DUP-01

Analysis Requested VOCs

Casing Volume Multipliers	Stabilization Criteria
Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65	pH = 0.1 Specific Conductance = 5%
1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47	Temperature = 5% DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. TW-03 Weather sunny, 60's, clear
 Site Personnel Kevin Hade (Heather Thompson)

Well Data		Purge Data	
Well Diameter/ Material	<u>1"</u>	Purge Method	<u>LOW FLOW</u>
Well Depth (ft BTOC)	<u>22.60</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>12.02</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>10.58</u>	Pump Intake Depth	<u>~ 20</u>
Casing Volume Multiplier	<u>0.04</u>	Static Pumping Level	<u>11.65</u>
Gallons in Well	<u>0.42</u>	Total Gallons Purged	<u>1.90</u>
Well Condition	<u>GOOD</u>		

Time		Field Parameters	
Begin Purge	<u>1125</u>	Initial Color	<u>clear</u> Final <u>clear</u>
End Purge	<u>~ 1209</u>	Odor	<u>None apparent</u> <u>none apparent</u>
Sample Time (as on COC)	<u>1210</u>	Appearance	<u>clear</u> <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>1130</u>	<u>12.02</u>	<u>0.2</u>	<u>39.3</u>	<u>17.06</u>	<u>7.009</u>	<u>4.04</u>	<u>2.07</u>	<u>216.3</u>
<u>1145</u>	<u>11.89</u>	<u>0.7</u>	<u>13.9</u>	<u>17.88</u>	<u>7.069</u>	<u>4.06</u>	<u>3.26</u>	<u>232.4</u>
<u>1150</u>	<u>11.83</u>	<u>0.9</u>	<u>4.71</u>	<u>17.52</u>	<u>7.091</u>	<u>4.06</u>	<u>6.01</u>	<u>243.9</u>
<u>1155</u>	<u>11.75</u>	<u>1.1</u>	<u>1.31</u>	<u>16.86</u>	<u>7.101</u>	<u>4.06</u>	<u>6.40</u>	<u>244.8</u>
<u>1200</u>	<u>11.65</u>	<u>1.3</u>	<u>4.00</u>	<u>17.13</u>	<u>7.112</u>	<u>4.06</u>	<u>5.90</u>	<u>244.3</u>
<u>1203</u>	<u>11.65</u>	<u>1.5</u>	<u>0.78</u>	<u>17.15</u>	<u>7.113</u>	<u>4.06</u>	<u>5.75</u>	<u>243.6</u>
<u>1206</u>	<u>11.65</u>	<u>1.7</u>	<u>0.23</u>	<u>16.84</u>	<u>7.116</u>	<u>4.06</u>	<u>5.76</u>	<u>241.0</u>
<u>1209</u>	<u>11.65</u>	<u>1.9</u>	<u>0.00</u>	<u>16.67</u>	<u>7.111</u>	<u>4.00</u>	<u>5.82</u>	<u>237.9</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: N/A
 Analysis Requested VOCs

	Casing Volume Multipliers				Stabilization Criteria	
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/11/13
 Site/Well No. TW-04 Weather Sunny, 60's, clear
 Site Personnel Kevin Hade, Heather Thompson

Well Data

Well Diameter/ Material 1"
 Well Depth (ft BTOC) 16.90
 Water Level (ft BTOC) 11.01
 Water Column in Well (ft) 5.89
 Casing Volume Multiplier 0.04
 Gallons in Well 0.24
 Well Condition GOOD

Purge Data

Purge Method Low Flow
 Equipment Used Peristaltic Creopump
 Type of Tubing Used Poly Tubing 1/4
 Pump Intake Depth ~ 14
 Static Pumping Level 11.01
 Total Gallons Purged 2.2

