Remedial Alternatives Evaluation

Castlebridge Properties, LLC Property

200/280 National Avenue
Spartanburg, South Carolina
VCC 07-5712-RP
June 10 2015

Terracon Project No. 86117104

Prepared for Submittal to:
SCDHEC
Columbia, SC

Prepared by:
Terracon Consultants, Inc.
Taylors, SC

June 10, 2015

State Remediation Section
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201-1708

Attn: Ms. Keisha Long
PHN: 803-896-4872
FAX: 803-896-4292
Email: longkd@dhec.sc.gov

Re: Remedial Alternatives Evaluation
Castlebridge Properties, LLC Property
200/280 National Avenue
Spartanburg, Spartanburg County, South Carolina
VCC 07-5712-RP
Terracon Project No. 86117104

Dear Ms. Long:

Terracon Consultants, Inc. (Terracon) is pleased to submit this Remedial Alternatives Evaluation for activities in conjunction with the site referenced above and in accordance with your review letter, dated January 23, 2015. (K. Long, SCDHEC to T. Morgan, Castlebridge Properties, LLC) for the Corrective Measure Study submitted on December 12, 2014.

A comparative evaluation on the relative performance of various alternatives in relation to the criteria of long-term effectiveness, reduction of toxicity, mobility and volume, short-term effectiveness, implementability and cost was conducted. Of the various options considered, the remedial alternative - In situ enhanced reductive dechlorination - is recommended as the preferred approach to achieve the stated goal of reducing contaminant mass transfer off the site.

Should you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,

TERRACON CONSULTANTS, INC.

Craig D. Eady, P.G.
Senior Geologist

CRAIG D. EADY REGISTERED NO. 1099 SOUTH CAROLINA PROFESSIONAL GEOLOGIST

George K. Flores, P.E.
Environmental Department Manager

Chuck R. Clymer, P.G.
Principal

CC: Mr. Thom Morgan, Castlebridge Properties, LLC, P.O. Box 128, Hazelwood, NC 28738
Ms. Gail Jeter, *Cardno*, 1233 Washington Street, Suite 1000, Columbia, SC 29201

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Spartanburg, Spartanburg County, South Carolina

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The purpose of the Remedial Alternatives Evaluation described herein is to develop and evaluate remedial alternative(s) that will be protective of human health and the environment. This objective is accomplished through the following activities:

- Determine Applicable or Relevant and Appropriate Requirements (ARARs),
- Present remedial action objectives,
- Develop remedial goals based on ARARs,
- Identify and screen remedial technology process options, and
- Develop and analyze remedial action alternatives.

The Remedial Alternatives Evaluation will be used to select a preferred remedial alternative to reduce contaminant mass transfer off the site.

1.0 BACKGROUND INFORMATION

1.1 Site Description

The Castlebridge Properties, LLC (Castlebridge) property is located at 200 and 280 National Avenue in Spartanburg, Spartanburg County, South Carolina, approximately one-half mile west of the intersection of New Cut Road and Interstate 26 (**Exhibit 1**). The Castlebridge property is comprised of two semi-rectangular parcels identified by Spartanburg County map numbers 2-54-00-008.01 (8.9 acres) and 2-54-00-008.00 (12.1 acres).

The Castlebridge property encompasses two vacant industrial-type warehouses, asphalt parking areas, a fire-suppression water-tank, and landscaped areas all encompassed within perimeter security fencing. A site diagram is included as **Exhibit 2** and shows the property layout and pertinent features.

The Castlebridge property is located in a developed portion of Spartanburg County used for industrial-type purposes. The Site is bound to the east by National Avenue followed by industrial warehouse operations; to the south by New Cut Road followed by single-family residential properties; to the north by Southern Railroad followed by wooded land and industrial warehouse operations and to the west by undeveloped land with an ephemeral stream (Cothran

property) and an industrial facility (Photo-Marker).

1.2 Site History

The building located at 200 National Avenue was constructed in 1973. The building consists of 147,000 square feet of warehousing and office space. The building is currently vacant. The building maintains an electrical room, a maintenance room and a former boiler room. No bulk chemicals or petroleum products are used or stored on the premises. However, according to the property caretaker, textile dry cleaning machines were previously used in the building with dry cleaning fluids stored in bulk quantities (55-gallon drums) in the former boiler room. The boiler room previously housed a fuel oil fired furnace that was converted to natural gas in 1990. The furnace utilized a 10,000-gallon fuel oil above ground storage tank that is located on the west side of the building. The building utilizes natural gas for heating and a backup generator is present in the electrical room. An electrical substation within a fenced enclosure is located on the southwest end of the building.

According to the property caretaker, the above building was previously used by National Lock from 1983 to 1985 for the manufacturing of cabinet and door hardware. The manufacturing process included metal plating, which was located on the northwest portion of the building. Located next to the former plating room are two large in-ground concrete basins that housed plastic tanks for the plating discharge waters. Located in the vicinity of the interior in-ground basins are two exterior above ground storage tanks enclosed within a brick containment area with a gravel base. The tanks consist of a 10,000-gallon fuel oil tank and a 6,000-gallon plating fluids tank. Wastewater from the plating operation was piped to a neutralization-settling tank located at the northwest corner of the property. According to the property caretaker, the settling tank was a partial in-ground plastic tank. The discharge waters from the settling tank were piped through an in-ground concrete weir with discharge to the public sanitary sewer. The remaining portions of the property include asphalt pavement for parking and loading docks/trailer storage and landscaped/grassy areas.

The building located at 280 National Avenue was constructed in 1971 and consists of 152,396 square feet of warehousing and office space. The building is currently vacant. No manufacturing was conducted in the building. The building maintains an electrical room, a maintenance room, a cold storage room and a former boiler room. No electrical transformers are present in the electrical room. The maintenance room is vacant. The boiler room previously housed a fuel oil fired furnace that was removed in 1990. According to the property caretaker, the boiler utilized a 10,000-gallon fuel oil underground storage tank that was located on the south side of the building. The fuel oil tank was removed from the ground in 1990. According to the property caretaker, a closure assessment was performed during the tank removal in accordance with SCDHEC UST guidelines. No release of petroleum products was identified with the tank during the tank removal. According to the property caretaker, textile dry cleaning machines were previously used at the south central

end of the building with dry cleaning fluids stored in bulk quantities (55-gallon drums) in the boiler room.

An electrical substation within a fenced enclosure is located on the southwest end of the building. Two concrete saddles for a former above ground propane tank are located on the west side of the building. A 300,000-gallon, aboveground water storage tank for fire protection is located on the southwest corner of the property. The remaining portions of the property include asphalt pavement for parking and loading docks/trailer storage, and landscaped/grassy areas.

1.3 Previous Site Assessments

A Phase I Environmental Site Assessment (ESA) was conducted on the property in May 2005 and the former metal plating process at the 200 National Avenue building was identified as a recognized environmental condition (REC). No information was available as to the chemical makeup of the plating fluids, the treatment process, or the disposal of solids generated from the treatment system.

As a result of the environmental concerns identified with the property, a Phase II ESA soil and groundwater investigation was conducted on the 200 National Avenue parcel in October 2005. Soil and groundwater samples were collected in the vicinity and downgradient of the interior wastewater treatment tank and the exterior plating fluids/heating oil above ground storage tanks, and analyzed for volatile organic compounds (soil and groundwater) and the RCRA eight metals plus zinc (soil only). The analytical results indicated detectable concentrations of chlorinated solvents including cis-1,2-dichloroethene (*cis* 1,2-DCE), trichloroethene (TCE) and tetrachloroethene (PCE) in soil and groundwater; however, the detections in soils did not exceed EPA Regional Screening Levels (RSL) for residential use. SCDHEC does not have established soil cleanup standards but uses the EPA RSLs. A copy of the Report of Findings of the Phase II soil and groundwater investigation was submitted to SCDHEC.

As a result of the October 2005 Phase II findings, SCDHEC requested additional assessment work and the property owner, Castlebridge Properties, LLC entered into a Voluntary Cleanup Contract (VCC) as a Responsible Party (RP). The VCC (VCC 07-5712-RP) was signed and approved with the requirement of a remedial investigation (RI) to assess the source, nature and extent of the release. A Phase I RI assessment was conducted in September 2008. Soil and groundwater samples were collected at locations near the dry cleaning operations and storage areas for both buildings which indicated PCE and, to a lesser degree, TCE as the primary constituents of concern in the groundwater at the site. Volatile organic compounds (VOC) impacts to soil were identified; however, the reported concentrations did not exceed EPA RSLs established for residential use. PCE and TCE were detected in the groundwater screening samples at concentrations exceeding their respective maximum contaminant levels (MCLs). No light non aqueous phase liquid (LNAPL) or dense non aqueous phase liquid (DNAPL) were

observed in the groundwater screening samples. Based on the Phase I RI screening results, seven permanent monitoring wells (MW-1D, -2D, -3, -4, -5, -6D, and -7D) were installed on the Castlebridge property in August 2009 to evaluate the on-site horizontal extent of the chlorinated hydrocarbon plume in the saprolite and shallow bedrock aquifer. Monitoring wells were not installed off of the property at that time due to site physical constraints and access issues. Based on the distribution of the detected PCE/TCE, the source of the groundwater contamination was related to the previous use of drycleaning fluids at the 200 National Avenue building and, to a lesser degree, at the 280 National Avenue building.

Results from the August 2009 groundwater sampling event indicated the groundwater flow direction at the site is to the north-northwest toward the assumed groundwater discharge point of the stream present on adjacent property along the site northwestern boundary. Two stream samples were collected off the property during the RI Phase I sampling activities with no chlorinated volatile organic compounds (CVOCs) detected in the surface water or sediment samples of the stream. Groundwater analytical data from the permanent monitoring wells revealed concentrations of PCE in excess of its MCL in all the wells, with the exception of MW-5. No other VOCs, including TCE, were detected in the samples above applicable regulatory standards. Based on a review of the groundwater sampling results, DHEC requested additional assessment, including on adjacent downgradient properties, to further define the extent of CVOCs in the groundwater downgradient of MW-6D and MW-1D (SCDHEC correspondence, K. Long, SCDHEC to T. Morgan, Castlebridge Properties, 2/26/2010).

Following a lengthy access approval process involving the west-adjacent land owner, Mr. J. Cothran (Spartanburg County Tax ID 2-54-00-008.06), Terracon conducted initial groundwater screening activities on the Cothran property in January 2013. Twelve (12) shallow temporary wells GP-1 through GP-12 were installed using a track-mounted GeoProbe® direct-push drill-rig to the saprolite/partially weathered bedrock interface, as defined by probe refusal, to assess the horizontal extent of CVOCs in the water table/upper bedrock aquifer. Groundwater samples were collected from each temporary monitoring well which exhibited groundwater and were screened for PCE using the low-level Color-Tec® method with duplicate samples submitted for laboratory analysis. Based on the field screening and laboratory analytical data in total, the downgradient horizontal extent of the chlorinated groundwater plume remained undefined on the Cothran property.

Terracon remobilized to the Cothran property in April 2013 to conduct additional field screening activities with the installation of seven temporary monitoring wells (GP-13 through GP-19). Groundwater samples from the temporary monitoring wells were collected in a similar fashion as the initial field screening activities. The field screening and laboratory analytical results for the second screening process indicate the horizontal extent of the plume had been adequately defined on the Cothran property downgradient of the 280 National Avenue building with no detections of PCE above the method detection limit as indicated by data from temporary wells GP-13 (< 1.0 µg/L) and GP-5 (< 1.0 µg/L). The laboratory analytical results indicated that the

horizontal extent of the plume had been adequately defined on the Cothran property downgradient of the 200 National Avenue building with no detections of PCE in downgradient temporary wells GP-18 (< 1.0 µg/L) and GP-19 (< 1.0 µg/L).

Based on the field screening analytical results, five (5) permanent monitoring wells (MW-9 through MW-13) were installed on the adjacent Cothran property to monitor the off-site CVOC plume and one background well (MW-8) was installed on the Castlebridge property in November 2013 as approved by SCDHEC on September 24, 2013.

Groundwater analytical data revealed concentrations of PCE and, to a lesser degree, TCE in excess of their respective MCLs (5 µg/L) in monitoring wells MW-1D; MW-2D; MW-3; MW-6D on the Castlebridge property and in MW-11, MW-12 and MW-13 on the Cothran property. No other VOCs were detected in the samples above applicable regulatory standards. Low levels of PCE/TCE impacted groundwater were documented on the Castlebridge property in the vicinity of the AST area at the southwest corner of the 200 National Avenue building (MW-2D/MW-3); in the vicinity of the storage area at the northwest corner of the 200 National Avenue building (MW-1D); and the eastern side of the 280 National Avenue building (MW-6D). Impacts to groundwater above applicable MCLs on the downgradient adjacent Cothran property were documented along the northern property boundary (MW-12 and MW-13). A comparative review of historical data indicated that the CVOC concentrations in the wells appeared to be stable with slight decreases in CVOC concentrations evident in MW-1D, MW-2D, MW-4, and MW-7. A depiction of the CVOC plume map is shown on **Exhibit 3**.

A well installation and groundwater monitoring report, dated March 21, 2014, was submitted to SCDHEC. In review of the report, SCDHEC acknowledged the assessment work performed to date largely established the source, nature and extent of the soil and groundwater contamination. However, since VOCs have migrated off the Castlebridge property at concentrations above MCLs in groundwater, SCDHEC requested an evaluation of options to mitigate further impacts off the property.

1.4 Site Topography and Geology

The Castlebridge property is situated within the Inner Piedmont Physiographic Province of South Carolina. This province is characterized by gently rolling hills and ridges intersected by stream and river valleys. Based on review of the 7.5-minute series topographic quadrangle (Inman, South Carolina, 1983), the elevation ranges from approximately 925 feet above mean sea level (MSL) at the intersection of New Cut Road and National Avenue to 905 feet above MSL at the northwest property boundary. Based on visual observations, two ephemeral streams were identified approximately 250 feet northwest of the site, along the western property boundary of the Cothran property and along the Norfolk Southern rail line right-of-way. The ephemeral drainage is indicated in **Exhibit 2**. Based on available reference information and visual observations, the ephemeral streams are not used as a drinking water supply or for

recreational purposes, including fishing and swimming. Surface water and sediment samples collected from the ephemeral streams in August 2009 during the Phase I RI did not reveal the presence of CVOCs.

The geology of the Piedmont Physiographic Province consists of three zones which include, in descending order, the regolith zone, the transition zone between the bedrock and regolith, and the bedrock zone. The regolith zone consists primarily of saprolite, the unconsolidated weathering product of the underlying parent rock that retains the relic structure of the parent rock. The transition zone consists of partially weathered bedrock (PWR) and primarily of rock fragments, boulder size rocks, and fractured bedrock. The bedrock zone consists of crystalline igneous and metamorphic rocks composed of fine grained granitic gneiss. Soil samples of the saprolite collected during the Phase I RI were described as predominantly micaceous sandy silt to silty sand. The thickness of the saprolite, as defined by GeoProbe refusal during the Phase I RI and hollow stem auger (HSA) refusal during well installation, is highly variable across the property from 3 feet below ground surface (bgs) along the eastern site boundary with National Avenue (B-22) to an average of 45 feet bgs towards the western property boundary (see **Exhibit 4** for soil boring locations). A thin transition zone of partially weathered bedrock was generally encountered between 45 to 50 feet bgs along the center of the property. The bedrock interface, as defined by refusal to hollow stem augers and confirmed with rock cores during the well installation, was encountered from 50 feet bgs at the southern property boundary along New Cut Road to 45 feet near the northern property boundary with the Norfolk Southern railroad. Deeper bedrock, to a depth of 65 feet bgs, was encountered in a relic draw along the western property boundary trending south-southeast to north-northwest towards the ephemeral stream on the Cothran property. Using data obtained from previous Phase I RI and subsequent groundwater assessments, geologic cross sections were prepared for the site and are included in **Exhibits 5, 5A, 5B, and 5C**.

1.5 Site Hydrogeology

Groundwater in the Piedmont Physiographic Province typically occurs under unconfined conditions within the saprolite and underlying fractured bedrock. Groundwater flow directions are a subtle reflection of the local topography from areas of topographic highs to areas of topographic lows. Local recharge of the shallow aquifer occurs by the direct infiltration of precipitation. Some quantity of groundwater in the regolith zone also migrates downward to recharge the transition zone and the underlying bedrock. Groundwater occurrence and migration in the bedrock is controlled by fractures. Although, very little to no fracturing was observed in rock cores obtained during the installation of the wells MW-1D, -2D, -6D, and -7D.

Based on the most recent groundwater sampling event (November 13, 2013), groundwater elevations across the area ranged from 869.74 feet above MSL (MW-13) to 901.87 feet above MSL (MW-8). The resulting groundwater flow direction is to the north-northwest in the direction of the ephemeral stream present along the northern and western Cothran property boundary

(**Exhibit 6**). The resulting average hydraulic gradient calculated from MW-8 to MW-11 is 0.025 feet/foot.

To estimate hydraulic conductivity at the site, slug tests were performed on monitoring wells MW-1D, MW-3 and MW-6D on April 10, 2015. Prior to performing the tests, depth-to-water level measurements were recorded for each well. A Solinst Level Logger (data-logger) was then lowered into the well followed by a four-foot long Teflon bailer. The bailer was lowered until it was completed submerged. Water level measurements were then recorded periodically until the static water level (SWL) returned to within 0.10 feet of the original reading. At that point the bailer (or "slug") was quickly removed from the well. Water level measurements were recorded on the data-logger at one-second intervals until the SWL had recovered to within five percent of the original elevation.

Slug test data was evaluated using the Bouwer and Rice method for estimating hydraulic conductivity in an unconfined aquifer. The hydraulic conductivity calculated for MW-1D is 0.21 feet/day; for MW-3 is 2.5 feet/day and for MW-6D is 2.1 feet/day for an average value of 1.6 feet/day. With an average hydraulic gradient for the shallow aquifer of 0.025 feet per foot and an effective porosity of 40 percent for saprolitic silty sands (*Groundwater*, Freeze & Cherry, 1979), an average seepage velocity of 36 feet per year (ft/yr)) was calculated for the shallow aquifer. Copies of slug test data and calculations are provided in Appendix C.

1.6 Site Geochemistry

Terracon assessed the groundwater quality parameters for the site wells on April 10, 2015. The water quality parameters of pH, conductivity (mS/cm), dissolved oxygen (% and mg/L), temperature (C^{o}) and oxidation-reduction potential (ORP) (mV) were measured using a downhole YSI 556 Multi Probe System. As comparison, groundwater quality parameters for MW-6D were measured using a Horiba U-52 Multi Water Quality Meter as part of a low-flow purge and sampling event conducted on April 13, 2015. A summary of the groundwater field parameters is provided on **Table 1**.

The groundwater pH varies from 6.22 in the upgradient well, MW-8, to 4.54 in the downgradient well, MW-3. The decrease in pH does not appear to correspond to any significant change in the composition of the aquifer material; as such, the decrease in pH may be attributed to hydrogen ion production sourced from increased biological activity. The dissolved oxygen and ORP do not appear to follow the same trend as pH; however, the overall dissolved oxygen and ORP data do not appear to currently support a strong reducing environment.

In order to evaluate the trends in pH and redox state, Terracon sampled MW-6D for a treatability study on April 13, 2015 to assess groundwater quality characteristics for various organic and inorganic parameters including VOCs with ethene, ethane and methane; chloride; hydrogen sulfide; iron (total and dissolved); manganese; nitrogen (nitrate, nitrite, ammonia); phosphorus;

sulfate, sulfide; and total organic carbon. The monitoring well was sampled using low-flow sampling techniques. The VOC analytical results are summarized on **Table 2** with comparison to historical results. The remaining analytical results are summarized on **Table 3**.

The groundwater quality characteristics presented in **Table 3** indicate detectable concentrations of nitrate, iron, and manganese. These analytes, when present in detectible concentrations, may indicate that the current subsurface environment is not limited by oxygen. In a more reducing environment (absent oxygen), these analytes should be absent given their energetic favorability for anaerobic respiration. Likewise, methane was not detected, as would be expected if steady state conditions were more favorable for anaerobic respiration. This situation seems supported by the ORP data.

Total organic carbon (TOC) was below detection limits. The presence of this natural electron donor is crucial for reductive dechlorination. The data included in **Table 3** do indicate that the current conditions are favorable to foster an anaerobic, reducing environment that can support reductive dechlorination if enough electron donors were present to overcome oxygen demand, as well as ambient nitrate, iron, and manganese concentrations. Note that any enhancement of the subsurface reductive conditions would require pH control of the aquifer in order to maintain an optimum environment. Naturally-occurring aquifer materials may help buffer pH.

Terracon performed an evaluation of the buffering capacity of the shallow saprolite aquifer in relation to remedial objectives and alternatives. For the buffer capacity study, Terracon installed three GeoProbe borings, GP-22/GP-23/GP-24, adjacent to MW-6D on March 5, 2015, per monitoring well permit MW-10035, for the collection of soil and groundwater samples. Approximately 3 liters of groundwater were collected from GP-22 from a depth interval of 32-36' bgs and 1 kilogram of soil was collected from two additional GeoProbe borings, GP-23 and GP-24, at a depth interval of 36-38' and 32-36' bgs, respectively. The materials were delivered to SiREM Laboratories (SiREM) of Guelph, Ontario under chain of custody documentation for a bench study using several reactors. The materials were mixed in the laboratory to create a slurry and treated with sodium bicarbonate to determine the buffering capacity. The average initial pH of the geological materials was 5.78. The titration results revealed that 1.37 grams of $NaCO_3$ per kilogram of aquifer material would be needed to neutralize the aquifer pH. A copy of the SiREM buffer capacity test report is included in Appendix F.

2.0 NATURE AND EXTENT OF CONTAMINATION

The Phase I RI and subsequent assessment activities at the site included sampling of various environmental media to determine the general nature and extent of contamination. Specifically, Terracon sampled groundwater, soil, and surface water and sediment from the ephemeral stream for TCL volatile and semi-volatile organic compounds, polychlorinated biphenyls and TAL metals. The sampling results for these media are summarized below.

2.1 Soil

Soil samples collected during the Phase I RI were compared to the USEPA Regional Soil Screening Levels (SSLs) for industrial soil listed in the *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites, RSL Table Update* (USEPA, September 2008). No SVOCs were detected above the laboratory method detection limit. No detected VOC concentrations exceeded the RSLs for residential soils. A comparison of detected VOC constituents to SSLs is included in **Tables 4 and 5**.

Various metals were detected above the practical quantitation limit (PQL) in most of the soil samples collected at the site. Arsenic, B-4 (25') at 6.3 mg/kg, was the only metal detected above the PQL that exceeded the arsenic screening level for industrial soil of 1.6 mg/kg. It is Terracon's opinion that the detection of arsenic is representative of naturally occurring background soil concentrations in the Piedmont of South Carolina and not an artifact of historical facility operations.

Soil samples B-1 and B-8, collected from the electrical sub-stations, were submitted for analysis of polychlorinated biphenyls (PCBs). PCBs were not detected in the two samples.

2.2 Groundwater

2.2.1 Vertical Assessment

During the installation of MW-6D as part of the Phase I RI activities, probe refusal was encountered at a depth interval of 42 feet bgs and hollow stem auger refusal at 44.5 feet bgs. Rock cores collected from 45 feet to 56 feet bgs revealed a fine-grained granitic gneiss. The depth to water, as measured in MW-6D, was measured at 25.8 feet bgs.

Terracon conducted an assessment of the vertical CVOC distribution in the approximate 20-foot thick saprolite aquifer within 5 feet of MW-6D on March 5, 2015, in order to provide better spatial resolution of the contaminant plume. Three shallow temporary wells, GP-20 through GP-22, were installed using a track-mounted GeoProbe® direct-push drill-rig (Grant Drilling, SC # 2000) to the saprolite/partially weathered bedrock interface, as defined by probe refusal. Probe refusal was again encountered, as evident in GP-20, at a depth of 42 feet bgs and a groundwater sample was collected from a depth interval of 38 to 42 feet bgs using a GeoProbe groundwater sampling tool to assess groundwater quality at the bedrock interface. Subsequently, GP-21 was installed to a depth of 30 feet bgs and a groundwater sample collected at a depth interval of 26-30 feet bgs to assess the top of the water table aquifer. GP-22 was installed to an intermediate interval between the GP-20 and GP-21 samples at a depth of 36 feet with a groundwater sample collected from a depth interval of 32 to 36 feet. After sample collection, each of the temporary wells was properly abandoned using tremie-applied

bentonite cement grout from the bottom of the boring to the ground surface. Copies of the SCDHEC Water Well Records (Form 1903) and the soil boring log are included in Appendix D.

The groundwater samples were analyzed for CVOCs using EPA Method 8260 by PACE Analytical Services, Inc. of Huntersville, NC (SC#99006001). The analytical results for the shallow interval (26-30 feet bgs) revealed PCE at 9.3 µg/L. No other VOCs were detected above the laboratory method limit. For the intermediate sample interval (32-36 feet bgs), PCE (1,520 µg/L), TCE (7.8 µg/L) and *cis* 1,2-DCE (11.9 µg/L) were detected. For the deep sample interval (38-42' bgs) PCE at 803 µg/L, TCE at 4.3 µg/L and *cis* 1,2-DCE at 7.8 µg/L were reported. As a comparison, a groundwater sample (B-2) collected from a depth interval of 38-42 feet bgs at the MW-6D location during the October 2008 Phase I RI revealed a similar distribution of PCE (440 µg/L), TCE (5.3 µg/L) and *cis* 1,2-DCE (7.6 µg/L). A summary of the analytical results is provided on **Table 6**. A copy of the laboratory analytical report is included in Appendix E.

2.3.2 Horizontal Assessment

Based on the results of the phased groundwater investigations and the most recent groundwater sampling event conducted in November 2013, groundwater analytical data revealed concentrations of PCE and, to a lesser degree, TCE in excess of their respective MCLs (5 µg/L) in monitoring wells MW-1D; MW-2D; MW-3; MW-6D (Castlebridge property) and in MW-11, MW-12 and MW-13 (Cothran property). No other VOCs were detected in the samples above applicable regulatory standards. No SVOCs were detected in the groundwater samples above the laboratory method detection limits.

Low levels of PCE/TCE impacted groundwater are present on the Castlebridge property in the vicinity of the AST area at the southwest corner of the 200 National Avenue building (MW-2D/MW-3); in the vicinity of the storage area at the northwest corner of the 200 National Avenue building (MW-1D); and on the west side of the 280 National Avenue building (MW-6D). Impacts to groundwater above applicable MCLs on the downgradient adjacent Cothran property are documented along the northern property boundary (MW-12 and MW-13). The northern Cothran property boundary is bordered by a north-northwestern flowing creek and Southern Railroad line. The historical ground water CVOC analytical results are summarized on **Table 2**. A depiction of the CVOC plume map is shown on **Exhibit 3**.

2.3 Creek Sediment

Sediment samples results from the ephemeral stream and the drainage swale from the former weir did not reveal VOC, SVOC or inorganic (metal) compounds either above the industrial soil regional screening levels or were consistent with concentrations indicative of background or naturally occurring conditions.

2.4 Surface Water

Surface water samples collected from the ephemeral stream did not reveal VOCs and SVOCs above the laboratory PQL, and inorganic (metal) detections were below Region 4 Waste Management Division Freshwater Surface Water Screening Values for Hazardous Waste Sites (http://www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html#tbl3). A surface water sample was not collected from the drainage swale owing to dry conditions.

3.0 REMEDIAL ACTION OBJECTIVES AND GOALS

Remedial action objectives (RAOs) are designed to meet regulatory requirements and to protect human health and the environment. The RAOs presented in this evaluation are established to protect human health and the environment by considering the nature and extent of contamination, the potential exposure pathways, and the location and sensitivity of potential receptors. Based on the results of the Phase I RI and subsequent phased site assessments, the following RAO has been identified: Mitigate the migration of groundwater in excess of remedial goals from the property.

3.1 Applicable or Relevant and Appropriate Requirements (ARARs)

In the process of developing specific remedial goals that will be used to achieve the RAO, consideration must be given to ARARs. Applicable requirements are those laws or regulations that specifically apply to the hazardous substance, location, or contemplated remedial action for the site. Relevant and appropriate requirements are laws or regulations that address problems or situations sufficiently similar to those encountered at the site, so that their use is well suited to the site but for which the jurisdictional prerequisites have not been met. The chemical-specific ARARs, action-specific ARARs, and location-specific ARARs applicable to the Castlebridge property are presented below.

