EMA
Environmental Management Associates, LLC

June 18, 2013 Reference No. 559

Ms. Kristen Ritter Rivera
Georgia Environmental Protection Division
Hazardous Sites Response Program
Floyd Towers East, Suite #1462
2 Martin Luther king Jr. Drive, SE
Atlanta, Georgia 30334-9000

Dear Ms. Ritter Rivera:

Re: VRP Compliance Status Report
Professional Cleaners & Linen Service
2040 Beaver Ruin Road, Norcross, GA

On behalf of Indian Trail Retail Assoc, LP, Environmental Management Associates, LLC (EMA) has attached the VRP Compliance Status Report for the above-referenced site (Site).

Should you have any questions related to this correspondence, please contact the undersigned at (770) 271-4628.

Yours truly,

Environmental Management Associates, LLC

Brent Cortelloni, CHMM

Encl.

cc: Craig Harper – Indian Trail Retail Assoc., LP

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VOLUNTARY REMEDIATION PLAN - COMPLIANCE STATUS REPORT

PROFESSIONAL CLEANERS & LINEN SERVICE
2040 BEAVER RUIN ROAD
NORCROSS, GEORGIA

HSI No. NA

May 15, 2013

Prepared for

Indian Trail Retail Assoc., LP
P.O. Box 767127
Roswell, Georgia

Brent Cortelloni, CHMM
Project Manager

John O. Schwaller, P.G.
(GA. Registration No. 1617)

EMA
Environmental Management Associates, LLC
4488 Commerce Drive, Suite A
Buford, Georgia 30518

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GEORGIA REGISTERED PROFESSIONAL GEOLOGIST

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STATEMENT OF FINDINGS

Environmental Management Associates, LLC (EMA), on behalf of Indian Trail Retail Assoc., LP, prepared this Voluntary Remediation Plan - Compliance Status Report (VRP-CSR) for the Professional Cleaners & Linen Service site (Site) located at 2040 Beaver Ruin Road in Norcross, Gwinnett County, Georgia. The investigations and remediation focused on a release of tetrachloroethene (PCE) at a concentration exceeding the notification concentration listed in Appendix I of GEPD Rule 391-3-19-.04.

This VRP-CSR documents the following findings:

Soils

The soils at the Site meet the Type I RRS for PCE.

Groundwater

The on-Site groundwater PCE contamination has been remediated to levels between the Type 1 and Type 4 RRS. The current groundwater PCE concentrations are significantly below the calculated Alternative Concentration Limit (ACL) and are in compliance with the associated Type 2 RRS with controls, including an Environmental Covenant. The off-Site groundwater contamination attributed to the release located on the Lowes property is below the associated Type 2 RRS.

VRP-COMPLIANCE STATUS REPORT
Professional Cleaners & Linen Service Site (Indian Trail Retail Assoc, LP)
2040 Beaver Ruin Road
Norcross, Gwinnett County, Georgia 30318
Hazardous Site Inventory No. (Not Listed)

Certification of Compliance with Risk Reduction Standards

I certify under penalty of law that this report and all attachments were prepared under my direction in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Based on my review of the findings of this report with respect to the risk reduction standards of the Rules for Hazardous Site Response, Rule 391-3-19.07, I have determined that this site/property is in compliance with Type 1 of the risk reduction standards for soils and Type 2 risk reduction standards for groundwater with controls, including an Environmental Covenant.

Mr. Craig Harper
Printed Name (Owner/Operator)
Indian Trail Retail Assoc, LP
President of General Partner

Signature (Owner/Operator)

VRP-COMPLIANCE STATUS REPORT
Professional Cleaners & Linen Service Site (Indian Trail Retail Assoc, LP)
2040 Beaver Ruin Road
Norcross, Gwinnett County, Georgia 30318
Hazardous Site Inventory No. (Not Listed)

GROUNDWATER SCIENTIST STATEMENT

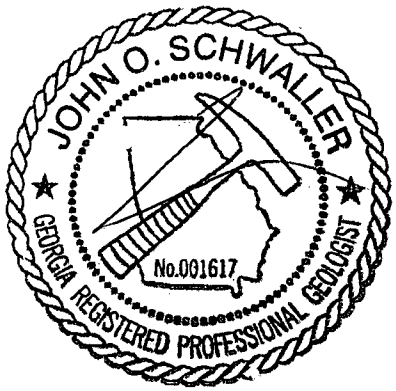
"I certify under penalty of law that this report and all attachments were prepared by me or under my direct supervision in accordance with the Voluntary Remediation Program Act (O.C.G.A. Section 12-8-101, et seq.). I am a professional engineer/professional geologist who is registered with the Georgia State Board of Registration for Professional Engineers and Land Surveyors/Georgia State Board for Professional Geologists and I have the necessary experience and am in charge of the investigation and remediation of this release of regulated substances.

Furthermore, to document my direct oversight of the Voluntary Remediation Plan development, implementation of corrective action, and log term monitoring, I have attached a monthly summary of hours invoiced and description of services provided by me to the Voluntary Remediation Program participant since the previous submittal to the Georgia Environmental Protection Division.

The information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. "

Mr. John O. Schwaller, P.G.
Georgia Registration No. 1617

Signature/Stamp



1.0 INTRODUCTION

The Professional Cleaners & Linen Service site (Site) is located at 2040 Beaver Ruin Road in Norcross, Gwinnett County, Georgia and is part of a 1.79-acre multi-tenant shopping center (Crossings Shopping Center) developed in 1984. The surrounding properties are predominantly commercial with some residential to the north. A dry cleaner has operated within one of the tenant spaces (Suite 15) since 1984 and is believed to be the source of the Site contamination. A topographic map (Property Location Map) of the surrounding area is included as Figure 1.

A Phase I and II Environmental Site Assessment (ESA) was completed in February 2011 for the subject property. During the Phase II ESA activities, a release of tetrachloroethene (PCE) was detected in the subsurface soils and groundwater above the applicable Notification Concentration (NC) referenced in Georgia Environmental Protection Division's (EPD) Hazardous Site Response Act (HSRA) Regulations Chapter 391-3-19, Appendix I. Within 30 day's of detection, the detected soils above the NC were removed from the Site based on the confirmatory soil sample results. A release notification to groundwater was subsequently submitted to EPD on April 7, 2011. It should be noted that PCE is the only contaminant of concern at this Site.

A Voluntary Investigation and Remediation Plan (VIRP) prepared by EMA was submitted to EPD on September 2, 2011. EPD approved the VIRP with conditions and comments in two letters dated March 6, 2012.

The first Semi-annual Voluntary Remediation Plan (VRP) Progress Report No. 1 was submitted in September 2012 in accordance with the VIRP and covered the activities conducted since the VIRP Application submittal up to September 2012. These activities included the groundwater source characterization, partial horizontal delineation, baseline groundwater monitoring, the initial groundwater application of the in-situ chemical oxidation (ISCO) reagent, and the subsequent post-injection quarterly monitoring event.

The Semi-annual VRP Progress Report No. 2 was submitted in March 2013 and covered the activities conducted since the submittal of the Semi-annual VRP Progress Report No. 1. These activities include the additional horizontal delineation of the on-Site

groundwater contamination, a second ISCO injection application, the second and third post-injection quarterly groundwater monitoring events, the drinking and surface water surveys, and the vapor intrusion and groundwater/surface water pathway evaluations.

The remaining sections of this VRP-CSR are organized as follows:

1. Section 2 provides a general description of Site characteristics and the source of the release;
2. Section 3 summarizes the Site soil investigations and analytical results;
3. Section 4 summarizes the groundwater investigation procedures;
4. Section 5 describes the physical characterization of the Site;
5. Section 6 describes the extent of soil and groundwater contamination;
6. Section 7 identifies release receptors and associated pathway evaluations;
7. Section 8 summarizes remedial actions performed to date;
8. Section 9 presents applicable risk reduction standards; and
9. Section 10 presents a summary and conclusions.

2.0 PROJECT BACKGROUND

The Crossings Shopping Center is 1.79 acres and was developed as a multi-tenant shopping center since 1984. The surrounding properties are predominantly commercial with some residential to the north. A dry cleaner has operated within one of the tenant spaces (Suite 15) since 1984, Professional Cleaners & Linen Service (EPA ID #GAD981269095). A Phase I and II ESA was completed by the previous consultant (GLE) in February 2011 for the subject property. During the Phase II ESA activities, a release of PCE was detected in the subsurface soils and groundwater above the applicable NC. Impacted soils above the NC were removed from the Site within 30 day's of detection as discussed later in Section 8.0. A release notification to groundwater was subsequently submitted to EPD on April 7, 2011.

2.1 SITE CHARACTERISTICS

The Site is located on the northeast side of the intersection of Indian Trail Road and Beaver Ruin Road. The tax parcel ID Number is 6212 036 and is zoned for commercial/industrial use. The Site covers approximately 1.79 acres and is completely covered by a building with a concrete floor (19,000 square ft.) and an asphalt parking lot. Depth to groundwater at this property ranges from 14 to 20 feet bgs. The Site is surrounded by commercial properties to the east (strip mall with gas station and a dry cleaner), west (office complex), and south and southeast (Lowes) and southwest (AutoSmith) and residential properties to the north. The nearest residence (Mr. Kwok Hon K Etal located at 5034 Cherokee Street) is approximately 200 feet to the north. The Site and surrounding properties are served by a public water supply system.

Surface water drainage across the Site is collected and drained via the storm sewers to a stormwater detention pond which discharges to the Gwinnett County Municipal Storm Sewer System. The closest hydraulically downgradient surface water body is Beaver Ruin Creek which is greater than 2,500 feet south-southeast from the Site. The Site is located in an area of lower groundwater pollution susceptibility based on the Groundwater Pollution Susceptibility Map of Georgia (Trent, 1992).

2.2 SOURCE OF THE RELEASE

The source of the release was the daily handling of the dry cleaning solvent near the former dry cleaning machine in Suite 15. Subsurface soil contamination was detected in borings installed threw the concrete slab in the immediate area surrounding the dry cleaning machine. While groundwater contamination was also reported hydraulically upgradient from this location (MW-1), soil sampling within these and other areas around the Site did not identify any other significant release sources as discussed later in this report.

2.3 NAME OF REGULATED SUBSTANCE RELEASED

The regulated substance detected on the Site, at concentrations greater than the applicable NCs, was PCE.

2.4 RESPONSIBLE PARTY(S)

The responsible party is Indian Trial Assoc., LTD.

3.0 SOIL INVESTIGATIONS

Based on the results of the Phase II ESA for the Property completed in February 2011, impacted soils under the building slab were removed in April 2011 as detailed later in Section 8.0. During the Phase II ESA, Geoprobe borings B-1, B-2, and B-3 were also advanced to ~30 feet below ground surface (bgs) at locations surrounding the dry cleaning operation (Suite 15) as illustrated on Figure 2. Soils were screened with an organic vapor analyzer and based on the levels detected were selectively submitted to the project laboratory for the analysis of target compound list (TCL) volatile organic compounds (VOCs). PCE was detected in the soil sample from B-2 (15 ft bgs) at a concentration of 13.6 micrograms per kilogram (µg/kg), which is below the applicable NC (180 µg/kg). The soil sample from B-3 (15 ft bgs) was free from detectable levels of TCL VOCs. A summary of the Phase II ESA soil data is included in Table 1. The boring logs are included in Appendix A.

In an effort to try and determine if a release occurred in the area surrounding monitoring well MW-1, EMA installed a hand auger boring B-4 to a depth of 1.5 feet bgs at a location where the blow down drain pipes from the boiler discharge at the rear of the building on July 21, 2011. The location of boring B-4 is also illustrated on Figure 2. The soil sample (BH-X) was collected by the grab method using a pre-cleaned stainless-steel hand auger directly into the pre-preserved sampling containers provided by the project laboratory and was submitted to the project laboratory for PCE analysis. PCE was reported at 33 µg/kg, which is also below the NC and Type I RRS for this analyte, as detailed in Table 2. A copy of the analytical report is included in Appendix B.

To further identify any other source areas, EMA collected a three-point composite surficial soil sample on September 10, 2012 from the on-Site stormwater detention pond to "screen" the soils within the pond. The soil samples were collected from the area directly below the three pipes that discharge stormwater into the pond. Grab soil samples were collected from three to six inches below the surface and homogenized in a stainless-steel bowl. The composite sample (Pond) was submitted to project laboratory for PCE analysis and was reported free from a detectable level of this COC. A copy of the analytical report is included in Appendix B.

4.0 GROUNDWATER INVESTIGATIONS

During the Phase II ESA, three groundwater samples were collected from Geoprobe borings B-1, B-2, and B-3. The groundwater samples were collected through the probe rods with a peristaltic pump and were submitted to the project laboratory for TCL VOCs analysis. PCE was reported in the groundwater samples collected from B-2 and B-3 at 1.53 microgram per liter (µg/L) and 16.1 µg/L, respectively. The sampling locations are illustrated on Figure 2. The results of this sampling including the analytical report were provided to EPD in the notification correspondence.

Based on EPD's correspondence dated June 7, 2011, three groundwater monitoring wells (MW-1, -2, -3) were installed to determine the groundwater flow direction and to try and delineate the horizontal extent of the PCE contamination. The wells were installed on June 30, 2011 and were sampled for PCE on July 1, 2011. The results of these activities, the associated analytical laboratory report, and stratigraphic and instrumentation logs were provided to EPD in correspondence dated July 12, 2011. Based on the highest PCE level that was reported in the groundwater sample collected from monitoring well MW-2 and the fact that this well is located closest to the source of the release, this sample was also analyzed for trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-DCE, and vinyl chloride. Only PCE was detected above the associated reporting limit.

An additional downgradient well (MW-4) was installed on July 21, 2011 to define the horizontal extent of the PCE contamination in groundwater. The well was sampled on July 22, 2011.

EPD requested additional horizontal delineation of the groundwater contamination at the source area and southwest of monitoring well MW-2 as detailed in the March 6, 2012 correspondence. EPD also requested that an additional well would be needed upgradient of monitoring well MW-1 to determine if contamination was from an off-Site source. Three groundwater monitoring wells (MW-5, MW-6, and MW-7) were installed on March 15, 2012 at locations agreed upon by EPD in e-mail correspondence. The wells were installed by Geo Lab Probing Services, Inc. under the supervision of EMA's Professional Geologist. Groundwater samples were collected from these wells and existing well MW-2 on March 19, 2012. The groundwater samples were submitted to the project laboratory for the analysis of TCL VOCs.

Prior to the initial ISCO injection, a baseline groundwater sampling event was conducted on March 19, 2012 for monitoring wells, MW-2, MW-5, MW-6, and MW-7 and on April 23, 2012 for wells MW-1, MW-3, and MW-4. The first quarterly sampling event following the initial ISCO injection was conducted on July 24, 2012 and included wells MW-1 thru MW-7. The second post-injection quarterly sampling event was conducted on October 14, 2012 and also included wells MW-1 thru MW-7. The groundwater samples were submitted to the project laboratory for analysis of TCL VOCs; chloride by SW-846 Method 9056A; hexavalent chromium by SW-846 7196; and select metals (arsenic, cadmium, chromium, barium, copper, iron, lead, manganese, and selenium) by SW-846 Method 6010C.