Time

Begin Purge 1025
 End Purge 1112
 Sample Time (as on COC) 1113

Field Parameters

Initial Color clear Final clear
 Odor none apparent
 Appearance clear

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µs/cm)	pH	DO (mg/L)	ORP
1030	11.01	0.15	1.92	16.99	1.778	4.08	9.07	275.5
1035	11.01	0.25	1.71	16.47	1.766	4.05	8.21	247.0
1040	11.01	0.4	0.12	16.85	1.744	4.05	7.36	227.4
1045	11.01	0.6	0.74	16.92	1.724	4.05	6.82	217.0
1050	11.01	0.8	0.31	16.62	1.718	4.04	6.89	216.9
1055	11.01	1.0	0.73	17.00	1.706	4.05	6.46	211.3
1058	11.01	1.2	0.01	17.12	1.700	4.05	6.28	203.8
1101	11.01	1.4	0.74	16.88	1.702	4.05	1.00	202.2
1103	11.01	1.6	0.03	16.72	1.698	4.04	0.80	202.4
1106	11.01	1.8	0.00	16.109	1.695	4.04	0.79	201.4
1109	11.01	2.0	0.00	16.42	1.692	4.04	0.80	200.0
1112	11.01	2.2	0.00	16.39	1.690	4.04	0.81	199.4

Laboratory Data

Laboratory Used Test America QA/QC Samples: N/A
 Analysis Requested VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%	

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/13
 Site/Well No. TW-25 Weather sunny, 50's, clear
 Site Personnel Kevin Hade, ~~Heather Thompson~~

Well Data		Purge Data	
Well Diameter/ Material	<u>1" 0.75"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>14.60</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>9.69</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>4.91</u>	Pump Intake Depth	<u>≈ 12.5</u>
Casing Volume Multiplier	<u>0.02</u>	Static Pumping Level	<u>9.69</u>
Gallons in Well	<u>0.10</u>	Total Gallons Purged	<u>2.20</u>
Well Condition	<u>Good</u>		

Time		Field Parameters	
Begin Purge	<u>0935</u>	Initial	Final
End Purge	<u>1024</u>	Color	<u>clear</u>
Sample Time (as on COC)	<u>1025</u>	Odor	<u>none apparent</u>
		Appearance	<u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µs/cm)	pH	DO (mg/L)	ORP
<u>0958</u>	<u>9.73</u>	<u>0.7</u>	<u>1.71</u>	<u>18.79</u>	<u>0.458</u>	<u>5.79</u>	<u>0.33</u>	<u>-100.4</u>
<u>0955</u>		<u>0.9</u>	<u>0.51</u>	<u>19.12</u>	<u>0.460</u>	<u>5.79</u>	<u>0.31</u>	<u>-167.2</u>
<u>1000</u>		<u>1.1</u>	<u>0.58</u>	<u>18.08</u>	<u>0.461</u>	<u>5.79</u>	<u>0.30</u>	<u>-194.6</u>
<u>1005</u>		<u>1.3</u>	<u>0.70</u>	<u>18.41</u>	<u>0.456</u>	<u>5.78</u>	<u>0.27</u>	<u>-253.0</u>
<u>1010</u>		<u>1.5</u>	<u>0.27</u>	<u>19.15</u>	<u>0.452</u>	<u>5.78</u>	<u>0.25</u>	<u>-204.0</u>
<u>1015</u>		<u>1.7</u>	<u>0.36</u>	<u>18.36</u>	<u>0.452</u>	<u>5.78</u>	<u>0.24</u>	<u>-211.9</u>
<u>1018</u>		<u>1.9</u>	<u>0.49</u>	<u>18.57</u>	<u>0.453</u>	<u>5.78</u>	<u>0.24</u>	<u>-243.1</u>
<u>1021</u>		<u>2.0</u>	<u>0.75</u>	<u>18.64</u>	<u>0.453</u>	<u>5.78</u>	<u>0.24</u>	<u>-235.8</u>
<u>1024</u>	<u>9.69</u>	<u>2.2</u>	<u>0.33</u>	<u>18.95</u>	<u>0.453</u>	<u>5.78</u>	<u>0.23</u>	<u>-229.8</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: N/A
 Analysis Requested VOCs, metals