3.1.1 Chemical-Specific ARARs

These rules define the permissible concentrations of chemicals for various environmental media, such as soil or groundwater. These requirements generally set health-or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, contaminants and pollutants. An example would include the South Carolina Primary Drinking Water Standards.

3.1.2 Action-Specific ARARS

These rules are technology-based requirements, establishing performance, design, or similar action-specific controls or regulations on activities related to the management of hazardous substances or pollutants. An example would be the South Carolina Underground Injection Control (UIC) permit.

3.1.3 Location-Specific ARARs

These rules are design requirements or activity restrictions based on the geographical or physical position of the site and its surrounding area. An example would be space limitations between the site buildings and the property boundary and/or limitations from working within the site buildings related to shallow underground utilities and building foundations.

3.1.4 Other Requirements to be Considered

These requirements pertain to federal and state criteria, advisories, guidelines, or proposed standards that are not generally enforceable but are advisory and that do not have the status of potential ARARs. Guidance documents or advisories "to be considered" in determining the necessary level of remediation for protection of human health or the environment may be used where no specific ARARs exist for a chemical or situation, or where such ARARs are not sufficient to be protective. An example would be the Regional Screening Levels established by the USEPA.

3.2 Remediation Goals

The proposed remedial goals (RGs) are identified for groundwater. The RGs are based on those compounds that have been identified as constituents of concern (COCs) and/or detected above an ARAR. For groundwater, the USEPA MCLs for the CVOCs at the property boundary are proposed for the RGs.

No RGs are presented for soil since significant concentrations of contaminants were not present above the Regional SSLs for industrial soil. No RGs are indicated for sediment or surface water since no COCs were detected above applicable regulatory criteria.

Although several inorganic compounds were detected in the groundwater samples above their respective MCLs including arsenic, barium, beryllium, copper and lead, the presence and concentration of these compounds is likely an artifact of naturally occurring suspended sediment indicative of sample collection with GeoProbe groundwater sample tools. Therefore, no RGs are established for the metal constituents.

4.0 IDENTIFICATION OF THE REMEDIAL ALTERNATIVES

This section presents the identification and screening of technology types and process options applicable for remediation of contaminated media at the Castlebridge property. The screening of technologies and development of alternatives address the media of concern: groundwater.

4.1 General Response Actions

General response actions (GRAs) describe those actions that will satisfy the remedial action objectives for the identified media by reducing the concentration of hazardous substances or reducing the likelihood of contact with hazardous substances. General response actions were evaluated based on their adequacy and the potential risks posed by the affected media. The response actions identified for this evaluation are listed below.

- No Action
- Institutional/Land Use Controls
- Monitored Natural Attenuation/Long Term Monitoring
- In Situ Enhanced Reductive Dechlorination
- In Situ Chemical Oxidation
- Air Sparging / Soil Vapor Extraction
- Permeable Reactive Barrier Wall

A description of each potentially applicable technology type and associated process options in relation to site applicability, threshold criteria, and evaluation summary are presented below.

4.1.1 Alternative 1: No Action

The No Action (NA) alternative is typically developed as a remedial alternative as a baseline against which other remedial alternatives are compared. This alternative would leave impacted groundwater in place with no control to prevent human or ecological exposure. No remedial action would be undertaken as part of this alternative to contain, remove, monitor, or otherwise treat the impacted groundwater. Therefore, this alternative is not protective of human health and the environment.

This alternative would not require any specialized equipment or design, and could be readily implemented. Under the No Action alternative, migration of CVOCs to off-property areas is expected to continue. A decrease in the CVOC concentrations in the groundwater may occur over time through natural processes. However, such reduction is expected to occur very slowly and would not be monitored, quantified, or documented.

Reduction of Toxicity, Mobility and Volume
The No Action alternative may reduce the mass of CVOCs through natural processes. The attenuation rates will not be verified, as no groundwater monitoring will be performed under this alternative.

Long-Term Effectiveness
This alternative employs no active remediation, so potential exposure risks via consumption of groundwater will remain until target constituents naturally attenuate. These natural processes may require an excessively long time (>30 years) to achieve applicable standards. No long term controls will be employed to manage this risk.

Short-Term Effectiveness
This alternative is not effective in the short-term. The application of this alternative does not contribute additional risks to the community, potential site worker or the environment beyond those currently present by the existing site conditions.

Community Acceptance
Though current site conditions pose no known risk to the community, this option does not provide ongoing evaluation of site conditions. Since target constituents currently exceed primary drinking water standards in South Carolina, the community acceptance of this alternative is expected to be low.

Costs
Costs for the No Action option may include a remedy review every five years which would include a review of new regulations, review of the status of the Site, and a meeting with SCDHEC. The No Action option would generally require little to no capital, and no operation and maintenance (O&M) costs.

4.1.2 Alternative 2: Institutional/Land Use Controls

Institutional/Land Use Controls (ILUC) consist of physical, legal, and administrative mechanisms to restrict the use of or limit access to an affected area of the site, and to protect current and future receptors. The implementation of ILUC at the site would involve the preparation of applicable deed restrictions to limit groundwater use. Possible restrictions imposed for the property would include prohibitive use of site groundwater for any purpose other than environmental monitoring and testing.

Reduction of Toxicity, Mobility and Volume
The ILUC alternative may reduce the mass of CVOCs through natural processes. The attenuation rates will not be verified, as no groundwater monitoring will be performed under this alternative.

Long-Term Effectiveness
This alternative employs no active remediation, so potential exposure risks imposed on other properties will remain until target constituents naturally attenuate. Even though institutional controls would be in place, this alternative would not remediate the contaminated groundwater. ILUC would also not be imposed on off-site properties. No long term monitoring will be employed to manage potential risk.

Short-Term Effectiveness
The application of this alternative does not contribute additional risks to the community, potential site worker or the environment beyond those currently present by the existing site conditions.

Community Acceptance
The alternative is expected to be marginally acceptable to the community because it would not remediate the contaminated groundwater; however, land use restrictions would reduce the possibility of exposure.

Costs
Low costs are associated with this alternative relative to other remedial action alternatives. Expenditures include capital costs for deed restrictions.

4.1.3 Alternative 3: Monitored Natural Attenuation/ Long Term Monitoring (MNA/LTM)

The MNA/LTM technology includes the long-term monitoring, confirmatory monitoring, and/or monitored natural attenuation process options. The MNA/LTM would be to document CVOC concentrations in groundwater and verify that the natural attenuation mechanisms are present in reducing the dissolved CVOCs and keeping the plume stable or shrinking. Groundwater monitoring and sampling from existing wells would be conducted to evaluate groundwater quality and flow conditions on the site.

Reduction of Toxicity, Mobility and Volume
The alternative may reduce the mass of target CVOCs through natural attenuation processes assuming anaerobic conditions conducive for reductive dechlorination are present.

Long-Term Effectiveness
Natural attenuation processes have been shown to be effective in limiting the migration of dissolved CVOCs at numerous chlorinated VOC sites; however, the rates of reduction are relatively slow. These natural processes may require an excessively long time (>30 years) to achieve applicable standards.

Short-Term Effectiveness
This alternative is not anticipated to be effective in reducing COC concentrations in the short-term. The application of this alternative does not contribute additional risks to the community, potential site worker or the environment beyond those currently present by the existing site conditions.

Community Acceptance
The alternative is expected to be marginally acceptable to the community since there is limited risk to human health or the environment and, coupled with proposed land use restrictions, would ensure that future uses of the property do not create exposure pathways.

Costs
Low costs are associated with this alternative relative to other remedial action alternatives. Expenditures include periodic groundwater monitoring and reporting for a long time period.

4.1.4 Alternative 4: Enhanced Reductive Dechlorination

In situ enhanced reductive dechlorination (ERD) is a groundwater technology that involves the development of subsurface geochemical conditions that allow indigenous or introduced microorganisms to biodegrade target constituents. For chlorinated ethenes, enhanced reductive dechlorination entails the addition of an electron donor (i.e. carbon source) within the subsurface to stimulate anaerobic microorganisms to biodegrade contaminants via reductive dechlorination. Potential carbon sources include a wide variety of food-grade (molasses, emulsified vegetable oil, commercially-derived products) or agricultural materials (cheese whey). Unamended liquids, liquid emulsions, or soluble carbon sources are usually emplaced via injection into temporary injection points or permanent injection wells. During the ERD process, carbon is used as an energy source by the anaerobic microbes in the subsurface, and the chlorinated hydrocarbons are used as one of the respiratory substrates, or electron acceptors, during metabolism. Bioaugmentation utilizing select dechlorinating bacteria (such as Dhc) provide complete reductive dechlorination processes beyond *cis* 1,2-DCE and vinyl chloride (VC) to a non-toxic end product such as ethene. This technology is widely utilized, and has demonstrated success on multiple sites impacted with chlorinated compounds.

This technology would involve the application of a carbon substrate into the groundwater plume using either direct push or permanent injection points at a targeted depth interval. Due to longevity of the injectate in the substrate, a single application of the carbon substrate may be sufficient to reach remedial action objectives. Subsequent groundwater monitoring would be performed to insure that adequate distribution is obtained, proper geochemical conditions are developed, and that biological reductive dechlorination is occurring. This post injection monitoring typically transitions into a monitoring program to document and verify the remediation goals are achieved.

Reduction of Toxicity, Mobility and Volume

The alternative is expected to reduce the mass of target CVOCs through active remediation in the saturated zone. With the introduction of a non-polar injectate, the CVOCs will preferentially partition and remain in the insoluble injectate until the contaminant is broken down. The use of an emulsifier increases the effective surface area to further enhance the partitioning process. Active remediation of groundwater will be performed by reductive dechlorination processes and should result in a significant reduction of target constituent mass on the site and mitigate additional off-site impacts.

Long-Term Effectiveness

Enhanced reductive dechlorination activities are typically much more rapid than natural attenuation processes and can be enhanced with bioaugmentation using introduced microbial cultures. The long-term controls necessary to manage the remaining risk shall be continued groundwater monitoring, which will verify that the groundwater target constituents are decreasing and no longer being transferred off-property. The implementation of ERD may also create long-term secondary water quality effects which may include elevated concentrations of ferrous iron, methane, volatile fatty acids and other constituents indicative of anaerobic conditions. These secondary effects are all low-risk and will likely not persist.

Short-Term Effectiveness

This alternative is generally effective at reducing CVOC concentrations in the short-term. However, the reductive dechlorination process may temporarily create slightly more mobile and more toxic intermediate breakdown products (such as vinyl chloride). However, the groundwater velocity at the site is relatively low, thus groundwater transport of breakdown products will be reduced. In some situations, the reductive dechlorination process can be inhibited, causing an accumulation of these by-products. However, this situation can typically be overcome with bio-augmentation, the addition of dechlorinating microorganisms, or the adjustment of aquifer geochemical conditions. Further, the biodegradation of carbon substrates can generate methane gas, which may cause an indoor air risk to the nearby buildings; however, since active injections will not be performed directly beneath the buildings, this risk is estimated to be low. In some settings, there is also a minimal risk of impact to the environment, in the event that the carbon substrates discharge into downgradient surface water. At this site, however, the ephemeral stream is located approximately 500 feet downgradient and the remedial amendments are not expected to reach this location based upon relative distance, the assumed (relatively small) volume of injectate, and the viscous nature of the injectate.

Community Acceptance

Injectate materials are typically off-spec food products; therefore, the alternative is expected to be generally acceptable to the community since there is limited risk to human health or the environment and, coupled with appropriate land use restrictions, would reduce the possibility of exposure pathways.

Costs
Moderate costs are associated with this alternative relative to other remedial action alternatives. Expenditures include capital costs for equipment and construction of injection points and injection material. O&M costs include periodic monitoring of the groundwater network and supplementary injections of substrate or bio-augmenting organisms.

4.1.5 Alternative 5: In Situ Chemical Oxidation

In situ chemical oxidation (ISCO) involves the injection of chemical oxidants into impacted areas. The chemical oxidant reacts with target constituents to reduce concentrations to target levels. Typical oxidants utilized include permanganate salts, persulfate, hydrogen peroxide and ozone. Persulfate and hydrogen peroxide are typically catalyzed with an additive, typically caustic (i.e. sodium hydroxide) or a chelated metal, usually iron. Permanganate, persulfate and peroxide are applied as liquid solutions while ozone is applied in gaseous form. The effectiveness of each oxidant is typically dependent on many site specific factors. The optimum oxidant type, catalyst and dose are typically estimated by performing bench and/or pilot scale studies prior to full scale implementation. ISCO is a widely used and effective remedial technology for chlorinated ethenes.

This technology would involve the application of a chemical oxidant in the treatment area either by temporary injection points or permanent injection points at a targeted depth interval. Subsequent groundwater monitoring would be performed to ensure that adequate distribution is obtained and that oxidation processes are occurring. Multiple applications of oxidant are typically necessary to reach the objectives. Post injection monitoring typically transitions into an ERD and/or MNA program to further reduce site COC and document achievement of the remedial objectives.

Reduction of Toxicity, Mobility and Volume
Active remediation of groundwater will be performed by the addition of chemical oxidants to convert dissolved chlorinated ethenes to non-toxic by-products. Implementation of this alternative should result in a significant reduction of target constituent mass, especially when concentrations are in the part per million range.

Long-Term Effectiveness
Chemical oxidation activities are typically much more rapid than both natural attenuation and ERD processes. Residual groundwater impacts may be addressed by natural attenuation mechanisms or by implementation of an ERD program. The long-term controls necessary to manage the remaining risk at this site would be continued groundwater monitoring to verify that the groundwater target constituents are decreasing and no longer being transferred off-site. A typical by-product of the ISCO process is the creation of inorganic salts, which are typically considered to present a low risk to human health, but may affect aquifer permeability within the

injection area(s). Salt formation may impact the ease of injection during subsequent injection events.

Short-Term Effectiveness
ISCO is typically highly effective in the short-term provided that the injectate is properly applied into the target areas. Contaminants are often destroyed very rapidly. There are risks associated with the implementation of ISCO, such as dermal exposure to oxidants, gas and heat generation, and potential uncontrolled reactions if the treatment chemicals are improperly stored or handled. Due to the proximity of the on-site buildings, these risks must be properly managed but can be minimized with proper planning and implementation of safety precautions such as engineering controls and appropriate personal protective equipment for the specified chemicals to be utilized. There is also a minimal risk of impact to the environment, in the event that the oxidants discharge into downgradient surface water. At this site, however, the ephemeral stream is located approximately 500 feet downgradient and the remedial amendments are not expected to reach this location based upon relative distance and the assumed (relatively small) volume of injectate.

Community Acceptance
The alternative is expected to be generally acceptable to the community since there is limited risk to human health or the environment and, if coupled with appropriate land use restrictions, would reduce the potential of future exposure pathways. All personnel involved in implementing this remedy will have appropriate training in how to handle and store these oxidants as well as the standard Hazardous Waste and Emergency Operations training. A site specific Health and Safety Plan will be prepared and implemented. As an added precaution, increased security at the site and notice to local authorities will be considered during implementation. As this is an aggressive remedial approach, it is unlikely that the local community would object. During injection of some oxidants, vigorous exothermic reactions can be created, causing upwelling and/or discharge of steam. However, this site is secured and the injection areas are generally located away from public view. Chemical oxidation is an accepted remedial approach by the USEPA and SCDHEC.

Costs
Moderate costs are associated with this alternative relative to other remedial action alternatives. Expenditures include capital costs for equipment, construction of injection points, and injection materials. O&M costs include periodic monitoring of the groundwater network as well as supplemental rounds of injection.

4.1.6 Alternative 6: Air Sparging / Soil Vapor Extraction

Air sparging (AS) is an in-situ treatment technology that uses injected air to remove volatile contaminants from the groundwater. As the injected air rises through the groundwater plume, contaminants are stripped from the water and carried towards the surface and removed from the

vadose zone through a soil vapor extraction (SVE) system. This process is very well known and can remove most types of dissolved-phased VOCs.

Reduction of Toxicity, Mobility and Volume
The alternative would be effective in reducing the mass of target CVOCs through active remediation in the saturated zone, and may therefore meet the established RAOs for the site. This alternative would be expected to reduce the toxicity and volume of contaminants in the regolith zone through treatment.

Long-Term Effectiveness
The mass of contaminants in groundwater would be reduced, limiting the toxicity and volume of contaminants in bedrock groundwater following treatment in the regolith zone. The long-term controls necessary to manage the remaining risk shall be continued groundwater monitoring, which will verify that the groundwater target constituents are decreasing and no longer being transferred off-site.

Short-Term Effectiveness
The mass of contaminants in groundwater would be reduced at a moderate rate relative to the other alternatives.

Community Acceptance
The alternative is expected to be generally acceptable to the community since there is limited risk to human health and the environment and, coupled with appropriate land use restrictions, would reduce the potential for exposure pathways.

Costs
Moderate to high costs are associated with this alternative relative to other remedial action alternatives. Expenditures include capital costs for equipment, construction of AS and SVE wells, and the installation and maintenance of the AS/SVE system. O&M costs include periodic maintenance and monitoring of the AS/SVE system and periodic monitoring of the groundwater network.

4.1.7 Alternative 7: Permeable Reactive Barrier Wall

A permeable reactive barrier wall (PRBW) can be used as a passive treatment option for the treatment of groundwater containing organic contaminants. This option is often used at property boundaries or upgradient of groundwater discharge points as an approach to mitigate further plume migration. At the site, this option would involve the installation of a PRBW along the downgradient edge of the property boundary, spanning across the estimated extent of groundwater impact. The wall would be keyed into an underlying layer of less permeable material (i.e., bedrock) to prevent short-circuiting. These types of barrier walls are often constructed of a mixture of sand and a reactive material (e.g., iron particulate). Groundwater is

allowed to flow through the wall naturally, allowing it to come in contact with the reactive material. The oxidation of the material in the presence of the contaminant (CVOCs) reduces the chemicals and converts them to less toxic constituents. Once the groundwater has passed through the barrier, it generally requires no further treatment or management.

The technical feasibility of this option depends on the availability of an impermeable strata under the site that will prevent/impair the downward movement of contaminants, or additional knowledge that impacted groundwater will not underflow the PRBW. Native soils present in the path of the barrier wall installation would be removed via trenching activities. The selected media mixture would be used to backfill the trenches and capped to prevent surface water infiltration. Periodic monitoring of downgradient monitoring wells is required to verify PRBW treatment efficacy.

Reduction of Toxicity, Mobility and Volume

Passive remediation of groundwater will be performed by the reduction of contaminants to convert dissolved chlorinated ethenes to non-toxic by-products. Implementation of this alternative should result in reduction of off-site contaminant migration.

Long-Term Effectiveness

Replacement of the barrier wall may be required if monitoring data indicates that the reactive media has been consumed prior to the acceptable reduction of the contaminants remaining upgradient of the barrier wall. The long-term controls necessary to manage the remaining risk shall be continued groundwater monitoring, which will verify that the groundwater target constituents are decreasing and no longer being transferred off-property. The implementation of chemical reduction via a PRBW may also create long-term secondary water quality effects which may include elevated concentrations of ferrous iron, sulfate and/or other metals. These secondary effects are all considered low-risk. The longevity of PRBWs typically ranges from 1-15+ years, depending on the media and field conditions. This alternative should often be used in conjunction with source area treatment in order to achieve site closure within a reasonable time frame.

Short-Term Effectiveness

The PRBW option can be implemented at the site in a reasonable timeframe (<1 year). Performance verification monitoring would be required on a frequent basis immediately following the installation activities (quarterly), and then at a lesser rate thereafter (semi-annually or annually). If properly designed and installed, water passing through the PRBW should emerge at, or below, the remediation goals.

Community Acceptance

The alternative is expected to be generally acceptable to the community since there is limited risk to human health and the environment and, coupled with appropriate land use restrictions, would reduce the potential for exposure pathways.

Costs

High costs are associated with this alternative relative to other remedial action alternatives. Expenditures include capital costs for trenching equipment and construction of the PRB wall, soil disposal, and PRB materials. O&M costs include long-term monitoring and O&M of the PRB wall and periodic monitoring of the groundwater network.

5.0 EVALUATION CRITERIA

This section presents a comparative discussion on the relative performance of alternatives in relation to the threshold and balancing criteria defined in the National Contingency Plan (NCP).

5.1 Threshold Criteria

The threshold criteria are described below:

- ***Protect Human Health and the Environment:*** Alternatives are evaluated to determine if implementation will provide and maintain adequate protection of human health and the environment by eliminating, reducing, or controlling site exposures to acceptable risk levels established in the corrective action objectives.

- ***Compliance with Applicable or Relevant and Appropriate Requirements (ARARs):*** Alternatives are evaluated to determine if their implementation would result in the attainment of media cleanup standards, based on health or risk based criteria, derived from existing state or federal regulations, as well as site-specific corrective action objectives.

5.2 Balancing Criteria

The balancing criteria are described below:

- ***Long-Term Effectiveness and Permanence:*** Alternatives are evaluated with respect to their demonstrated and expected reliability and permanence based on the degree of certainty that the alternative would prove to be successful in establishing controls to eliminate or manage the risk posed by treatment residuals and/or untreated wastes. Each alternative is also evaluated in terms of its projected useful life (i.e., the length of time the level of effectiveness can be maintained).

- ***Toxicity, Mobility, and Volume Reduction:*** Alternatives are evaluated to determine the degree to which their implementation would reduce or eliminate the toxicity, mobility, or volume of waste at the site. This evaluation focuses on specific factors, including the

amount of hazardous materials that will be destroyed or treated, the expected reduction of the toxicity, mobility, and volume, the degree to which the treatment will be irreversible, and the type and quantity of treatment residuals.

- ***Short-Term Effectiveness:*** Alternatives are evaluated with respect to the short-term risks that might be posed to the community, workers, and the environment during the construction and implementation of the alternative. Each alternative is also evaluated in terms of the time that site conditions are protective of human health and the environment.

- ***Implementability:*** Alternatives are evaluated in terms of the ease or difficulty of their implementation considering the technical and administrative feasibility. Technical feasibility includes difficulties and unknowns associated with constructability, safety, time for implementation, time for beneficial results, and availability of technologies, as well as the availability of adequate off-site treatment, storage capacity, disposal services, and technical services and materials. Administrative feasibility includes permits, rights of way, and off-site approvals and the length of time necessary to obtain any approvals.

- ***Cost:*** Alternatives are evaluated in terms of the capital costs and the annual operation and maintenance costs. Capital costs consist of direct costs and indirect costs. Direct costs include labor, equipment, and materials expenditures necessary to install the corrective measure. Indirect costs include engineering, financial, and other service fees apart from installation activities. Cost analyses for the corrective action alternatives are derived from a number of sources, including vendor estimates, estimates from similar projects, actual experience at other sites, and standard cost estimation and guidance references.

- ***State and Community Acceptance:*** Alternatives are evaluated to determine if site management activities associated with the implementation of each alternative would be conducted in compliance with all applicable state or local regulations.

6.0 DETAILED ANALYSIS OF ALTERNATIVES

A comparative analysis of how the alternatives satisfy or do not satisfy each of the criteria is presented in this section.

6.1 Alternative 1: No Action

Overall Protection of Human Health and the Environment
Because remedial actions would not be initiated as part of this alternative, it will not provide any increased protection to human health or the environment.

Compliance with ARARs
Compliance with ARARs may be achieved in certain areas of the site, where CVOCs in groundwater are detected below RGs. However, this alternative would not achieve chemical-specific ARARs for groundwater CVOCs above RGs. Location- and action-specific ARARs do not apply to this alternative since remedial actions would not be conducted.

Long-Term Effectiveness and Permanence
This alternative has no long-term effectiveness and permanence as impacted groundwater remains on property with off-property impacts.

Reduction of Toxicity, Mobility and Volume
No significant reductions in contaminant mass are likely under this alternative beyond the nominal amount that may be occurring due to natural processes.

Short-Term Effectiveness
Since no further remedial actions would be implemented at the site, this alternative poses no short-term risks to on-site workers, the environment, or the nearby community. The remedy would not be effective in reducing CVOC mass in the short term.

Implementability
This alternative requires no further action and could be implemented immediately.

Cost
The total present worth cost for this alternative is $13,000.

6.2 Alternative 2: Institutional/Land Use Controls

Overall Protection of Human Health and the Environment
The alternative would be effective in protecting human health on the property since access to the property is limited with fencing around the site and 24-hour active manned security measures. Deed restrictions would prohibit future use of the property for residential purposes and future use of groundwater as a potable water supply. This alternative would not be protective of downgradient properties, however, since those properties are not owned or under the control of Castlebridge.

Compliance with ARARs
Compliance with ARARS may be achieved in certain areas of the site, where CVOCs in groundwater are detected below RGs. However, this alternative would not achieve chemical-specific ARARs for groundwater CVOCs above RGs. Location- and action-specific ARARs do not apply to this alternative since remedial actions would not be conducted outside of maintaining limited access to the property.

Long-Term Effectiveness and Permanence
This alternative is expected to be effective as long as institutional controls are maintained. However, this alternative would not result in reducing contaminant migration off property.

Reduction of Toxicity, Mobility and Volume
No significant reductions in contaminant mass are likely under this alternative beyond the nominal amount that may be occurring due to natural processes.

Short-Term Effectiveness
Remedial actions at the site under this alternative would likely be limited to maintaining perimeter fencing, which is already installed at the property. This alternative poses minimal short-term risks to on-site workers, the environment, or the nearby community. The remedy would not be effective in reducing CVOC mass in the short term.

Implementability
This alternative could be implemented quickly since fencing and security are already in place. An SCDHEC provision of a Restrictive Covenant document, as specified in the VCC, could also be readily obtained through a filing with Spartanburg County.

Cost
The total present worth cost for this alternative is estimated to be $5,000. The capital costs include implementing deed restrictions.

6.3 Alternative 3: Monitored Natural Attenuation/ Long Term Monitoring (MNA/LTM)

Overall Protection of Human Health and the Environment
Because active remediation would not be initiated as part of this alternative, it will not provide any increased protection to human health or the environment. Monitoring proposed under this alternative would allow for regulatory authorities to evaluate whether additional actions would need to be taken.

Compliance with ARARs
Compliance with ARARS may be achieved in certain areas of the site, where CVOCs in groundwater are detected below RGs. However, this alternative would not achieve chemical-

specific ARARs for groundwater CVOCs above RGs. Location- and action-specific ARARs do not apply to this alternative since active remediation would not be conducted.

Long-Term Effectiveness and Permanence
This alternative would not result in minimizing contaminant migration from off of the property. Long-term monitoring of the groundwater would be conducted to determine any ongoing risks that the property poses to human health and the environment.

Reduction of Toxicity, Mobility and Volume
This alternative would not significantly reduce the mass of target CVOCs through natural attenuation processes based on historical CVOC data which demonstrated no significant reduction of the PCE as indicated by detection of degradation products (TCE, DCE and VC). Based on the geochemistry of the aquifer evident by acidic conditions (low pH), elevated oxygen levels (> 5 mg/L), elevated ORP (> 50 mV) and low total organic carbon (< 20 mg/L), conditions conducive to the natural reductive dechlorination of chlorinated ethenes is not readily apparent.

Short-Term Effectiveness
This alternative poses minimal short-term risks to on-site workers, the environment, or the nearby community and would not be effective in reducing CVOC mass in the short-term.

Implementability
This alternative could be implemented immediately since monitoring wells are in place and procedures established.

Cost
The total present worth cost for this alternative is $101,000. The O&M costs include site monitoring and reporting on an annual basis for a 20-year period.

6.4 Alternative 4: Enhanced Reductive Dechlorination

Overall Protection of Human Health and the Environment
Successful implementation of this alternative would reduce risks to human health and the environment and meet RAOs by treatment of the regolith contaminated groundwater (toxicity and volume reduction) and reduce potential impacts for the underlying bedrock through mass reduction.

Compliance with ARARs
This alternative would likely achieve chemical-specific ARARs in the regolith and subsequently to the bedrock groundwater. All location- and action-specific ARARs are expected to be met. The required state and federal permits will be evaluated during the remedial design phase. At a minimum, these are expected to include an underground injection control permit.

Long-Term Effectiveness and Permanence

This alternative is expected to be effective in meeting the RAOs derived for the property. It would reduce contaminant concentrations in regolith groundwater and limit the mobility of contaminants in the bedrock. Long-term monitoring (of media and institutional controls) would be conducted to determine any ongoing risks that the property poses to human health and the environment.