Following the submittal of the Semiannual VRP Progress Report No. 1, EPD requested additional horizontal groundwater delineation at locations south of the on-site stormwater detention pond, at a location 80 to 100 feet west of existing well MW-6, and hydraulically downgradient of existing well MW-4. The proposed well locations, well type, and installation methods were approved by EPD (Reuland to Cortelloni) in email dated November 19, 2012. Wells MW-8 and MW-9 were installed on December 10, 2012 by Geo Lab Probing Services, Inc.

The third post-injection quarterly sampling event was conducted on February 8, 2013 and included wells MW-1 thru MW-9. The groundwater samples were submitted for TCL VOCs, chloride, hexavalent chromium, and select metals (arsenic, cadmium, chromium, barium, copper, iron, lead, manganese, and selenium).

Based on the PCE groundwater contamination reported in the groundwater sample collected from monitoring well MW-4, an additional well (MW-10) was installed on the adjacent Lowes property to delineate the horizontal downgradient extent of contamination. This well was installed in a similar manner as MW-8 and MW-9 by GeoLab Probing Services, Inc. on February 11, 2013. A groundwater sample was collected from well MW-10 on February 12, 2013 and submitted to AES for TCL VOC analysis.

To define the vertical extent of the groundwater contamination, bedrock monitoring well MW-2D was installed on March 28, 2013 by GeoLab Probing Services, Inc. to a

depth of 75 feet bgs. A groundwater sample was collected from well MW-2D on April 4, 2013 and submitted to the project laboratory for analysis of TCL VOCs.

A copy of the stratigraphic and instrumentation logs for all of the wells are included in Attachment C.

The baseline and quarterly monitoring events included the collection of duplicate samples for TCL VOCs to assess precision and a trip blank sample was included with each sample set to assess cross-contamination during shipping. Field "rinsate" samples were not required since only disposable equipment for the sample collection was utilized.

4.1 MONITORING WELL GAUGING AND SAMPLING PROCEDURES

Static groundwater level measurements were recorded at each monitoring well prior to the sampling events. The measurements were made with a pre-cleaned "Slope" electronic water level detector and were reported to the nearest 0.01-foot based on a fixed point on the top of the well casing. The top of casing and ground surface elevations were measured with a CST/Berger Model SAL 28 surveying level based on an assumed datum. A summary of the ground surface, top of casing, and groundwater elevation data is provided in Table 3.

Groundwater samples, following the Phase II ESA, were collected using low-flow/low-stress purging and sampling technique referenced in USEPA Region IV's SESD Operating Procedures - Groundwater Sampling dated March 4, 2013. Peristaltic pumps with disposable Teflon or Teflon lined tubing was used for the purging and sampling. The "Soda Straw" method was used to collect the groundwater samples for the TCL VOCs or just in some cases for PCE. Groundwater samples collected for the general chemistry parameters and metals were collected directly into the sampling containers from the discharge tubing from the pump. The groundwater samples were submitted to Analytical Environmental Services, Inc. (AES) located in Atlanta, Georgia. AES is an accredited laboratory under the National Environmental Laboratory Accreditation Program (NELAC) (Accreditation ID: E87582).

4.2 ANALYTICAL RESULTS

There have been several groundwater sampling events from June 2011 to the most recent event in April 2013. The results of these events were previously provided to EPD in the VIRP Application and the subsequent VRP Progress Reports. A summary of the PCE analytical data is provided in Table 4. A summary of the geochemical and metal parameter data is provided in Table 5. It should be noted that groundwater remediation was occurring during the semiannual monitoring events so a significant decrease in PCE concentrations was observed in the background and source area monitoring wells.

A data quality assessment for each sampling event was conducted by EMA's chemist in accordance with USEPA's "Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review" dated February 1994, with revisions and updates. The data quality assessments involved the evaluation of the accuracy and precision of the data based on surrogate spike recoveries, matrix spike/matrix spike duplicate recoveries and relative percent differences, laboratory control samples, field duplicate samples for the baseline and quarterly events, and method blank results. Cross-contamination of VOCs was also monitored with trip blank samples. The trip blank samples were free from detectable levels of VOCs and therefore it does not appear that cross-contamination occurred. The field duplicate results indicated an adequate level of precision was achieved. The remainder of quality control sample data was within the control limits indicating that the data could be used without qualification.

The analytical reports not previously provided to EPD in the associated EMA Progress Reports are included in Appendix B.

5.0 SITE PHYSICAL CHARACTERIZATION

5.1 GEOLOGICAL SETTING

The regional geology and hydrogeology and the generalized stratigraphy beneath the Site are described in the sub-sections which follow. The description of regional geologic and hydrogeologic characteristics beneath the Site are based on literature made available by the Georgia Geologic Survey and is specifically noted herein where utilized.

5.2 REGIONAL GEOLOGY

The Property is located within the Piedmont Physiographic Province. The regional subsurface geologic setting is characterized by a gradational weathering profile with depth from soil to partially weathered rock (PWR) to competent bedrock. The soils of this province are generally characterized as silty sands and clays derived from the in-place weathering of the underlying bedrock (saprolite). The bedrock underlying the saprolite of this area has been highly metamorphosed and due to regional stresses contains complex folds which have been further intruded by plutons and dikes and faulted (Georgia Geologic Survey, 1984). The major bedrock units are comprised of metamorphic rock units of amphibolite, biotite, gneiss, and schist.

Groundwater occurs under unconfined conditions where the potentiometric surface is generally similar to the ground surface topography. Along topographically low areas, the water table typically occurs within the soil to PWR portions of the weathering profile, whereas along topographically high areas, the water table often occurs in the underlying bedrock.

5.3 PROPERTY GEOLOGY

The Site is primarily asphalt parking lot. The geologic units encountered during the investigation included:

- native silt with sand, sandy clay;
- saprolite;
- partially weathered bedrock; and

- bedrock.

The characteristics of the stratigraphic units encountered beneath the Site are illustrated on geologic cross section location map presented as Figure 3 and perpendicular geologic cross sections presented as Figures 4 and 5.

5.3.1 Lithology

Soil borings and monitoring wells were advanced to depths ranging from 13 to 42 feet bgs. In addition, one groundwater monitoring well was installed in the bedrock beneath the Site to depths of 75 feet bgs. The characteristics of the geologic units are discussed in the sub-sections which follow.

<u>Native Soils</u>

The native soils encountered beneath the Site at all borings and groundwater monitoring wells consist of silt that is sandy with some clay, and is medium dense, fine to very fine grained, and dry. Some minor sandy clay lenses (18 to 22 ft bgs) were encountered grading to saprolite to an approximate depth of 30 feet bgs.

<u>Saprolite</u>

The saprolite unit was encountered beneath the sandy silt. The saprolite is generally fine to medium grained, extremely dense, exhibiting structure and extends from approximately 30 ffet bgs to a depth of approximately 52 feet at which point drilling becomes more difficult and the partially weathered rock is encountered.

<u>Bedrock</u>

Partially weathered rock (PWR) is encountered at approximately 52 feet bgs at monitoring well MW-2D. Competent bedrock was observed in monitoring well MW-2D at a depth of 60 feet bgs. The bedrock was observed to be a fine grained granitic gneiss with some biotite, feldspar, and quartz filling. The unit is a most likely a member of the Atlanta Group.

5.4 REGIONAL HYDROGEOLOGY

As the Site is located in the southern Piedmont, groundwater occurs through recharge due to precipitation and upgradient surface water discharge. Groundwater yield is limited in the overburden soils due to clay content and mainly occurs at the soil/saprolite contact. Groundwater in the underlying bedrock aquifer consisting of highly metamorphosed granitic gneiss is primarily contained in secondary openings such as joints and fractures (Georgia Geologic Survey, 1983). Large groundwater supplies mainly occur in areas of contact zones, fault zones, in areas with stress relief fractures, localized zones of high fracture concentration, and small scale structures such as joints where the rock type inhomogeneity form planes of weakness that increase weathering thus increasing permeability.

Groundwater flow direction generally follows the topography of the area and groundwater yield ranges from 20 to 350 gallons per minute (gpm). Two water supply wells for the City of Norcross were completed in 1945 in the same locality and were completed to 342 and 385 feet bgs and delivered approximately 100 gallons per minute and a static water level of 80 feet bgs in the 1980's (Georgia Geologic Survey, 1983).

5.5 SITE HYDROGEOLOGY

Groundwater Flow Direction

Groundwater in the overburden is encountered within the saprolite layer. The groundwater table stabilizes at depths ranging from 15 to 17 feet bgs. Groundwater levels were measured numerous times throughout the project with a pre-cleaned Solinst electronic water level detector and were reported to the nearest 0.01-foot based on a fixed point on the top of the well casing. A summary of the groundwater level measurements collected on May 13, 2013 is provided in Table 3 and the resulting potentiometric surface map is presented as Figure 6. The groundwater flow direction is determined by plotting the groundwater elevations at each groundwater monitoring well and determining hydraulic potentiometric points between the groundwater monitoring wells and then connecting lines of equal potentiometric value. Groundwater flows from the highest points of potentiometric value to points of lower value.

Groundwater flow direction was consistently determined to be towards the southeast as currently presented on Figure 3.

Hydraulic Gradient

The gradient is calculated by determining the difference in groundwater elevations from the most upgradient and most downgradient groundwater monitoring wells and dividing by the distance between the two wells.

The hydraulic gradient across the site was calculated to be 0.02 foot/foot using the data presented on Figure 6.

Hydraulic Conductivity and Horizontal Velocity

Single well response testing (slug testing) to determine the approximate saturated hydraulic conductivity in the shallow overburden aquifer at the Site was conducted on monitoring well MW-4. Based on in-situ hydraulic conductivity testing (slug test) performed on monitoring well MW-4, the horizontal hydraulic conductivity is estimated at 1.25E-02 cm/sec.

The velocity across the Site using the estimated hydraulic conductivity value at MW-4 (1.25E-02 cm/sec or 35.43 ft/day), the average on-site gradient (0.02 foot/foot) calculated using May 2013 data, and an estimated effective porosity of 0.15 for sandy silt is 4.7 ft/day .

The PWR typically has a higher sand-size grain content and is therefore more transmissive than the surrounding saprolite, which has a higher clay content. The native soils, saprolite, PWR, and shallow bedrock aquifers are generally assumed to be interconnected.

6.0 EXTENT OF CONTAMINATION

6.1 GENERAL

The extent of contamination was based on the data determined following the soil removal and the groundwater remediation activities. The extent of the contamination to the applicable Type 1 RRS in the Site soils and groundwater is described in the subsections which follow.

6.2 SOILS

The impacted soils under the former dry cleaning machine with concentrations of PCE that exceeded the associated NC were removed in April 2011 as discussed later in Section 8.0. Confirmatory soil samples were collected from the base of the excavation and one from each of the four sidewalls to confirm the removal of the soils with concentrations of PCE above the associated NC. Following the initial confirmatory sampling, additional soils were removed from the base and sidewall, SWA. These two areas were re-sampled. The final confirmatory sampling locations (B-2, SWA-2, SWB-1, SWC-1, and SWD-1) are illustrated on Figure 7 and the associated analytical results are summarized in Table 2. The isoconcentration contour map is provided as Figure 8.

The remaining soils meet the applicable Type 1 RRS for PCE.

6.3 GROUNDWATER

The results of the 3rd quarterly monitoring event and the recent sampling results from newly installed wells MW-10 and MW-2D are summarized in Table 5. The current extent of the groundwater contamination is illustrated on Figure 8. The highest level of PCE detected during the 3rd quarterly event was 36 µg/L at location MW-2. Concentrations of PCE reported within the heart of the plume at MW-7 and at upgradient location MW-1 have been reduced to levels either below the reporting limit (BRL) or reported at the detection limit of 5 µg/L.

PCE extends off the Site in the groundwater in a southeasterly direction onto the Lowes property at concentrations that exceed the associated Type 1 RRS but below the associated Type 2 RRS. The vertical extent of the groundwater contamination is limited

to overburden aquifer based on the groundwater sampling results of shallow bedrock well MW-2D.

7.0 RELEASE RECEPTORS

The potential receptors are limited to human receptors. Ecological receptors do not appear possible based on the distance to the closest downgradient surface water body from the Property. The human receptors include the commercial workers at the Property and off-site residents with private drinking water wells downgradient from the Property. In addition, construction activities could take place in the future. Construction workers could potentially have short-term (<1 year) dermal exposure to contaminants in groundwater at concentrations above Type 1 RRS but below Type 4 RRS; however, the depth to groundwater is 17 feet bgs and therefore excavation to this depth and exposure are unlikely.

The Site and surrounding properties are served by a public water supply system. A USGS well search for public and private wells within a one-mile radius was completed to locate any wells within this radius. The well search was limited to a one-mile radius based on the toxicity of the associated contaminants detected and based on if the contaminant exceeded the associated Type 1 RRS. Based on the results of the well search and EPD's review of their internal database, six private wells were located at the Jones RV Park at 2200 Willowtrail Parkway, which is approximately 2,600 feet to the south. According to information provided by EPD, the closest one of the six wells is also 2,600 feet from the Site. EMA's well search correspondence and supporting documentation was previously provided to EPD in the notification documentation.

The closest hydraulically downgradient surface water body is Beaver Ruin Creek which is greater than 2,500 feet south-southeast from the Site. The locations of the Jones RV Park and this creek are identified on Figure 10.

7.1 PATHWAY EVALUATIONS

Pathway evaluations were completed for indoor air exposure, groundwater, and surface water as required by EPD's March 6, 2012 correspondence. Each pathway is discussed in the following subsections.

7.1.1 Indoor Air Exposure Pathway

PCE was detected in soils and the groundwater beneath the Professional Cleaners business. While the contamination has been reduced by soil removal and groundwater ISCO applications, low levels remain. The workers at the Professional Cleaners business may be subject to vapors emitting from the remaining PCE in subsurface soils below the slab and in the groundwater.

An initial screening evaluation was completed in accordance with the OSWER Draft Guidance for Evaluation of Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002. Based on the results of the Tier 1 and Tier 2 steps outlined in the Subsurface Vapor Intrusion Guidance, a site-specific pathway assessment was required. The site-specific evaluation was completed to determine the incidental risks resulting from vapor intrusion using USEPA's "User Guide for Evaluating Subsurface Vapor Intrusion into Buildings", dated February 22, 2004. The USEPA's "Johnson and Ettinger Model for Subsurface Vapor Intrusion into Buildings" (GW-ADV Version 3.1 and SL-ADV Version 3.1, February 2004) was used to model the potential exposure.