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/13
 Site/Well No. TW-27 Weather sunny, 50's, clear
 Site Personnel Kevin Hade (Heather Thompson)

Well Data		Purge Data	
Well Diameter/ Material	<u>+ 0.75"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>19.45</u>	Equipment Used	<u>Peristaltic Geopump</u>
Water Level (ft BTOC)	<u>10.39</u>	Type of Tubing Used	<u>Poly Tubing 1/4</u>
Water Column in Well (ft)	<u>9.06</u>	Pump Intake Depth	<u>≈ 17.0</u>
Casing Volume Multiplier	<u>0.02</u>	Static Pumping Level	<u>10.42</u>
Gallons in Well	<u>0.18</u>	Total Gallons Purged	<u>1.40</u>
Well Condition	<u>Buried</u>		

Time		Field Parameters	
Begin Purge	<u>1050</u>	Initial Color	<u>clear</u> Final <u>clear</u>
End Purge	<u>1119</u>	Odor	<u>none apparent</u> <u>none apparent</u>
Sample Time (as on COC)	<u>1120</u>	Appearance	<u>clear</u> <u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>1055</u>	<u>10.39</u>	<u>0.2</u>	<u>25.2</u>	<u>17.81</u>	<u>0.115</u>	<u>4.60</u>	<u>1.46</u>	<u>41.9</u>
<u>1100</u>		<u>0.4</u>	<u>7.03</u>	<u>17.71</u>	<u>0.114</u>	<u>4.59</u>	<u>1.26</u>	<u>46.3</u>
<u>1105</u>		<u>0.6</u>	<u>7.31</u>	<u>17.50</u>	<u>0.115</u>	<u>4.58</u>	<u>1.00</u>	<u>36.4</u>
<u>1110</u>		<u>0.8</u>	<u>10.0</u>	<u>15.97</u>	<u>0.115</u>	<u>4.58</u>	<u>1.01</u>	<u>32.9</u>
<u>1113</u>		<u>1.0</u>	<u>8.75</u>	<u>16.40</u>	<u>0.116</u>	<u>4.55</u>	<u>0.94</u>	<u>27.0</u>
<u>1116</u>		<u>1.2</u>	<u>7.07</u>	<u>16.99</u>	<u>0.116</u>	<u>4.56</u>	<u>0.90</u>	<u>21.5</u>
<u>1119</u>	<u>10.42</u>	<u>1.4</u>	<u>3.26</u>	<u>17.89</u>	<u>0.117</u>	<u>4.57</u>	<u>0.85</u>	<u>29.4</u>

Laboratory Data

Laboratory Used _____ QAQC Samples: _____

Analysis Requested _____

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/2013
 Site/Well No. TW-29 Weather Sunny, 42°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material*	<u>3/4 inch</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>17.79</u>	Equipment Used	<u>Peristaltic Pump</u>
Water Level (ft BTOC)	<u>10.19</u>	Type of Tubing Used	<u>LDPE</u>
Water Column in Well (ft)	<u>7.6</u>	Pump Intake Depth	<u>~16.5 ft BTOC</u>
Casing Volume Multiplier	<u>0.02</u>	Static Pumping Level	<u>—</u>
Gallons in Well	<u>0.15</u>	Total Gallons Purged	<u>2.2</u>
Well Condition	<u>Buried, no well cover, hole filled with gravel</u>		

Time		Field Parameters	
Begin Purge	<u>1005</u>	Initial Color	<u>brown</u> Final <u>none</u>
End Purge	<u>1038</u>	Odor	<u>none</u> Final <u>none</u>
Sample Time (as on COC)	<u>1038</u>	Appearance	<u>turbid</u> Final <u>clear</u>

Field Measurements (note units) *WL not recorded because well diameter too narrow to fit probe and tubing