Reduction of Toxicity, Mobility and Volume

This alternative would be effective in reducing the toxicity and volume of contaminants in the regolith groundwater after providing the necessary amendments (carbon source) and adjustments to the aquifer geochemistry. Potential impacts to the shallow bedrock would be reduced after removing contaminants in the regolith zone.

Short-Term Effectiveness

This alternative poses minimal short-term risks to on-site workers, provided appropriate personal protective equipment is used. One injection event is estimated to be required to achieve the remediation goals; however, performance verification monitoring would be performed on a semiannual basis for one year followed by annual sampling for CVOC and geochemical parameters to assess remedy effectiveness. This alternative can be effective in reducing CVOC concentrations in the short term.

Implementability

Injection well construction uses standard practices and is readily implemented. Injectate materials and amendments are readily available. No significant construction issues are expected to be encountered. Associated permits would be obtained from SCDHEC prior to implementation of this alternative.

Cost

The total present worth cost for this alternative is $260,000. The capital costs for this alternative include installing injection wells or temporary injection points and performing one ERD event. The O&M costs include site monitoring and reporting on a semi-annual basis for a 5-year period. The cost is based on installation of approximately 35 temporary injection points along the northwestern property boundary of the 280 National Avenue building and along the western boundary of the 200 National Avenue building. A radius of influence of 10 to 15 feet is assumed for the purposes of this evaluation based on the sandy silt to silt sand conditions observed at the property. Based on the vertical distribution of CVOCs, the targeted injection interval for treatment is assumed to be between 25 and 40 feet. This interval was selected as it is assumed that the CVOC impacts are uniformly present in the saturated zone. Amendments would include electron donor (emulsified vegetable oil), nutrients to stimulate microbial growth, select dechlorinating microbes (such as Dhc) and magnesium hydroxide to increase the aquifer pH.

6.5 Alternative 5: In Situ Chemical Oxidation

Overall Protection of Human Health and the Environment
Successful implementation of this alternative would reduce risks to human health and the environment and meet RAOs by treatment of the regolith contaminated groundwater (toxicity and volume reduction) and reduce potential impacts for the underlying bedrock through mass reduction.

Compliance with ARARs
This alternative would likely achieve chemical-specific ARARs in the regolith and subsequently in the bedrock groundwater. All location-specific and action-specific ARARs are expected to be met. The required state and federal permits will be evaluated during the remedial design phase. At a minimum, these are expected to include an underground injection control permit.

Long-Term Effectiveness and Permanence
This alternative is expected to be effective in meeting the RAOs derived for the property. It would reduce contaminant concentrations in regolith groundwater and limit the mobility of contaminants in the bedrock. Long-term monitoring (of media and via institutional controls) would be conducted to determine any ongoing risks that the property poses to human health and the environment.

Reduction of Toxicity, Mobility and Volume
Implementation of this alternative should result in a significant reduction of target constituent mass in the regolith groundwater. The effectiveness of ISCO is limited by a variety of factors including direct oxidant-contaminant interaction and total oxidant demand. Potential impacts to the shallow bedrock would be reduced after removing contaminants in the regolith zone.

Short-Term Effectiveness
This alternative poses moderate short-term risks to on-site workers in handling of the oxidant. For this property, three injection events are estimated to be required to achieve the remediation goals; injection events would typically occur in 4-6 month intervals with performance verification monitoring performed to assess remedy effectiveness. This alternative is effective at reducing CVOC mass in the short-term.

Implementability
Chemical oxidation injection well construction uses standard practices and is readily implemented. Oxidant materials are readily available. No significant construction issues are expected to be encountered unless the oxidant material daylights. Associated permits would be obtained from SCDHEC prior to implementation of this alternative.

Cost

The total present worth cost for this alternative is $351,000. The capital costs for this alternative includes installing permanent injection wells and performing three injection events using sodium permanganate. The O&M costs include site monitoring and reporting on a semi-annual basis for a 5-year period. As with ERD, the cost is based on installation of approximately 35 injection points along the northwestern property boundary of the 280 National Avenue building and along the western boundary of the 200 National Avenue building. A radius of influence of 10 to 15 feet is assumed for the purposes of this evaluation based on the sandy silt to silt sand conditions observed at the property. Based on the vertical distribution of CVOCs, the targeted injection interval for treatment is assumed to be between 25 and 40 feet. This interval was selected as it is assumed that the CVOC impacts are uniformly present in the saturated zone.

6.6 Alternative 6: Air Sparging / Soil Vapor Extraction

Overall Protection of Human Health and the Environment

Successful implementation of this alternative would reduce risks to human health and the environment and meet RAOs by treatment of the regolith contaminated groundwater (toxicity and volume reduction) and reduce potential impacts for the underlying bedrock through mass reduction.

Compliance with ARARs

This alternative would likely achieve chemical-specific ARARs in the regolith and subsequently in the bedrock groundwater. All location- and action-specific ARARs are expected to be met. The required state and federal permits will be evaluated during the remedial design phase. At a minimum, these are expected to include an underground injection control permit.

Long-Term Effectiveness and Permanence

This alternative is expected to be effective in meeting the RAOs derived for the property. It would reduce contaminant concentrations in regolith groundwater and limit the mobility of contaminants in the bedrock. Long-term monitoring (of media and institutional controls) would be conducted to determine any ongoing risks that the property poses to human health and the environment.

Reduction of Toxicity, Mobility and Volume

This alternative would be effective in reducing the volume of contaminants in the regolith groundwater and vadose zones. Potential impacts to the shallow bedrock would be reduced as a result of removing contaminants in the regolith zone.

Short-Term Effectiveness

This alternative poses low to moderate risks to onsite workers during installation of the AS/SVE system and component piping. Off-gas would be vented through a stack elevated a sufficient

height above the breathing zone. This alternative is expected to be moderately effective in the short-term based upon the relatively low dissolved concentrations and estimated permeability.

Implementability

Air sparge injection well and SVE well construction use standard construction practices and equipment and is readily implemented. The air sparge process would require pilot-scale testing prior to full-scale implementation. No significant construction issues are expected to be encountered. Associated permits would be obtained from SCDHEC prior to implementation of this alternative.

Cost

The total present worth cost for this alternative is $857,000. The capital costs for this alternative includes installing permanent air sparge and SVE wells. The O&M costs include treatment system O&M, site monitoring semi-annually for a 10-year period and monthly maintenance. For evaluation and cost estimating purposes, the air sparging wells would be installed at the top of bedrock so that air would be allowed to rise through the entire saturated aquifer. Air sparging wells would be spaced approximately 30 feet from each other (15-foot radii) for a total of 30 sparge wells. SVE would be installed at a ratio of one SVE well per four air sparging wells (for a total of 8 SVE wells) to remove the contaminants as they are volatilized from the vadose zone. SVE wells would be installed above the water table.

6.7 Alternative 7: Permeable Reactive Barrier Wall

Overall Protection of Human Health and the Environment

Successful implementation of this alternative would reduce risks to human health and the environment by treatment of the regolith contaminated groundwater (toxicity and volume reduction) prior to migrating off property and reduce potential impacts for the underlying bedrock through mass reduction.

Compliance with ARARs

This alternative would likely achieve chemical-specific ARARs in the regolith prior to moving off property. All location- and action-specific ARARs are expected to be met. The required state and federal permits will be evaluated during the remedial design phase.

Long-Term Effectiveness and Permanence

This alternative is expected to be effective in meeting the RAOs derived for the property. It would reduce contaminant concentrations in regolith groundwater from moving off site and/or into the underlying bedrock. Long-term monitoring (of media and institutional controls) would be conducted to determine any ongoing risks that the property poses to human health and the environment.

Reduction of Toxicity, Mobility and Volume

This alternative would be effective in reducing the toxicity and volume of contaminants migrating into and through the barrier wall. Limited toxicity and volume reductions would be expected in bedrock.

Short-Term Effectiveness

The construction phase of this alternative would likely be accomplished in less than one year. Installation of the PRBW could expose workers to groundwater contamination. Therefore, impacts associated with construction would likely be moderate. Short-term impacts associated with this alternative include disturbing soil and groundwater during construction. Onsite workers would be adequately protected from short-term risks by using appropriate personal protective equipment and by following proper operating and safety procedures. As this is a passive remedy, the short-term effectiveness is limited by the permeability of the aquifer and the wall materials.

Implementability

Installation of a PRBW to 45-50 feet below grade, as would be specified at this property, would require the use of specialized equipment operated by trained workers. Construction issues may also be encountered with the presence of boulders and the proximity of the PRBW to the property buildings. The PRBW process requires bench- and pilot-scale testing to full-scale implementation. Associated permits would be obtained from SCDHEC prior to implementation of this alternative.

Cost

The total present worth cost for this alternative is $1,963,000. The capital costs for this alternative include installing the PRBW including trenching equipment and construction of the PRB wall, soil disposal, and PRB materials. The O&M costs include treatment system O&M, site monitoring semi-annually for a 10-year period, and periodic maintenance.

7.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section presents a comparative analysis of the alternative described above based on the threshold and balancing evaluation criteria. Table 7 presents the ranking scores for each alternative and evaluation criterion for groundwater remedial alternatives. Each alternative's performance against the criteria was ranked on a scale of 0 to 5, with 0 indicating that none of the criterion's requirements were met and 5 indicating that all of the requirements were met. The ranking scores combined with the present worth cost provide the basis for comparison among the alternatives.

Long-Term Effectiveness

ERD has the best potential for long-term effectiveness. The CVOC would preferentially partition into the non-polar injectate which can be further enhanced through the introduction of an emulsifier. Microbial cultures, both indigenous and amended, would continue to grow by following the food source and electron acceptor (CVOCs). Both ERD and ISCO can effectively reduce CVOC mass in a relatively short time frame; however, groundwater concentrations have less of a potential for 'rebound' following the initial ERD injection when compared to ISCO. PBRW can also rapidly reduce CVOC concentrations at the point of contact, but is a slower process overall as it relies on the rate of groundwater flow to reduce contaminant mass when it encounters the reactive barrier wall.

Reduction of Toxicity, Mobility and Volume

ERD has the best potential for contaminant reduction at the property boundary and can reduce contaminant mass; however, it may create toxic by-products during the dechlorination process under certain conditions. ISCO is effective in reducing contaminant concentrations but is less reliable for treating lower concentrations (parts per billion) and usually is coupled with ERD for lower remedial goals. PRBW and air sparge/SVE have similar advantages and disadvantages as ISCO, but the rate of treatment is usually slower since it relies on physical treatment processes.

Short-Term Effectiveness

ISCO has the best potential for short-term effectiveness due to the quick reaction of the oxidant and resulting reactions. ERD is also very effective in the short term as the CVOC would preferentially partition into the non-polar injectate which can be further enhanced through the introduction of emulsifiers and select microbial cultures. PRBW is effective in the short term at the point of contact but is limited overall since it is a passive system. AS/SVE is also moderately effective in the short term.

Implementability

No Action, ILUC and MNA are readily implementable, but without mass reduction or compliance with ARARs. ISCO and ERD can be readily implemented with commonly available injectates and equipment, though each would require the appropriate regulatory permitting and site coordination. Air sparge/SVE and PRBW would also require environmental permitting and may also require land disturbance permitting. Successful implementation of PRBW at the property would be hindered due to the proximity of the property buildings. PRBW would also require the use of trenching equipment that is not commonly available.

Cost

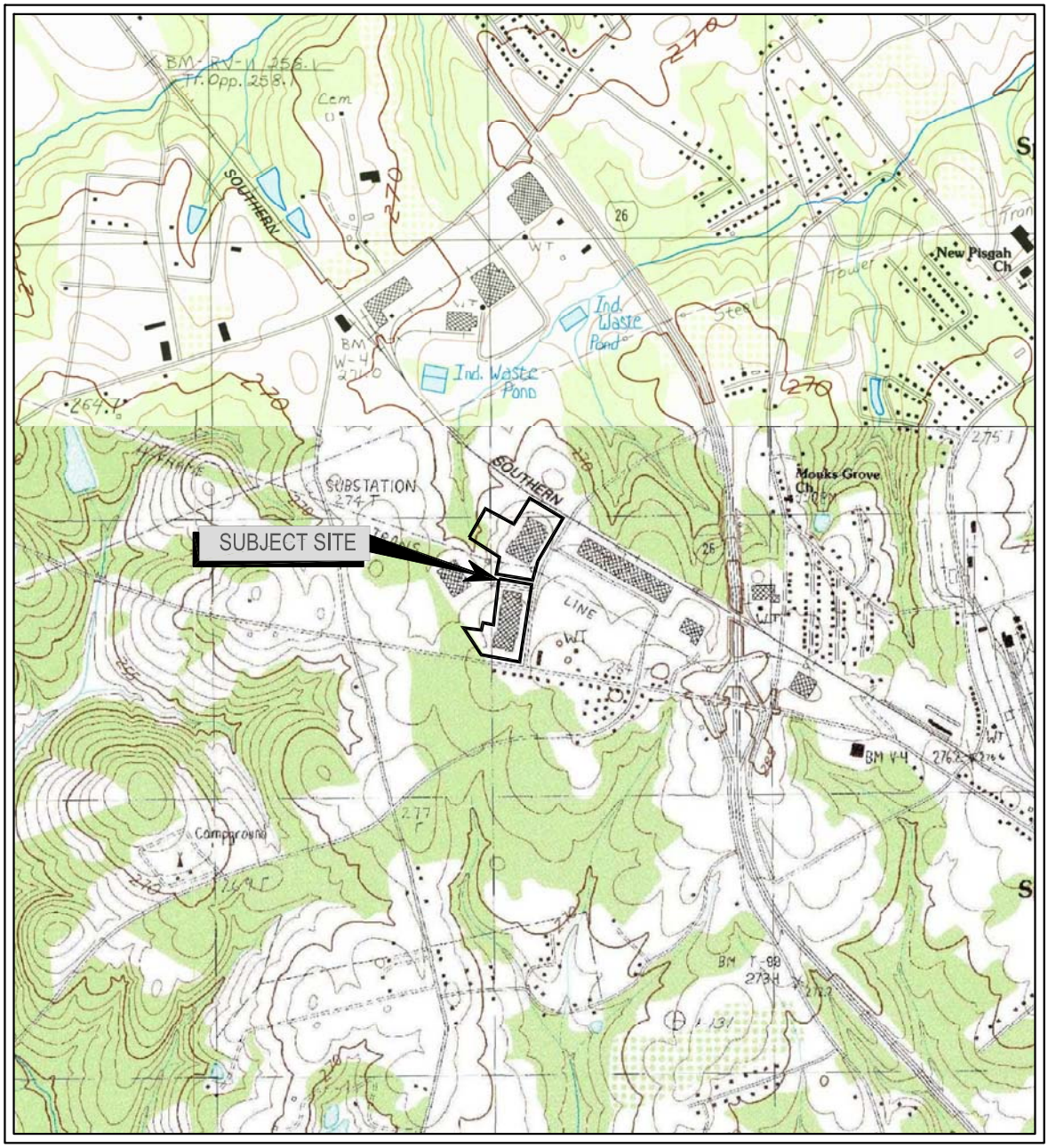
As presented in Table 7, ERD is the most cost effective remedial approach; the remaining active remedial alternatives are progressively more expensive. The remedial alternatives present worth cost worksheets are provided in Appendix G.

APPENDIX A

EXHIBITS

Exhibit 1 – Site Location Map
Exhibit 2 – Monitoring Well Location Map
Exhibit 3 – COC Plume Configuration
Exhibit 4 – Phase I RE Soil Boring Location Map
Exhibit 5 – Cross Section Transect Map
Exhibit 5A – Geologic Cross Section A-A'
Exhibit 5B – Geologic Cross Section B-B'
Exhibit 5C – Geologic Cross Section C-C'
Exhibit 6 – Potentiometric Surface Map (11/13/13)

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY



SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 METERS 1000 2000

1 .5 0 1

MILES

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

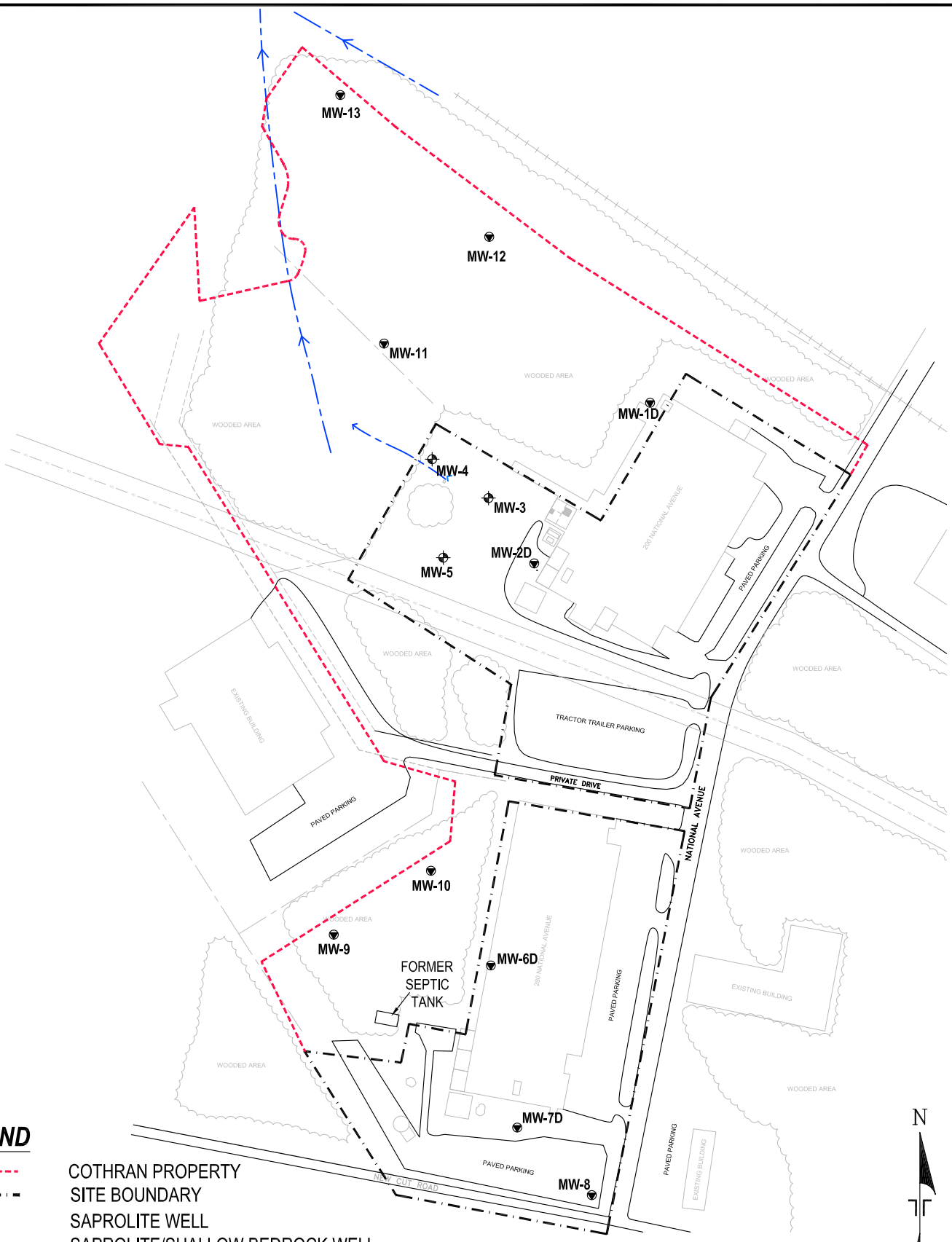
CONTOUR INTERVAL 3 METERS

NATIONAL GEODETIC VERTICAL DATUM OF 1929

INMAN, SOUTH CAROLINA
WELLFORD, SOUTH CAROLINA
1983
7.5 MINUTE SERIES (TOPOGRAPHIC)

Project Mngr: CDE	Project No. 86117104	Terracon Consulting Engineers and Scientists	SITE LOCATION MAP
Drawn By: DWD	Scale: AS SHOWN	3534 Rutherford Road Taylors, SC 29687	REMEDIAL ALTERNATIVES EVALUATION
Checked By: CDE/MRF	File No. 86117104-1	(864) 292-2901 (864) 292-6361	CASTLEBRIDGE PROPERTIES, LLC PROPERTY
Approved By: CDE	Date: APRIL 2015		200 AND 280 NATIONAL AVENUE
			SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT 1



LEGEND

- COTHRAN PROPERTY
- SITE BOUNDARY
- SAPROLITE WELL
- SAPROLITE/SHALLOW BEDROCK WELL
- STREAM

N

0 300

Approximate Scale (Feet)

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr:	CDE
Drawn By:	DWD
Checked By:	CDE/MRF
Approved By:	CDE

Project No.	86117104
Scale:	AS SHOWN
File No.	86117104-2
Date:	MAY 2015

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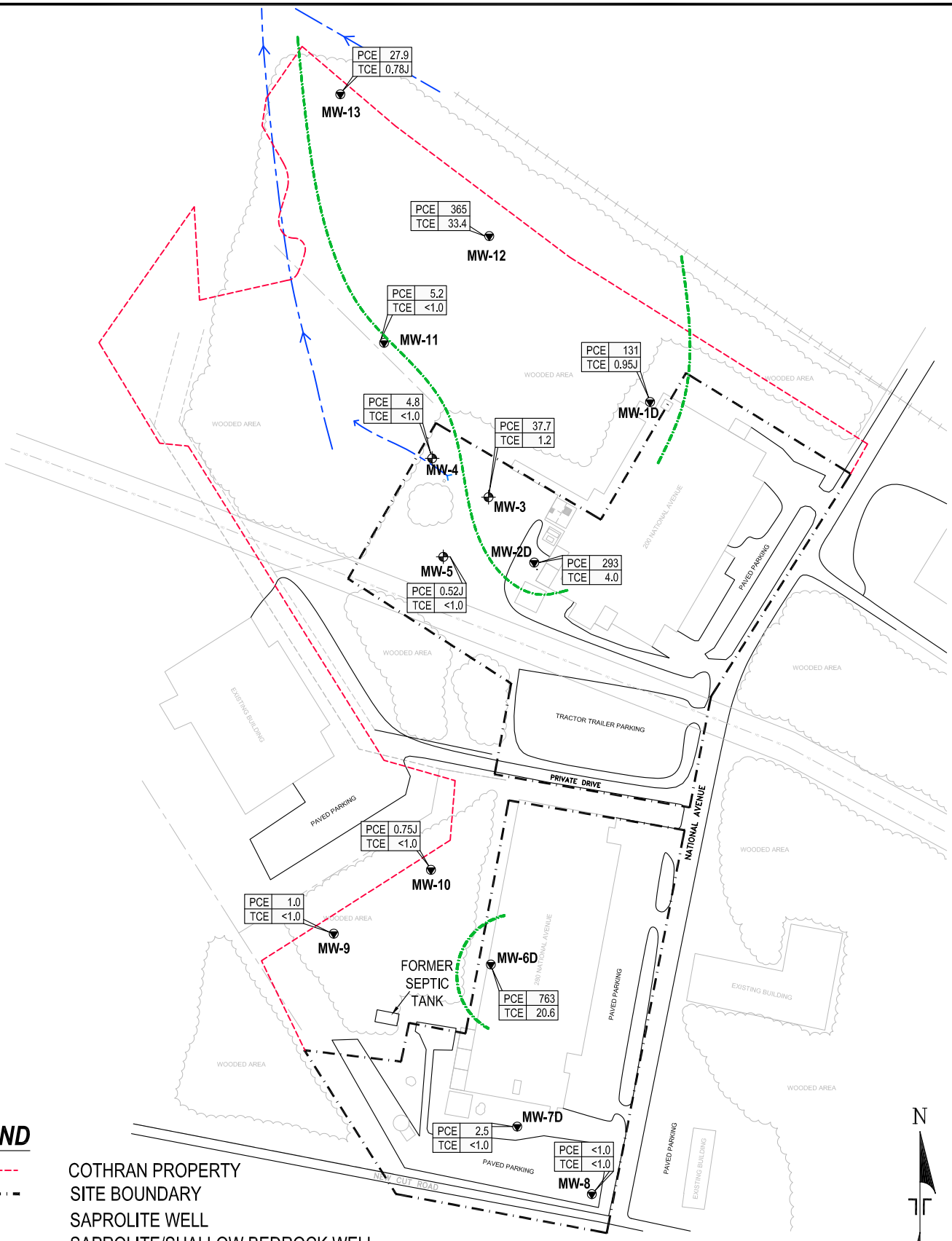
Consulting Engineers and Scientists
3534 Rutherford Road Taylors, SC 29687
(864) 292-2901 (864) 292-6361

MONITORING WELL LOCATION MAP

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT 2



LEGEND

- COTHRAN PROPERTY
- SITE BOUNDARY
- SAPROLITE WELL
- SAPROLITE/SHALLOW BEDROCK WELL
- PCE — TETRACHLOROETHENE, µG/L
- TCE — TRICHLOROETHENE, µG/L
- <5mg/L CVOC MCL

NOTE: GROUNDWATER ANALYTICAL DATA COLLECTED ON NOVEMBER 13 &18, 2013.