The highest of the five post-removal confirmatory soil sample results for PCE (71 µg/kg) was used in the soil model and the highest PCE concentration detected within the groundwater under the building (MW-7) since remediation (31 µg/L) was used in the groundwater model even though the current PCE concentration is non-detect. The space is a commercial dry cleaning operation with an exhaust fan so indoor air exchange rate was determined to be 3.1 (see determination in the notes in Tables 1 and 2 in Appendix D); however, a conservative value of one/half this amount (1.5) was used in the model (It should be noted that we can reduce the exchange rate value down to below 0.25 (USEPA default value) and increase the PCE value to the proposed ACL in these models without posing an unacceptable hazard). The toxicity values (Inhalation reference Contraction (RfC) and Unit Risk Factor (URF)) used in the evaluation were obtained from the USEPA Regional Screening Level Table (USEPA, November 2012). The Target Risk (TR) for PCE was set at 10^{-5}. A summary of all other input parameters are included in Tables 1 and 2 in Appendix D.

The estimated incremental risk from vapor intrusion in indoor air from the potential carcinogen in groundwater is 1.1E-9 and the estimated hazard index for the potential systemic toxicant in groundwater is 2.9E-4. The estimated

incremental risk from vapor intrusion in indoor air from the potential carcinogen in soil is 7.9E-9 and the estimated hazard index for the potential systemic toxicant in soil is 2.1E-3. The cumulative incremental risk for vapor intrusion from both soil and groundwater is 9.0E-9 and the cumulative hazard index is 0.00239. The results of the modeling are included in Appendix D.

Based on these results, the vapor intrusion would not pose an unacceptable hazard or risk to occupational receptors, and would not be of regulatory concern. In addition, the estimated indoor air concentrations would not exceed OSHA exposure limits for ongoing facility operations.

7.1.2 Groundwater Pathway

As discussed in Section 2.5, the closest drinking water receptor is 2,600 feet south from the Site. Therefore, the POE is a hypothetical drinking water receptor located 1,000 feet downgradient from the property boundary. In an effort to determine whether this hypothetical receptor would be impacted, EMA utilized the BIOCHLOR Natural Attenuation Decision Support System, Version 2.2 (BIOCHLOR) to assist in determining the concentration and time frame when dissolved phase PCE in groundwater reaches the hypothetical POE. The model was also utilized to develop an ACL to determine the highest concentration allowed at the source area before the POE would be impacted at a concentration above the Type 1 RRS.

For the Professional Cleaners Site, anaerobic dechlorination has not been confirmed or observed to be occurring. As there is such a small data set available, the most conservative model using solute transport without decay (No Degradation) was utilized to determine contaminant transport.

Following the calibration run and using the most conservative "No Degradation" results from the models, the following was determined:

- The Type I groundwater RRS for PCE of 5 µg/L is never observed at the hypothetical drinking water receptor using the current concentrations observed at the source area of 36 µg/L;
- The Type II groundwater RRS for PCE of 19 µg/L is never exceeded at the property boundary using the current concentrations observed at the source area of 36 µg/L;

- An ACL of 70 µg/L at the source area was determined from the model. This is the maximum concentration which would be allowed at the source area before the Type I RRS for PCE of 5 µg/L is exceeded at the hypothetical downgradient drinking water receptor located 1000 feet from edge of the property after 100 years.

The model detail, input parameters, and the model outputs are presented in Appendix E.

7.1.3 Surface Water Pathway

Based on the fate and transport modeling results for the groundwater pathway evaluation, the existing concentration of PCE or the proposed ACL will never impact the closest surface water body which is approximately 2,500 feet to the south-southeast at a concentration at or above the Georgia Instream Water Quality Standard (8.85 µg/L).

8.0 SUMMARY OF REMEDIAL ACTIONS PERFORMED

8.1 SOILS

REM-CON, on behalf of Indian Trail Assoc, LTD, initiated soil removal activities on April 2 and 8, 2011 to address the reported NC exceedances. The concrete floor was removed to allow access to the impacted soils. The impacted soils were excavated by manual methods and were transferred to two 55-gallon drums. The final excavation was approximately 4 feet wide by 4.33 feet long and 1.25 feet deep.

The soils were disposed of as a listed hazardous waste (F-002) based on the source of the release (used dry cleaning solvents). A total of 2 drums of soils were transported on April 15, 2011 by MCF Systems of Atlanta, Inc. to Giant Resource Recovery - Attalla, Inc. located in Attalla, Alabama. A copy of REM-CON's removal report was previously provided to EPD.

8.2 GROUNDWATER

The use of an in-situ chemical oxidation (ISCO) reagent sodium persulfate to reduce the existing groundwater contamination to levels at or below the Type I or II RRS was proposed as an option in the VIRP. The objective of the ISCO was to reduce the level of PCE by immediate dechlorination upon contact (residuals are carbon dioxide and water). The chemical oxidant used for this ISCO application was FMC Corporation's Klozur® sodium persulfate mixed with an alkaline activator (sodium hydroxide) to form sulfate and hydroxyl radicals that were injected into the aquifer at locations upgradient of MW-1 to slightly downgradient of well MW-2. This injection area included locations throughout the building in the area where the PCE plume was expected.

Prior to the ISCO injection, a Pilot Study Notification was submitted to EPD's Underground Injection Control Program in correspondence dated April 16, 2012. In addition, saturated soil and groundwater samples were collected from the Site and delivered to FMC Corporations laboratory to determine the soil oxygen demand (SOD) and sodium hydroxide demand of the background soils. FMC used this data along with the estimated horizontal and vertical extent of the groundwater contaminant plume and average PCE concentration to calculate the quantity of sodium persulfate and alkaline

activator needed to mineralize the existing groundwater PCE contamination. FMC determined that 2,750 pounds of sodium persulfate would be required to overcome the background SOD and effectively mineralize the PCE.

EMA's subcontractors, REM-CON and Geo Lab Probing Services, injected approximately 5,500 gallons of an alkaline activated 10 percent sodium persulfate solution in 15 direct push borings installed throughout the contaminant plume during the week of April 24, 2012 and on June 7, 2012. The sodium persulfate reagent was injected from the bottom up at five foot intervals in the top 20 feet of the aquifer. The injection area was from monitoring well MW-1 to well MW-2 and included several injection borings within the building.

Based on the analytical results from the first quarterly monitoring event conducted on July 24, 2012, a second formal injection was completed by REM-CON and GeoLab Probing Services on August 23 and 24, 2012. An additional 1,100 gallons of alkaline activated 17 percent sodium persulfate solution was injected into the contaminant plume. A detailed description of the ISCO injection activities was provided to EPD in the Semi-annual VRP Progress Report No. 1.

9.0 RISK REDUCTION STANDARDS

9.1 GENERAL

GEPD Rule 391-3-19-.07 allows for the determination of risk reduction standards that are protective of human health. Risk reduction standards are based on risk assessment procedures for standard or site-specific exposure assumptions. If the determined risk reduction standard is lower than the background and/or detection limit for the compound, the greater value of the background or detection limit can be used. The HSRA regulations include five types of risk reduction standards that can be used to determine the need for corrective action measures. The standards are described below:

1. Type 1 – risk reduction standards are based on standardized exposure assumptions to ensure that the regulated substance poses no significant risk to residential properties;

2. Type 2 – risk reduction standards are based on a site-specific risk assessment to ensure that the regulated substance poses no significant risk to residential properties;

3. Type 3 – risk reduction standards are based on standardized exposure assumptions to ensure that the regulated substance poses no significant risk to non-residential properties;

4. Type 4 – risk reduction standards are based on a site-specific risk assessment to ensure that the regulated substance poses no significant risk to non-residential properties; and

5. Type 5 – risk reduction standards involve the use of controls such as caps, slurry walls, fences, etc. to minimize risk when it is not appropriate and/or practical to apply Type 1-4 standards.

9.2 GENERATION OF RRS

The Type 1 RRS criteria for soils were developed for the Site as follows:

Concentrations at any point above the uppermost groundwater zone in soil that has been affected by a release shall not exceed the concentrations given in Table 2 of Appendix III of Rule 391-3-19 or, for those substances not listed, the least of the concentrations from items 1 through 3 below.

1) *Concentrations at any point above the uppermost groundwater zone in soil that has been affected by a release shall not exceed the higher of:*

   i) *soil concentrations in Appendix I, excluding any values given in square brackets;*

   ii) *multiplication of the Type 1 groundwater concentration criteria by a factor of 100;*

   iii) *demonstration through use of the Toxicity Characteristic Leaching Procedure, SW-846 Method 1311, or other method approved by the EPD Director that a concentration in soil will not generate leachate concentrations that exceed Type 1 groundwater concentration criteria;*

2) *concentrations which are unlikely to result in any noncancer toxic effects on human health via soil ingestion along with inhalation of particulates and volatiles, determined using Equation 7 of RAGS, Part B, and standard residential exposure assumptions in Table 3 of Appendix III;*

3) *concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to 10^{-5} (10^{-4} for Class C carcinogens) via soil ingestion and inhalation of particulates and volatiles, determined using Equation 6, RAGS, Part B, and standard residential exposure assumptions in Table 3 of Appendix III.*

The Type 1 RRS for PCE in soil calculated by EMA is 500 µg/kg.

The Type 1 RRS for PCE in groundwater was determined as follows:

At any point within any groundwater that has been affected by a release, concentrations of regulated substances in groundwater samples must not exceed concentrations in Table 1 of Appendix III or, for those substances not listed, the background or detection limit concentrations.

The Type 1 RRS for PCE in groundwater is 5 µg/L.

The Type 2 RRS is based on a site-specific risk assessment to ensure that the regulated substance poses no significant risk to a residential property. The Type 2 RRS for PCE in groundwater was calculated in accordance with the EPD Rule 391-3-19-.07 as follows:

At any point within any groundwater that has been affected by a release, concentrations of regulated substances in groundwater samples must not exceed the lesser of the values from items 1 and 2 below or, for those substances for which neither calculation can be made, the higher of concentrations in Table 1 of Appendix III, background concentrations, or detection limit concentrations.

1) *concentrations which are unlikely to result in any noncancer toxic effects on human health via ingestion of, or inhalation of volatiles from, groundwater, determined using equation 2 from RAGS, Part B, and site-specific exposure factors for the residential use scenario.*

2) *concentrations for which the upper bound on the estimated excess cancer risk is less than or equal to 10^{-5} via ingestion of, and inhalation of volatiles from, groundwater, determined using Equation 1 from RAGS, Part B, and site-specific exposure factors for the residential use scenario.*

The Type 2 RRS for PCE in groundwater calculated by EMA is 19 µg/L.

The Type 4 RRS is based on a site-specific risk assessment to ensure that the regulated substance poses no significant risk to a non-residential property. The Type 4 RRS was calculated using the same procedures and equations detailed for the Type 2 RRS for groundwater but the site-specific non-residential use exposure factors were substituted for the site-specific residential exposure factors. The Type 4 RRS for PCE in groundwater calculated by EMA is 98 µg/L.

The RRS calculation spreadsheets are included in Appendix F.

10.0 SUMMARY AND CONCLUSIONS

The investigations and remediation focused on a release of PCE at a concentration exceeding the notification concentration listed in Appendix I of GEPD Rule 391-3-19-.04.

This VRP-CSR documents the following findings:

Soils

The soils at the Site meet the Type 1 RRS for PCE.

Groundwater

The groundwater PCE contamination has been remediated to levels between the Type 1 and Type 4 RRS. The results of the fate and transport modeling indicate that the existing PCE concentrations will not impact the hypothetical downgradient drinking water receptor (1,000 feet from edge of property) at a concentration above the Type 1 RRS or the closest surface water body at a concentration above the Georgia ISWQS at any point in the future. The indoor air vapor intrusion modeling indicates that the existing concentrations of PCE remaining in the soils and groundwater will not pose an unacceptable hazard or risk to occupational receptors.

The current groundwater PCE concentrations are significantly below the calculated ACL and are in compliance with the associated Type 2 RRS with controls, including an Environmental Covenant. The draft Environmental Covenant will be provided to EPD after the VRP-CSR has been approved.

A summary of the initial estimate included in the VIRP and the updated estimate for the remaining tasks is included in Appendix G. We have also included a tabulated summary of the expenses since the last reporting period and a summary of hours charged by our Professional Geologist.

All of Which is Respectfully Submitted,

Environmental Management Associates, LLC

Brent Cortelloni, CHMM
Project Manager

John O. Schwaller, PG
(Georgia Reg. No. 1617)

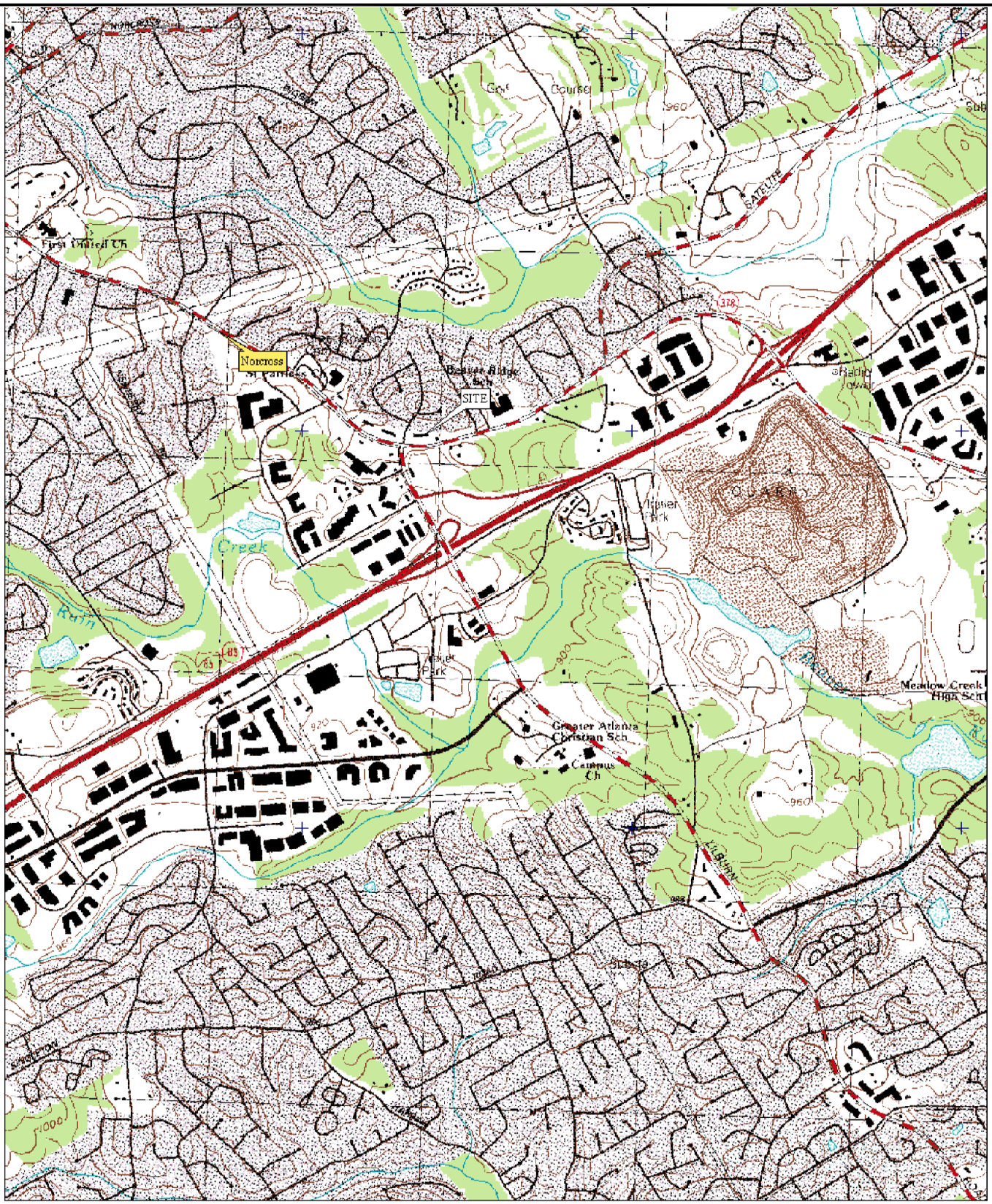
REFERENCES

1) Cressler, C.W., Thurmond, C.J., Hester, W.G., 1983, Groundwater in the Greater Atlanta Region, Information Circular 63, DNR, EPD, GGS.