Time	WL*(ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>1020</u>	<u>—</u>	<u>1 gallon</u>	<u>13.4</u>	<u>13.92</u>	<u>622</u>	<u>5.51</u>	<u>5.07</u>	<u>121.7</u>
<u>1023</u>	<u>—</u>	<u>1.2</u>	<u>—</u>	<u>14.29</u>	<u>577</u>	<u>5.56</u>	<u>4.38</u>	<u>107.3</u>
<u>1028</u>	<u>—</u>	<u>1.4</u>	<u>2.41</u>	<u>14.36</u>	<u>569</u>	<u>5.66</u>	<u>1.25</u>	<u>89.1</u>
<u>1029</u>	<u>—</u>	<u>1.6</u>	<u>1.62</u>	<u>13.86</u>	<u>571</u>	<u>5.66</u>	<u>1.18</u>	<u>82.7</u>
<u>1032</u>	<u>—</u>	<u>1.8</u>	<u>0.79</u>	<u>13.83</u>	<u>570</u>	<u>5.66</u>	<u>1.15</u>	<u>81.6</u>
<u>1035</u>	<u>—</u>	<u>2</u>	<u>0.00</u>	<u>13.84</u>	<u>576</u>	<u>5.68</u>	<u>1.28</u>	<u>80.0</u>
<u>1038</u>	<u>—</u>	<u>2.2</u>	<u>0.00</u>	<u>13.80</u>	<u>571</u>	<u>5.69</u>	<u>1.15</u>	<u>78.2</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: DUP-02
 Analysis Requested VOCs, Metals

Casing Volume Multipliers				Stabilization Criteria	
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Specific Conductance = 5%
					Temperature = 5%
					DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/12/2013
 Site/Well No. TW-31 Weather Sunny, 50° F
 Site Personnel Kevin Hads, Heather Thompson

Well Data		Purge Data	
Well Diameter/ Material*	<u>3/4"</u>	Purge Method	<u>Low Flow</u>
Well Depth (ft BTOC)	<u>18.5</u>	Equipment Used	<u>Peristaltic Pump</u>
Water Level (ft BTOC)	<u>8.91</u>	Type of Tubing Used	<u>LDPE</u>
Water Column in Well (ft)	<u>9.59</u>	Pump Intake Depth	<u>17.5</u>
Casing Volume Multiplier	<u>0.02</u>	Static Pumping Level	<u>—</u>
Gallons in Well	<u>0.19</u>	Total Gallons Purged	<u>1.1</u>
Well Condition	<u>buried</u>		

Time		Field Parameters	
Begin Purge	<u>1155</u>	Initial Color	<u>dark brown</u> Final <u>none</u>
End Purge	<u>1230</u>	Odor	<u>none</u> <u>none</u>
Sample Time (as on COC)	<u>1230</u>	Appearance	<u>turbid</u> <u>clear</u>

Field Measurements (note units) *well diameter too narrow to fit WL probe and tubing at the same time.

Time	WL (ft BTOC)*	Vol. Purged (gallons)	Turbidity	Temp. (°C)	Sp. Conductance (µS/cm)	pH	DO (mg/L)	ORP
<u>1218</u>	<u>—</u>	<u>0.75</u>	<u>18.6</u>	<u>17.32</u>	<u>421</u>	<u>5.71</u>	<u>0.78</u>	<u>130.1</u>
<u>1221</u>	<u>—</u>	<u>0.8</u>	<u>34.8</u>	<u>16.80</u>	<u>417</u>	<u>5.69</u>	<u>0.89</u>	<u>126.9</u>
<u>1224</u>	<u>—</u>	<u>0.9</u>	<u>13.5</u>	<u>17.62</u>	<u>415</u>	<u>5.71</u>	<u>0.89</u>	<u>122.0</u>
<u>1227</u>	<u>—</u>	<u>1</u>	<u>8.36</u>	<u>17.24</u>	<u>414</u>	<u>5.68</u>	<u>0.93</u>	<u>120.6</u>
<u>1230</u>	<u>—</u>	<u>1.1</u>	<u>8.48</u>	<u>17.07</u>	<u>412</u>	<u>5.67</u>	<u>0.85</u>	<u>119.3</u>