N

0 300

Approximate Scale (Feet)

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

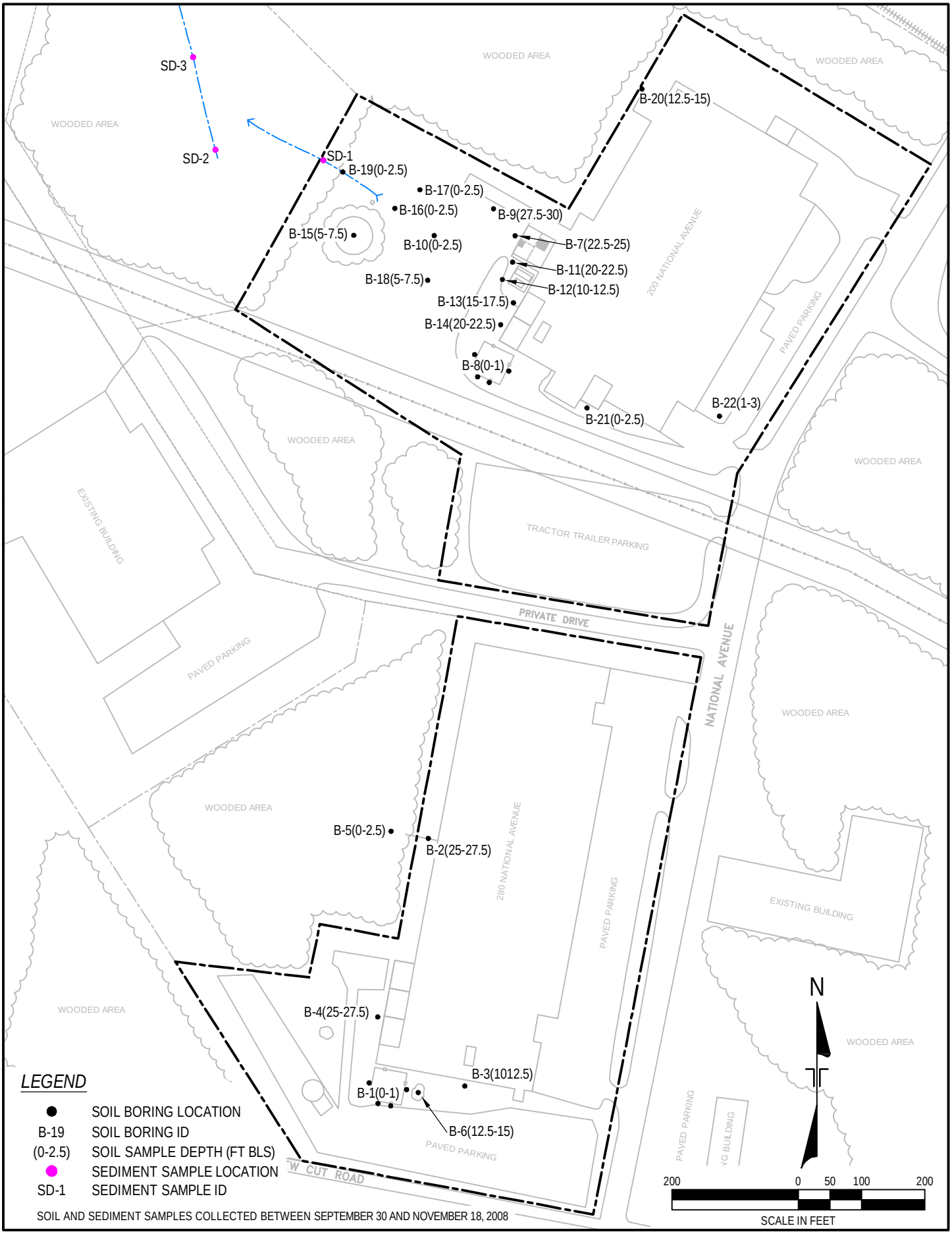
Project Mngr:	CDE
Drawn By:	DWD
Checked By:	CDE/MRF
Approved By:	CDE
Project No.	86117104
Scale:	AS SHOWN
File No.	86117104-3
Date:	MAY 2015

Terracon
Consulting Engineers and Scientists
3534 Rutherford Road Taylors, SC 29687
(864) 292-2901 (864) 292-6361

COC PLUME CONFIGURATION

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT 3



LEGEND

- ● SOIL BORING LOCATION
- B-19 SOIL BORING ID
- (0-2.5) SOIL SAMPLE DEPTH (FT BLS)
- ● SEDIMENT SAMPLE LOCATION
- SD-1 SEDIMENT SAMPLE ID

SOIL AND SEDIMENT SAMPLES COLLECTED BETWEEN SEPTEMBER 30 AND NOVEMBER 18, 2008

Project Mngr:	CDE
Drawn By:	KTL
Checked By:	CDE
Approved By:	CDE
Project No:	86117104
Scale:	AS SHOWN
File Name:	86117104-F6
Date:	MAY 2014

Terracon
Consulting Engineers and Scientists
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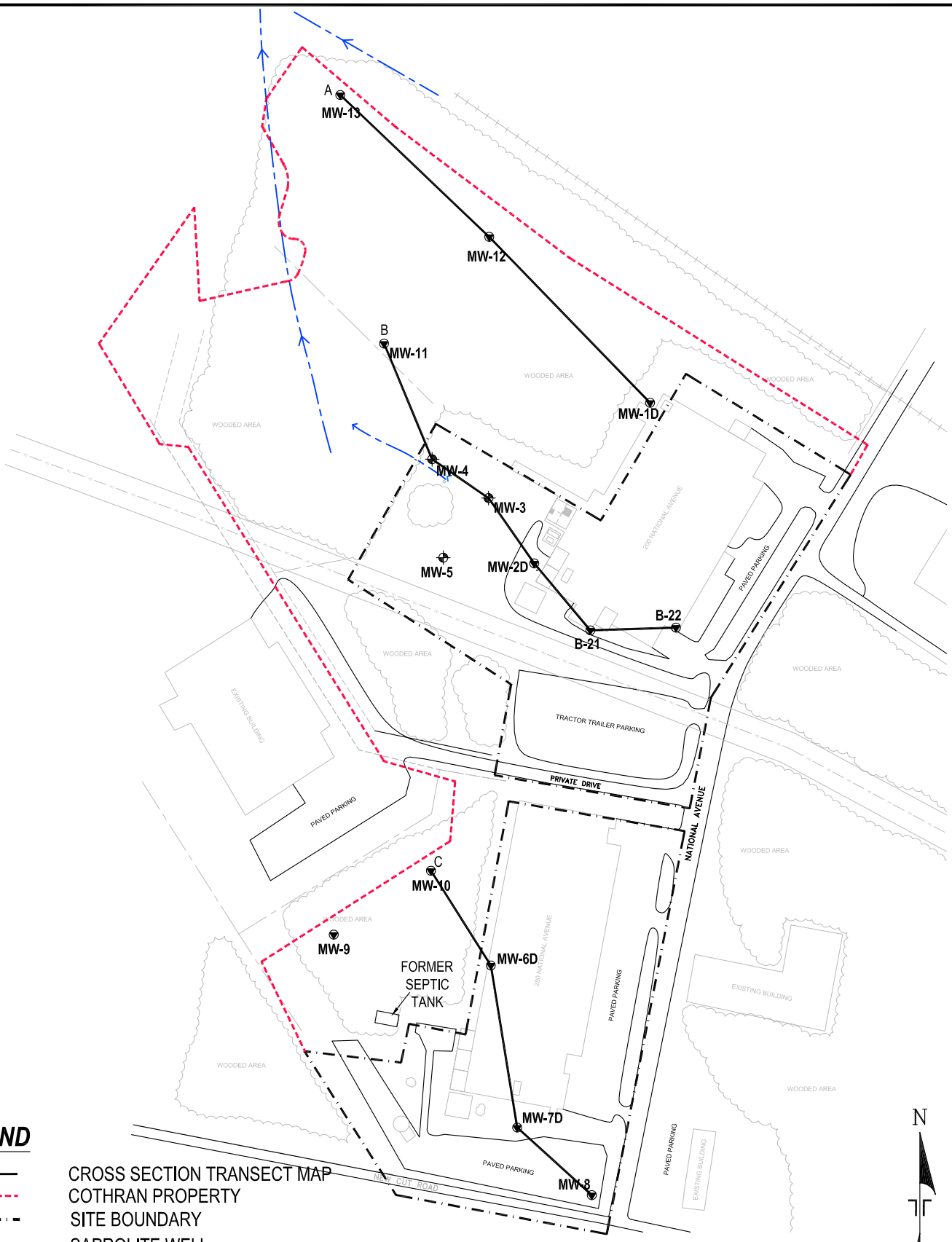
PH. (864) 292-2901 FAX (864) 292-6361

PHASE I RI SOIL BORING LOCATION MAP

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT 4



LEGEND

- CROSS SECTION TRANSECT MAP
- COTHRAN PROPERTY
- SITE BOUNDARY
- SAPROLITE WELL
- SAPROLITE/SHALLOW BEDROCK WELL
- STREAM

N

0 300

Approximate Scale (Feet)

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr:	CDE
Drawn By:	DWD/PTK
Checked By:	CDE
Approved By:	CDE
Project No.	86117104
Scale:	AS SHOWN
File No.	86117104-5
Date:	MAY 2015

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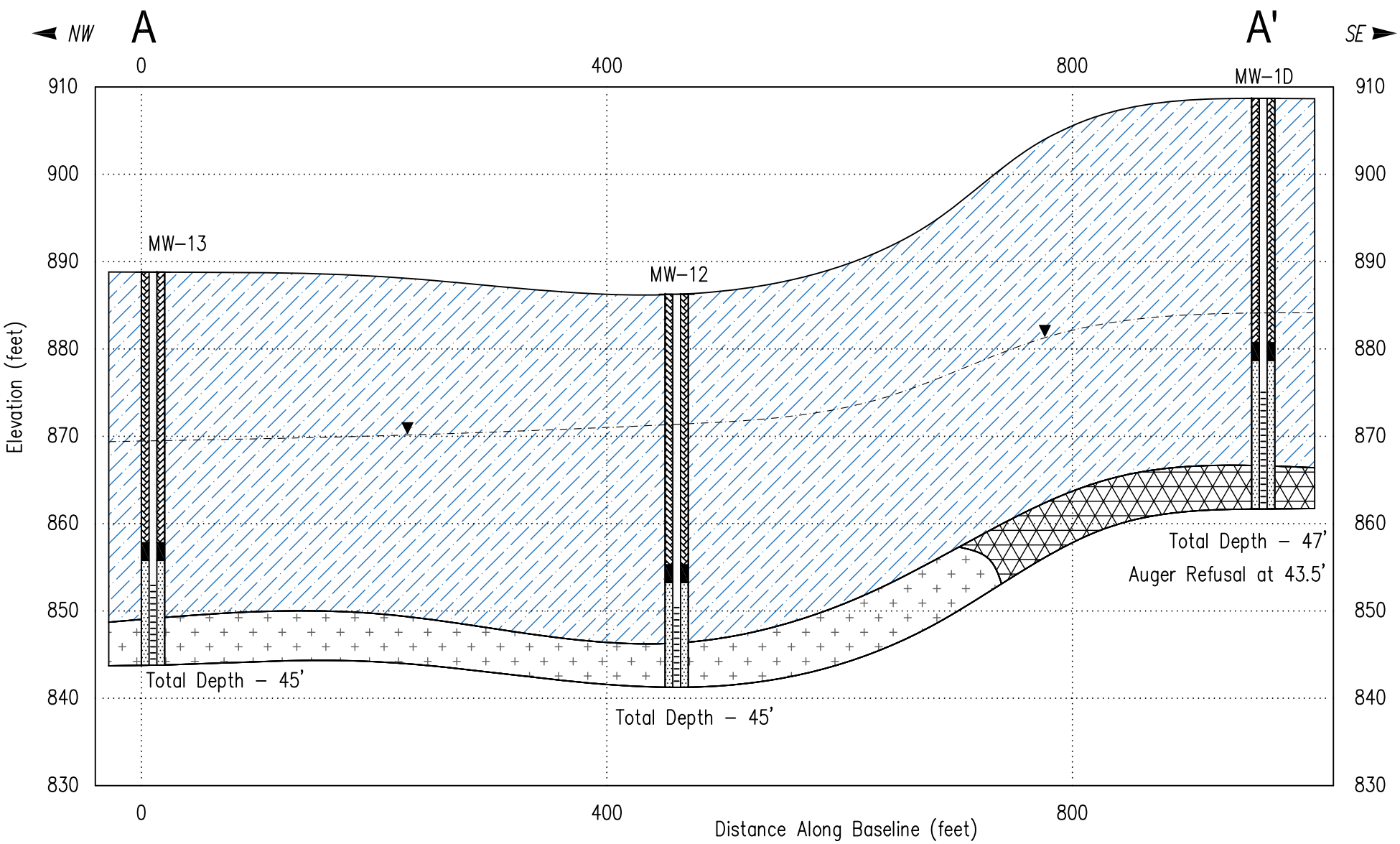
Consulting Engineers and Scientists
3534 Rutherford Road Taylors, SC 29687
(864) 292-2901 (864) 292-6361

CROSS SECTION TRANSECT MAP

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT 5



SAPROLITE

WELLSCREEN AND ARTIFICIAL FILTER

PARTIALLY WEATHERED ROCK

BEDROCK

APPROXIMATE GROUNDWATER ELEVATION

MONITORING WELL CONSTRUCTION DETAILS EXAGGERATED FOR DETAIL

Project Mngr:	CDE
Drawn By:	KTL
Checked By:	CDE
Approved By:	CDE

Project No.	86117104
Scale:	AS SHOWN
File No.	86117104-5A
Date:	APRIL 2015

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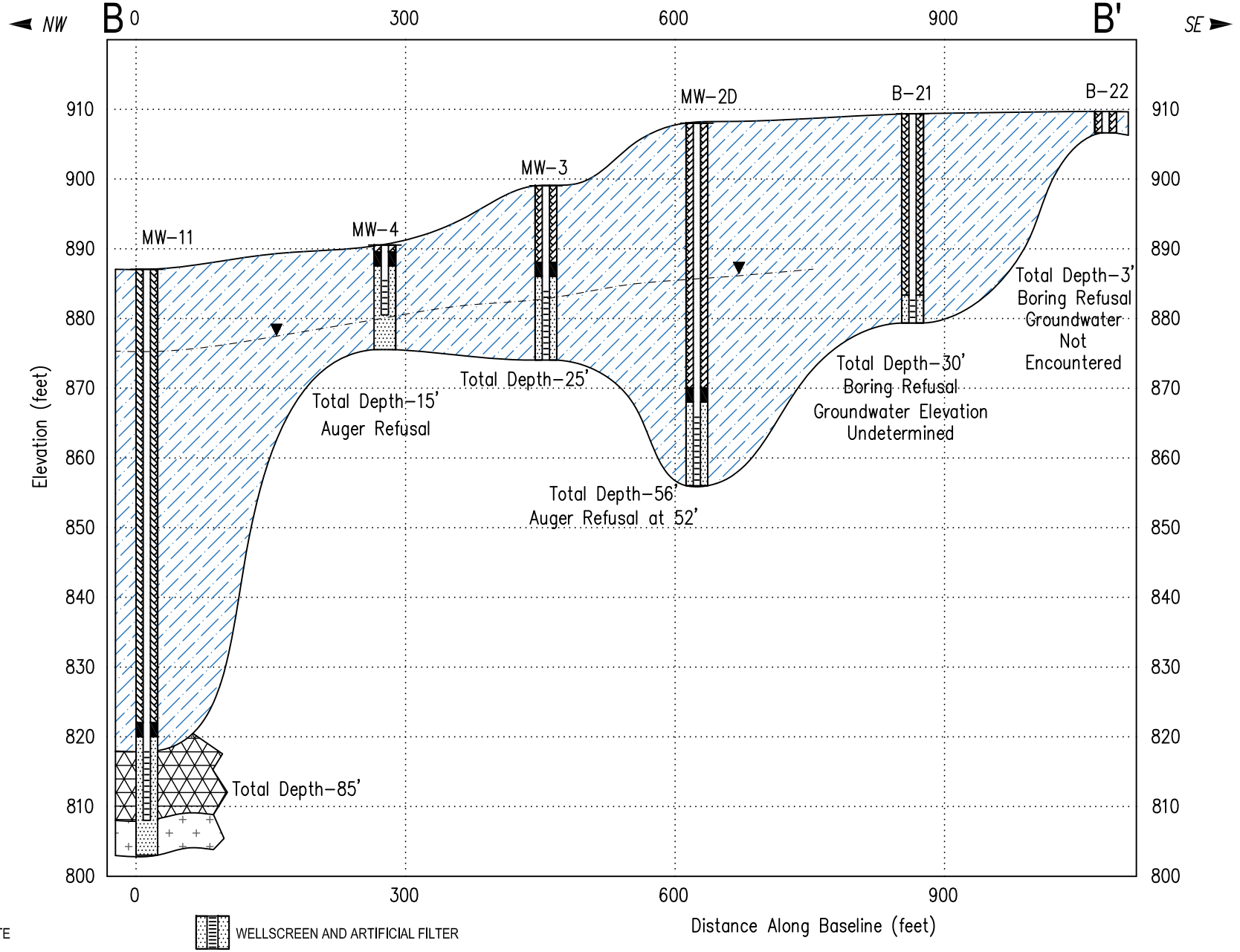
GEOLOGIC CROSS SECTION A-A'

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT

5A



MONITORING WELL CONSTRUCTION DETAILS EXAGGERATED FOR DETAIL

Project Mngr:	CDE
Drawn By:	KTL
Checked By:	CDE
Approved By:	CDE

Project No.	86117104
Scale:	AS SHOWN
File No.	86117104-5B
Date:	APRIL 2015

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3534 RUTHERFORD ROAD TAYLORS, SC 29687
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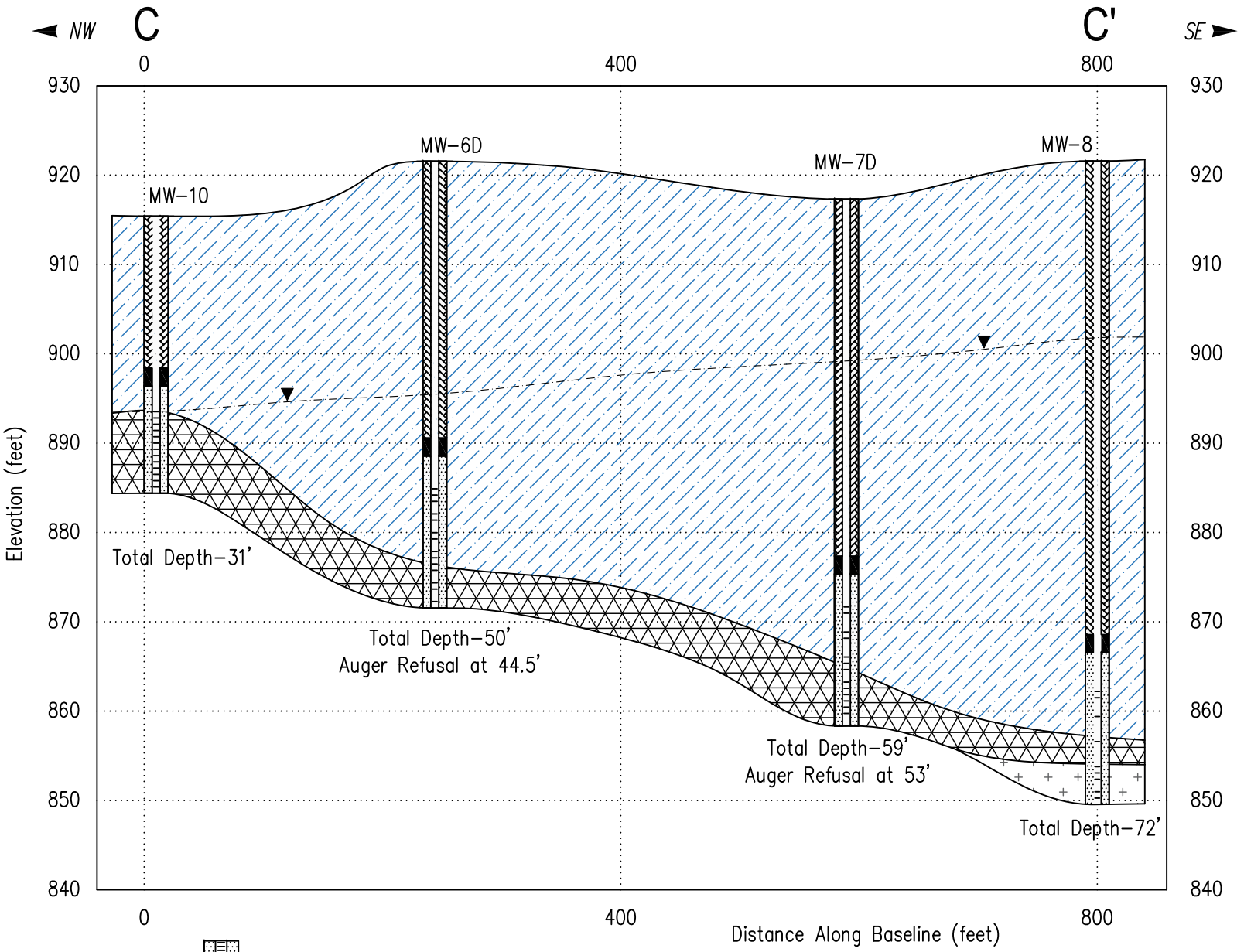
GEOLOGIC CROSS SECTION B-B'

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT

5B



MONITORING WELL CONSTRUCTION DETAILS EXAGGERATED FOR DETAIL

Project Mngr:	CDE
Drawn By:	KTL
Checked By:	CDE
Approved By:	CDE

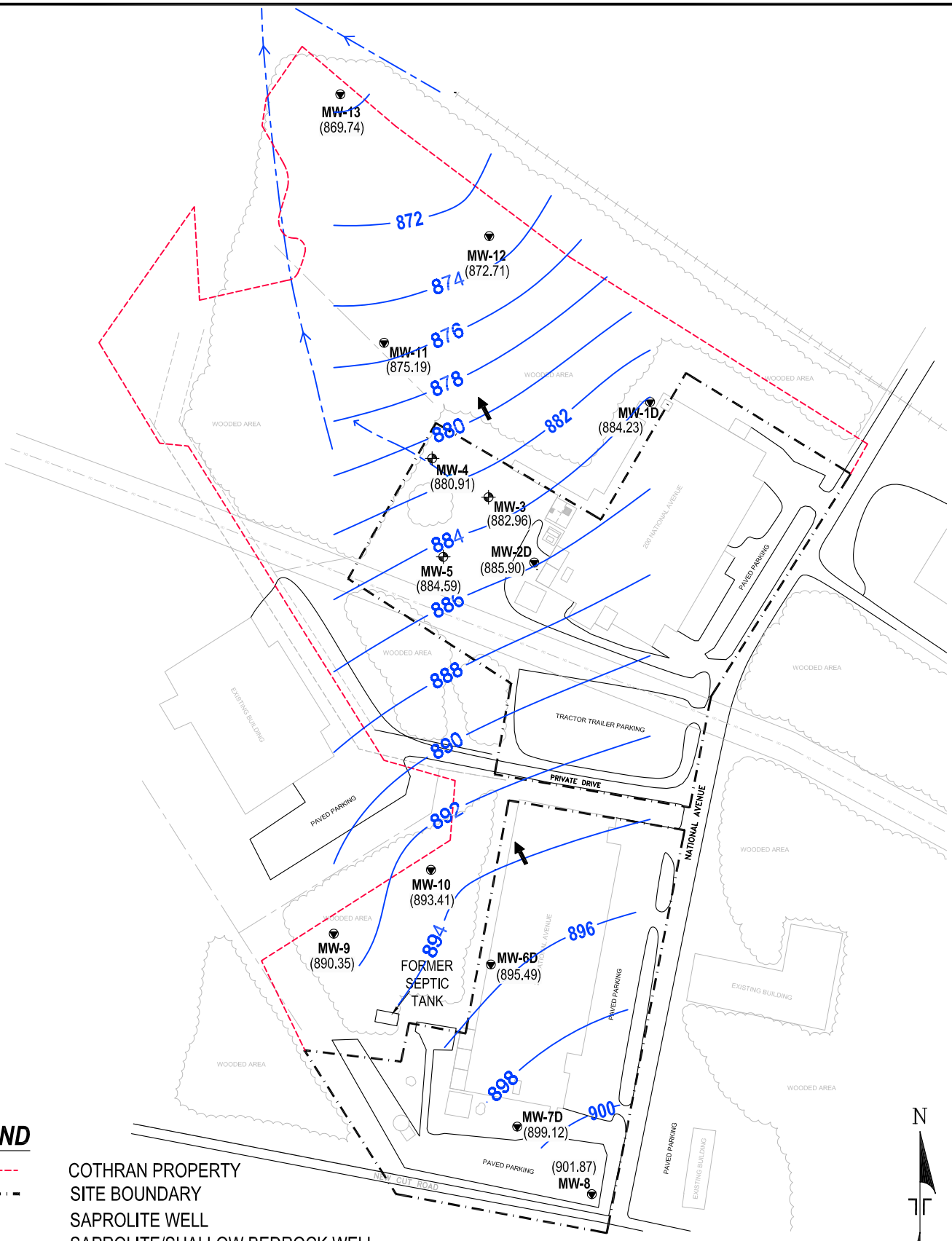
Project No.	86117104
Scale:	AS SHOWN
File No.	86117104-5C
Date:	APRIL 2015

Terracon
Consulting Engineers and Scientists
3534 RUTHERFORD ROAD TAYLORS, SC 29687
PH. (864) 292-2901 FAX. (864) 292-6361

GEOLOGIC CROSS SECTION C-C'

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT
5C



LEGEND

- COTHRAN PROPERTY
- SITE BOUNDARY
- SAPROLITE WELL
- SAPROLITE/SHALLOW BEDROCK WELL
- (884.59) GROUNDWATER ELEVATION, IN FEET
- 884 GROUNDWATER CONTOUR, IN FEET
- APPARENT GROUNDWATER FLOW DIRECTION
- STREAM

N

0 300

Approximate Scale
(Feet)

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr:	CDE
Drawn By:	DWD
Checked By:	CDE/MRF
Approved By:	CDE
Project No.	86117104
Scale:	AS SHOWN
File No.	86117104-3
Date:	MAY 2015

Terracon
Consulting Engineers and Scientists
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(864) 292-2901 (864) 292-6361

POTENTIOMETRIC SURFACE MAP (11/13/13)

REMEDIAL ALTERNATIVES EVALUATION
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SPARTANBURG COUNTY, SC

EXHIBIT
6

APPENDIX B

TABLES

TABLE 1
GROUNDWATER FIELD PARAMETERS
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SOUTH CAROLINA
TERRACON PROJECT NO. 86117104

Groundwater Field Parameters											
Well ID	Date	TOC Elevation (feet MSL)	Screen (feet BGS)	Depth to Groundwater (Feet TOC)	Groundwater Elevation (Feet MSL)	Temperature (Degree Celcius)	pH	Conductivity (mS/cm)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	ORP (mV)
MW-1D	3/10/2015	911.58	32-47	24.73	886.85	18.96	5.00	0.037	67.4	6.24	107.5
MW-2D	3/10/2015	910.85	42-52	24.06	886.79	18.22	4.69	0.029	62.8	5.98	122.6
MW-3	3/10/2015	901.96	15-25	17.46	884.50	15.82	4.54	0.041	65.0	6.41	122.2
MW-4	3/10/2015	893.42	5-10	11.29	882.13	12.38	4.85	0.039	33.4	3.53	111.6
MW-5	3/10/2015	903.38	10-20	17.34	886.04	15.26	4.67	0.029	63.3	6.32	123.1
MW-6D	3/10/2015	923.91	35-50	28.42	895.49	17.54	5.34	0.036	59.9	5.72	29.6
MW-6D*	3/13/2015	923.91	35-50	28.45	895.46	15.9	5.05	0.029	58.6	5.61	232
MW-7D	3/10/2015	917.17	44-59	17.72	899.45	18.84	6.15	0.080	60.7	5.66	64.6
MW-8	3/10/2015	921.76	57-72	18.86	902.90	17.53	6.22	0.073	71.2	6.86	49.9

MSL = Mean Sea Level
TOC = Top of Casing
GBS = Below Ground Surface
All groundwater quality parameters measured with a YSI 556 Multi Probe System (MPS) unless otherwise indicated
* = Indicates groundwater quality parameters measured with a Horiba U-52 Multi Water Quality Checker

TABLE 2
GROUNDWATER CVOC DATA
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SOUTH CAROLINA
TERRACON PROJECT NO. 86117104

Chlorinated Volatile Organic Compounds - Detected COCs in Groundwater								
Well ID	Date	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	Tetrachloroethene	Trichloroethene	Vinyl chloride
	MCL	*NE*	*5*	*7*	*70*	*5*	*5*	*2*
	Units	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
MW-1D	9/2/2009	<5.0	<5.0	<5.0	<5.0	170.0	<5.0	<2.0
	11/18/2013	<1.0	<1.0	<1.0	**1.2**	**131.0**	**0.95J**	<1.0
	11/18/2013 (dup)	<1.0	<1.0	<1.0	**1.2**	**140.0**	**0.94J**	<1.0
MW-2D	9/2/2009	<5.0	<5.0	<5.0	<5.0	**400.0**	<5.0	<2.0
	11/18/2013	**0.79J**	<1.0	**0.84J**	**6.4**	**293.0**	**4.0**	<1.0
MW-3	9/2/2009	<5.0	<5.0	<5.0	<5.0	**33.0**	<5.0	<2.0
	11/18/2013	<1.0	<1.0	<1.0	**1.5**	**37.7**	**1.2**	<1.0
MW-4	9/2/2009	<5.0	<5.0	<5.0	<5.0	**6.3**	<5.0	<2.0
	11/18/2013	<1.0	<1.0	<1.0	<1.0	**4.8**	<1.0	<1.0
MW-5	9/2/2009	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<2.0
	11/18/2013	<1.0	<1.0	<1.0	<1.0	**0.52J**	<1.0	<1.0
MW-6D	9/2/2009	<5.0	<5.0	<5.0	<5.0	**750.0**	<5.0	<2.0
	11/18/2013	**1.9**	<1.0	**1.8**	**37.6**	**763.0**	**20.6**	<1.0
	3/13/2015	<1.0	<1.0	<1.0	<1.0	**873**	**6.6J**	<1.0
MW-7D	9/2/2009	<5.0	<5.0	<5.0	<5.0	**20.0**	<5.0	<2.0
	11/13/2013	<1.0	<1.0	<1.0	<1.0	**2.5**	<1.0	<1.0
MW-8	11/13/2013	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
MW-9	11/18/2013	<1.0	<1.0	<1.0	<1.0	**1.0**	<1.0	<1.0
MW-10	11/18/2013	<1.0	<1.0	<1.0	<1.0	**0.75J**	<1.0	<1.0
MW-11	11/13/2013	<1.0	<1.0	<1.0	**0.21J**	**5.2**	<1.0	<1.0
MW-12	11/13/2013	**0.37J**	<1.0	**0.67J**	**26.9**	**365.0**	**33.4**	<1.0
MW-13	11/13/2013	<1.0	<1.0	<1.0	**1.3**	**27.9**	**0.78J**	<1.0

MCL: Maximum Contaminant Levels
RSL: United States Environmental Protection Agency Region 9 Screening Levels, January 2015
J: Estimated result < PQL and ≥ MDL
ND: Non-detect
NA: Not analyzed
NE: Not established
Bold results exceed method detection limit
Shaded results exceed indicated regulatory screening level