2) McConnell, K.I., Abrams, C.E., 1984, Geology of the Greater Atlanta Region, Bulletin 96, DNR, EPD, GGS

3) Trent, V.P., 1992, *Ground-Water Pollution Susceptibility Map of Georgia*, Scale 1:500,000, Georgia Geologic Survey.

FIGURES



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

700 ft Scale: 1 : 24,000 Detail: 13-1 Datum: WGS84

N

Title

SITE LOCATION MAP

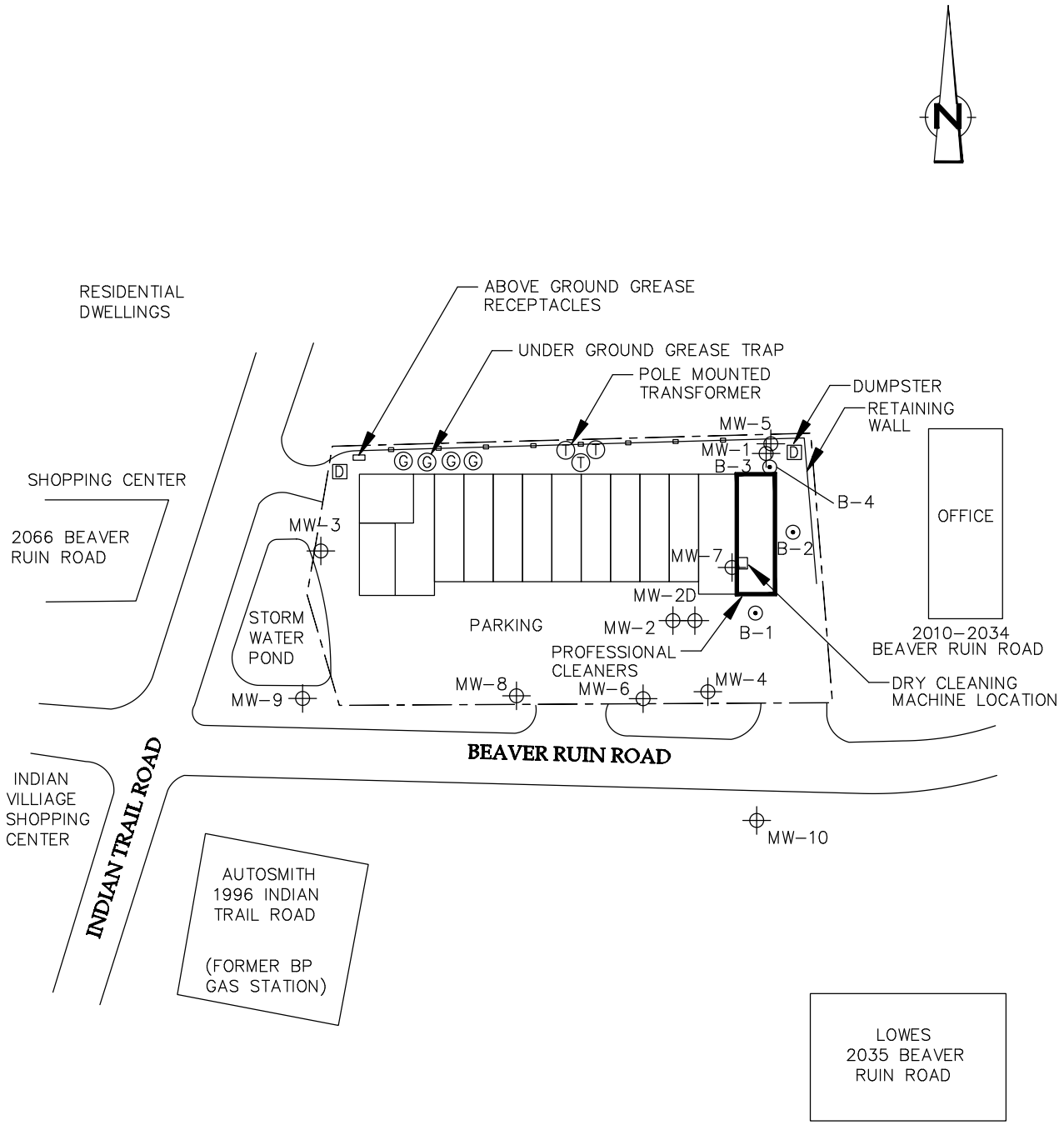
Site

PROFESSIONAL CLEANERS & LINEN SERVICE
2040 Beaver Ruin Road, Norcross, Georgia

EMA
Environmental Management Associates, LLC

Facility ID.

Figure
1



LEGEND:

B-1 ⊙ BOREHOLE LOCATION

MW-1 ⊕ MONITORING WELL LOCATION

NOTE:

BASE MAP CREATED FROM GLE ASSOCIATES, INC DRAWING 11000-11045 SHEET A-3.

0 50 100FT

SCALE

Title

SITE PLAN

Site

PROFESSIONAL CLEANERS & LINEN SERVICE

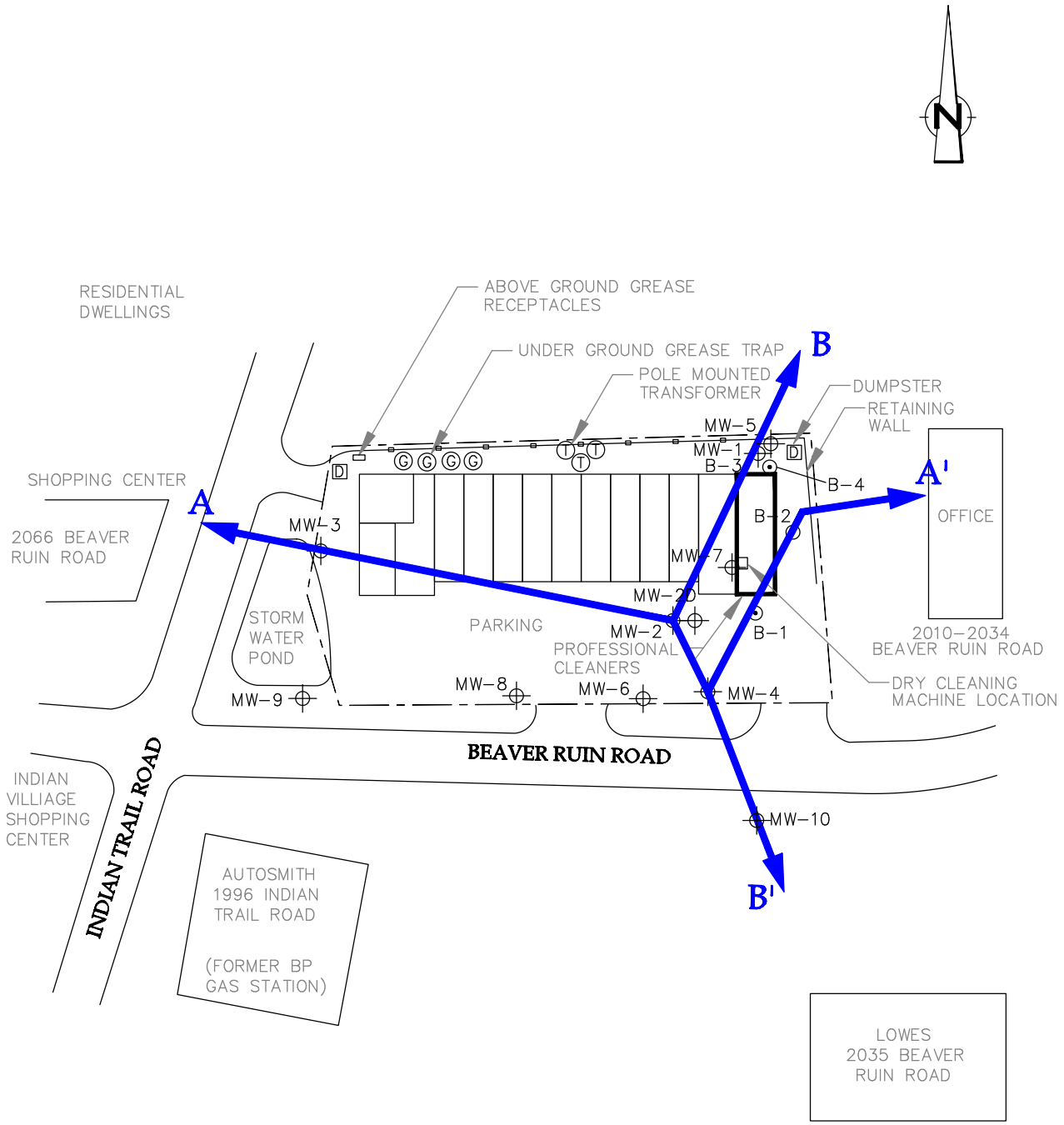
2040 Beaver Ruin Road, Norcross, Georgia

EMA

Environmental Management Associates, LLC

Facility ID.

Figure 2



LEGEND:

B-1 ⊙ BOREHOLE LOCATION

MW-1 ⊕ MONITORING WELL LOCATION

NOTE:

BASE MAP CREATED FROM GLE ASSOCIATES, INC DRAWING 11000-11045 SHEET A-3.

0 50 100FT

SCALE

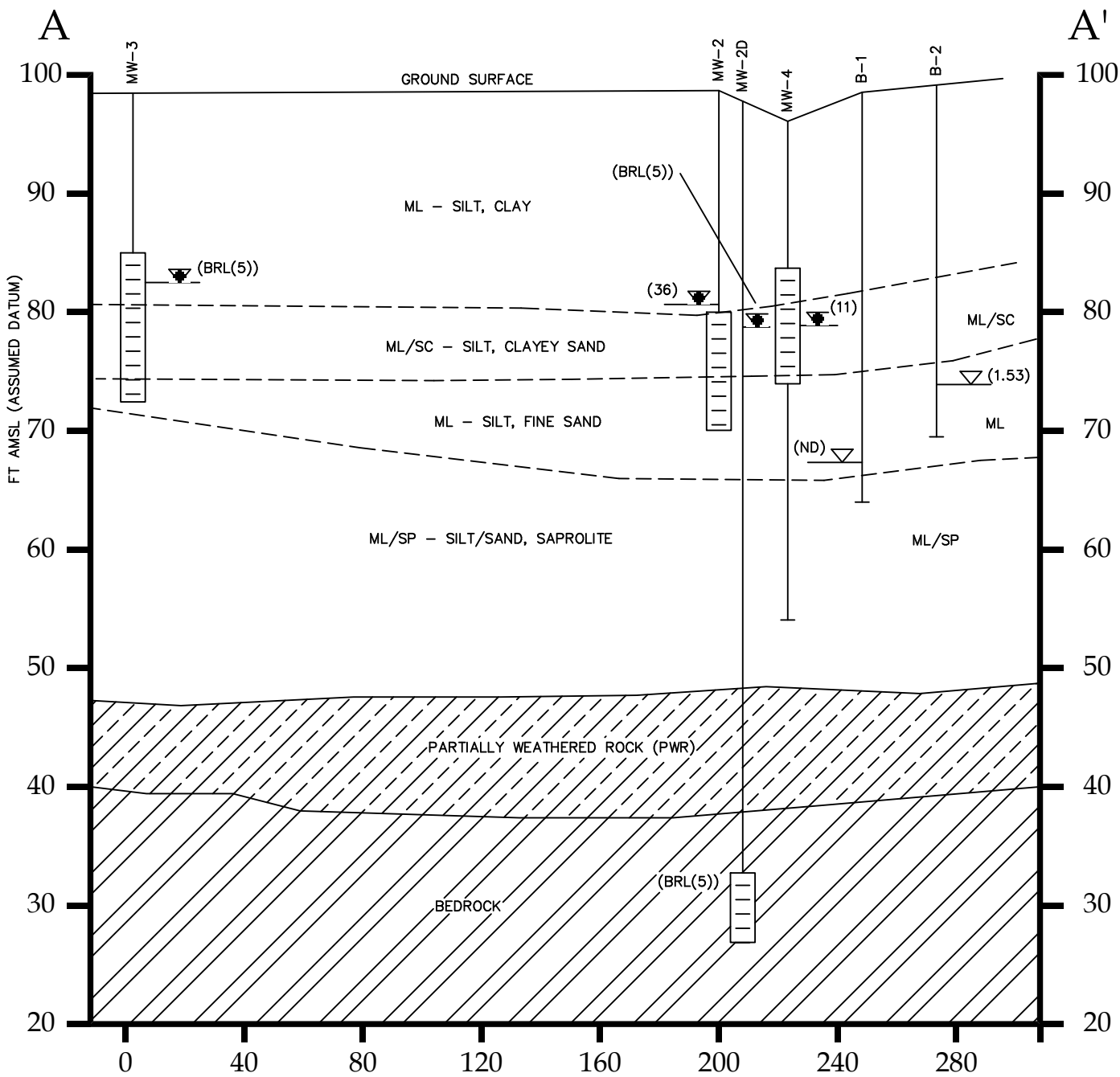
Title: CROSS-SECTION LOCATION MAP

Site: PROFESSIONAL CLEANERS & LINEN SERVICE
2040 Beaver Ruin Road, Norcross, Georgia

EMA
Environmental Management Associates, LLC

Facility ID.