Laboratory Data
 Laboratory Used Test America QAQC Samples: n/a
 Analysis Requested VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/13/13
 Site/Well No. SW-01 Weather Sunny, 60°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data	Purge Data
Well Diameter/ Material _____	Purge Method <u>Low Flow</u>
Well Depth (ft BTOC) _____	Equipment Used <u>Peristaltic Pump</u>
Water Level (ft BTOC) _____	Type of Tubing Used <u>LDPE</u>
Water Column in Well (ft) _____	Pump Intake Depth _____
Casing Volume Multiplier _____	Static Pumping Level _____
Gallons in Well _____	Total Gallons Purged _____
Well Condition _____	

Time	Field Parameters	
	Initial	Final
Begin Purge <u>1140</u>	Color <u>none</u>	<u>none</u>
End Purge <u>1150</u>	Odor <u>none</u>	<u>none</u>
Sample Time (as on COC) <u>1150</u>	Appearance <u>clear</u>	<u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (mS/cm)	pH	DO (mg/L)	ORP
<u>1145</u>	<u>n/a</u>	<u>0.25</u>	<u>20.1</u>	<u>13.6</u>	<u>12.42</u>	<u>7.28</u>	<u>6.48</u>	<u>-38.9</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs (only 2 vials)

	Casing Volume Multipliers				Stabilization Criteria	
Gal./Ft.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/13/13
 Site/Well No. SN-02 Weather Sunny, 60°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data	Purge Data
Well Diameter/ Material _____	Purge Method <u>Low Flow</u>
Well Depth (ft BTOC) _____	Equipment Used <u>Peristaltic Pump</u>
Water Level (ft BTOC) _____	Type of Tubing Used <u>LDPE</u>
Water Column in Well (ft) _____	Pump Intake Depth _____
Casing Volume Multiplier _____	Static Pumping Level _____
Gallons in Well _____	Total Gallons Purged _____
Well Condition _____	

Time	Field Parameters	
	Initial	Final
Begin Purge <u>1205</u>	Color <u>none</u>	<u>none</u>
End Purge <u>1220</u>	Odor <u>none</u>	<u>none</u>
Sample Time (as on COC) <u>1220</u>	Appearance <u>clear</u>	<u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (mS/cm)	pH	DO (mg/L)	ORP
<u>1215</u>	<u>—</u>	<u>0.25</u>	<u>21.3</u>	<u>13.22</u>	<u>12.13</u>	<u>7.39</u>	<u>6.10</u>	<u>-142.4</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%

ENVIRON

Water Sampling Log

Project Colonial Terminals Project No. 07-30114 Page 1 of 1
 Site Location Savannah, GA Date 12/13/13
 Site/Well No. SN-03 Weather Sunny 60°F
 Site Personnel Kevin Hade, Heather Thompson

Well Data	Purge Data
Well Diameter/ Material _____	Purge Method <u>Low Flow</u>
Well Depth (ft BTOC) _____	Equipment Used <u>Peristaltic Pump</u>
Water Level (ft BTOC) _____	Type of Tubing Used <u>LDPE</u>
Water Column in Well (ft) _____	Pump Intake Depth _____
Casing Volume Multiplier _____	Static Pumping Level _____
Gallons in Well _____	Total Gallons Purged _____
Well Condition _____	

Time	Field Parameters	
Begin Purge <u>1230</u>	Initial Color <u>Blue none</u>	Final <u>none</u>
End Purge <u>1245</u>	Odor <u>none</u>	<u>none</u>
Sample Time (as on COC) <u>1245</u>	Appearance <u>clear</u>	<u>clear</u>

Field Measurements (note units)

Time	WL (ft BTOC)	Vol. Purged	Turbidity	Temp. (°C)	Sp. Conductance (mS/cm)	pH	DO (mg/L)	ORP
<u>1240</u>	<u>—</u>	<u>0.25</u>	<u>22.9</u>	<u>12.84</u>	<u>11.93</u>	<u>7.41</u>	<u>6.88</u>	<u>-124.2</u>