TABLE 3
MW-6D GROUNDWATER RESULTS - TREATABILITY STUDY
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SOUTH CAROLINA
TERRACON PROJECT NO. 86117104

Groundwater Results - Treatability Study					
Cas#	**Parameter**	**Method**	**Units**	**USEPA RSLs MCLs**	**MW-6D 3/13/2014**
16887-00-6	Chloride	SM 4500-Cl-E	ug/L	NE	**1200**
74-84-0	Ethane	RSK 175	ug/L	NE	<6.2
74-85-1	Ethene	RSK 175	ug/L	NE	<6.2
7783-06-4	Hydrogen Sulfide	SM 4500-S2H	ug/L	NE	<50
7439-89-6	Iron	EPA 200.7	ug/L	NE	**38.0 J**
7439-89-6	Iron, Dissolved	EPA 200.7	ug/L	NE	<50.0
7439-95-4	Manganese, Dissolved	EPA 200.7	ug/L	NE	**4.2 J**
7439-95-4	Manganese, Total	EPA 200.7	ug/L	NE	**5.9**
74-82-8	Methane	RSK 175	ug/L	NE	<6.6
7664-41-7	Nitrogen, Ammonia	EPA 350.1	ug/L	NE	<100
NE	Nitrogen, NO2 plus NO3	EPA 353.2	ug/L	10,000	**92**
14797-55-8	Nitrogen, Nitrate	EPA 353.2	ug/L	10,000	**92**
14797-65-0	Nitrogen, Nitrite	EPA 353.2	ug/L	1,000	<20
7723-14-0	Phosphorus, Total (as P)	EPA 365.4	ug/L	NE	<100
14808-79-8	Sulfate	EPA 300.0	ug/L	NE	<2000
18496-25-8	Sulfide	SM 4500-S2D	ug/L	NE	<100
7440-44-0	Total Organic Carbon	SM 5310C	ug/L	NE	<500

MCL: Maximum Contaminant Level
RSL: United States Environmental Protection Regional Screening Levels, January 2015
J: Estimated result < PQL and ≥ MDL
NE: Not established
Bold results exceed method detection limit
Shaded results exceed indicated regulatory screening level

TABLE 4
HISTORICAL SOIL ANALYTICAL DATA - 280 NATIONAL AVENUE
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SOUTH CAROLINA
TERRACON PROJECT NO. 86117104

Constituent	Industrial SSL[1]	280 National Avenue			
		B-2(25) 30-Sep-08	B-3(10) 30-Sep-08	B-4(25) 30-Sep-08	B-5(0) 1-Oct-08
1,1,1-Trichloroethane	NA[2]	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,1,2,2-Tetrachloroethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,1,2-Trichloro-1,2,2-Trifluoroethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,1,2-Trichloroethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,1-Dichloroethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,1-Dichloroethene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,2,4-Trichlorobenzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,2-Dibromo-3-chloropropane (DBCP)	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,2-Dibromoethane (EDB)	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,2-Dichlorobenzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,2-Dichloroethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,2-Dichloropropane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,3-Dichlorobenzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
1,4-Dichlorobenzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
2-Butanone (MEK)	NA	*< 11*	*< 14*	*< 10*	*< 9.6*
2-Hexanone	NA	*< 11*	*< 14*	*< 10*	*< 9.6*
4-Methyl-2-pentanone	NA	*< 11*	*< 14*	*< 10*	*< 9.6*
Acetone	610,000,000	*< 23*	*< 27*	**53**	*< 19*
Benzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Bromodichloromethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Bromoform	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Bromomethane (Methyl bromide)	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Carbon disulfide	3,000,000	*< 5.7*	*< 6.8*	**6.7**	*< 4.8*
Carbon tetrachloride	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Chlorobenzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Chloroethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Chloroform	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Chloromethane (Methyl chloride)	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
cis-1,2-Dichloroethene	10,000,000	*< 5.7*	*< 6.8*	**81**	*< 4.8*
cis-1,3-Dichloropropene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Cyclohexane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Dibromochloromethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Dichlorodifluoromethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Ethylbenzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Isopropylbenzene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Methyl acetate	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Methyl tertiary butyl ether (MTBE)	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Methylcyclohexane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Methylene chloride	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Styrene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Tetrachloroethene	2,700	*< 5.7*	*< 6.8*	**80**	*< 4.8*
Toluene	46,000,000	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
trans-1,2-Dichloroethene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
trans-1,3-Dichloropropene	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Trichloroethene	14,000	*< 5.7*	*< 6.8*	**24**	*< 4.8*
Trichlorofluoromethane	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Vinyl chloride	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*
Xylenes (total)	NA	*< 5.7*	*< 6.8*	*< 5*	*< 4.8*

NOTES:

[1] Industrial Soil Screening Level (SSL), Regional Screening Levels (RSL) for Chemical Contaminants at Superfund

[2] Contaminant not detected in soil samples; screening level Not Applicable (NA).

- Concentrations reported in µg/kg.
- Bold concentrations indicate contaminant detected in sample above Practical Quantitation Limit (PQL).

TABLE 5
HISTORICAL SOIL ANALYTICAL DATA - 200 NATIONAL AVENUE
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SOUTH CAROLINA
TERRACON PROJECT NO. 86117104

Constituent	Industrial SSL[1]	200 National Avenue																	
		B-6(12.5)	B-7(22.5)	B-9(27.5)	B-10(0)	B-11(20)	B-12(10)	B-13(15)	B-14(20)	B-15(5)	B-16(0)	B-17(0)	B-18(5)	B-19(0)	B-20(12.5)	B-21(0)	B-22(3)	SD-1	SD-2	SD-3
		30-Sep-08	1-Oct-08	2-Oct-08	1-Oct-08	2-Oct-08	2-Oct-08	2-Oct-08	3-Oct-08	3-Oct-08	3-Oct-08	3-Oct-08	1-Oct-08	3-Oct-08	6-Oct-08	6-Oct-08	18-Nov-08	18-Nov-08	18-Nov-08	18-Nov-08
1,1,1-Trichloroethane	NA[2]	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,1,2,2-Tetrachloroethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,1,2-Trichloro-1,2,2-Trifluoroethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,1,2-Trichloroethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,1-Dichloroethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,1-Dichloroethene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,2,4-Trichlorobenzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,2-Dibromo-3-chloropropane (DBCP)	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,2-Dibromoethane (EDB)	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,2-Dichlorobenzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,2-Dichloroethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,2-Dichloropropane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,3-Dichlorobenzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
1,4-Dichlorobenzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
2-Butanone (MEK)	NA	*< 8.7*	*< 14*	*< 12*	*< 12*	*< 15*	*< 12*	*< 12*	*< 12*	*< 14*	*< 9.7*	*< 9.5*	*< 11*	*< 9.1*	*< 9.0*	*< 13*	*< 10*	*< 10*	*< 9.8*	*< 20*
2-Hexanone	NA	*< 8.7*	*< 14*	*< 12*	*< 12*	*< 15*	*< 12*	*< 12*	*< 12*	*< 14*	*< 9.7*	*< 9.5*	*< 11*	*< 9.1*	*< 9.0*	*< 13*	*< 10*	*< 10*	*< 9.8*	*< 20*
4-Methyl-2-pentanone	NA	*< 8.7*	*< 14*	*< 12*	*< 12*	*< 15*	*< 12*	*< 12*	*< 12*	*< 14*	*< 9.7*	*< 9.5*	*< 11*	*< 9.1*	*< 9.0*	*< 13*	*< 10*	*< 10*	*< 9.8*	*< 20*
Acetone	610,000,000	*< 17*	*< 27*	*< 24*	*< 24*	*< 30*	*< 24*	*< 23*	*< 25*	**42**	*< 19*	*< 19*	*< 23*	*< 18*	*< 18*	*< 26*	*< 20*	*< 20*	**68**	**53**
Benzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Bromodichloromethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Bromoform	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Bromomethane (Methyl bromide)	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Carbon disulfide	3,000,000	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Carbon tetrachloride	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Chlorobenzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Chloroethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Chloroform	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Chloromethane (Methyl chloride)	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
cis-1,2-Dichloroethene	10,000,000	*< 4.4*	*< 6.8*	**7.4**	*< 6.1*	**46**	*< 6*	**12**	**7.7**	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	**240**	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
cis-1,3-Dichloropropene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Cyclohexane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Dibromochloromethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Dichlorodifluoromethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Ethylbenzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Isopropylbenzene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Methyl acetate	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Methyl tertiary butyl ether (MTBE)	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Methylcyclohexane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Methylene chloride	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Styrene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Tetrachloroethene	2,700	**110**	**12**	**40**	*< 6.1*	**70**	**660**	**43**	**150**	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Toluene	46,000,000	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	**17**	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	**9.1**	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
trans-1,2-Dichloroethene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	**19**	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
trans-1,3-Dichloropropene	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Trichloroethene	14,000	*< 4.4*	*< 6.8*	**8.5**	*< 6.1*	**20**	*< 6*	*< 5.8*	**20**	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	**220**	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Trichlorofluoromethane	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Vinyl chloride	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*
Xylenes (total)	NA	*< 4.4*	*< 6.8*	*< 6.1*	*< 6.1*	*< 7.6*	*< 6*	*< 5.8*	*< 6.2*	*< 6.8*	*< 4.8*	*< 4.8*	*< 5.7*	*< 4.6*	*< 4.5*	*< 6.6*	*< 5.0*	*< 5.1*	*< 4.9*	*< 10*

NOTES:

[1] Industrial Soil Screening Level (SSL), Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites, RSL Table

[2] Contaminant not detected in soil samples; screening level Not Applicable (NA).

- Concentrations reported in µg/kg.

- Bold concentrations indicate contaminant detected in sample above Practical Quantitation Limit (PQL).

TABLE 6
VERTICAL CVOC GROUNDWATER ASSESSMENT NEAR WELL MW-6D
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SOUTH CAROLINA
TERRACON PROJECT NO. 86117104

Chlorinated Volatile Organic Compounds Summary							
Cas#	**Parameter**	**Method**	**Units**	**USEPA RSLs MCLs**	**GP-21 (26'-30') 3/5/2015**	**GP-22 (32'-36') 3/5/2015**	**GP-20 (38'-42') 3/5/2015**
127-18-4	Tetrachloroethene	EPA 8260	ug/L	5	**9.3**	**1520**	**803**
79-01-6	Trichloroethene	EPA 8260	ug/L	5	<0.47	**7.8**	**4.3**
75-01-4	Vinyl chloride	EPA 8260	ug/L	2	<0.62	<0.62	<0.62
156-59-2	cis-1,2-Dichloroethene	EPA 8260	ug/L	70	<0.19	**11.9**	**7.8**
156-60-5	trans-1,2-Dichloroethene	EPA 8260	ug/L	100	<0.49	<0.49	<0.49

MCL: Maximum Contaminant Levels
RSL: United States Environmental Protection Agency Regional Screening Levels, January 2015
J: Estimated result < PQL and ≥ MDL
Bold results exceed method detection limit
Shaded results exceed indicated regulatory screening level

TABLE 7
COMPARATIVE ANALYSIS OF GROUNDWATER ALTERNATIVES
CASTLEBRIDGE PROPERTIES, LLC PROPERTY
200 AND 280 NATIONAL AVENUE
SPARTANBURG, SOUTH CAROLINA
TERRACON PROJECT NO. 86117104

Remedial Alternative	*Criteria Rating*						Approximate Present Worth
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Performance	Reduction of M/T/V Through Treatment	Short Term Effectiveness	Implementability	
1 - No Action	0	0	0	0	0	5	13,000
2 - Institutional Controls	1	1	1	0	1	5	5,000
3 - Monitored Natural Attenuation	1	2	2	2	2	5	101,000
4 - In Situ Enhanced Bioremediation	4	4	4	4	4	4	260,000
5 - In Situ Chemical Oxidation	4	4	3	3	4	4	351,000
6 - In Situ Air Sparging / SVE	3	4	3	3	3	3	857,000
7 - In Situ Permeable Reactive Barrier Wall	3	2	3	3	3	2	1,963,000

Notes:
A ranking of "0" indicates that the criterion is not met, while a ranking of "5" indicates that the criterion is completely met.
ARAR: Applicable or Relevant and Appropriate Requirements
M/T/V:

APPENDIX C

SLUG TEST DATA

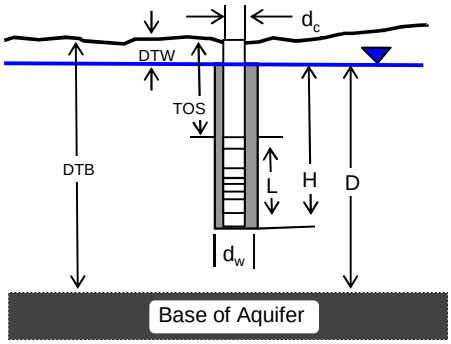
Castlebridge Properties

WELL ID: MW-1D

Local ID: Spartanburg, SC
Date: 3/10/2015
Time: 15:59

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	15	Feet
Depths to:		
water level (DTW)	17.46	Feet (TOC)
top of screen (TOS)	32	Feet (BGS)
Base of Aquifer (DTB)	60	Feet
Annular Fill:		
across screen --	Coarse Sand	
above screen --	Bentonite	
Aquifer Material --	Silt, Loess	



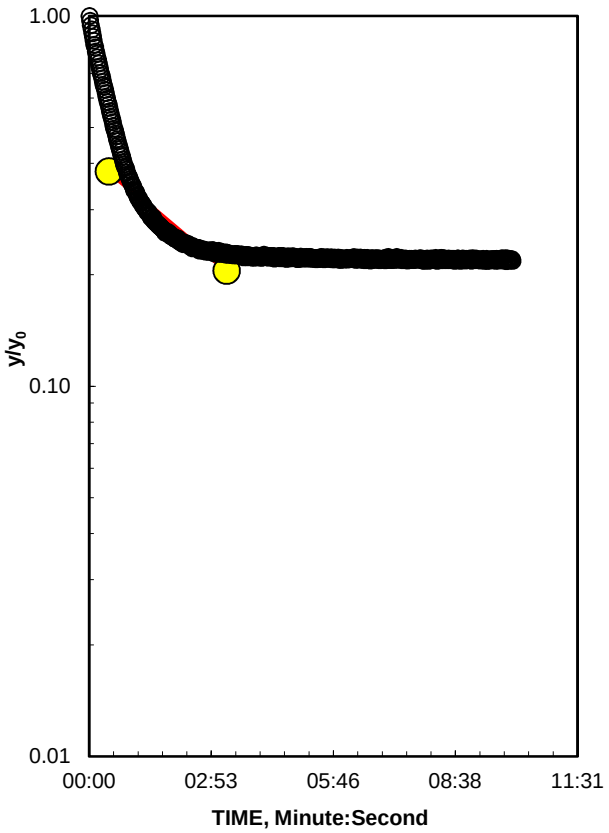
COMPUTED

L_{wetted}	15	Feet
D =	42.54	Feet
H =	29.54	Feet
L/r_w =	43.64	
$y_{0\text{-DISPLACEMENT}}$ =	1.62	Feet
$y_{0\text{-SLUG}}$ =	1.69	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.938	
B =	0.473	
ln(Re/rw) =	2.827	
Re =	5.81	Feet
Slope =	0.001605	$\log_{10}$/sec
$t_{90\%}$ recovery =	623	sec

Input is consistent.

K = 0.21 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

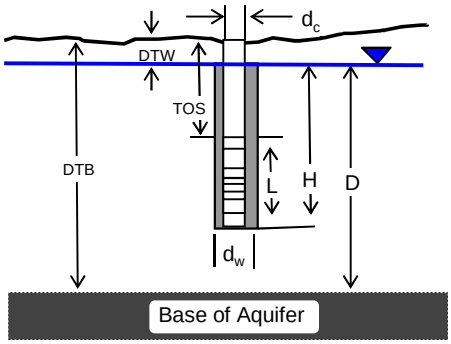
Castlebridge Properties

WELL ID: MW-3

Local ID: Spartanburg, SC
Date: 3/10/2015
Time: 14:55

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	17.46	Feet (TOC)
top of screen (TOS)	15	Feet (BGS)
Base of Aquifer (DTB)	60	Feet
Annular Fill:		
across screen --	Coarse Sand	
above screen --	Bentonite	
Aquifer Material --	Fine Sand	



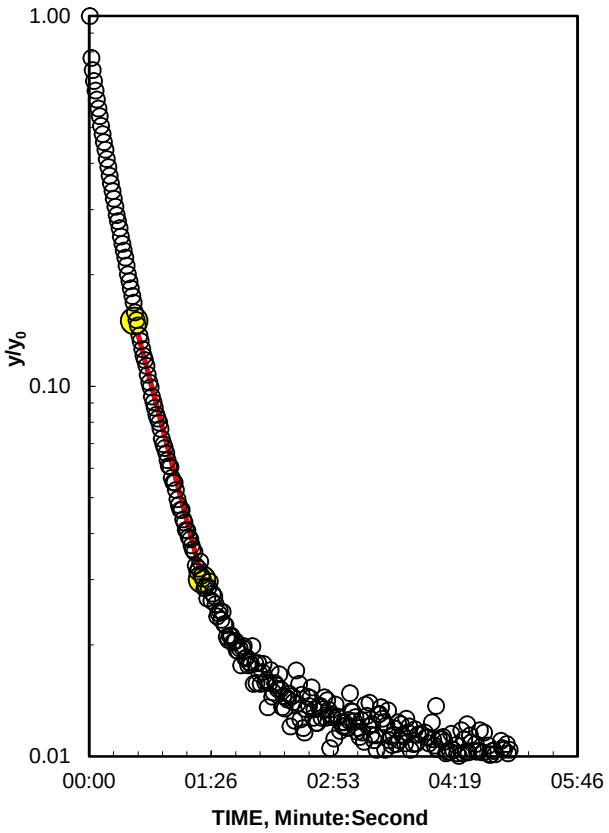
COMPUTED

L_{wetted}	7.54	Feet
D =	42.54	Feet
H =	7.54	Feet
L/r_w =	21.93	
$y_{0\text{-DISPLACEMENT}}$ =	1.84	Feet
$y_{0\text{-SLUG}}$ =	1.69	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.269	
B =	0.361	
ln(Re/rw) =	1.866	
Re =	2.22	Feet
Slope =	0.014562	$\log_{10}$/sec
$t_{90\%}$ recovery =	69	sec

Input is consistent.

K = 2.5 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Castlebridge Properties

WELL ID: MW-6D

Local ID: Spartanburg, SC
Date: 3/10/2015
Time: 14:08

INPUT

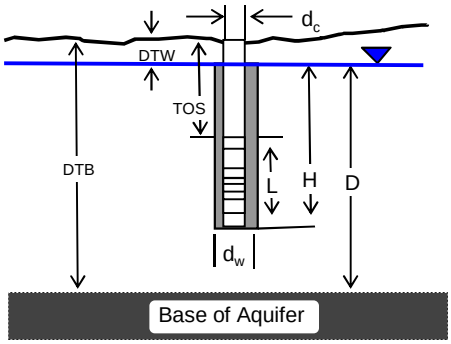
Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	15	Feet
Depths to:		
water level (DTW)	28.42	Feet (TOC)
top of screen (TOS)	35	Feet (BGS)
Base of Aquifer (DTB)	60	Feet
Annular Fill:		
across screen --	Coarse Sand	
above screen --	Bentonite	
Aquifer Material --	Fine Sand	

COMPUTED

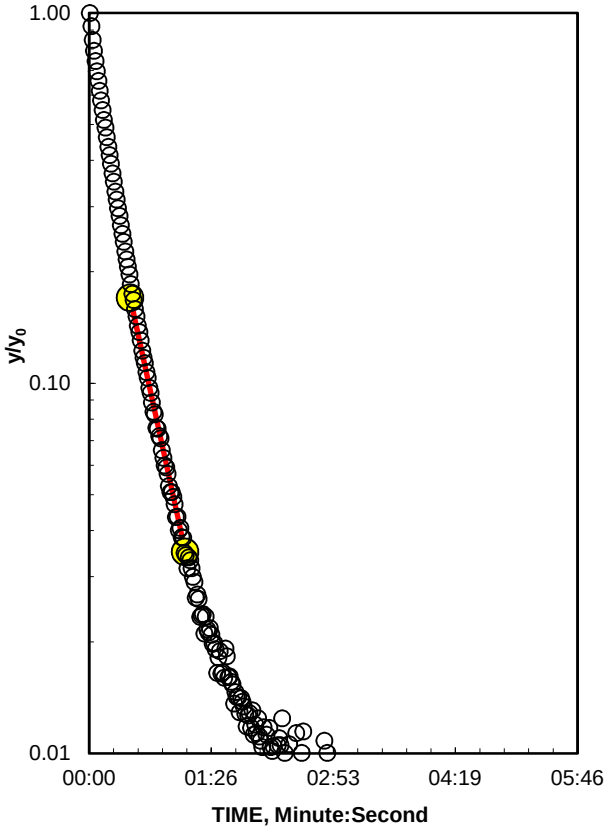
L_{wetted}	15	Feet
D =	31.58	Feet
H =	21.58	Feet
L/r_w =	43.64	
$y_{0\text{-DISPLACEMENT}}$ =	1.67	Feet
$y_{0\text{-SLUG}}$ =	1.69	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.938	
B =	0.473	
ln(Re/rw) =	2.705	
Re =	5.14	Feet
Slope =	0.0176	$\log_{10}$/sec
$t_{90\%}$ recovery =	57	sec

Input is consistent.

K =	2.2	Feet/Day



Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

APPENDIX D

SCDHEC WATER WELL RECORDS / SOIL BORING LOG

D H E C
PROMOTE PROTECT PROSPER
W. Marshall Taylor Jr., Acting Director
Promoting and protecting the health of the public and the environment

Monitoring Well Approval

Date of Issuance: March 5, 2015 **Approval #:** MW-10035

Approval is hereby granted to: Craig Eady, Terracon
3534 Rutherford Road
Taylors, SC 29687

Facility: Castlebridge Properties
Spartanburg County
SCD 073 707 614

This approval is for the installation of one (1) temporary, direct push well. This well is to be installed per the construction details included in the Monitoring Well Application dated March 5, 2015 and in the locations as depicted in Figure 2 of that application. All wells are to be installed following the applicable requirements of R.61-71.

***Please note that R.61-71 requires the* following:**

1. All wells shall be drilled, constructed, and abandoned by a South Carolina certified well driller per R.61-71.D.1.
2. A Water Well Record Form or other form provided or approved by the Department shall be completed and submitted within 30 days after well completion or abandonment unless another schedule has been approved by the Department. The form should contain the "as-built" construction details and all other information required by R.61-71.H.1.f
3. All analytical data and water levels obtained from each monitoring well shall be submitted to the Project Manager (Keisha Long) within 30 days of receipt of laboratory results unless another schedule has been approved by the Department as required by R.61-71.H.1.d.
4. All temporary monitoring wells shall be abandoned within 5 days of borehole completion using appropriate methods as required by R.61-71.H.2.c.
5. If any of the information provided to the Department changes, including the proposed drilling date, the Project Manager (Keisha Long) shall be notified at least twenty-four (24) hours prior to well construction as required by R.61-71.H.1.a.

This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and R.61-71 of the South Carolina Well Standards and Regulations, dated April 25, 2008.

Keisha D. Long

Keisha D. Long, Environmental Engineer Associate
State Remediation Section
Bureau of Land and Waste Management
File # 57423

WELL LOG NO. GP-20/GP-21/GP-22

PROJECT: Remedial Investigation

CLIENT: Castlebridge Properties, LLC

SITE: 200 & 280 National Avenue
Spartanburg, South Carolina

LOCATION See Exhibit A-2

INSTALLATION DETAILS

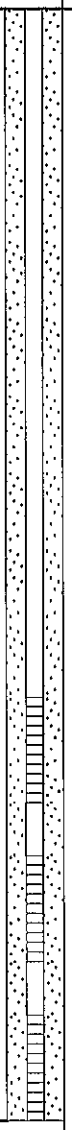
Well Completion:

DEPTH	MATERIAL DESCRIPTION
32.0	**CLAYEY SILT (ML)**, with mica, gray, soft
38.0	
	Boring Refusal at 42 Feet

GP-21

GP-22

GP-20



The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Advancement Method:
Direct Push

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

See Appendices for description of field procedures.

See Appendices for description of laboratory procedures and additional data (if any).