Figure 3



LEGEND:

(62) PCE CONCENTRATION IN MICROGRAMS PER LITER

STABILIZED GROUINDWATER ELEVATION

GROUNDWATER DEPTH IN SOIL BORING

0 5 10FT
VERTICAL SCALE

0 20 40FT
HORIZONTAL SCALE

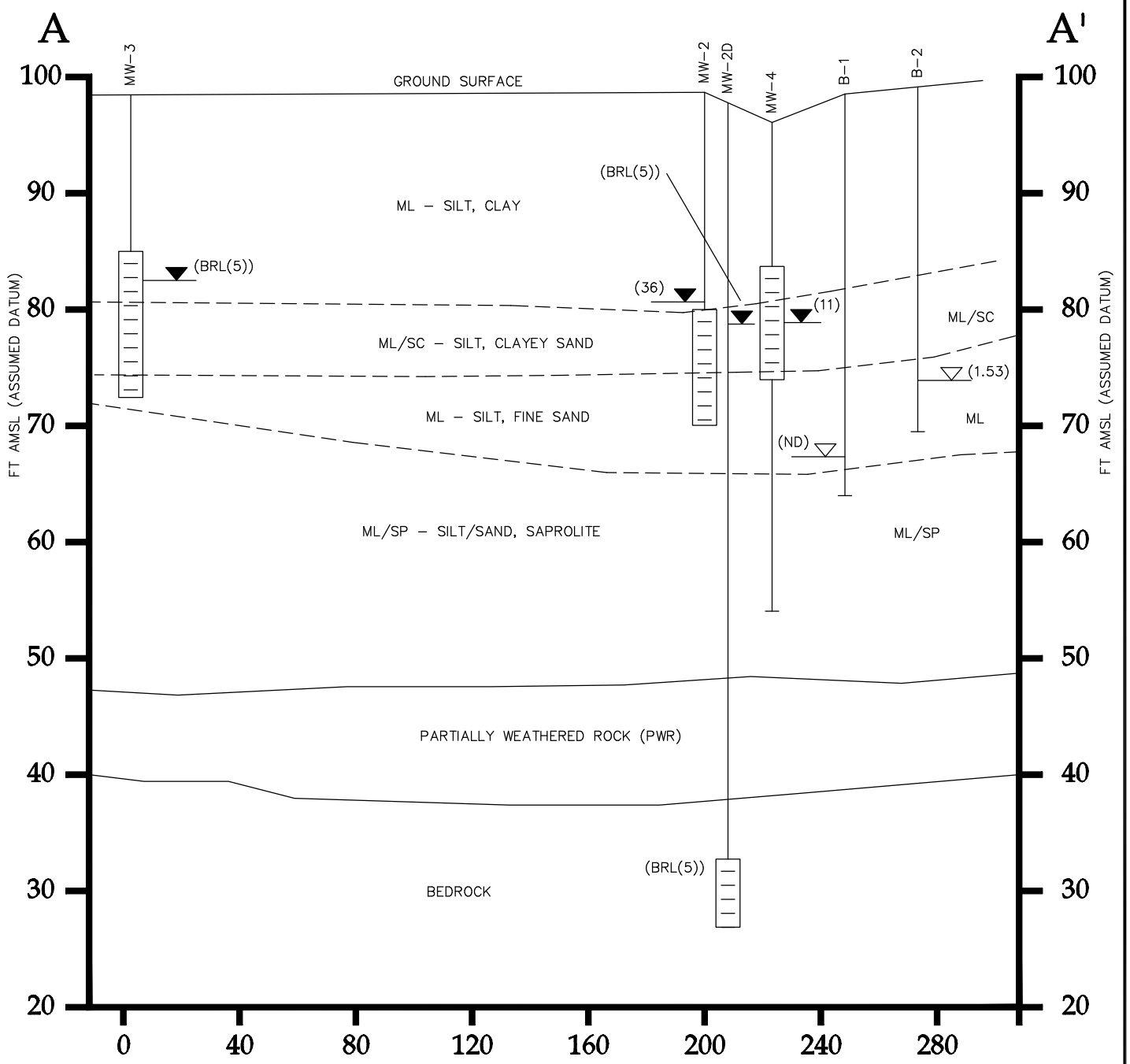
Title
CROSS SECTION A-A'

Site
PROFESSIONAL CLEANERS & LINEN SERVICE
2040 Beaver Ruin Road, Norcross, Georgia

EMA
Environmental Management Associates, LLC

Facility ID.

Figure
4



LEGEND:

(62) PCE CONCENTRATION IN MICROGRAMS PER LITER

▼ STABILIZED GROUINDWATER ELEVATION

▽ GROUNDWATER DEPTH IN SOIL BORING

0 5 10FT
VERTICAL SCALE

0 20 40FT
HORIZONTAL SCALE

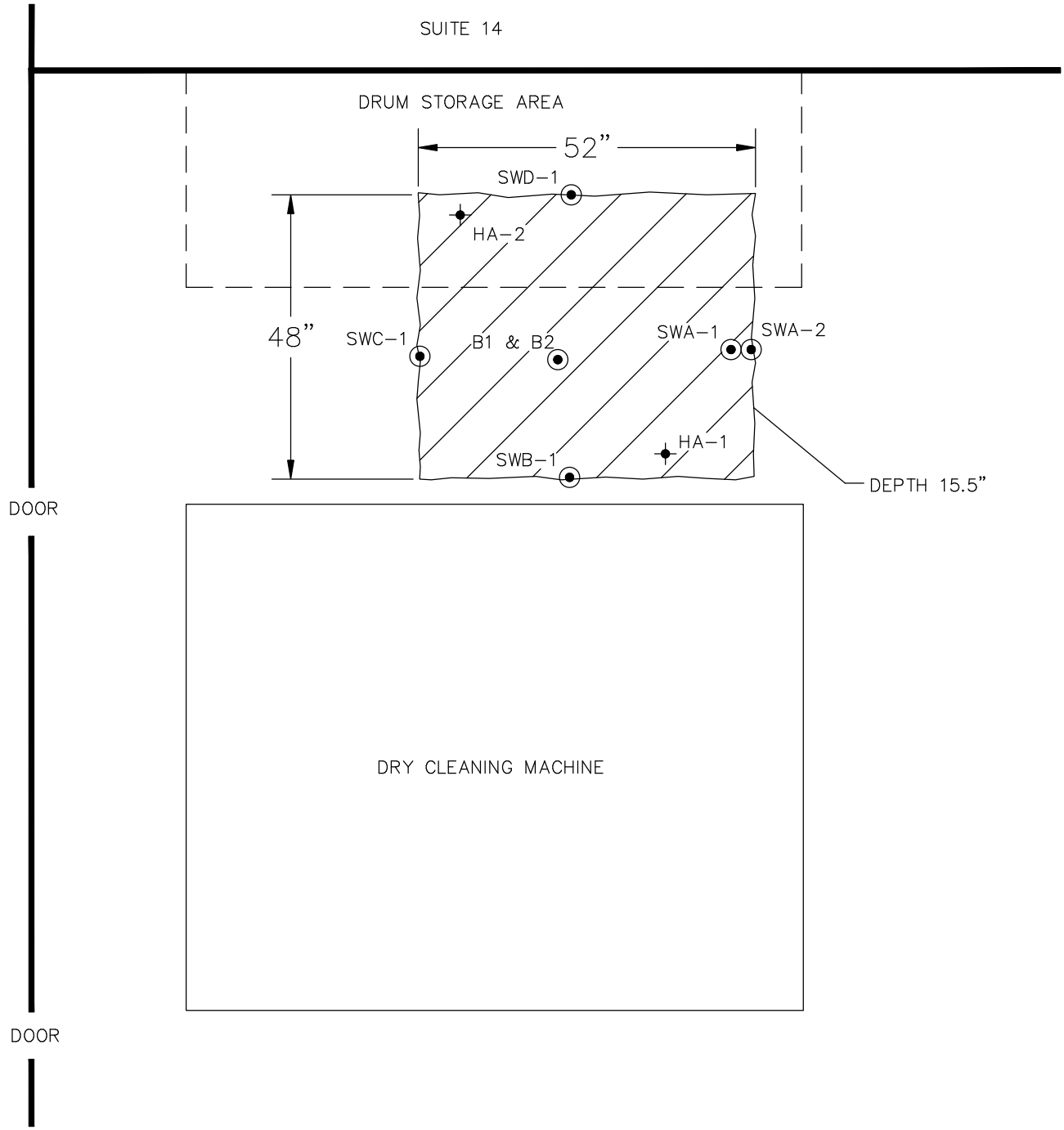
Title
CROSS SECTION A-A'

Site
PROFESSIONAL CLEANERS & LINEN SERVICE
2040 Beaver Ruin Road, Norcross, Georgia

EMA
Environmental Management Associates, LLC

Facility ID.

Figure
5



LEGEND

- ⊙ CONFIRMATORY SAMPLE LOCATION
- ✦ HAND AUGER LOCATIONS

NOTE:

1.) BASED ON GLE ASSOCIATES, INC., FIGURE A–2A HAND AUGER BORING LOCATION MAP, DATED 11/19/2011.

NOT TO SCALE

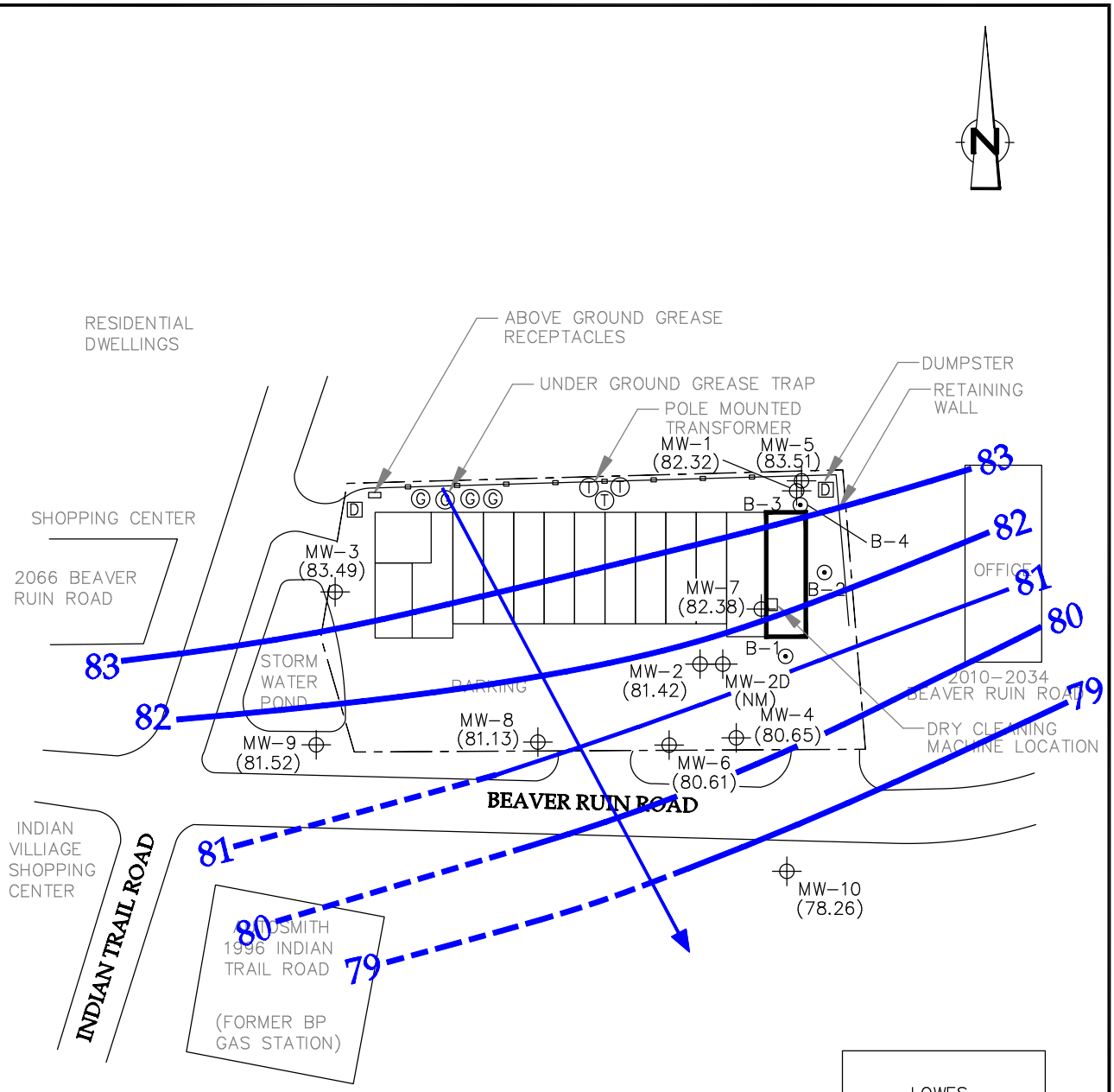
Title: EXCAVATION SITE PLAN

Site: PROFESSIONAL CLEANERS & LINEN SERVICE
2040 Beaver Ruin Road, Norcross, Georgia

EMA
Environmental Management Associates, LLC

Facility ID.