Laboratory Data

Laboratory Used Test America QA/QC Samples: n/a
 Analysis Requested VOCs

Gal./Ft.	Casing Volume Multipliers				Stabilization Criteria	
	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	pH = 0.1	Specific Conductance = 5%
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	Temperature = 5%	DO = 0.2 or 10%	

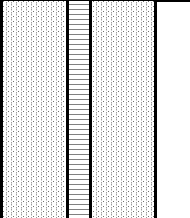

Appendix B

Well Construction Logs






PROJECT NAME: Colonial Terminals PROJECT NUMBER: 07-30114H PROJECT LOCATION: Savannah, GA	BORING / WELL ID: MW-101D LOGGED BY: K. Nye DATE: 04/15/2014 (outer casing) - 04/17/2014 (well)
DRILLING CONTRACTOR: Environmental Exploration DRILLER: David Walls RIG TYPE: CME-75 DRILLING METHOD: HSA & mud rotary SAMPLING METHOD: Split-spoon (~2" x 2')	TOTAL BORING DEPTH: ~55 Feet BGS BOREHOLE DIAMETER: ~5 Inches (within screened interval) OUTER CASING DEPTH: ~35 Feet BGS OUTER CASING DIAMETER: 6 Inches TOTAL WELL DEPTH: ~55 Feet BGS WELL DIAMETER: 2 Inches DEPTH TO WATER (DTW): ~13 Feet BGS (estimated during drilling) DTW DATE: 04/15/2014 (drilling to install outer casing)
LATITUDE: 32.100827° LONGITUDE: -81.115954° TOC ELEVATION: (not surveyed)	

DEPTH (FEET)	BLOW COUNTS	RECOVERY	PID (PPM)	WELL CONSTRUCTION	WATER LEVEL	DESCRIPTION
			0			4-6" concrete cover Hand augered to approximately 4 ft bgs FILL: Sand/silt/clay mix w/ gravel/rock, brick fragments, orangish-brown
5	2-38-21-8	75%	0			FILL: As before w/o brick fragments, orange ----- Native soil encountered at approximately 7 ft bgs
10	4-4-7-8	60%	9.4			Sandy CLAY to clayey SAND, yellowish-brown (~9-10 ft bgs) SAND (fine), minor silt/clay, v. thin clay lense (<1cm) at ~10.5', lt brownish-yellow
15	2-2-3-2	10%	38.8		▽	As before, wet
20	2-2-3-4	50%	20.3			SAND (fine), some silt/clay, lt brownish-yellow & orange (~19-20 ft bgs) CLAY, some fine sand/silt, firm, slight plasticity, lt brownish-yellow/orange (~20-20.6 ft bgs) CLAY, stiff, med plasticity, brownish-gray (~20.6-21 ft bgs)
25	2-3-3-4	20%	36.9			SILT/SAND (med) w/ some clay - layered, clay increasing w/ depth (~24-25.7 ft bgs) SAND (med-coarse), dk brown (~25.7-26 ft bgs)
30	8-3-4-5	30%	25.7			SILT, some fine sand/clay, trace shell frags, stiff, med brown
35	7-11-14-14	30%	8.6			Clayey SILT to silty CLAY, hard, greenish-gray
40	5-9-8-10	100%	0			Silty CLAY, hard, greenish-gray
45	5-7-8-9	100%	0			Similar as before, slight decrease in clay content