See Appendices for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water Table Encountered (25.8 ft)*

Terracon

Well Started: 3/5/2015	Well Completed: 3/5/2015
Drill Rig: Geoprobe 7822	Driller: W. Mowbray
Project No.: 86117104	Exhibit: B-1

D H E C
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name: (last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Zip:
Latitude: 34.993865 Longitude: -82.029535

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 36 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS:
GP-22

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-5-15
36 ft. Date Completed: 3-5-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 32 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 32 ft. and 36 ft.
ft. and ft.
Sieve Analysis ☐ Yes (please enclose) ☑ No
NOTE: MULTIPLE SCREENS USE SECOND SHEET

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 36 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray Date: 3-5-15
Well Driller

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

DHEC — PROMOTE PROTECT PROSPER

1. WELL OWNER INFORMATION:
Name: (last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Zip:
Latitude: 34.993865 Longitude: -82.029535

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 30 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS:
GP-21

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-5-15
30 ft. Date Completed: 3-5-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 26 ft. depth
in. to ft. depth
Height: Above /Below ✓
Surface ft.
Weight lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 26 ft. and 30 ft.
ft. and ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
ft. after hrs. Pumping G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield:

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐ No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from ft. to ft.
Effective size Uniformity Coefficient

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other
Depth: From 0 ft. to 30 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ft. direction
Type
Well Disinfected ☐ Yes ☐ No Type: Amount:

18. PUMP: Date installed: Not Installed ☑
Mfr. Name: Model No.:
H.P. Volts Length of drop pipe ft. Capacity gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D ✓ (circle one)
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3743 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray (Well Driller) Date: 3-5-15

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

DHEC 1903 (07/2003) **COPY 1 MAIL TO: S.C. DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL (ADDRESS ABOVE)**

D H E C
PROMOTE PROTECT PROSPER

Water Well Record
Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708; (803) 898-4300

1. WELL OWNER INFORMATION:
Name: (last) (first)
Address:
City: State: SC Zip:
Telephone: Work: Home:

2. LOCATION OF WELL: **COUNTY:**
Name:
Street Address:
City: Zip:
Latitude: 34.993865 Longitude: -82.029535

3. PUBLIC SYSTEM NAME: **PUBLIC SYSTEM NUMBER:**

4. ABANDONMENT: ☑ Yes ☐ No
Grouted Depth: from 0 ft. to 42 ft.

Formation Description	*Thickness of Stratum	Depth to Bottom of Stratum
*Indicate Water Bearing Zones (Use a 2nd sheet if needed)		

5. REMARKS:
GP-20

6. TYPE: ☐ Mud Rotary ☐ Jetted ☐ Bored ☐ Dug ☐ Air Rotary ☑ Driven ☐ Cable tool ☐ Other

7. PERMIT NUMBER:

8. USE:
☐ Residential ☐ Public Supply ☐ Process
☐ Irrigation ☐ Air Conditioning ☐ Emergency
☐ Test Well ☑ Monitor Well ☐ Replacement

9. WELL DEPTH (completed) Date Started: 3-5-15
42 ft. Date Completed: 3-5-15

10. CASING: ☑ Threaded ☐ Welded
Diam.: 1.5 -Inch
Type: ☐ PVC ☐ Galvanized ☐ Steel ☐ Other
0 in. to 38 ft. depth
_____ in. to _____ ft. depth
Height: Above /Below ✓
Surface _____ ft.
Weight _____ lb./ft.
Drive Shoe? ☐ Yes ☐ No

11. SCREEN:
Type: Stainless Steel Diam.: 1-Inch
Slot/Gauge: .010 Slot Length: 4-Feet
Set Between: 38 ft. and 42 ft.
_____ ft. and _____ ft.
NOTE: MULTIPLE SCREENS USE SECOND SHEET
Sieve Analysis ☐ Yes (please enclose) ☑ No

12. STATIC WATER LEVEL _____ ft. below land surface after 24 hours

13. PUMPING LEVEL Below Land Surface.
_____ ft. after _____ hrs. Pumping _____ G.P.M.
Pumping Test: ☐ Yes (please enclose) ☐ No
Yield: _____

14. WATER QUALITY
Chemical Analysis ☐ Yes ☐No Bacterial Analysis ☐ Yes ☐ No
Please enclose lab results.

15. ARTIFICIAL FILTER (filter pack) ☑ Yes ☐ No
Installed from _____ ft. to _____ ft.
Effective size _____ Uniformity Coefficient _____

16. WELL GROUTED? ☑ Yes ☐ No
☐ Neat Cement ☑ Bentonite ☑ Bentonite/Cement ☐ Other _____
Depth: From 0 ft. to 42 ft.

17. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ____ ft. ____ direction
Type _____
Well Disinfected ☐ Yes ☐ No Type: _____ Amount: _____

18. PUMP: Date installed: _____ Not installed ☑
Mfr. Name: _____ Model No.: _____
H.P._____ Volts_____ Length of drop pipe ___ ft. Capacity ___ gpm
TYPE: ☐ Submersible ☐ Jet (shallow) ☐ Turbine ☐ Jet (deep) ☐ Reciprocating ☐ Centrifugal

19. WELL DRILLER: Wayne Mowbray **CERT. NO.:** 2000
Address: (Print) Level: A B C D (circle one) ✓
100 Bent Willow Way, Easley, SC
Telephone No.: 864-331-3745 Fax No.: 864-236-9097

20. WATER WELL DRILLER'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

Signed: Wayne Mowbray (Well Driller) Date: 3-5-15

If D Level Driller, provide supervising driller's name:
Jeffrey Grant-License No:2105, Level B

APPENDIX E

LABORATORY ANALYTICAL RESULTS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

March 13, 2015

Mr. Craig Eady
Terracon
3534 Rutherford Road
Taylors, SC 29687

RE: Project: Castlebridge 86117104
Pace Project No.: 92240279

Dear Mr. Eady:
Enclosed are the analytical results for sample(s) received by the laboratory on March 09, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Analyses were performed at the Pace Analytical Services location indicated on the sample analyte page for analysis unless otherwise footnoted.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Nicole Benjamin
nicole.benjamin@pacelabs.com
Project Manager

Enclosures

cc: Ben Hestir, Terracon
Kyle Lawing, Terracon

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

CERTIFICATIONS

Project: Castlebridge 86117104
Pace Project No.: 92240279

Charlotte Certification IDs
9800 Kincey Ave. Ste 100, Huntersville, NC 28078
North Carolina Drinking Water Certification #: 37706
North Carolina Field Services Certification #: 5342
North Carolina Wastewater Certification #: 12
South Carolina Certification #: 99006001
Florida/NELAP Certification #: E87627
Kentucky UST Certification #: 84
West Virginia Certification #: 357
Virginia/VELAP Certification #: 460221

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

SAMPLE SUMMARY

Project: Castlebridge 86117104
Pace Project No.: 92240279

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92240279001	**GP-20**	Water	03/05/15 14:40	03/09/15 14:14
92240279002	**GP-21**	Water	03/05/15 15:05	03/09/15 14:14
92240279003	**GP-22**	Water	03/05/15 16:35	03/09/15 14:14

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Huntersville, NC 28078
(704)875-9092

SAMPLE ANALYTE COUNT

Project: Castlebridge 86117104
Pace Project No.: 92240279

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92240279001	**GP-20**	EPA 8260	GAW	8	PASI-C
92240279002	**GP-21**	EPA 8260	GAW	8	PASI-C
92240279003	**GP-22**	EPA 8260	GAW	8	PASI-C

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 86117104
Pace Project No.: 92240279

Method: **EPA 8260**
Description: 8260 MSV Low Level SC
Client: Terracon SC
Date: March 13, 2015

General Information:
3 samples were analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: Castlebridge 86117104
Pace Project No.: 92240279

Sample: GP-20 **Lab ID: 92240279001** Collected: 03/05/15 14:40 Received: 03/09/15 14:14 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
cis-1,2-Dichloroethene	**7.8**	ug/L	1.0	0.19	1		03/11/15 19:42	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/11/15 19:42	156-60-5	
Tetrachloroethene	**803**	ug/L	12.5	5.8	12.5		03/12/15 23:03	127-18-4	
Trichloroethene	**4.3**	ug/L	1.0	0.47	1		03/11/15 19:42	79-01-6	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/11/15 19:42	75-01-4	
Surrogates									
4-Bromofluorobenzene (S)	102	%	70-130		1		03/11/15 19:42	460-00-4	
1,2-Dichloroethane-d4 (S)	108	%	70-130		1		03/11/15 19:42	17060-07-0	
Toluene-d8 (S)	93	%	70-130		1		03/11/15 19:42	2037-26-5	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: Castlebridge 86117104
Pace Project No.: 92240279

Sample: GP-21 **Lab ID: 92240279002** Collected: 03/05/15 15:05 Received: 03/09/15 14:14 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.19	1		03/12/15 19:57	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/12/15 19:57	156-60-5	
Tetrachloroethene	**9.3**	ug/L	1.0	0.46	1		03/12/15 19:57	127-18-4	
Trichloroethene	ND	ug/L	1.0	0.47	1		03/12/15 19:57	79-01-6	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/12/15 19:57	75-01-4	
Surrogates									
4-Bromofluorobenzene (S)	104	%	70-130		1		03/12/15 19:57	460-00-4	
1,2-Dichloroethane-d4 (S)	114	%	70-130		1		03/12/15 19:57	17060-07-0	
Toluene-d8 (S)	98	%	70-130		1		03/12/15 19:57	2037-26-5	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: Castlebridge 86117104
Pace Project No.: 92240279

Sample: GP-22 **Lab ID: 92240279003** Collected: 03/05/15 16:35 Received: 03/09/15 14:14 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
cis-1,2-Dichloroethene	**11.9**	ug/L	1.0	0.19	1		03/11/15 20:16	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/11/15 20:16	156-60-5	
Tetrachloroethene	**1520**	ug/L	12.5	5.8	12.5		03/12/15 15:44	127-18-4	
Trichloroethene	**7.8**	ug/L	1.0	0.47	1		03/11/15 20:16	79-01-6	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/11/15 20:16	75-01-4	
Surrogates									
4-Bromofluorobenzene (S)	100	%	70-130		1		03/11/15 20:16	460-00-4	
1,2-Dichloroethane-d4 (S)	111	%	70-130		1		03/11/15 20:16	17060-07-0	
Toluene-d8 (S)	92	%	70-130		1		03/11/15 20:16	2037-26-5	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 86117104
Pace Project No.: 92240279

QC Batch: MSV/30680 Analysis Method: EPA 8260
QC Batch Method: EPA 8260 Analysis Description: 8260 MSV Low Level SC
Associated Lab Samples: 92240279001, 92240279003

METHOD BLANK: 1408190 Matrix: Water
Associated Lab Samples: 92240279001, 92240279003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
cis-1,2-Dichloroethene	ug/L	ND	1.0	03/11/15 15:45	
Tetrachloroethene	ug/L	ND	1.0	03/11/15 15:45	
trans-1,2-Dichloroethene	ug/L	ND	1.0	03/11/15 15:45	
Trichloroethene	ug/L	ND	1.0	03/11/15 15:45	
Vinyl chloride	ug/L	ND	1.0	03/11/15 15:45	
1,2-Dichloroethane-d4 (S)	%	111	70-130	03/11/15 15:45	
4-Bromofluorobenzene (S)	%	96	70-130	03/11/15 15:45	
Toluene-d8 (S)	%	95	70-130	03/11/15 15:45	

LABORATORY CONTROL SAMPLE: 1408191

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
cis-1,2-Dichloroethene	ug/L	50	49.2	98	70-130	
Tetrachloroethene	ug/L	50	49.0	98	70-130	
trans-1,2-Dichloroethene	ug/L	50	49.1	98	70-130	
Trichloroethene	ug/L	50	49.5	99	70-130	
Vinyl chloride	ug/L	50	51.4	103	70-130	
1,2-Dichloroethane-d4 (S)	%			101	70-130	
4-Bromofluorobenzene (S)	%			97	70-130	
Toluene-d8 (S)	%			102	70-130	

MATRIX SPIKE SAMPLE: 1408193

Parameter	Units	92240215004 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
cis-1,2-Dichloroethene	ug/L	ND	20	20.7	103	70-130	
Tetrachloroethene	ug/L	ND	20	21.9	109	70-130	
trans-1,2-Dichloroethene	ug/L	ND	20	20.3	102	70-130	
Trichloroethene	ug/L	ND	20	22.4	112	70-130	
Vinyl chloride	ug/L	ND	20	22.1	110	70-130	
1,2-Dichloroethane-d4 (S)	%				99	70-130	
4-Bromofluorobenzene (S)	%				95	70-130	
Toluene-d8 (S)	%				97	70-130	

SAMPLE DUPLICATE: 1408192

Parameter	Units	92240215003 Result	Dup Result	RPD	Max RPD	Qualifiers
cis-1,2-Dichloroethene	ug/L	ND	ND		30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 86117104
Pace Project No.: 92240279

SAMPLE DUPLICATE: 1408192

Parameter	Units	92240215003 Result	Dup Result	RPD	Max RPD	Qualifiers
Tetrachloroethene	ug/L	ND	ND		30	
trans-1,2-Dichloroethene	ug/L	ND	ND		30	
Trichloroethene	ug/L	ND	ND		30	
Vinyl chloride	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	104	106	2		
4-Bromofluorobenzene (S)	%	101	101	1		
Toluene-d8 (S)	%	94	95	1		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 86117104
Pace Project No.: 92240279

QC Batch: MSV/30694
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV Low Level SC
Associated Lab Samples: 92240279002

METHOD BLANK: 1409522 Matrix: Water
Associated Lab Samples: 92240279002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
cis-1,2-Dichloroethene	ug/L	ND	1.0	03/12/15 16:18	
Tetrachloroethene	ug/L	ND	1.0	03/12/15 16:18	
trans-1,2-Dichloroethene	ug/L	ND	1.0	03/12/15 16:18	
Trichloroethene	ug/L	ND	1.0	03/12/15 16:18	
Vinyl chloride	ug/L	ND	1.0	03/12/15 16:18	
1,2-Dichloroethane-d4 (S)	%	109	70-130	03/12/15 16:18	
4-Bromofluorobenzene (S)	%	103	70-130	03/12/15 16:18	
Toluene-d8 (S)	%	95	70-130	03/12/15 16:18	

LABORATORY CONTROL SAMPLE: 1409523

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
cis-1,2-Dichloroethene	ug/L	50	49.5	99	70-130	
Tetrachloroethene	ug/L	50	50.1	100	70-130	
trans-1,2-Dichloroethene	ug/L	50	49.9	100	70-130	
Trichloroethene	ug/L	50	50.9	102	70-130	
Vinyl chloride	ug/L	50	52.7	105	70-130	
1,2-Dichloroethane-d4 (S)	%			98	70-130	
4-Bromofluorobenzene (S)	%			100	70-130	
Toluene-d8 (S)	%			101	70-130	

MATRIX SPIKE SAMPLE: 1409525

Parameter	Units	92240421006 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
cis-1,2-Dichloroethene	ug/L	ND	20	22.5	113	70-130	
Tetrachloroethene	ug/L	ND	20	23.2	116	70-130	
trans-1,2-Dichloroethene	ug/L	ND	20	22.5	113	70-130	
Trichloroethene	ug/L	ND	20	25.0	125	70-130	
Vinyl chloride	ug/L	ND	20	23.6	118	70-130	
1,2-Dichloroethane-d4 (S)	%				97	70-130	
4-Bromofluorobenzene (S)	%				96	70-130	
Toluene-d8 (S)	%				99	70-130	

SAMPLE DUPLICATE: 1409524

Parameter	Units	92240421005 Result	Dup Result	RPD	Max RPD	Qualifiers
cis-1,2-Dichloroethene	ug/L	ND	ND		30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 86117104
Pace Project No.: 92240279

SAMPLE DUPLICATE: 1409524

Parameter	Units	92240421005 Result	Dup Result	RPD	Max RPD	Qualifiers
Tetrachloroethene	ug/L	ND	ND		30	
trans-1,2-Dichloroethene	ug/L	ND	ND		30	
Trichloroethene	ug/L	ND	ND		30	
Vinyl chloride	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	112	114	2		
4-Bromofluorobenzene (S)	%	107	107	0		
Toluene-d8 (S)	%	96	96	1		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALIFIERS

Project: Castlebridge 86117104
Pace Project No.: 92240279

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether, Styrene, and Vinyl chloride.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-C Pace Analytical Services - Charlotte

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Castlebridge 86117104
Pace Project No.: 92240279

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92240279001	**GP-20**	EPA 8260	MSV/30680		
92240279002	**GP-21**	EPA 8260	MSV/30694		
92240279003	**GP-22**	EPA 8260	MSV/30680		

Client Name: Tesaro

Courier (Circle): Fed Ex UPS USPS Client Commercial Pace Other_____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other_____

Thermometer Used: IR Gun#3 -130265963 Type of Ice: (Wet) Blue None ☑ Samples on ice, cooling process has begun

IR Gun #4 SN:140290365 Other:_____

Temp Correction Factor: Add / Subtract 0.0 C

Corrected Cooler Temp.: 2.6 C Biological Tissue is Frozen: Yes No N/A

Temp should be above freezing to 6°C

Date and Initials of person examining contents: BDG 3/9/15

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: WT		
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☑No BDG 3/9/15	
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☑No ☐N/A	15.
Trip Blank Present:	☐Yes ☑No ☐N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☐N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution:

Field Data Required? Y / N

Person Contacted: Craig Lady Date/Time: 03/12/15

Comments/ Resolution: Confirm "Short List" ☑

SCURF Review: ☑ Date: 03/09/15

SRF Review: ☑ Date: 03/12/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Label here

WO# : 92240279

92240279

Pace Analytical®
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

1901528

Section A Required Client Information:
Company: Terracon
Address: 3534 Rutherford Rd. Taylors, SC
Email To: cleady@terracon.com
Phone: 864.292.2901 Fax:
Requested Due Date/TAT:

Section B Required Project Information:
Report To: Craig Eady
Copy To:
Purchase Order No.:
Project Name: Castlebridge
Project Number: 86117104

Section C Invoice Information:
Attention:
Company Name:
Address:
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY
☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER
Site Location STATE: SC

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes (MATRIX / CODE): Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N: VOCs (Short List)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	GP-20	WT	G			3-5-15	1440		3	X								3		92240279
2	GP-21	↓	↓			↓	1505		3	X								3		02
3	GP-22	↓	↓			↓	1635		3	X								3		03
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
		3.9.15	14:14		3.9.15	12:43				
					3/9/15	14:14	2.8	Y	N	J

ORIGINAL

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Kyle Laning
SIGNATURE of SAMPLER:
DATE Signed (MM/DD/YY): 3-5-15

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

March 23, 2015

George Flores
Terracon
3534 Rutherford Road
Taylors, SC 29687

RE: Project: Castlebridge 8611710
Pace Project No.: 92241216

Dear George Flores:
Enclosed are the analytical results for sample(s) received by the laboratory on March 13, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Analyses were performed at the Pace Analytical Services location indicated on the sample analyte page for analysis unless otherwise footnoted.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Nicole Benjamin
nicole.benjamin@pacelabs.com
Project Manager

Enclosures

cc: Kyle Lawing, Terracon

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

CERTIFICATIONS

Project: Castlebridge 8611710
Pace Project No.: 92241216

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

Ormond Beach Certification IDs
8 East Tower Circle, Ormond Beach, FL 32174
Alabama Certification #: 41320
Arizona Certification #: AZ0735
Connecticut Certification #: PH-0216
Delaware Certification: FL NELAC Reciprocity
Florida Certification #: E83079
Georgia Certification #: 955
Guam Certification: FL NELAC Reciprocity
Hawaii Certification: FL NELAC Reciprocity
Illinois Certification #: 200068
Indiana Certification: FL NELAC Reciprocity
Kansas Certification #: E-10383
Kentucky Certification #: 90050
Louisiana Certification #: FL NELAC Reciprocity
Louisiana Environmental Certificate #: 05007
Maryland Certification: #346
Massachusetts Certification #: M-FL1264
Michigan Certification #: 9911
Mississippi Certification: FL NELAC Reciprocity
Missouri Certification #: 236
Montana Certification #: Cert 0074
Nebraska Certification: NE-OS-28-14
Nevada Certification: FL NELAC Reciprocity
New Hampshire Certification #: 2958
New Jersey Certification #: FL765
New York Certification #: 11608
North Carolina Environmental Certificate #: 667
Pennsylvania Certification #: 68-00547
Puerto Rico Certification #: FL01264
South Carolina Certification: #96042001
Tennessee Certification #: TN02974
Texas Certification: FL NELAC Reciprocity
US Virgin Islands Certification: FL NELAC Reciprocity
Virginia Environmental Certification #: 460165
Washington Certification #: C955
West Virginia Certification #: 9962C
Wisconsin Certification #: 399079670
Wyoming (EPA Region 8): FL NELAC Reciprocity

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750

Charlotte Certification IDs
9800 Kincey Ave. Ste 100, Huntersville, NC 28078
North Carolina Drinking Water Certification #: 37706
North Carolina Field Services Certification #: 5342
North Carolina Wastewater Certification #: 12

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

CERTIFICATIONS

Project: Castlebridge 8611710
Pace Project No.: 92241216

Charlotte Certification IDs
South Carolina Certification #: 99006001
Florida/NELAP Certification #: E87627
Kentucky UST Certification #: 84
West Virginia Certification #: 357
Virginia/VELAP Certification #: 460221

Asheville Certification IDs
2225 Riverside Drive, Asheville, NC 28804
Florida/NELAP Certification #: E87648
Massachusetts Certification #: M-NC030
North Carolina Drinking Water Certification #: 37712
North Carolina Wastewater Certification #: 40
South Carolina Certification #: 99030001
West Virginia Certification #: 356
Virginia/VELAP Certification #: 460222

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

SAMPLE SUMMARY

Project: Castlebridge 8611710
Pace Project No.: 92241216

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92241216001	**MW-6D**	Water	03/13/15 11:00	03/13/15 13:57
92241216002	**Trip Blank**	Water	03/13/15 00:00	03/13/15 13:57

Pace Analytical Services, Inc.
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Huntersville, NC 28078
(704)875-9092

SAMPLE ANALYTE COUNT

Project: Castlebridge 8611710
Pace Project No.: 92241216

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92241216001	**MW-6D**	RSK 175	DR1	3	PASI-M
		EPA 200.7	JMW	2	PASI-A
		EPA 200.7	JMW	1	PASI-A
		EPA 8260	GAW	62	PASI-C
		SM 4500-S2H	EWS	1	PASI-A
		EPA 300.0	AES2	1	PASI-A
		EPA 350.1	KLB	1	PASI-A
		EPA 353.2	DMN	3	PASI-A
		EPA 365.4	CLS	1	PASI-O
		SM 4500-Cl-E	SER	1	PASI-A
		SM 5310C	TJJ	1	PASI-G
92241216002	**Trip Blank**	EPA 8260	GAW	62	PASI-C

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **RSK 175**
Description: RSK 175 AIR Headspace
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for RSK 175. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **EPA 200.7**
Description: 200.7 MET ICP
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for EPA 200.7. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 200.7 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **EPA 200.7**
Description: 200.7 MET ICP, Lab Filtered
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for EPA 200.7. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 200.7 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
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PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **EPA 8260**
Description: 8260 MSV Low Level SC
Client: Terracon SC
Date: March 23, 2015

General Information:
2 samples were analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **SM 4500-S2H**
Description: 4500H2S Hydrogen Sulfide
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for SM 4500-S2H. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
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(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **EPA 300.0**
Description: 300.0 IC Anions 28 Days
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for EPA 300.0. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: WETA/22246

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 92240945001,92241121004

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 1412776)
  - Sulfate
- MSD (Lab ID: 1412777)
  - Sulfate

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **EPA 350.1**
Description: 350.1 Ammonia
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for EPA 350.1. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **EPA 353.2**
Description: 353.2 Nitrogen, NO2/NO3 unpres
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for EPA 353.2. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: WETA/22207

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 92241046001,92241046002

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 1411222)
  - Nitrogen, NO2 plus NO3
  - Nitrogen, Nitrate
- MSD (Lab ID: 1411223)
  - Nitrogen, NO2 plus NO3
  - Nitrogen, Nitrate

Additional Comments:

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **EPA 365.4**
Description: 365.4 Phosphorus, Total
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for EPA 365.4. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 365.4 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
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PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **SM 4500-Cl-E**
Description: 4500 Chloride
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for SM 4500-Cl-E. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, Inc.
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PROJECT NARRATIVE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Method: **SM 5310C**
Description: 5310C TOC
Client: Terracon SC
Date: March 23, 2015

General Information:
1 sample was analyzed for SM 5310C. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: Castlebridge 8611710
Pace Project No.: 92241216

Sample: MW-6D **Lab ID: 92241216001** Collected: 03/13/15 11:00 Received: 03/13/15 13:57 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
RSK 175 AIR Headspace	Analytical Method: RSK 175								
Ethane	ND	ug/L	6.2	3.1	1		03/18/15 00:11	74-84-0	
Ethene	ND	ug/L	6.2	3.1	1		03/18/15 00:11	74-85-1	
Methane	ND	ug/L	6.6	3.3	1		03/18/15 00:11	74-82-8	
200.7 MET ICP	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Iron	**38.0J**	ug/L	50.0	25.0	1	03/16/15 15:10	03/16/15 23:17	7439-89-6	
Magnesium	**941**	ug/L	100	50.0	1	03/16/15 15:10	03/16/15 23:17	7439-95-4	
200.7 MET ICP, Lab Filtered	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7								
Iron, Dissolved	ND	ug/L	50.0	25.0	1	03/16/15 17:15	03/16/15 20:11	7439-89-6	
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	250	100	10		03/19/15 21:47	67-64-1	
Benzene	ND	ug/L	10.0	2.5	10		03/19/15 21:47	71-43-2	
Bromobenzene	ND	ug/L	10.0	3.0	10		03/19/15 21:47	108-86-1	
Bromochloromethane	ND	ug/L	10.0	1.7	10		03/19/15 21:47	74-97-5	
Bromodichloromethane	ND	ug/L	10.0	1.8	10		03/19/15 21:47	75-27-4	
Bromoform	ND	ug/L	10.0	2.6	10		03/19/15 21:47	75-25-2	
Bromomethane	ND	ug/L	50.0	2.9	10		03/19/15 21:47	74-83-9	
2-Butanone (MEK)	ND	ug/L	50.0	9.6	10		03/19/15 21:47	78-93-3	
Carbon tetrachloride	ND	ug/L	10.0	2.5	10		03/19/15 21:47	56-23-5	
Chlorobenzene	ND	ug/L	10.0	2.3	10		03/19/15 21:47	108-90-7	
Chloroethane	ND	ug/L	10.0	5.4	10		03/19/15 21:47	75-00-3	
Chloroform	ND	ug/L	10.0	1.4	10		03/19/15 21:47	67-66-3	
Chloromethane	ND	ug/L	10.0	1.1	10		03/19/15 21:47	74-87-3	
2-Chlorotoluene	ND	ug/L	10.0	3.5	10		03/19/15 21:47	95-49-8	
4-Chlorotoluene	ND	ug/L	10.0	3.1	10		03/19/15 21:47	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	20.0	20.0	10		03/19/15 21:47	96-12-8	
Dibromochloromethane	ND	ug/L	10.0	2.1	10		03/19/15 21:47	124-48-1	
Dibromomethane	ND	ug/L	10.0	2.1	10		03/19/15 21:47	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	10.0	3.0	10		03/19/15 21:47	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	10.0	2.4	10		03/19/15 21:47	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	10.0	3.3	10		03/19/15 21:47	106-46-7	
Dichlorodifluoromethane	ND	ug/L	10.0	2.1	10		03/19/15 21:47	75-71-8	
1,1-Dichloroethane	ND	ug/L	10.0	3.2	10		03/19/15 21:47	75-34-3	
1,2-Dichloroethane	ND	ug/L	10.0	1.2	10		03/19/15 21:47	107-06-2	
1,1-Dichloroethene	ND	ug/L	10.0	5.6	10		03/19/15 21:47	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	10.0	1.9	10		03/19/15 21:47	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	10.0	4.9	10		03/19/15 21:47	156-60-5	
1,2-Dichloropropane	ND	ug/L	10.0	2.7	10		03/19/15 21:47	78-87-5	
1,3-Dichloropropane	ND	ug/L	10.0	2.8	10		03/19/15 21:47	142-28-9	
2,2-Dichloropropane	ND	ug/L	10.0	1.3	10		03/19/15 21:47	594-20-7	
1,1-Dichloropropene	ND	ug/L	10.0	4.9	10		03/19/15 21:47	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	10.0	1.3	10		03/19/15 21:47	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	10.0	2.6	10		03/19/15 21:47	10061-02-6	
Diisopropyl ether	ND	ug/L	10.0	1.2	10		03/19/15 21:47	108-20-3	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: Castlebridge 8611710
Pace Project No.: 92241216

Sample: MW-6D **Lab ID: 92241216001** Collected: 03/13/15 11:00 Received: 03/13/15 13:57 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Ethylbenzene	ND	ug/L	10.0	3.0	10		03/19/15 21:47	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	10.0	7.1	10		03/19/15 21:47	87-68-3	
2-Hexanone	ND	ug/L	50.0	4.6	10		03/19/15 21:47	591-78-6	
p-Isopropyltoluene	ND	ug/L	10.0	3.1	10		03/19/15 21:47	99-87-6	
Methylene Chloride	ND	ug/L	20.0	9.7	10		03/19/15 21:47	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	50.0	3.3	10		03/19/15 21:47	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	10.0	2.1	10		03/19/15 21:47	1634-04-4	
Naphthalene	ND	ug/L	10.0	2.4	10		03/19/15 21:47	91-20-3	
Styrene	ND	ug/L	10.0	2.6	10		03/19/15 21:47	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	10.0	3.3	10		03/19/15 21:47	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	10.0	4.0	10		03/19/15 21:47	79-34-5	
Tetrachloroethene	**873**	ug/L	10.0	4.6	10		03/19/15 21:47	127-18-4	
Toluene	ND	ug/L	10.0	2.6	10		03/19/15 21:47	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	10.0	3.3	10		03/19/15 21:47	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	10.0	3.5	10		03/19/15 21:47	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	10.0	4.8	10		03/19/15 21:47	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	10.0	2.9	10		03/19/15 21:47	79-00-5	
Trichloroethene	**6.6J**	ug/L	10.0	4.7	10		03/19/15 21:47	79-01-6	
Trichlorofluoromethane	ND	ug/L	10.0	2.0	10		03/19/15 21:47	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	10.0	4.1	10		03/19/15 21:47	96-18-4	
Vinyl acetate	ND	ug/L	20.0	3.5	10		03/19/15 21:47	108-05-4	
Vinyl chloride	ND	ug/L	10.0	6.2	10		03/19/15 21:47	75-01-4	
Xylene (Total)	ND	ug/L	20.0	6.6	10		03/19/15 21:47	1330-20-7	
m&p-Xylene	ND	ug/L	20.0	6.6	10		03/19/15 21:47	179601-23-1	
o-Xylene	ND	ug/L	10.0	2.3	10		03/19/15 21:47	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	104	%	70-130		10		03/19/15 21:47	460-00-4	
1,2-Dichloroethane-d4 (S)	122	%	70-130		10		03/19/15 21:47	17060-07-0	
Toluene-d8 (S)	96	%	70-130		10		03/19/15 21:47	2037-26-5	
4500H2S Hydrogen Sulfide	Analytical Method: SM 4500-S2H								
Hydrogen Sulfide	ND	mg/L	0.050	0.050	1		03/20/15 14:30	7783-06-4	
	Analytical Method: SM 4500-S2D								
Sulfide	ND	mg/L	0.10	0.10	1		03/20/15 14:30	18496-25-8	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	ND	mg/L	2.0	1.0	1		03/17/15 23:34	14808-79-8	
350.1 Ammonia	Analytical Method: EPA 350.1								
Nitrogen, Ammonia	ND	mg/L	0.10	0.050	1		03/16/15 18:42	7664-41-7	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2								
Nitrogen, Nitrate	**0.092**	mg/L	0.020	0.010	1		03/13/15 22:40		
Nitrogen, Nitrite	ND	mg/L	0.020	0.010	1		03/13/15 22:40		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: Castlebridge 8611710
Pace Project No.: 92241216