Figure 7



LEGEND:

B-1 ⊙ BOREHOLE LOCATION

MW-1 ⊕ MONITORING WELL LOCATION

(79.19) GROUNDWATER CONCENTRATION, FT AMSL

(NM) NOT MEASURED

80 GROUNDWATER CONCENTRATION CONTOUR, FT AMSL

GROUNDWATER FLOW DIRECTION

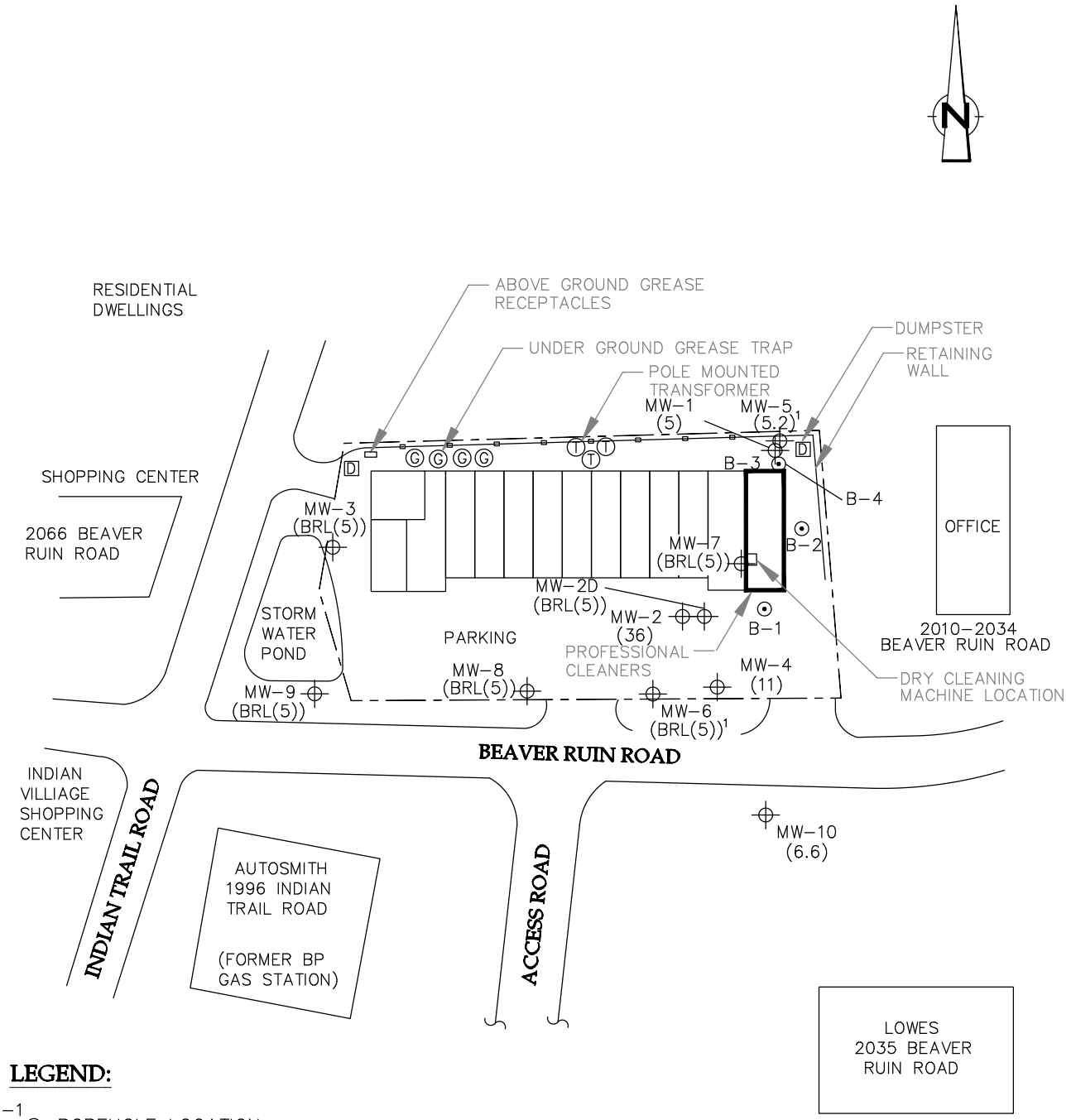
NOTE:

BASE MAP CREATED FROM GLE ASSOCIATES, INC DRAWING 11000-11045 SHEET A-3.

0 50 100FT

SCALE

Title	GROUNDWATER CONTOURS AND FLOW DIRECTION - MAY 13, 2013
Site	PROFESSIONAL CLEANERS & LINEN SERVICE 2040 Beaver Ruin Road, Norcross, Georgia
EMA Environmental Management Associates, LLC	Facility ID.
	Figure 6



LEGEND:

B-1 ⊙ BOREHOLE LOCATION

MW-1 ⊕ MONITORING WELL LOCATION

(BRL(5)) BELOW REPORTING LIMITS

NOTES:

1.) CONFIRMATORY SAMPLE RESULT.

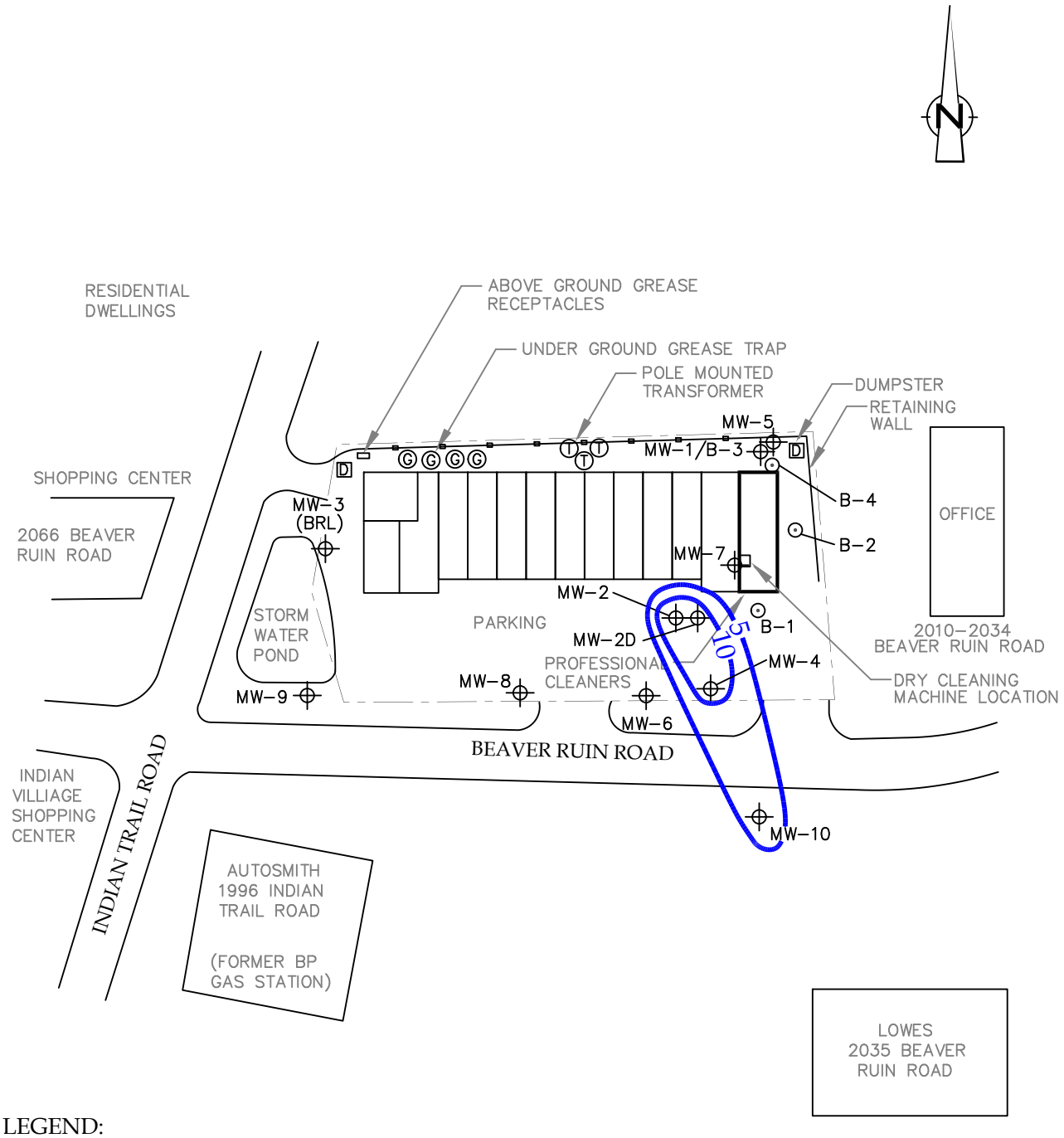
2.) CONCENTRATIONS ARE IN MICROGRAMS PER PER LITER.

3.) BASE MAP CREATED FROM GLE ASSOCIATES, INC. DRAWING 11000-11045 SHEET A-3.

0 50 100FT

SCALE

Title	PCE ANALYTICAL RESULTS FEBRUARY 2013
Site	PROFESSIONAL CLEANERS & LINEN SERVICE 2040 Beaver Ruin Road, Norcross, Georgia
EMA Environmental Management Associates, LLC	Facility ID.
	Figure 8



LEGEND:

B-1 ⊙ BOREHOLE LOCATION

MW-1 ⊕ MONITORING WELL LOCATION

10 ISOCONCENTRATION CONTOUR, ppb

NOTES:

1.) BASE MAP CREATED FROM GLE ASSOCIATES, INC. DRAWING 11000-11045 SHEET A-3.

0 50 100FT

SCALE

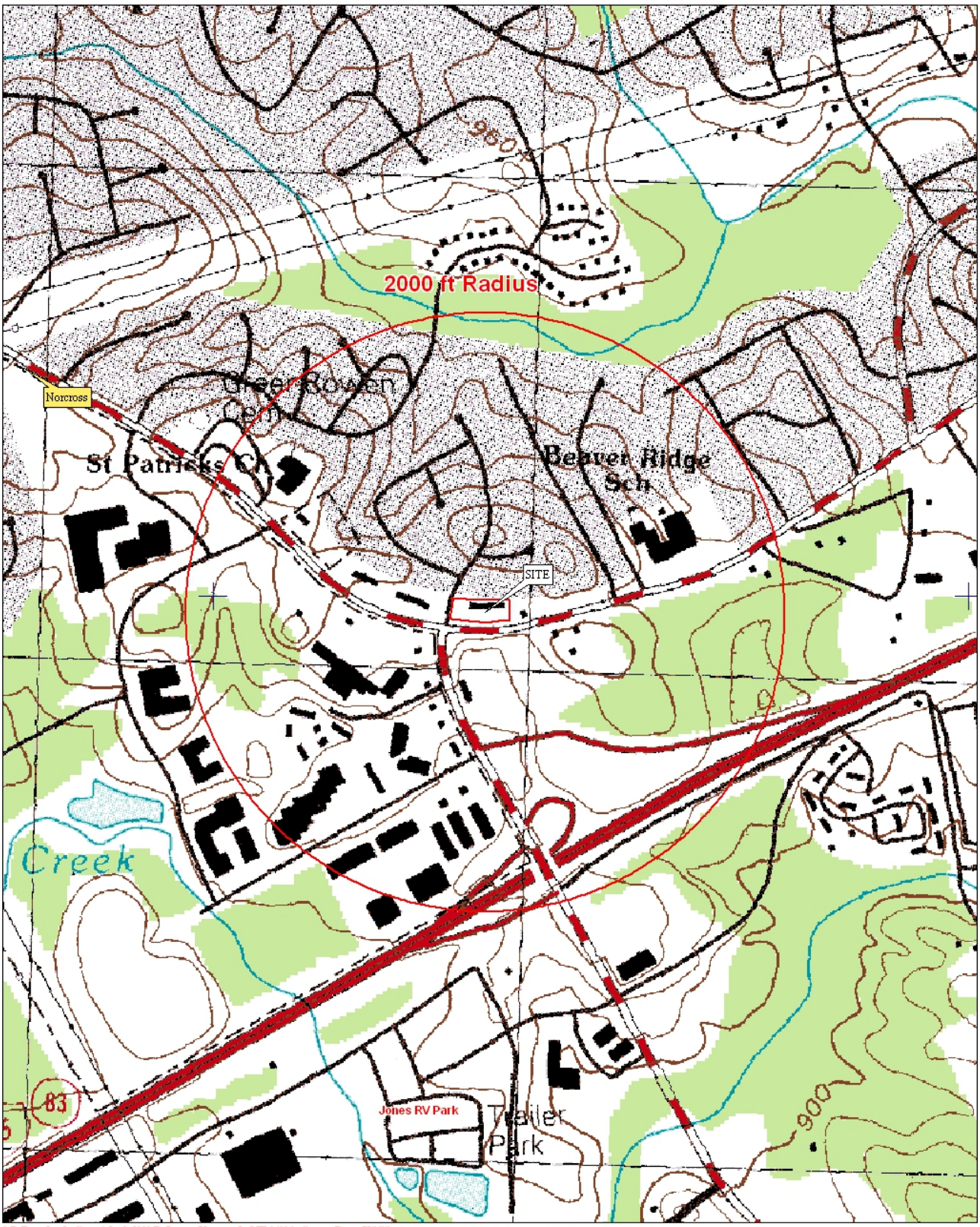
Title: ISOCONCENTRATION CONTOURS

Site: PROFESSIONAL CLEANERS & LINEN SERVICE
2040 Beaver Ruin Road, Norcross, Georgia

EMA
Environmental Management Associates, LLC

Facility ID.

Figure 9



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS 300 ft Scale: 1 : 10,400 Detail: 14-3 Datum: WGS84

NOTE:

TOPOQUAD OBTAINED FROM DELORME, SOURCE DATA FROM USGS.

Title	DRINKING WATER/ SURFACE WATER SURVEY MAP
Site	PROFESSIONAL CLEANERS & LINEN SERVICE 2040 Beaver Ruin Road, Norcross, Georgia
EMA Environmental Management Associates, LLC	Facility ID.
	Figure 10

TABLES

TABLE 1

PHASE II ESA INVESTIGATION SOIL SAMPLING DATA
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Sample ID	*Sample Date*	*Sample Depth (ft. bgs)*	*Analyte*	*Concentration (µg/kg)* [1]	*Standard* [2] *(µg/kg)*
B-2-15	2/11/2011	15	PCE	13.6	180
B-3-15	2/11/2011	15	PCE	BRL (5.36)[3]	180
HA-1-1	2/11/2011	1	PCE	**222**	180
			Acetone	277	2740
HA-2-1	2/11/2011	1	PCE	**296**	180

Notes:
1) µg/kg - micrograms per kilogram
2) Notification Concentration for analyte in soil.
3) BRL - Below reporting limit

TABLE 2

CONFIRMATORY AND ADDITIONAL INVESTIGATION SOIL SAMPLING DATA
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Sample ID	*Sample Date*	*Sample Depth (ft. bgs)*	*Analyte*	*Concentration (µg/kg)* [1]	*Standard* [2] *(µg/kg)*
SWA-1	4/2/2011	0.5	PCE	**340**	180/500
SWA-2	4/8/2011	0.5	PCE	38	180/500
SWB-1	4/2/2011	0.5	PCE	38	180/500
SWC-1	4/2/2011	0.5	PCE	71	180/500
SWD-1	4/2/2011	0.5	PCE	26	180/500
B-1	4/2/2011	1.0	PCE	**330**	180/500
B-2	4/8/2011	1.25	PCE	43	180/500
B-4	7/21/2011	1.5	PCE	**33**	180/500
Pond	9/10/2012	0.25-0.5	PCE	BRL (4.3)	180/500

Notes:
1) µg/kg - micrograms per kilogram
2) Notification Concentration/Type 1 Risk Reduction Standard for analyte in soil
3) BRL - Below reporting limit