PROJECT NAME: Colonial Terminals PROJECT NUMBER: 07-30114H PROJECT LOCATION: Savannah, GA	BORING / WELL ID: MW-101D LOGGED BY: K. Nye DATE: 04/15/2014 (outer casing) - 04/17/2014 (well)
DRILLING CONTRACTOR: Environmental Exploration DRILLER: David Walls RIG TYPE: CME-75 DRILLING METHOD: HSA & mud rotary SAMPLING METHOD: Split-spoon (~2" x 2')	TOTAL BORING DEPTH: ~55 Feet BGS BOREHOLE DIAMETER: ~5 Inches (within screened interval) OUTER CASING DEPTH: ~35 Feet BGS OUTER CASING DIAMETER: 6 Inches TOTAL WELL DEPTH: ~55 Feet BGS WELL DIAMETER: 2 Inches DEPTH TO WATER (DTW): ~13 Feet BGS (estimated during drilling) DTW DATE: 04/15/2014 (drilling to install outer casing)
LATITUDE: 32.100827° LONGITUDE: -81.115954° TOC ELEVATION: (not surveyed)	

DEPTH (FEET)	BLOW COUNTS	RECOVERY	PID (PPM)	WELL CONSTRUCTION	WATER LEVEL	DESCRIPTION
50	8-7-9-10	100%	0			SILT, some clay, hard, greenish-gray
55	8-10-17-27	100%				SILT, some clay, minor fine sand, greenish-gray
60						Boring terminated at approximately 55 ft bgs Final split-spoon driven to approximately 57 ft bgs
65						
70						
75						
80						

LEGEND

-  Neat Cement Grout
-  Bentonite Pellets
-  Filter Pack (silica sand)
-  Well Screen Interval
-  Groundwater (encountered during drilling)

MATERIALS

- 6-inch, flush-threaded, Sch 40 PVC outer casing
- 2-inch, flush-threaded, Sch 40 PVC well casing and screen
- No. 10-slot (0.010-inch aperture) well screen
- Filter Pack: 20/40 silica sand
- Grout Mix: ~14 lbs Portland w/ ~1 lb bentonite per gallon of water

BOREHOLE ADVANCEMENT DETAILS

- 0 - 35 ft bgs: 8.25-inch Hollow-Stem Augers (HSA)
- 35 - 55 ft bgs: 5-inch Roller Cone (mud rotary)

WELLHEAD PROTECTION/SURFACE COMPLETION

- 8-inch, steel, bolt-down, flush-mount cover
- 2-ft x 2-ft x 4-in concrete pad

PROJECT NAME: Colonial Terminals PROJECT NUMBER: 07-30114H PROJECT LOCATION: Savannah, GA	BORING / WELL ID: MW-102D LOGGED BY: K. Nye DATE: 04/16/2014 (outer casing) - 04/18/2014 (well)
DRILLING CONTRACTOR: Environmental Exploration DRILLER: David Walls RIG TYPE: CME-75 DRILLING METHOD: HSA & mud rotary SAMPLING METHOD: Split-spoon (~2" x 2')	TOTAL BORING DEPTH: ~71 Feet BGS BOREHOLE DIAMETER: ~5 Inches (within screened interval) OUTER CASING DEPTH: ~55 Feet BGS OUTER CASING DIAMETER: 6 Inches TOTAL WELL DEPTH: ~71 Feet BGS WELL DIAMETER: 2 Inches DEPTH TO WATER (DTW): ~12 Feet BGS (estimated during drilling) DTW DATE: 04/16/2014 (drilling to install outer casing)
LATITUDE: 32.101292° LONGITUDE: -81.115933° TOC ELEVATION: (not surveyed)	