Sample: MW-6D **Lab ID: 92241216001** Collected: 03/13/15 11:00 Received: 03/13/15 13:57 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2								
Nitrogen, NO2 plus NO3	**0.092**	mg/L	0.020	0.010	1		03/13/15 22:40		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4								
Phosphorus, Total (as P)	ND	mg/L	0.10	0.050	1	03/17/15 11:45	03/17/15 23:15	7723-14-0	
4500 Chloride	Analytical Method: SM 4500-Cl-E								
Chloride	**1.2**	mg/L	1.0	0.50	1		03/17/15 01:51	16887-00-6	
5310C TOC	Analytical Method: SM 5310C								
Total Organic Carbon	ND	mg/L	0.50	0.17	1		03/19/15 12:45	7440-44-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Castlebridge 8611710
Pace Project No.: 92241216

Sample: Trip Blank **Lab ID: 92241216002** Collected: 03/13/15 00:00 Received: 03/13/15 13:57 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	25.0	10.0	1		03/17/15 11:21	67-64-1	
Benzene	ND	ug/L	1.0	0.25	1		03/17/15 11:21	71-43-2	
Bromobenzene	ND	ug/L	1.0	0.30	1		03/17/15 11:21	108-86-1	
Bromochloromethane	ND	ug/L	1.0	0.17	1		03/17/15 11:21	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.18	1		03/17/15 11:21	75-27-4	
Bromoform	ND	ug/L	1.0	0.26	1		03/17/15 11:21	75-25-2	
Bromomethane	ND	ug/L	5.0	0.29	1		03/17/15 11:21	74-83-9	
2-Butanone (MEK)	ND	ug/L	5.0	0.96	1		03/17/15 11:21	78-93-3	
Carbon tetrachloride	ND	ug/L	1.0	0.25	1		03/17/15 11:21	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.23	1		03/17/15 11:21	108-90-7	
Chloroethane	ND	ug/L	1.0	0.54	1		03/17/15 11:21	75-00-3	
Chloroform	ND	ug/L	1.0	0.14	1		03/17/15 11:21	67-66-3	
Chloromethane	ND	ug/L	1.0	0.11	1		03/17/15 11:21	74-87-3	
2-Chlorotoluene	ND	ug/L	1.0	0.35	1		03/17/15 11:21	95-49-8	
4-Chlorotoluene	ND	ug/L	1.0	0.31	1		03/17/15 11:21	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	2.0	2.0	1		03/17/15 11:21	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.21	1		03/17/15 11:21	124-48-1	
Dibromomethane	ND	ug/L	1.0	0.21	1		03/17/15 11:21	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.30	1		03/17/15 11:21	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	1.0	0.24	1		03/17/15 11:21	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.33	1		03/17/15 11:21	106-46-7	
Dichlorodifluoromethane	ND	ug/L	1.0	0.21	1		03/17/15 11:21	75-71-8	
1,1-Dichloroethane	ND	ug/L	1.0	0.32	1		03/17/15 11:21	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.12	1		03/17/15 11:21	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.56	1		03/17/15 11:21	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.19	1		03/17/15 11:21	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.49	1		03/17/15 11:21	156-60-5	
1,2-Dichloropropane	ND	ug/L	1.0	0.27	1		03/17/15 11:21	78-87-5	
1,3-Dichloropropane	ND	ug/L	1.0	0.28	1		03/17/15 11:21	142-28-9	
2,2-Dichloropropane	ND	ug/L	1.0	0.13	1		03/17/15 11:21	594-20-7	
1,1-Dichloropropene	ND	ug/L	1.0	0.49	1		03/17/15 11:21	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	1.0	0.13	1		03/17/15 11:21	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	1.0	0.26	1		03/17/15 11:21	10061-02-6	
Diisopropyl ether	ND	ug/L	1.0	0.12	1		03/17/15 11:21	108-20-3	
Ethylbenzene	ND	ug/L	1.0	0.30	1		03/17/15 11:21	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	1.0	0.71	1		03/17/15 11:21	87-68-3	
2-Hexanone	ND	ug/L	5.0	0.46	1		03/17/15 11:21	591-78-6	
p-Isopropyltoluene	ND	ug/L	1.0	0.31	1		03/17/15 11:21	99-87-6	
Methylene Chloride	ND	ug/L	2.0	0.97	1		03/17/15 11:21	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	5.0	0.33	1		03/17/15 11:21	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.21	1		03/17/15 11:21	1634-04-4	
Naphthalene	ND	ug/L	1.0	0.24	1		03/17/15 11:21	91-20-3	
Styrene	ND	ug/L	1.0	0.26	1		03/17/15 11:21	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.33	1		03/17/15 11:21	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.40	1		03/17/15 11:21	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.46	1		03/17/15 11:21	127-18-4	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

ANALYTICAL RESULTS

Project: Castlebridge 8611710
Pace Project No.: 92241216

Sample: Trip Blank **Lab ID: 92241216002** Collected: 03/13/15 00:00 Received: 03/13/15 13:57 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 MSV Low Level SC	Analytical Method: EPA 8260								
Toluene	ND	ug/L	1.0	0.26	1		03/17/15 11:21	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	1.0	0.33	1		03/17/15 11:21	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	1.0	0.35	1		03/17/15 11:21	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.48	1		03/17/15 11:21	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.29	1		03/17/15 11:21	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.47	1		03/17/15 11:21	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.20	1		03/17/15 11:21	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.41	1		03/17/15 11:21	96-18-4	
Vinyl acetate	ND	ug/L	2.0	0.35	1		03/17/15 11:21	108-05-4	
Vinyl chloride	ND	ug/L	1.0	0.62	1		03/17/15 11:21	75-01-4	
Xylene (Total)	ND	ug/L	2.0	0.66	1		03/17/15 11:21	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.66	1		03/17/15 11:21	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.23	1		03/17/15 11:21	95-47-6	
Surrogates									
4-Bromofluorobenzene (S)	106	%	70-130		1		03/17/15 11:21	460-00-4	
1,2-Dichloroethane-d4 (S)	114	%	70-130		1		03/17/15 11:21	17060-07-0	
Toluene-d8 (S)	97	%	70-130		1		03/17/15 11:21	2037-26-5	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: AIR/22750
QC Batch Method: RSK 175
Analysis Method: RSK 175
Analysis Description: RSK 175 AIR HEADSPACE
Associated Lab Samples: 92241216001

METHOD BLANK: 1920055 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethane	ug/L	ND	6.2	03/17/15 21:50	
Ethene	ug/L	ND	6.2	03/17/15 21:50	
Methane	ug/L	ND	6.6	03/17/15 21:50	

LABORATORY CONTROL SAMPLE & LCSD: 1920056 1920057

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Ethane	ug/L	114	113	114	100	100	85-115	1	20	
Ethene	ug/L	106	105	106	99	100	85-115	1	20	
Methane	ug/L	60.7	58.1	58.9	96	97	85-115	1	20	

SAMPLE DUPLICATE: 1920058

Parameter	Units	60189576010 Result	Dup Result	RPD	Max RPD	Qualifiers
Ethane	ug/L	ND	ND		20	
Ethene	ug/L	ND	ND		20	
Methane	ug/L	ND	ND		20	

SAMPLE DUPLICATE: 1920059

Parameter	Units	10299677005 Result	Dup Result	RPD	Max RPD	Qualifiers
Ethane	ug/L	ND	ND		20	
Ethene	ug/L	ND	ND		20	
Methane	ug/L	0.018 mg/L	18.6	4	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: MPRP/18077
QC Batch Method: EPA 200.7
Analysis Method: EPA 200.7
Analysis Description: 200.7 MET
Associated Lab Samples: 92241216001

METHOD BLANK: 1411941 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Iron	ug/L	ND	50.0	03/16/15 22:15	
Magnesium	ug/L	ND	100	03/16/15 22:15	

LABORATORY CONTROL SAMPLE: 1411942

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Iron	ug/L	5000	4970	99	85-115	
Magnesium	ug/L	5000	5080	102	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1411943 1411944

Parameter	Units	92240657001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Iron	ug/L	1410	5000	5000	6290	6070	98	93	70-130	4	20	
Magnesium	ug/L	16700	5000	5000	21300	21000	92	86	70-130	1	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1411945 1411946

Parameter	Units	92241072001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Iron	ug/L	8.6 mg/L	5000	5000	13800	13900	103	106	70-130	1	20	
Magnesium	ug/L	30.3 mg/L	5000	5000	36300	36700	120	127	70-130	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: MPRP/18082
QC Batch Method: EPA 200.7
Analysis Method: EPA 200.7
Analysis Description: 200.7 MET Dissolved
Associated Lab Samples: 92241216001

METHOD BLANK: 1412112 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Iron, Dissolved	ug/L	ND	50.0	03/16/15 19:40	

LABORATORY CONTROL SAMPLE: 1412113

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Iron, Dissolved	ug/L	5000	4950	99	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1412114 1412115

Parameter	Units	92240927002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Iron, Dissolved	ug/L	712	5000	5000	4880	4980	83	85	70-130	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
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QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: MSV/30761
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV Low Level SC
Associated Lab Samples: 92241216002

METHOD BLANK: 1411969
Matrix: Water
Associated Lab Samples: 92241216002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	03/17/15 11:04	
1,1,1-Trichloroethane	ug/L	ND	1.0	03/17/15 11:04	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	03/17/15 11:04	
1,1,2-Trichloroethane	ug/L	ND	1.0	03/17/15 11:04	
1,1-Dichloroethane	ug/L	ND	1.0	03/17/15 11:04	
1,1-Dichloroethene	ug/L	ND	1.0	03/17/15 11:04	
1,1-Dichloropropene	ug/L	ND	1.0	03/17/15 11:04	
1,2,3-Trichlorobenzene	ug/L	ND	1.0	03/17/15 11:04	
1,2,3-Trichloropropane	ug/L	ND	1.0	03/17/15 11:04	
1,2,4-Trichlorobenzene	ug/L	ND	1.0	03/17/15 11:04	
1,2-Dibromo-3-chloropropane	ug/L	ND	2.0	03/17/15 11:04	
1,2-Dichlorobenzene	ug/L	ND	1.0	03/17/15 11:04	
1,2-Dichloroethane	ug/L	ND	1.0	03/17/15 11:04	
1,2-Dichloropropane	ug/L	ND	1.0	03/17/15 11:04	
1,3-Dichlorobenzene	ug/L	ND	1.0	03/17/15 11:04	
1,3-Dichloropropane	ug/L	ND	1.0	03/17/15 11:04	
1,4-Dichlorobenzene	ug/L	ND	1.0	03/17/15 11:04	
2,2-Dichloropropane	ug/L	ND	1.0	03/17/15 11:04	
2-Butanone (MEK)	ug/L	ND	5.0	03/17/15 11:04	
2-Chlorotoluene	ug/L	ND	1.0	03/17/15 11:04	
2-Hexanone	ug/L	ND	5.0	03/17/15 11:04	
4-Chlorotoluene	ug/L	ND	1.0	03/17/15 11:04	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	5.0	03/17/15 11:04	
Acetone	ug/L	ND	25.0	03/17/15 11:04	
Benzene	ug/L	ND	1.0	03/17/15 11:04	
Bromobenzene	ug/L	ND	1.0	03/17/15 11:04	
Bromochloromethane	ug/L	ND	1.0	03/17/15 11:04	
Bromodichloromethane	ug/L	ND	1.0	03/17/15 11:04	
Bromoform	ug/L	ND	1.0	03/17/15 11:04	
Bromomethane	ug/L	ND	5.0	03/17/15 11:04	
Carbon tetrachloride	ug/L	ND	1.0	03/17/15 11:04	
Chlorobenzene	ug/L	ND	1.0	03/17/15 11:04	
Chloroethane	ug/L	ND	1.0	03/17/15 11:04	
Chloroform	ug/L	ND	1.0	03/17/15 11:04	
Chloromethane	ug/L	ND	1.0	03/17/15 11:04	
cis-1,2-Dichloroethene	ug/L	ND	1.0	03/17/15 11:04	
cis-1,3-Dichloropropene	ug/L	ND	1.0	03/17/15 11:04	
Dibromochloromethane	ug/L	ND	1.0	03/17/15 11:04	
Dibromomethane	ug/L	ND	1.0	03/17/15 11:04	
Dichlorodifluoromethane	ug/L	ND	1.0	03/17/15 11:04	
Diisopropyl ether	ug/L	ND	1.0	03/17/15 11:04	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

METHOD BLANK: 1411969 Matrix: Water
Associated Lab Samples: 92241216002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethylbenzene	ug/L	ND	1.0	03/17/15 11:04	
Hexachloro-1,3-butadiene	ug/L	ND	1.0	03/17/15 11:04	
m&p-Xylene	ug/L	ND	2.0	03/17/15 11:04	
Methyl-tert-butyl ether	ug/L	ND	1.0	03/17/15 11:04	
Methylene Chloride	ug/L	ND	2.0	03/17/15 11:04	
Naphthalene	ug/L	ND	1.0	03/17/15 11:04	
o-Xylene	ug/L	ND	1.0	03/17/15 11:04	
p-Isopropyltoluene	ug/L	ND	1.0	03/17/15 11:04	
Styrene	ug/L	ND	1.0	03/17/15 11:04	
Tetrachloroethene	ug/L	ND	1.0	03/17/15 11:04	
Toluene	ug/L	ND	1.0	03/17/15 11:04	
trans-1,2-Dichloroethene	ug/L	ND	1.0	03/17/15 11:04	
trans-1,3-Dichloropropene	ug/L	ND	1.0	03/17/15 11:04	
Trichloroethene	ug/L	ND	1.0	03/17/15 11:04	
Trichlorofluoromethane	ug/L	ND	1.0	03/17/15 11:04	
Vinyl acetate	ug/L	ND	2.0	03/17/15 11:04	
Vinyl chloride	ug/L	ND	1.0	03/17/15 11:04	
Xylene (Total)	ug/L	ND	2.0	03/17/15 11:04	
1,2-Dichloroethane-d4 (S)	%	113	70-130	03/17/15 11:04	
4-Bromofluorobenzene (S)	%	98	70-130	03/17/15 11:04	
Toluene-d8 (S)	%	97	70-130	03/17/15 11:04	

LABORATORY CONTROL SAMPLE: 1411970

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	53.1	106	70-130	
1,1,1-Trichloroethane	ug/L	50	57.3	115	70-130	
1,1,2,2-Tetrachloroethane	ug/L	50	47.9	96	70-130	
1,1,2-Trichloroethane	ug/L	50	51.1	102	70-130	
1,1-Dichloroethane	ug/L	50	53.3	107	70-130	
1,1-Dichloroethene	ug/L	50	56.7	113	70-130	
1,1-Dichloropropene	ug/L	50	54.4	109	70-130	
1,2,3-Trichlorobenzene	ug/L	50	57.1	114	70-130	
1,2,3-Trichloropropane	ug/L	50	47.8	96	70-130	
1,2,4-Trichlorobenzene	ug/L	50	49.4	99	70-130	
1,2-Dibromo-3-chloropropane	ug/L	50	50.6	101	70-130	
1,2-Dichlorobenzene	ug/L	50	54.4	109	70-130	
1,2-Dichloroethane	ug/L	50	49.3	99	70-130	
1,2-Dichloropropane	ug/L	50	52.3	105	70-130	
1,3-Dichlorobenzene	ug/L	50	52.8	106	70-130	
1,3-Dichloropropane	ug/L	50	52.4	105	70-130	
1,4-Dichlorobenzene	ug/L	50	51.1	102	70-130	
2,2-Dichloropropane	ug/L	50	40.6	81	70-130	
2-Butanone (MEK)	ug/L	100	92.1	92	70-130	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

LABORATORY CONTROL SAMPLE: 1411970

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2-Chlorotoluene	ug/L	50	51.9	104	70-130	
2-Hexanone	ug/L	100	98.9	99	70-130	
4-Chlorotoluene	ug/L	50	54.6	109	70-130	
4-Methyl-2-pentanone (MIBK)	ug/L	100	91.9	92	70-130	
Acetone	ug/L	100	90.3	90	70-130	
Benzene	ug/L	50	55.5	111	70-130	
Bromobenzene	ug/L	50	53.0	106	70-130	
Bromochloromethane	ug/L	50	53.1	106	70-130	
Bromodichloromethane	ug/L	50	48.1	96	70-130	
Bromoform	ug/L	50	47.5	95	70-130	
Bromomethane	ug/L	50	47.9	96	70-130	
Carbon tetrachloride	ug/L	50	52.1	104	70-130	
Chlorobenzene	ug/L	50	51.6	103	70-130	
Chloroethane	ug/L	50	47.0	94	70-130	
Chloroform	ug/L	50	47.7	95	70-130	
Chloromethane	ug/L	50	51.4	103	70-130	
cis-1,2-Dichloroethene	ug/L	50	54.2	108	70-130	
cis-1,3-Dichloropropene	ug/L	50	47.6	95	70-130	
Dibromochloromethane	ug/L	50	48.0	96	70-130	
Dibromomethane	ug/L	50	50.7	101	70-130	
Dichlorodifluoromethane	ug/L	50	47.3	95	70-130	
Diisopropyl ether	ug/L	50	52.8	106	70-130	
Ethylbenzene	ug/L	50	56.0	112	70-130	
Hexachloro-1,3-butadiene	ug/L	50	50.0	100	70-130	
m&p-Xylene	ug/L	100	113	113	70-130	
Methyl-tert-butyl ether	ug/L	50	51.5	103	70-130	
Methylene Chloride	ug/L	50	51.5	103	70-130	
Naphthalene	ug/L	50	47.8	96	70-130	
o-Xylene	ug/L	50	50.0	100	70-130	
p-Isopropyltoluene	ug/L	50	49.6	99	70-130	
Styrene	ug/L	50	52.2	104	70-130	
Tetrachloroethene	ug/L	50	57.7	115	70-130	
Toluene	ug/L	50	54.4	109	70-130	
trans-1,2-Dichloroethene	ug/L	50	54.4	109	70-130	
trans-1,3-Dichloropropene	ug/L	50	48.4	97	70-130	
Trichloroethene	ug/L	50	54.5	109	70-130	
Trichlorofluoromethane	ug/L	50	47.0	94	70-130	
Vinyl acetate	ug/L	100	110	110	70-130	
Vinyl chloride	ug/L	50	56.1	112	70-130	
Xylene (Total)	ug/L	150	163	109	70-130	
1,2-Dichloroethane-d4 (S)	%			99	70-130	
4-Bromofluorobenzene (S)	%			99	70-130	
Toluene-d8 (S)	%			100	70-130	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: MSV/30811
QC Batch Method: EPA 8260
Analysis Method: EPA 8260
Analysis Description: 8260 MSV Low Level SC
Associated Lab Samples: 92241216001

METHOD BLANK: 1415090
Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	03/19/15 13:35	
1,1,1-Trichloroethane	ug/L	ND	1.0	03/19/15 13:35	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	03/19/15 13:35	
1,1,2-Trichloroethane	ug/L	ND	1.0	03/19/15 13:35	
1,1-Dichloroethane	ug/L	ND	1.0	03/19/15 13:35	
1,1-Dichloroethene	ug/L	ND	1.0	03/19/15 13:35	
1,1-Dichloropropene	ug/L	ND	1.0	03/19/15 13:35	
1,2,3-Trichlorobenzene	ug/L	ND	1.0	03/19/15 13:35	
1,2,3-Trichloropropane	ug/L	ND	1.0	03/19/15 13:35	
1,2,4-Trichlorobenzene	ug/L	ND	1.0	03/19/15 13:35	
1,2-Dibromo-3-chloropropane	ug/L	ND	2.0	03/19/15 13:35	
1,2-Dichlorobenzene	ug/L	ND	1.0	03/19/15 13:35	
1,2-Dichloroethane	ug/L	ND	1.0	03/19/15 13:35	
1,2-Dichloropropane	ug/L	ND	1.0	03/19/15 13:35	
1,3-Dichlorobenzene	ug/L	ND	1.0	03/19/15 13:35	
1,3-Dichloropropane	ug/L	ND	1.0	03/19/15 13:35	
1,4-Dichlorobenzene	ug/L	ND	1.0	03/19/15 13:35	
2,2-Dichloropropane	ug/L	ND	1.0	03/19/15 13:35	
2-Butanone (MEK)	ug/L	ND	5.0	03/19/15 13:35	
2-Chlorotoluene	ug/L	ND	1.0	03/19/15 13:35	
2-Hexanone	ug/L	ND	5.0	03/19/15 13:35	
4-Chlorotoluene	ug/L	ND	1.0	03/19/15 13:35	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	5.0	03/19/15 13:35	
Acetone	ug/L	ND	25.0	03/19/15 13:35	
Benzene	ug/L	ND	1.0	03/19/15 13:35	
Bromobenzene	ug/L	ND	1.0	03/19/15 13:35	
Bromochloromethane	ug/L	ND	1.0	03/19/15 13:35	
Bromodichloromethane	ug/L	ND	1.0	03/19/15 13:35	
Bromoform	ug/L	ND	1.0	03/19/15 13:35	
Bromomethane	ug/L	ND	5.0	03/19/15 13:35	
Carbon tetrachloride	ug/L	ND	1.0	03/19/15 13:35	
Chlorobenzene	ug/L	ND	1.0	03/19/15 13:35	
Chloroethane	ug/L	ND	1.0	03/19/15 13:35	
Chloroform	ug/L	ND	1.0	03/19/15 13:35	
Chloromethane	ug/L	ND	1.0	03/19/15 13:35	
cis-1,2-Dichloroethene	ug/L	ND	1.0	03/19/15 13:35	
cis-1,3-Dichloropropene	ug/L	ND	1.0	03/19/15 13:35	
Dibromochloromethane	ug/L	ND	1.0	03/19/15 13:35	
Dibromomethane	ug/L	ND	1.0	03/19/15 13:35	
Dichlorodifluoromethane	ug/L	ND	1.0	03/19/15 13:35	
Diisopropyl ether	ug/L	ND	1.0	03/19/15 13:35	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

METHOD BLANK: 1415090 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethylbenzene	ug/L	ND	1.0	03/19/15 13:35	
Hexachloro-1,3-butadiene	ug/L	ND	1.0	03/19/15 13:35	
m&p-Xylene	ug/L	ND	2.0	03/19/15 13:35	
Methyl-tert-butyl ether	ug/L	ND	1.0	03/19/15 13:35	
Methylene Chloride	ug/L	ND	2.0	03/19/15 13:35	
Naphthalene	ug/L	ND	1.0	03/19/15 13:35	
o-Xylene	ug/L	ND	1.0	03/19/15 13:35	
p-Isopropyltoluene	ug/L	ND	1.0	03/19/15 13:35	
Styrene	ug/L	ND	1.0	03/19/15 13:35	
Tetrachloroethene	ug/L	ND	1.0	03/19/15 13:35	
Toluene	ug/L	ND	1.0	03/19/15 13:35	
trans-1,2-Dichloroethene	ug/L	ND	1.0	03/19/15 13:35	
trans-1,3-Dichloropropene	ug/L	ND	1.0	03/19/15 13:35	
Trichloroethene	ug/L	ND	1.0	03/19/15 13:35	
Trichlorofluoromethane	ug/L	ND	1.0	03/19/15 13:35	
Vinyl acetate	ug/L	ND	2.0	03/19/15 13:35	
Vinyl chloride	ug/L	ND	1.0	03/19/15 13:35	
Xylene (Total)	ug/L	ND	2.0	03/19/15 13:35	
1,2-Dichloroethane-d4 (S)	%	109	70-130	03/19/15 13:35	
4-Bromofluorobenzene (S)	%	97	70-130	03/19/15 13:35	
Toluene-d8 (S)	%	95	70-130	03/19/15 13:35	

LABORATORY CONTROL SAMPLE: 1415091

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	54.5	109	70-130	
1,1,1-Trichloroethane	ug/L	50	55.7	111	70-130	
1,1,2,2-Tetrachloroethane	ug/L	50	49.9	100	70-130	
1,1,2-Trichloroethane	ug/L	50	52.6	105	70-130	
1,1-Dichloroethane	ug/L	50	52.0	104	70-130	
1,1-Dichloroethene	ug/L	50	52.2	104	70-130	
1,1-Dichloropropene	ug/L	50	53.1	106	70-130	
1,2,3-Trichlorobenzene	ug/L	50	59.3	119	70-130	
1,2,3-Trichloropropane	ug/L	50	50.0	100	70-130	
1,2,4-Trichlorobenzene	ug/L	50	52.3	105	70-130	
1,2-Dibromo-3-chloropropane	ug/L	50	54.4	109	70-130	
1,2-Dichlorobenzene	ug/L	50	53.9	108	70-130	
1,2-Dichloroethane	ug/L	50	48.5	97	70-130	
1,2-Dichloropropane	ug/L	50	53.0	106	70-130	
1,3-Dichlorobenzene	ug/L	50	53.0	106	70-130	
1,3-Dichloropropane	ug/L	50	54.2	108	70-130	
1,4-Dichlorobenzene	ug/L	50	50.8	102	70-130	
2,2-Dichloropropane	ug/L	50	40.2	80	70-130	
2-Butanone (MEK)	ug/L	100	97.4	97	70-130	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

LABORATORY CONTROL SAMPLE: 1415091

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2-Chlorotoluene	ug/L	50	51.7	103	70-130	
2-Hexanone	ug/L	100	107	107	70-130	
4-Chlorotoluene	ug/L	50	54.4	109	70-130	
4-Methyl-2-pentanone (MIBK)	ug/L	100	97.1	97	70-130	
Acetone	ug/L	100	95.9	96	70-130	
Benzene	ug/L	50	55.8	112	70-130	
Bromobenzene	ug/L	50	53.5	107	70-130	
Bromochloromethane	ug/L	50	53.6	107	70-130	
Bromodichloromethane	ug/L	50	48.7	97	70-130	
Bromoform	ug/L	50	49.9	100	70-130	
Bromomethane	ug/L	50	44.5	89	70-130	
Carbon tetrachloride	ug/L	50	52.2	104	70-130	
Chlorobenzene	ug/L	50	52.7	105	70-130	
Chloroethane	ug/L	50	44.2	88	70-130	
Chloroform	ug/L	50	47.3	95	70-130	
Chloromethane	ug/L	50	48.7	97	70-130	
cis-1,2-Dichloroethene	ug/L	50	54.0	108	70-130	
cis-1,3-Dichloropropene	ug/L	50	48.6	97	70-130	
Dibromochloromethane	ug/L	50	49.8	100	70-130	
Dibromomethane	ug/L	50	52.5	105	70-130	
Dichlorodifluoromethane	ug/L	50	42.6	85	70-130	
Diisopropyl ether	ug/L	50	52.4	105	70-130	
Ethylbenzene	ug/L	50	55.8	112	70-130	
Hexachloro-1,3-butadiene	ug/L	50	54.0	108	70-130	
m&p-Xylene	ug/L	100	112	112	70-130	
Methyl-tert-butyl ether	ug/L	50	53.0	106	70-130	
Methylene Chloride	ug/L	50	51.3	103	70-130	
Naphthalene	ug/L	50	50.7	101	70-130	
o-Xylene	ug/L	50	50.1	100	70-130	
p-Isopropyltoluene	ug/L	50	50.0	100	70-130	
Styrene	ug/L	50	53.0	106	70-130	
Tetrachloroethene	ug/L	50	59.6	119	70-130	
Toluene	ug/L	50	54.8	110	70-130	
trans-1,2-Dichloroethene	ug/L	50	54.7	109	70-130	
trans-1,3-Dichloropropene	ug/L	50	49.5	99	70-130	
Trichloroethene	ug/L	50	54.2	108	70-130	
Trichlorofluoromethane	ug/L	50	44.5	89	70-130	
Vinyl acetate	ug/L	100	109	109	70-130	
Vinyl chloride	ug/L	50	51.9	104	70-130	
Xylene (Total)	ug/L	150	162	108	70-130	
1,2-Dichloroethane-d4 (S)	%			97	70-130	
4-Bromofluorobenzene (S)	%			100	70-130	
Toluene-d8 (S)	%			101	70-130	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: WET/36312 Analysis Method: SM 4500-S2D
QC Batch Method: SM 4500-S2D Analysis Description: 4500S2D Sulfide Water
Associated Lab Samples: 92241216001

METHOD BLANK: 1414433 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfide	mg/L	ND	0.10	03/20/15 14:30	