TABLE 3

GROUNDWATER LEVEL MEASUREMENTS
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Well Number	*Date Measured*	*Ground Surface Elevation* (1)	*TOC Elevation* (1)	*Depth to Groundwater (feet BTOC)* (2)	*Groundwater Elevation* (1)
MW-1	7/1/2011	99.59	99.18	15.10	84.08
	7/12/2011	99.59	99.18	15.25	83.93
	8/17/2011	100.41	100.00	15.76	84.24
	3/19/2012	100.41	100.00	17.78	82.22
	4/23/2012	100.41	100.00	18.00	82.00
	7/24/2012	100.41	100.10	18.65	81.45
	10/24/2012	100.41	100.10	19.02	81.08
	12/13/2012	100.41	100.10	19.43	80.67
	2/8/2013	100.41	100.10	18.81	81.29
	5/13/2013	100.41	100.10	17.78	82.32
MW-2	7/1/2011	98.53	97.96	16.50	81.46
	7/12/2011	98.53	97.96	16.63	81.33
	8/17/2011	99.37	98.80	17.30	81.50
	3/19/2012	99.37	98.80	18.43	80.37
	4/23/2012	99.37	98.80	18.59	80.21
	7/24/2012	99.37	98.92	18.70	80.22
	10/24/2012	99.37	98.92	19.50	79.42
	12/13/2012	99.37	98.92	19.83	79.09
	2/8/2013	99.37	98.92	NM	NM
	5/13/2013	99.37	98.92	17.50	81.42
MW-2D	5/3/2013	99.58	99.33	18.05	81.28
MW-3	7/1/2011	98.43	98.00	14.39	83.61
	7/12/2011	98.43	98.00	14.75	83.25
	8/17/2011	99.26	98.83	15.47	83.36
	3/19/2012	99.26	98.83	17.09	81.74
	4/23/2012	99.26	98.83	17.04	81.79
	7/24/2012	99.26	98.83	17.06	81.77
	10/24/2012	99.26	98.83	NM	NM
	12/13/2012	99.26	98.83	18.70	80.13
	2/8/2013	99.26	98.83	17.82	81.01
	5/13/2013	99.26	98.83	15.34	83.49
MW-4	8/17/2011	97.81	97.39	16.70	80.69
	3/19/2012	97.81	97.39	17.71	79.68
	4/23/2012	97.81	97.39	17.87	79.52
	7/24/2012	97.81	97.39	17.94	79.45
	10/24/2012	97.81	97.39	18.55	78.84
	12/13/2012	97.81	97.39	19.00	78.39
	2/8/2013	97.81	97.39	18.43	78.96
	5/13/2013	97.81	97.39	16.74	80.65

TABLE 3

GROUNDWATER LEVEL MEASUREMENTS
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Well Number	*Date Measured*	*Ground Surface Elevation* (1)	*TOC Elevation* (1)	*Depth to Groundwater (feet BTOC)* (2)	*Groundwater Elevation* (1)
MW-5	3/19/2012	100.74	100.34	17.85	82.49
	4/23/2012	100.74	100.34	18.12	82.22
	7/24/2012	100.74	100.34	18.61	81.73
	10/24/2012	100.74	100.34	18.99	81.35
	12/13/2012	100.74	100.34	19.38	80.96
	2/8/2013	100.74	100.34	18.84	81.50
	5/13/2013	100.74	100.34	16.83	83.51
MW-6	3/19/2012	97.21	96.81	17.18	79.63
	4/23/2012	97.21	96.81	17.62	79.19
	7/24/2012	97.21	96.81	17.34	79.47
	10/24/2012	97.21	96.81	17.95	78.86
	12/13/2012	97.21	96.81	18.40	78.41
	2/8/2013	97.21	96.81	17.85	78.96
	5/13/2013	97.21	96.81	16.20	80.61
MW-7	3/19/2012	100.89	100.69	19.39	81.30
	4/23/2012	100.89	100.69	19.54	81.15
	7/24/2012	100.89	100.78	19.27	81.51
	10/24/2012	100.89	100.78	20.51	80.27
	12/13/2012	100.89	100.78	20.86	79.92
	2/8/2013	100.89	100.78	20.46	80.32
	5/13/2013	100.89	100.78	18.40	82.38
MW-8	12/13/2012	98.78	98.65	19.97	78.68
	2/8/2013	98.78	98.65	19.44	79.21
	5/13/2013	98.78	98.65	17.52	81.13
MW-9	12/13/2012	98.78	98.63	19.89	78.74
	2/8/2013	98.78	98.63	19.15	79.48
	5/13/2013	98.78	98.63	17.11	81.52
MW-10	2/12/2013	100.89	100.77	24.29	76.48
	5/13/2013	100.89	100.77	22.51	78.26

Notes:

(1) Top of casing (TOC), ground surface, and groundwater elevations based on an assumed datum. Re-surveyed on August 17, 2011. Modifications made to TOC elevations for MW-1, 2, and 7 on May 24, 2012.

(2) BTOC - below top of casing

TABLE 4

GROUNDWATER PCE ANALYTICAL DATA
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Sample Location	*Sampling Period*	*Sample Date*	*Analyte*	*Concentration (µg/L)* [1]	*Standard* [2] (µg/L)
MW-1	Initial Inv.	7/1/2011	PCE	50	5/19/98
	Baseline	4/23/2012	PCE	91/100[3]	
	1st Quarter	7/24/2012	PCE	46	
	2nd Quarter	10/14/2012	PCE	BRL (5)	
	3rd Quarter	2/8/2013	PCE	5	
MW-2	Initial Inv.	7/1/2011	PCE	62	5/19/98
	Baseline	3/19/2012	PCE	47	
	1st Quarter	7/24/2012	PCE	41	
	2nd Quarter	10/14/2012	PCE	29/29[3]	
	3rd Quarter	2/8/2013	PCE	36/35[3]	
MW-2D	Delineation	4/4/2013	PCE	BRL (5)	
MW-3	Initial Inv.	7/1/2011	PCE	BRL (5)[4]	5/19/98
	Baseline	4/23/2012	PCE	BRL (5)	
	1st Quarter	7/24/2012	PCE	BRL (5)/BRL[3]	
	2nd Quarter	10/14/2012	PCE	Not Sampled [5]	
	3rd Quarter	2/8/2013	PCE	BRL (5)	
MW-4	Initial Inv.	7/22/2011	PCE	BRL (5)	5/19/98
	Baseline	4/23/2012	PCE	BRL (5)	
	1st Quarter	7/24/2012	PCE	8.9	
	Confirmation	8/23/2012	PCE	8.3	
	2nd Quarter	10/14/2012	PCE	11	
	3rd Quarter	2/8/2013	PCE	11	
MW-5	Baseline	3/19/2012	PCE	BRL (5)	5/19/98
	1st Quarter	7/24/2012	PCE	BRL (5)	
	2nd Quarter	10/14/2012	PCE	BRL (5)	
	3rd Quarter	2/8/2013	PCE	11	
	Confirmation	2/18/2013	PCE	5.2	
MW-6	Baseline	3/19/2012	PCE	BRL (5)	5/19/98
	1st Quarter	7/24/2012	PCE	5.2	
	Confirmation	8/23/2012	PCE	BRL (5)	
	2nd Quarter	10/14/2012	PCE	BRL(5)	
	3rd Quarter	2/8/2013	PCE	11	
	Confirmation	2/18/2013	PCE	BRL (5)	

TABLE 4

GROUNDWATER PCE ANALYTICAL DATA
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Sample Location	*Sampling Period*	*Sample Date*	*Analyte*	*Concentration (µg/L)* [1]	*Standard* [2] (µg/L)
MW-7	Baseline	3/19/2012	PCE	82	5/19/98
	1st Quarter	7/24/2012	PCE	31	
	2nd Quarter	10/14/2012	PCE	19	
	3rd Quarter	2/8/2013	PCE	BRL (5)	
MW-8	Delineation	12/11/2012	PCE	7.9	5/19/98
	Confirmation	12/13/2012	PCE	BRL(5)	
	3rd Quarter	2/8/2013	PCE	BRL (5)	
MW-9	Delineation	12/11/2012	PCE	BRL (5)	5/19/98
	3rd Quarter	2/8/2013	PCE	BRL(5)	
MW-10	Delineation	2/12/2013	PCE	6.6	

Notes:
1) µg/L - micrograms per liter
2) Type 1 Risk Reduction Standard (RRS)/Type 2 RRS/Type 4 RRS for groundwater.
3) Sample result and field duplicate result
4) BRL - Below reporting limit listed in paranthese
5) Insufficient groundwater available for sampling.

TABLE 5
SUMMARY OF GROUNDWATER GEOCHEMICAL DATA
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Well Number	*Sampling Period*	*Sampling Date*	*pH*	*ORP mV* [1]	*D.O. (mg/L)* [2]	*Chloride (mg/L)*	*Arsenic (mg/L)*	*Barium (mg/L)*	*Cadmium (mg/L)*	*Chromium (mg/L)*	*Copper (mg/L)*	*Iron (mg/L)*	*Lead (mg/L)*	*Manganese (mg/L)*	*Selenium (mg/L)*	*Hex. Chrom. (mg/L)*
Background																
MW-5	Baseline	4/23/2012	4.41	324	9.32	3.1	BRL (0.05)[3]	0.104	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.142	BRL (0.01)	0.211	BRL (0.02)	BRL (0.01)
	1st Quarterly	7/24/2012	4.70	276	3.49	3.2	BRL (0.05)	0.132	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.101	BRL (0.01)	0.187	BRL (0.02)	BRL (0.01)
	2nd Quarterly	10/14/2012	4.59	278	3.56	3.3	BRL (0.05)	0.147	BRL (0.005)	BRL (0.01)	BRL (0.01)	BRL (0.1)	BRL (0.01)	0.173	BRL (0.02)	BRL (0.01)
	3rd Quarterly	2/8/2013	5.95	151	4.00	3.4	BRL (0.05)	0.105	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.167	BRL (0.01)	0.0967	BRL (0.02)	BRL (0.01)
MW-3	Baseline	4/23/2012	4.69	411	1.20	5.2	BRL (0.05)	0.185	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.998	BRL (0.01)	4.07	BRL (0.02)	BRL (0.01)
	1st Quarterly	7/24/2012	4.96	244	2.45	6.0	BR: (0.05)	0.34	BRL (0.005)	0.0151	BRL (0.01)	13.80	0.0273	4.25	BRL (0.02)	BRL (0.01)
	2nd Quarterly	10/14/2012	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	3rd Quarterly	2/8/2013	4.85	305	2.01	5.5	BR: (0.05)	0.177	BRL (0.005)	0.0151	BRL (0.01)	2.97	0.0105	3.47	BRL (0.02)	BRL (0.01)
Source Area																
MW-1	Baseline	4/23/2012	4.59	318	6.75	1.9	BRL (0.05)	0.106	BRL (0.005)	BRL (0.01)	BRL (0.01)	2.88	BRL (0.01)	1.79	BRL (0.02)	BRL (0.01)
	1st Quarterly	7/24/2012	12.57	264	13.26	BRL (500)	BRL (0.05)	BRL (0.02)	BRL (0.005)	**0.18**	BRL (0.01)	1.06	BRL (0.01)	0.56	BRL (0.02)	0.0619
	2nd Quarterly	10/14/2012	12.93	282	7.10	BRL (500)	BRL (0.05)	BRL (0.02)	BRL (0.005)	**0.26**	BRL (0.01)	1.42	BRL (0.01)	1.02	BRL (0.02)	BRKL (0.01)
	3rd Quarterly	2/8/2013	12.20	39	7.55	BRL (50)	BRL (0.05)	BRL (0.02)	BRL (0.005)	0.0454	BRL (0.01)	0.104	BRL (0.01)	0.113	BRL (0.02)	0.0652
MW-2	Baseline	4/23/2012	5.71	236	2.99	2.8	BRL (0.05)	0.151	BRL (0.005)	BRL (0.01)	BRL (0.01)	BRL (0.1)	BRL (0.01)	0.273	BRL (0.02)	BRL (0.01)
	1st Quarterly	7/24/2012	12.28	-58	29.74	BRL (50)	BRL (0.05)	BRL (0.02)	BRL (0.005)	0.0257	BRL (0.01)	0.476	BRL (0.01)	BRL (0.015)	BRL (0.02)	0.0347
	2nd Quarterly	10/14/2012	12.91	-29	11.60	BRL (50)	BRL (0.05)	BRL (0.02)	BRL (0.005)	0.0949	BRL (0.01)	1.00	BRL (0.01)	BRL (0.015)	BRL (0.02)	0.0254
	3rd Quarterly	2/8/2013	11.35	-38	9.11	BRL (10)	BRL (0.05)	BRL (0.02)	BRL (0.005)	0.0161	BRL (0.01)	0.654	BRL (0.01)	0.0197	BRL (0.02)	0.0203
MW-7	Baseline	4/23/2012	4.80	249	2.81	2.00	BRL (0.05)	0.113	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.440	BRL (0.01)	0.678	BRL (0.02)	BRL (0.01)
	1st Quarterly	7/24/2012	12.40	244	17.56	BRL (100)	BRL (0.05)	BRL (0.02)	BRL (0.005)	0.0172	BRL (0.01)	0.663	**0.0185**	0.25	BRL (0.02)	0.0225
	2nd Quarterly	10/14/2012	12.79	268	16.85	BRL (100)	BRL (0.05)	BRL (0.02)	BRL (0.005)	0.0239	BRL (0.01)	0.560	BRL (0.01)	0.26	BRL (0.02)	BRL (0.01)
	3rd Quarterly	2/8/2013	11.89	156	9.65	BRL (50)	BRL (0.05)	BRL (0.02)	BRL (0.005)	BRL (0.01)	BRL (0.01)	1.18	BRL (0.01)	0.191	BRL (0.02)	BRL (0.01)
Downgradient of Source																
MW-4	Baseline	4/23/2012	4.85	277	2.63	8.4	BRL (0.05)	0.279	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.545	BRL (0.01)	0.260	BRL (0.02)	BRL (0.01)
	1st Quarterly	7/24/2012	4.72	215	5.88	7.8	BRL (0.05)	0.234	BRL (0.005)	BRL (0.01)	BRL (0.01)	BRL (0.1)	BRL (0.01)	0.217	BRL (0.02)	BRL (0.01)
	2nd Quarterly	10/14/2012	5.24	198	2.60	8.9	BRL (0.05)	0.273	BRL (0.005)	BRL (0.01)	BRL (0.01)	BRL (0.1)	BRL (0.01)	0.183	BRL (0.02)	BRL (0.01)
	3rd Quarterly	2/8/2013	4.26	346	2.00	8.2	BRL (0.05)	0.238	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.167	BRL (0.01)	0.201	BRL (0.02)	BRL (0.01)