DEPTH (FEET)	BLOW COUNTS	RECOVERY	PID (PPM)	WELL CONSTRUCTION	WATER LEVEL	DESCRIPTION
			0			~2" gravel cover Hand augered to approximately 4 ft bgs FILL: Sand/silt/clay mix w/ gravel, trace brick fragments, orangish-brown
5	2-2-21-20	75%	0			FILL: Similar as before w/o gravel or brick fragments, orangish-brown to yellowish-brown (sand/silt) - gray (clay) ----- Native soil estimated at approximately 7 ft bgs
10	2-4-10-7	75%	27.4		▽	Silty CLAY to clayey SILT, trace sand (fine), orangish-brown (~9-9.3 ft bgs) SAND (fine), some silt/clay, trace mica, v. thin clay lenses (mm), lt brownish-yellow, damp
15	1-2-1-1	1%	NR			No recovery - residual material is SAND (fine), lt brownish-yellow/orange, wet
20	1-2-2-2	60%	13.8			SAND (fine), some clay, trace mica, thin clay lenses (~1cm) at ~20.5' & 20.8', orangish-yellow to yellowish-brown (clay lenses gray)
25	1-1-1-2	1%	NR			No recovery - residual material is similar SAND (as before)
30	1-1-2-2	5%	5.7			SILT, some clay, trace fine sand, med grayish-brown (poor recovery - sluff/plug)
35	4-4-7-9	100%	0			Attempted 34-36 ft sampling failed - flowing sands filled augers (~3' in lead auger) Converted to mud rotatory to continue boring Clayey SILT to silty CLAY, firm, greenish-gray
40	5-9-9-11	100%	0			As before
45	26-38-50-44	100%	0			SILT, some clay (decreasing w/ depth), hard, greenish-gray

PROJECT NAME: Colonial Terminals PROJECT NUMBER: 07-30114H PROJECT LOCATION: Savannah, GA	BORING / WELL ID: MW-102D LOGGED BY: K. Nye DATE: 04/16/2014 (outer casing) - 04/18/2014 (well)
DRILLING CONTRACTOR: Environmental Exploration DRILLER: David Walls RIG TYPE: CME-75 DRILLING METHOD: HSA & mud rotary SAMPLING METHOD: Split-spoon (~2" x 2')	TOTAL BORING DEPTH: ~71 Feet BGS BOREHOLE DIAMETER: ~5 Inches (within screened interval) OUTER CASING DEPTH: ~55 Feet BGS OUTER CASING DIAMETER: 6 Inches TOTAL WELL DEPTH: ~71 Feet BGS WELL DIAMETER: 2 Inches DEPTH TO WATER (DTW): ~12 Feet BGS (estimated during drilling) DTW DATE: 04/16/2014 (drilling to install outer casing)
LATITUDE: 32.101292° LONGITUDE: -81.115933° TOC ELEVATION: (not surveyed)	

DEPTH (FEET)	BLOW COUNTS	RECOVERY	PID (PPM)	WELL CONSTRUCTION	WATER LEVEL	DESCRIPTION
50	27-37-39-40	100%	0			As before
55	20-18-14-15	100%	0			Similar as before - SILT w/ trace clay, firm, greenish-gray
60	10-18-21-22	100%	0			Clayey SILT, some fine sand, firm/hard, med greenish-gray
65	9-10-12-10	100%	0			Clayey SILT to silty CLAY, firm, greenish-gray
70	14-12-18-19	100%	0			Silty CLAY, firm/hard, greenish-gray
Boring terminated at approximately 71 ft bgs Final split-spoon driven to approximately 72 ft bgs						
75						
80						

LEGEND

- Neat Cement Grout
- Bentonite Pellets
- Filter Pack (silica sand)
- Well Screen Interval
- Groundwater (encountered during drilling)

MATERIALS

- 6-inch, flush-threaded, Sch 40 PVC outer casing
- 2-inch, flush-threaded, Sch 40 PVC well casing and screen
- No. 10-slot (0.010-inch aperture) well screen
- Filter Pack: 20/40 silica sand
- Grout Mix: ~14 lbs Portland w/ ~1 lb bentonite per gallon of water

BOREHOLE ADVANCEMENT DETAILS

- 0 - 34 ft bgs: 8.25-inch Hollow-Stem Augers (HSA)
- 34 - 55 ft bgs: 8-inch Roller Cone (mud rotary)
- 55 - 71 ft bgs: 5-inch Roller Cone (mud rotary)

WELLHEAD PROTECTION/SURFACE COMPLETION

- 8-inch, steel, bolt-down, flush-mount cover
- 2-ft x 2-ft x 4-in concrete pad

Appendix C
Laboratory Analytical Reports
Provided on CD