LABORATORY CONTROL SAMPLE: 1414434

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfide	mg/L	.5	0.53	106	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1414435 1414436

Parameter	Units	92241686001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfide	mg/L	ND	.5	.5	0.50	0.50	100	100	90-110	0	10	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: WETA/22246 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 92241216001

METHOD BLANK: 1412772 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	2.0	03/17/15 22:26	

LABORATORY CONTROL SAMPLE: 1412773

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	20	19.0	95	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1412774 1412775

Parameter	Units	92240945001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	10.4	20	20	30.0	30.1	98	99	90-110	1	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1412776 1412777

Parameter	Units	92241121004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	83400J ug/L	20	20	101	99.3	88	80	90-110	2	10	M1

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: WETA/22228 Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 92241216001

METHOD BLANK: 1411837 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	03/16/15 18:31	

LABORATORY CONTROL SAMPLE: 1411838

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	5	5.1	103	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1411839 1411840

Parameter	Units	92241197001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	0.10	5	5	5.0	5.1	99	99	90-110	1	7	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1411982 1411983

Parameter	Units	92241290004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Ammonia	mg/L	ND	5	5	4.8	4.7	96	94	90-110	3	7	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: WETA/22207
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite, Unpres.
Associated Lab Samples: 92241216001

METHOD BLANK: 1411218 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/L	ND	0.020	03/13/15 22:06	
Nitrogen, Nitrite	mg/L	ND	0.020	03/13/15 22:06	
Nitrogen, NO2 plus NO3	mg/L	ND	0.020	03/13/15 22:06	

LABORATORY CONTROL SAMPLE: 1411219

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	2.5	2.4	97	90-110	
Nitrogen, Nitrite	mg/L	1	0.96	96	90-110	
Nitrogen, NO2 plus NO3	mg/L	2.5	2.4	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1411220 1411221

Parameter	Units	92241046001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Nitrate	mg/L	0.14	2.5	2.5	2.5	2.4	92	92	90-110	0	10	
Nitrogen, Nitrite	mg/L	ND	1	1	1.0	1.0	101	101	90-110	0	10	
Nitrogen, NO2 plus NO3	mg/L	0.14	2.5	2.5	2.5	2.4	92	92	90-110	0	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1411222 1411223

Parameter	Units	92241046002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Nitrate	mg/L	2.3	2.5	2.5	4.5	4.5	87	87	90-110	0	10	M1
Nitrogen, Nitrite	mg/L	ND	1	1	0.99	0.99	99	99	90-110	0	10	
Nitrogen, NO2 plus NO3	mg/L	2.3	2.5	2.5	4.5	4.5	87	87	90-110	0	10	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: WETA/44617 Analysis Method: EPA 365.4
QC Batch Method: EPA 365.4 Analysis Description: 365.4 Phosphorus
Associated Lab Samples: 92241216001

METHOD BLANK: 1158600 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus, Total (as P)	mg/L	ND	0.10	03/17/15 22:37	

LABORATORY CONTROL SAMPLE: 1158601

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus, Total (as P)	mg/L	4	4.1	101	90-110	

MATRIX SPIKE SAMPLE: 1158603

Parameter	Units	35179626001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Phosphorus, Total (as P)	mg/L	2.2	4	6.2	99	80-120	

SAMPLE DUPLICATE: 1158602

Parameter	Units	35179626001 Result	Dup Result	RPD	Max RPD	Qualifiers
Phosphorus, Total (as P)	mg/L	2.2	2.2	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: WETA/22236
QC Batch Method: SM 4500-Cl-E
Analysis Method: SM 4500-Cl-E
Analysis Description: 4500 Chloride
Associated Lab Samples: 92241216001

METHOD BLANK: 1412251 Matrix: Water
Associated Lab Samples: 92241216001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	03/17/15 01:47	

LABORATORY CONTROL SAMPLE: 1412252

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	20	20.4	102	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1412253 1412254

Parameter	Units	92241124001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	3140	9000	9000	12100	12100	99	100	90-110	0	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1412255 1412256

Parameter	Units	92241046003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Chloride	mg/L	1.5	20	20	21.0	20.6	97	95	90-110	2	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: Castlebridge 8611710
Pace Project No.: 92241216

QC Batch: WETA/27644
QC Batch Method: SM 5310C
Analysis Method: SM 5310C
Analysis Description: 5310C Total Organic Carbon
Associated Lab Samples: 92241216001

METHOD BLANK: 1129348 Matrix: Water
Associated Lab Samples:

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Organic Carbon	mg/L	ND	0.50	03/19/15 12:07	

LABORATORY CONTROL SAMPLE: 1129349

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Organic Carbon	mg/L	2.5	2.5	102	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1129350 1129351

Parameter	Units	92241216001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Total Organic Carbon	mg/L	ND	2.5	2.5	2.9	3.0	116	120	80-120	4	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALIFIERS

Project: Castlebridge 8611710
Pace Project No.: 92241216

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether, Styrene, and Vinyl chloride.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-A	Pace Analytical Services - Asheville
PASI-C	Pace Analytical Services - Charlotte
PASI-G	Pace Analytical Services - Green Bay
PASI-M	Pace Analytical Services - Minneapolis
PASI-O	Pace Analytical Services - Ormond Beach

ANALYTE QUALIFIERS

M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Castlebridge 8611710
Pace Project No.: 92241216

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92241216001	**MW-6D**	RSK 175	AIR/22750		
92241216001	**MW-6D**	EPA 200.7	MPRP/18077	EPA 200.7	ICP/16249
92241216001	**MW-6D**	EPA 200.7	MPRP/18082	EPA 200.7	ICP/16247
92241216001	**MW-6D**	EPA 8260	MSV/30811		
92241216002	**Trip Blank**	EPA 8260	MSV/30761		
92241216001	**MW-6D**	SM 4500-S2H	WET/36381		
92241216001	**MW-6D**	EPA 300.0	WETA/22246		
92241216001	**MW-6D**	EPA 350.1	WETA/22228		
92241216001	**MW-6D**	EPA 353.2	WETA/22207		
92241216001	**MW-6D**	EPA 365.4	WETA/44617	EPA 365.4	WETA/44634
92241216001	**MW-6D**	SM 4500-Cl-E	WETA/22236		
92241216001	**MW-6D**	SM 5310C	WETA/27644		

Pace Analytical www.pacelabs.com	Document Name: **Sample Condition Upon Receipt (SCUR)**	Document Revised: June 10, 2014 Page 1 of 2
	Document No.: F-ASV-CS-003-rev.14	Issuing Authorities: Pace Asheville Quality Office

Client Name: Terracon

Courier (Circle): Fed Ex UPS USPS Client Commercial Pace Other_____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ Other_____

Thermometer Used: IR Gun#3 -130265963 Type of Ice: (Wet) Blue None ☐ Samples on ice, cooling process has begun

IR Gun #4 SN:140290365 Other:_____

Temp Correction Factor: Add / Subtract 0.0 C

Corrected Cooler Temp.: 4.8 C Biological Tissue Is Frozen: Yes No N/A

Date and Initials of person examining contents: LDB 3/13/15

Temp should be above freezing to 6°C

		Comments:
Chain of Custody Present:	☐Yes ☑No ☐N/A	1.
Chain of Custody Filled Out:	☐Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☐Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☑Yes ☐No ☑N/A	6. NH4+C
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☐N/A	11.
Sample Labels match COC:	☐Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: WT		
All containers needing preservation have been checked.	☐Yes ☐No ☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☑Yes ☐No	
Samples checked for dechlorination:	☑Yes ☐No ☐N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☑No ☐N/A	15.
Trip Blank Present:	☐Yes ☑No ☐N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☐N/A	
Pace Trip Blank Lot # (if purchased):_____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted:_____ Date/Time:_____

Comments/ Resolution:_____

SCURF Review: NMG Date: 3-13-15

SRF Review: NJ Date: 031615

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

WO# : 92241216

92241216

Pace Analytical
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

1698487

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: Terracon	Report To: Craig Eady	Attention:
Address: 3534 Rutherford Rd Taylors, SC 29687	Copy To:	Company Name:
Email To: ceady@terracon.com	Purchase Order No.:	Address:
Phone: 864 292 2901 Fax:	Project Name: Castlebridge	Pace Quote Reference:
Requested Due Date/TAT: Standard	Project Number: 86117104	Pace Project Manager:
		Pace Profile #: 6917-2

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: SC

Section D Required Client Information

Matrix Codes (MATRIX / CODE): Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N: TOC by 5310C	Ammonia	Nitrate + Nitrite	Metals-Total (Mg + Fe)	Metals-Lab Filtered (Fe)	Chloride + Sulfate	Hydrogen Sulfide	Phosphate-Prod PL	Methane, Ethane, Ethene	VOC by 8260	FOC (Lacey Proj)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-6D	WT	G	—	—	3-13-15	1100	15	14									1	1	1	1	1	1	1	3	3	3	1		92241216 001
2																														002
3																														
4																														
5																														
6																														
7																														
8																														
9																														
10																														
11																														
12																														

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
		3-13-15	1155		3.13.15	1155	
		3.13.15	1357		3/13/15	1357	2.8 Y N Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Kyle Lowing

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 3-13-15

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

ORIGINAL

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

APPENDIX F

SIREM BUFFER CAPACITY STUDY

Prepared for:

Terracon
3534 Rutherford Rd
Taylors, SC 29687

Final Report

Buffering Capacity Testing

Castlebridge, Spartanburg, SC

Prepared by:

130 Research Lane, Suite 2
Guelph, Ontario N1G 5G3

SiREM Ref: S-3513

27 March 2015

siremlab.com

INTRODUCTION

Terracon retained SiREM to perform a buffer capacity test using sodium bicarbonate ($NaHCO_3$) to obtain a target pH of 7.0 ± 0.2 at the Castlebridge site in Spartanburg, SC (the Site). Three liters (L) of Site groundwater from the GP-22 (32-36) location and geologic material from the GP-23 (36-38) and the GP-24 (32-36) locations were collected on 5 March 2015. The samples arrived at SiREM on 13 March 2015 in good condition in a cooler with a measured temperature of 9°C. The samples were stored at 4.0 °C upon arrival until reactor construction. Refer to Attachment A for Chain of Custody documentation received with the samples.

CASE NARRATIVE

On 16 March 2015, Site groundwater and geologic material were transferred into a fume hood for reactor construction. In consultation with Terracon, the geologic materials from the two locations (GP-22 and GP-23) were homogenized together by hand to maximize reproducibility between replicates.

The reactors were constructed by adding 140 grams (g) of Site geologic material (wet weight) and adding 140 milliliters (mL) of Site groundwater to 250 mL (nominal volume) screw cap Boston round clear glass bottles (systems Plus, New Hamburg, ON). The bottles were capped with Mininert™ closures to allow repetitive sampling. Control and treatment reactors were prepared in duplicate.

The control reactors did not receive $NaHCO_3$ amendments and were sampled for pH analysis at Time 0 and after 1 and 7 days of incubation. The treatment reactors were amended with $NaHCO_3$ incrementally to reach a target pH of 7.0 ± 0.2 ,monitored every half hour on the day of construction (T=0), and adjusted as necessary after 1, 3 and 7 days of incubation. The pH of each reactor was measured with an Oakton water proof pH spear (Oakton Instruments, Vernon Hills, IL). The pH meter was calibrated at each sampling event using pH standards (pH 4.0, 7.0 and 10).

All reactors were mixed thoroughly after $NaHCO_3$ additions. The reactors were then allowed to settle prior to pH measurement and sampled using a 1 mL plastic syringe. Each titration was conducted by adding a series of saturated $NaHCO_3$ (96 gram per liter [g/L]) solution aliquots to the treatment reactors as required until the target pH was attained. Additional $NaHCO_3$ was not required after the initial pH adjustment to 7.0 ± 0.2 at T=0.

RESULTS

Table 1 provides a summary of the treatment reactor buffer demand. The buffer demand was calculated by converting the volume of $NaHCO_3$ added to the reactors to millimolar equivalents and dividing by the dry weight of geological material in the reactors.

Table 1: Reactor Buffer Demand

Sample	Average Initial pH (Slurry)	Target pH	Average final pH (Slurry)	Duration (Days)	Geologic Material Buffer Demand (g/kg)	Millimoles of $NaHCO_3$ per gram of geological material
Buffered Treatment Bottles 3 & 4	5.78	7.0 ± 0.2	6.79	7	1.37	1.631E-02

Table 2 provides a summary of the control and treatment reactor pH results and detailed $NaHCO_3$ amendment volumes throughout the study. The percent (%) dry weight of the geologic material was determined to be 77.54%%.

Tables

Table 2: Base Titration and Buffering Evaluation

Castlebridge Site, Spartanburg, South Carolina

GW + Soil Treatment
Bottles 1 & 2

Average volume of groundwater (mL)	138
Average mass of dry soil (g)	109
Concentration of $NaHCO_3$ (g/L)	96
Molecular Weight of $NaHCO_3$ (g/mol)	84.01

Date	Day	Time (h)	pH	
			Bottle 1	Bottle 2
17-Mar-15	0	0.0	5.97	5.76
		1.0	5.49	5.51
		2.0	5.53	5.54
		3.0	5.59	5.52
		4.0	5.53	5.59
		5.0	5.51	5.51
18-Mar-15	1	24.0	5.41	5.40
24-Mar-15	7	168.0	5.48	5.48

GW + Soil Buffered Treatment
Bottles3 & 4

Average volume of groundwater (mL)	138
Average mass of dry soil (g)	109
Concentration of $NaHCO_3$ (g/L)	96
Molecular Weight of $NaHCO_3$ (g/mol)	84.01

Date	Day	Time (h)	pH		Volume of Buffer solution added (mL)	Cumulative Buffer solution added (mL)	Buffer Demand (g/bottle)	Buffer Demand (g/kg)	Buffer Demand (mmol/g)
			Bottle 3	Bottle 4					
17-Mar-15	0	0.00	5.82	5.74	0.20	0.20	--	--	--
		0.75	6.52	6.29	0.05	0.25	--	--	--
		1.25	6.20	6.21	0.10	0.35	--	--	--
		1.75	6.22	6.26	0.20	0.55	--	--	--
		2.25	6.46	6.44	0.30	0.85	--	--	--
		2.75	6.65	6.70	0.20	1.05	--	--	--
		3.25	6.71	6.69	0.30	1.35	--	--	--
		3.75	6.85	6.82	0.20	1.55	--	--	--
		4.75	6.93	6.90	0.00	1.55	--	--	--
		5.25	6.99	6.94	0.00	1.55	0.15	1.37	1.63E-02
18-Mar-15	1	24	6.92	6.94	0.00	1.55	0.15	1.37	1.63E-02
20-Mar-15	3	72	7.02	7.02	0.00	1.55	0.15	1.37	1.63E-02
24-Mar-15	7	168	6.78	6.80	0.00	1.55	0.15	1.37	1.63E-02

Notes:

- - not analyzed
h - hours
g - grams
g/bottle - grams per bottle
g/kg - grams per kilogram
g/L - grams per liter
g/mol - grams per mole
mL - milliliter
mmol/g - millimoles per gram
$NaHCO_3$ - sodium bicarbonate

ATTACHMENT A: Chain of Custody Documentation

SiREM

Chain-of-Custody Form

siremlab.com

130 Research Lane, Ste 2
Guelph ON, Canada N1G 5G3
(519) 822-2265

Lab # S-3513

*Project Name: Castlebridge	*Project #: 36117109
*Project Manager: Craig Eady	*Company: Terracon
*Email Address: Ceady@terracon.com	
Address (Street): 3539 Rutherford Rd.	
City: Taylors	State/Province: SC
Country: USA	
*Phone #: ~~843~~ 864.292.8901	
*Sampler's Signature:	*Sampler's Printed Name: Kyle Lawing

Analysis

Client Sample ID	Sampling Date	Sampling Time	Matrix	# of Containers	Gene-Trac DHC	Gene-Trac VC	Gene-Trac DHB	Gene-Trac DHG	Treatability Study	Other Information
GP-22 (32-36)	3-5-15	1655	H2O	3					X	
GP-23 (36-38)	3-5-15	1750	Geolog	1					X	
GP-24 (32-36)	3-5-15	1745	Geolog	1					X	

Preservative Key

0. None
1. HCl
2. Other _____
3. Other _____
4. Other _____
5. Other _____
6. Other _____

Billing Information

P.O. #:

*Bill To: Terracon

Turnaround Time Requested

Normal ☒
Rush ☐

For Lab Use Only

Cooler Condition: good
Cooler Temperature: 4° C
Custody Seals: Yes ☐ No ☒

For Lab Use Only

Proposal #: _____

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature:	Signature:	Signature:	Signature:	Signature:	Signature:
Printed Name: Kyle Lawing	Printed Name: Tatiana Mantarak	Printed Name:	Printed Name:	Printed Name:	Printed Name:
Firm: Terracon	Firm: Sirem	Firm:	Firm:	Firm:	Firm:
Date/Time: 3-10-15	Date/Time: Mar 13/15, 2:30pm	Date/Time:	Date/Time:	Date/Time:	Date/Time:

Distribution: White - return to Originator; Yellow - Lab Copy; Pink - Retained by Client

* Mandatory Fields

APPENDIX G

REMEDIAL ALTERNATIVES PRESENT WORTH COST WORKSHEETS

PRESENT WORTH COST
GROUNDWATER ALTERNATIVE 1: NO ACTION
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL COST (DOLLARS)
NO CAPITAL COSTS RELATED TO THIS ALTERNATIVE				
TOTAL CONSTRUCTION COST				$0
PRESENT WORTH O&M COST				$13,000
TOTAL PRESENT WORTH COST (ROUNDED TO NEAREST THOUSAND)				**$13,000**

OPERATION AND MAINTENANCE COST
GROUNDWATER ALTERNATIVE 1: NO ACTION
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

Inflation Rate: 1.6% Real Discount Rate: 0.1%
Nominal Discount Rate: 1.7%

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL ANNUAL COST (DOLLARS)	OPERATION TIME (YEARS)	PRESENT WORTH
SITE REVIEW						
Remedy Review (5-year interval)	lump sum	1	$2,000	$400	30	$11,816
Subtotal						$11,816
Contingency (10% of O&M Cost)						$1,182
TOTAL						$12,998

PRESENT WORTH COST
GROUNDWATER ALTERNATIVE 2: ILUC
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL COST (DOLLARS)
IMPLEMENT DEED RESTRICTIONS				
Consulting	lump sum	1	$1,500	$1,500
Legal Fees, Licenses, and Permits	lump sum	1	$2,500	$2,500
Subtotal				$4,000
Contingency (25% of Subtotal)				$1,000
TOTAL CONSTRUCTION COST				$5,000
PRESENT WORTH O&M COST				$0
TOTAL PRESENT WORTH COST (ROUNDED TO NEAREST THOUSAND)				**$5,000**

OPERATION AND MAINTENANCE COST
GROUNDWATER ALTERNATIVE 2: ILUC
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

Inflation Rate: 1.6% Real Discount Rate: 0.1%
Nominal Discount Rate: 1.7%

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL ANNUAL COST (DOLLARS)	OPERATION TIME (YEARS)	PRESENT WORTH
NO OPERATIONS AND MAINTENANCE COSTS RELATED TO THIS ALTERNATIVE						
Subtotal						$0
Contingency (10% of O&M Cost)						$0
TOTAL						$0

PRESENT WORTH COST
GROUNDWATER ALTERNATIVE 3: MONITORED NATURAL ATTENUATION
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL COST (DOLLARS)
SAMPLING AND ANALYSIS PLAN DEVELOPMENT				
Consulting	lump sum	1	$2,500	$2,500
Subtotal				$2,500
Contingency (25% of Subtotal)				$625
TOTAL CONSTRUCTION COST				$3,125
PRESENT WORTH O&M COST				$97,968
TOTAL PRESENT WORTH COST (ROUNDED TO NEAREST THOUSAND)				**$101,000**

OPERATION AND MAINTENANCE COST
GROUNDWATER ALTERNATIVE 3: MONITORED NATURAL ATTENUATION
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

Inflation Rate: 1.6% Real Discount Rate: 0.1%
Nominal Discount Rate: 1.7%

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL ANNUAL COST (DOLLARS)	OPERATION TIME (YEARS)	PRESENT WORTH
GROUNDWATER MONITORING						
Sampling and Analysis (annually)	lump sum	1	$3,000	$3,000	20	$59,374.59
Reporting (annually)	lump sum	1	$1,500	$1,500	20	$29,687.30
Subtotal						$89,062
Contractor Fee (10% of O&M Cost)						$8,906
Legal Fees, Licenses, and Permits (5% of O&M Cost)						$4,453
Contingency (10% of O&M Cost)						$8,906
TOTAL						$97,968

PRESENT WORTH COST
GROUNDWATER ALTERNATIVE 4: ENHANCED REDUCTIVE DECHLORINATION
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL COST (DOLLARS)
MOBILIZATION	lump sum	1	$4,000	$4,000
INSTALLATION				
Permitting	lump sum	1	$3,000	$3,000
Injection Well Installation (temporary wells)	each	35	$750	$26,250
Injection Team (3-man team)	event	1	$20,000	$20,000
Emulsified Vegetable Oil and Amendments (1 injection event)	pounds	275	$300	$82,500
Subtotal - Capital Cost				$135,750
Legal Fees, Licenses, and Permits (5% of Capital Cost)				$6,788
Engineering and Administrative (15% of Capital Cost)				$20,363
Subtotal				$162,900
Contingency (25% of Subtotal)				$40,725
TOTAL CONSTRUCTION COST				$203,625
PRESENT WORTH O&M COST				$56,082
TOTAL PRESENT WORTH COST (ROUNDED TO NEAREST THOUSAND)				**$260,000**

OPERATION AND MAINTENANCE COST
GROUNDWATER ALTERNATIVE 4: ENHANCED REDUCTIVE DECHLORINATION
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

Inflation Rate: 1.6% Real Discount Rate: 0.1%
Nominal Discount Rate: 1.7%

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL ANNUAL COST (DOLLARS)	OPERATION TIME (YEARS)	PRESENT WORTH
GROUNDWATER MONITORING						
Sampling and Analysis (semi-annually)	lump sum	2	$3,000	$6,000	5	$29,910.21
Reporting (semi-annually)	lump sum	2	$1,500	$3,000	5	$14,955.10
Subtotal						$44,865
Contractor Fee (10% of O&M Cost)						$4,487
Legal Fees, Licenses, and Permits (5% of O&M Cost)						$2,243
Contingency (10% of O&M Cost)						$4,487
TOTAL						$56,082

PRESENT WORTH COST
GROUNDWATER ALTERNATIVE 5: **INSITU CHEMICAL OXIDATION**
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL COST (DOLLARS)
MOBILIZATION	lump sum	2	$1,500	$3,000
INSTALLATION				
Permitting	lump sum	1	$3,000	$3,000
Injection Well Installation (permanent wells)	each	35	$1,500	$52,500
Injection Team (3-man team)	event	2	$30,000	$60,000
Injection System Construction	lump sum	1	$3,500	$3,500
Sodium Permanganate	pounds	15,000	$4	$60,000
Subtotal - Capital Cost				$182,000
Legal Fees, Licenses, and Permits (5% of Capital Cost)				$9,100
Engineering and Administrative (15% of Capital Cost)				$27,300
Subtotal				$218,400
Contingency (25% of Subtotal)				$54,600
TOTAL CONSTRUCTION COST				$273,000
PRESENT WORTH O&M COST				$78,436
TOTAL PRESENT WORTH COST (ROUNDED TO NEAREST THOUSAND)				**$351,000**

OPERATION AND MAINTENANCE COST
GROUNDWATER ALTERNATIVE 5: **INSITU CHEMICAL OXIDATION**
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

Inflation Rate: 1.6% Real Discount Rate: 0.1%
Nominal Discount Rate: 1.7%

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL ANNUAL COST (DOLLARS)	OPERATION TIME (YEARS)	PRESENT WORTH
GROUNDWATER MONITORING						
Sampling and Analysis (semi-annually)	lump sum	2	$3,000	$6,000	7	$41,832.50
Reporting (semi-annually)	lump sum	2	$1,500	$3,000	7	$20,916.25
Subtotal						$62,749
Contractor Fee (10% of O&M Cost)						$6,275
Legal Fees, Licenses, and Permits (5% of O&M Cost)						$3,137
Contingency (10% of O&M Cost)						$6,275
TOTAL						$78,436

PRESENT WORTH COST
GROUNDWATER ALTERNATIVE 6: **AIR SPARGING / SOIL VAPOR EXTRACTION**
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL COST (DOLLARS)
MOBILIZATION	lump sum	1	$5,000	$5,000
INSTALLATION				
Pilot Study	lump sum	1	$5,000	$5,000
Permitting	lump sum	1	$7,000	$7,000
AS Well Installation	each	35	$1,500	$52,500
SVE Well Installation	each	9	$1,000	$9,000
AS/SVE System Installation	lump sum	2	$75,000	$150,000
Subtotal - Capital Cost				$228,500
Legal Fees, Licenses, and Permits (5% of Capital Cost)				$11,425
Engineering and Administrative (15% of Capital Cost)				$34,275
Subtotal				$274,200
Contingency (25% of Subtotal)				$68,550
TOTAL CONSTRUCTION COST				$342,750
PRESENT WORTH O&M COST				$514,665
TOTAL PRESENT WORTH COST (ROUNDED TO NEAREST THOUSAND)				**$857,000**

OPERATION AND MAINTENANCE COST
GROUNDWATER ALTERNATIVE 6: **AIR SPARGING / SOIL VAPOR EXTRACTION**
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

Inflation Rate: 1.6% Real Discount Rate: 0.1%
Nominal Discount Rate: 1.7%

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL ANNUAL COST (DOLLARS)	OPERATION TIME (YEARS)	PRESENT WORTH
GROUNDWATER MONITORING						
Sampling and Analysis (semi-annually)	lump sum	2	$3,000	$6,000	10	$59,671.32
Reporting (semi-annually)	lump sum	2	$1,500	$3,000	10	$29,835.66
AS/SVE SYSTEM O&M						
Equipment Maintenance (2 systems)	month	12	$1,200	$14,400	10	$143,211
Utility Costs (2 systems)	month	12	$1,500	$18,000	10	$179,014
Subtotal						$411,732
Contractor Fee (10% of O&M Cost)						$41,173
Legal Fees, Licenses, and Permits (5% of O&M Cost)						$20,587
Contingency (10% of O&M Cost)						$41,173
TOTAL						$514,665

PRESENT WORTH COST
GROUNDWATER ALTERNATIVE 7: PERMEABLE REACTIVE BARRIER
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL COST (DOLLARS)
MOBILIZATION	lump sum	1	$20,000	$20,000
INSTALLATION				
Bench Scale Study	lump sum	1	$10,000	$10,000
Permitting	lump sum	1	$4,000	$4,000
Barrier Installation (3 feet thick, 500 feet long, 40 feet deep)	cubic yards	2,400	$500	$1,200,000
Subtotal - Capital Cost				$1,234,000
Legal Fees, Licenses, and Permits (5% of Capital Cost)				$61,700
Engineering and Administrative (15% of Capital Cost)				$185,100
Subtotal				$1,480,800
Contingency (25% of Subtotal)				$370,200
TOTAL CONSTRUCTION COST				$1,851,000
PRESENT WORTH O&M COST				$111,884
TOTAL PRESENT WORTH COST (ROUNDED TO NEAREST THOUSAND)				**$1,963,000**

OPERATION AND MAINTENANCE COST
GROUNDWATER ALTERNATIVE 7: PERMEABLE REACTIVE BARRIER
FEASIBILITY STUDY
CASTLEBRIDGE PROPERTIES SITE
SPARTANBURG, SC
TERRACON PROJECT NO. 86117104

Inflation Rate: 1.6% Real Discount Rate: 0.1%
Nominal Discount Rate: 1.7%

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE (DOLLARS)	TOTAL ANNUAL COST (DOLLARS)	OPERATION TIME (YEARS)	PRESENT WORTH
GROUNDWATER MONITORING						
Sampling and Analysis (semi-annually)	lump sum	2	$3,000	$6,000	10	$59,671.32
Reporting (semi-annually)	lump sum	2	$1,500	$3,000	10	$29,835.66
Subtotal						$89,507
Contractor Fee (10% of O&M Cost)						$8,951
Legal Fees, Licenses, and Permits (5% of O&M Cost)						$4,475
Contingency (10% of O&M Cost)						$8,951
TOTAL						$111,884