TABLE 5
SUMMARY OF GROUNDWATER GEOCHEMICAL DATA
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Well Number	*Sampling Period*	*Sampling Date*	*pH*	*ORP mV* [1]	*D.O. (mg/L)* [2]	*Chloride (mg/L)*	*Arsenic (mg/L)*	*Barium (mg/L)*	*Cadmium (mg/L)*	*Chromium (mg/L)*	*Copper (mg/L)*	*Iron (mg/L)*	*Lead (mg/L)*	*Manganese (mg/L)*	*Selenium (mg/L)*	*Hex. Chrom. (mg/L)*
MW-6	Baseline	4/23/2012	5.19	245	2.71	2.1	BRL (0.05)	0.225	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.853	BRL (0.01)	0.0677	BRL (0.02)	BRL (0.01)
	1st Quarterly	7/24/2012	5.02	218	3.48	2.5	BRL (0.05)	0.241	BRL (0.005)	BRL (0.01)	BRL (0.01)	BRL (0.1)	BRL (0.01)	0.0453	BRL (0.02)	BRL (0.01)
	2nd Quarterly	10/14/2012	5.73	138	3.37	2.4	BRL (0.05)	0.247	BRL (0.005)	BRL (0.01)	BRL (0.01)	BRL (0.1)	BRL (0.01)	0.0305	BRL (0.02)	BRL (0.01)
	3rd Quarterly	2/8/2013	4.51	317	2.24	2.7	BRL (0.05)	0.251	BRL (0.005)	BRL (0.01)	BRL (0.01)	0.145	BRL (0.01)	0.0403	BRL (0.02)	BRL (0.01)
Sidegradient of Source																
MW-8	3rd Quarterly	2/8/2013	4.34	293	2.60	3.3	BRL (0.05)	0.516	BRL (0.005)	BRL (0.01)	BRL (0.01)	BRL (0.1)	BRL (0.01)	0.0977	BRL (0.02)	BRL (0.01)
MW-9	3rd Quarterly	2/8/2013	6.15	-22	1.68	2.4	BRL (0.05)	0.0327	BRL (0.005)	BRL (0.01)	BRL (0.01)	54.3	BRL (0.01)	0.959	BRL (0.02)	BRL (0.01)
MCLs for Metals							0.01	2	0.005	0.10	1.30	--	0.015	--	0.05	--

Notes:
(1) mV- millivolts
(2) mg/L - milligrams per liter
(3) BRL - Below reporting limit listed in parantheses
(1) mg/L - milligrams per liter

APPENDIX A

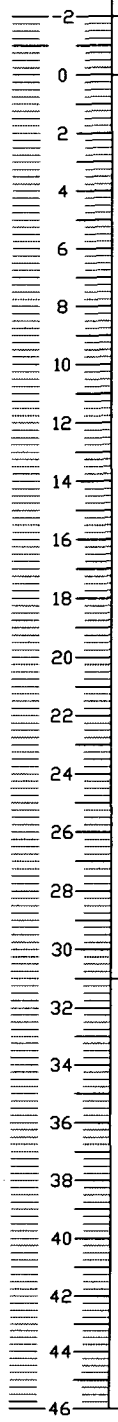
PHASE II ESA SOIL BORING LOGS

WELL CONSTRUCTION DETAIL/SOIL BORING LOG

LOCATION: THE CROSSINGS
GROUND ELEVATION: NA
WATER DEPTH: 31 FT
PROJECT SCIENTIST: LARRY CARTER
DRAWN BY: B. HAAS
CHECKED BY: LC

PROJECT NO.: 11000-11045
PROJECT NAME: THE CROSSINGS
POINT ID. #.: B-1
DATE STARTED: 02/11/11
DATE COMPLETED: 02/11/11
DRILL MASTER: GEOLAB
DRILL METHOD: DIRECT PUSH

B-1



DEPTH (FEET)	NET OVA READING (PPM)	LITHOLOGICAL DESCRIPTION	NOTES / OVA
-2			
0		ASPHALT & GRAVEL	
2		FILL: CLAY, SILTY, TRACE SAND, RED BROWN, & GRAY	
4			
6	0.3	RESIDUUM: SILT, CLAYEY, TRACE SAND, RED BROWN & ORANGE BROWN	
8			
10	0		
12			
14			
16	0		
18		SILT, TRACE CLAY, TRACE SAND, GRAY, TAN, & YELLOW BROWN	
20	0		
22			
24			
26			
28			
30			
32			COLLECTED GROUNDWATER SAMPLE B-1-GW FOR LABORATORY ANALYSIS
34		BORING TERMINATED @ 34 FT	
36			
38			
40			
42			NA = NOT AVAILABLE
44			NE = NOT ENCOUNTERED
46			ND = NONE DETECTED
			▼ = APPROX. GROUNDWATER DEPTH

SOIL BORING LOG B-1
THE CROSSINGS SHOPPING CENTER
2040 BEAVER RUIN ROAD
NORCROSS, GA 30003

PREPARED FOR :
BB&T
5130 PARKWAY PLAZA BLVD
CHARLOTTE, NC. 28217

Prepared By: GLE ASSOCIATES, INC.
4300 W CYPRESS STREET STE 400
TAMPA, FLORIDA 33607
(813) 241-8350 (813) 241-8737

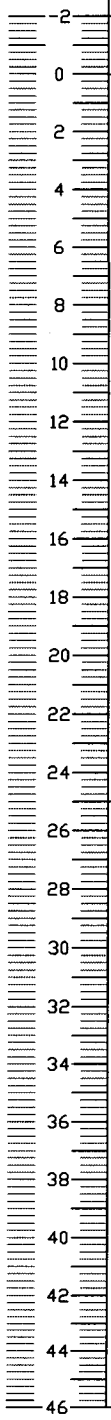
GLE
Facilities and Environmental Consultants

GLE CAD NO.	CAD/PROJ/11000/11045
DRAWN BPH	JOB NO. 11000-11045
CHECKED LC	SHEET B-1
DATE 02/19/11	OF __ SHEET(S)

WELL CONSTRUCTION DETAIL/SOIL BORING LOG

LOCATION: THE CROSSINGS
GROUND ELEVATION: NA
WATER DEPTH: 25 FT
PROJECT SCIENTIST: LARRY CARTER
DRAWN BY: B. HAAS
CHECKED BY: LC

PROJECT NO.: 11000-11045
PROJECT NAME: THE CROSSINGS
POINT ID. #.: B-2
DATE STARTED: 02/11/11
DATE COMPLETED: 02/11/11
DRILL MASTER: GEOLAB
DRILL METHOD: DIRECT PUSH



NET OVA READING (PPM)	LITHOLOGICAL DESCRIPTION	NOTES / OVA
	ASPHALT & GRAVEL 6 INCHES	
	RESIDUUM: SILT, CLAYEY, SANDY, RED BROWN	
0	SILT, TRACE CLAY, TRACE SAND, ORANGE BROWN & RED BROWN	
0.3	SILT, MICACEOUS, TAN, ORANGE BROWN & WHITE	
1.1		COLLECTED SOIL SAMPLE B-2-15 FOR LABORATORY ANALYSIS
1.0		
		COLLECTED GROUNDWATER SAMPLE B-2-GW FOR LABORATORY ANALYSIS
	BORING TERMINATED @ 30 FT	

NA = NOT AVAILABLE
NE = NOT ENCOUNTERED
ND = NONE DETECTED
▼ = APPROX. GROUNDWATER DEPTH

SOIL BORING LOG B-2
THE CROSSINGS SHOPPING CENTER
2040 BEAVER RUIN ROAD
NORCROSS, GA 30003

PREPARED FOR:
SB&T
5130 PARKWAY PLAZA BLVD
CHARLOTTE, NC. 28217

Prepared By: GLE ASSOCIATES, INC.
4300 W CYPRESS STREET STE 400
TAMPA, FLORIDA 33607
(813) 241-8350 (813) 241-8737

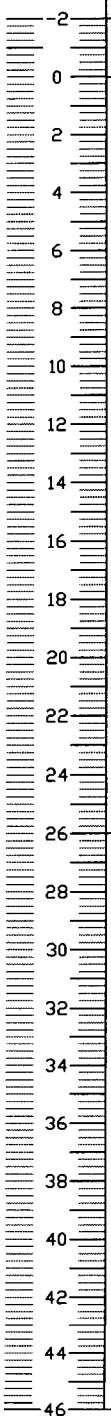
GLE
Facilities and Environmental Consultants

REF. CAD NO.	CAD/PROJ/11000/11045
DRAWN BPH	JOB NO. 11000-11045
DESIGNED LC	SHEET B-2
DATE 02/19/11	OF ___ SHEET(S)

WELL CONSTRUCTION DETAIL/SOIL BORING LOG

LOCATION: THE CROSSINGS
GROUND ELEVATION: NA
WATER DEPTH: 26 FT
PROJECT SCIENTIST: LARRY CARTER
DRAWN BY: B. HAAS
CHECKED BY: LC

PROJECT NO.: 11000-11045
PROJECT NAME: THE CROSSINGS
POINT ID. #.: B-3
DATE STARTED: 02/11/11
DATE COMPLETED: 02/11/11
DRILL MASTER: GEOLAB
DRILL METHOD: DIRECT PUSH



NET OVA READING (PPM)	LITHOLOGICAL DESCRIPTION	NOTES / OVA
	ASPHALT & GRAVEL 6 INCHES	
	SILT, CLAYEY, TRACE SAND, TRACE MICA, RED BROWN	
3.0	SILT, MICACEOUS, TRACE SAND, ORANGE BROWN GRADING INTO WHITE, ORANGE BROWN & TAN	
3.1		
0.4		COLLECTED SOIL SAMPLE B-3-15 FOR LABORATORY ANALYSIS
0		
		COLLECTED GROUNDWATER SAMPLE B-3-GW FOR LABORATORY ANALYSIS
	BORING TERMINATED @ 30 FT	

NA = NOT AVAILABLE
NE = NOT ENCOUNTERED
ND = NONE DETECTED
▼ = APPROX. GROUNDWATER DEPTH

SOIL BORING LOG B-3
THE CROSSINGS SHOPPING CENTER
2040 BEAVER RUIN ROAD
NORCROSS, GA 30003

PREPARED FOR :
SB&T
5130 PARKWAY PLAZA BLVD
CHARLOTTE, NC 28217

Prepared By: GLE ASSOCIATES, INC.
4300 W CYPRESS STREET STE 400
TAMPA, FLORIDA 33607
(813) 241-8350 (813) 241-8737

GLE
Facilities and Environmental Consultants

GLE CAD NO.	CAD/PROJ/11000/11045
DRAWN BY	8PH
JOB NO.	11000-11045
DESIGN.	LC
SHEET	B-3
DATE	02/19/11
OF ___ SHEET(S)	

WELL CONSTRUCTION DETAIL/SOIL BORING LOG

HA-1

LOCATION: THE CROSSINGS
GROUND ELEVATION: NA
WATER DEPTH: NE
PROJECT SCIENTIST: LARRY CARTER
DRAWN BY: B. HAAS
CHECKED BY: LC

PROJECT NO.: 11000-11045
PROJECT NAME: THE CROSSINGS
POINT ID. #.: HA-1
DATE STARTED: 02/09/11
DATE COMPLETED: 02/09/11
DRILL MASTER: GEOLAB
DRILL METHOD: HAND AUGER

DEPTH (FEET)	NET OVA READING (PPM)	LITHOLOGICAL DESCRIPTION	NOTES / OVA
-2			
0		CONCRETE & GRAVEL 6 INCHES	
	3.0	FILL: SILT, CLAY, SILTY, BROWN	
2	0		SOIL SAMPLE HA-1-1 @ 1 FT COLLECTED FOR LABORATORY ANALYSIS
4	0		
6		BORING TERMINATED @ 5 FT	
8			
10			
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			

NA = NOT AVAILABLE
NE = NOT ENCOUNTERED
ND = NONE DETECTED
▼ = APPROX. GROUNDWATER DEPTH

SOIL BORING LOG HA-1
THE CROSSINGS SHOPPING CENTER
2040 BEAVER RUIN ROAD
NORCROSS, GA 30003

PREPARED FOR :
BR&T
5130 PARKWAY PLAZA BLVD
CHARLOTTE, NC. 28217

Prepared By: GLE ASSOCIATES, INC.
4300 W CYPRESS STREET STE 400
TAMPA, FLORIDA 33607
(813) 241-8350 (813) 241-8737

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Facilities and Environmental Consultants

GLE CAD NO.	CAD/PROJ/11000/11045
DRAWN BPH	JOB NO. 11000-11045
CHECKED LC	SHEET HA-1
DATE 02/19/11	OF ___ SHEET(S)

WELL CONSTRUCTION DETAIL/SOIL BORING LOG

HA-2

LOCATION: THE CROSSINGS
GROUND ELEVATION: NA
WATER DEPTH: NE
PROJECT SCIENTIST: LARRY CARTER
DRAWN BY: B. HAAS
CHECKED BY: LC

PROJECT NO.: 11000-11045
PROJECT NAME: THE CROSSINGS
POINT ID. #.: HA-2
DATE STARTED: 02/09/11
DATE COMPLETED: 02/09/11
DRILL MASTER: GEOLAB
DRILL METHOD: HAND AUGER

DEPTH (FEET)	NET OVA READING (PPM)	LITHOLOGICAL DESCRIPTION	NOTES / OVA
-2			
0		CONCRETE & GRAVEL 6 INCHES	
	0.9	FILL: SILT, CLAY, SILTY, BROWN	SOIL SAMPLE HA-2-1 @ 1 FT COLLECTED FOR LABORATORY ANALYSIS
2	0		
4	0		
6		BORING TERMINATED @ 5 FT	
8			
10			
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			
38			
40			
42			
44			
46			

NA = NOT AVAILABLE
NE = NOT ENCOUNTERED
ND = NONE DETECTED
▼ = APPROX. GROUNDWATER DEPTH

SOIL BORING LOG HA-2
THE CROSSINGS SHOPPING CENTER
2040 BEAVER RUIN ROAD
NORCROSS, GA 30003

PREPARED FOR :
BB&T
5130 PARKWAY PLAZA BLVD
CHARLOTTE, NC. 28217

Prepared By: GLE ASSOCIATES, INC.
4300 W CYPRESS STREET STE 400
TAMPA, FLORIDA 33607
(813) 241-8350 (813) 241-8737

GLE
Facilities and Environmental Consultants

GLE CAD NO.: CAD/PROJ/11000/11045
DRAWN: BPH
JOB NO.: 11000-11045
CHECKED: LC
SHEET: HA-2
DATE: 02/19/11
OF __ SHEET(S)

APPENDIX B

ANALYTICAL REPORTS

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

AES

July 27, 2011

Brent Cortelloni
Environmental Management Associates, LLC
5262 Belle Wood Court
Buford Georgi30518

TEL: (770) 271-4628
FAX: (770) 271-8944

RE: 2040 Beaver Ruin Road

Dear Brent Cortelloni: Order No: 1107E86

Analytical Environmental Services, Inc. received 1 samples on 7/21/2011 12:30:00 PM for the analyses presented in following report.

No problems were encountered during the analyses. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits. Any discrepancies associated with the analyses contained herein will be noted and submitted in the form of a project Case Narrative.
AES' certifications are as follows:
-NELAC/Florida Certification number E87582 for analysis of Environmental Water, soil/hazardous waste, and Drinking Water Microbiology, effective 07/01/11-06/30/12.
-AIHA Certification ID #100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) effective until 09/01/11.

These results relate only to the items tested. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

Mirzeta Kararic

Mirzeta Kararic
Project Manager

3785 PRESIDENTIAL PARKWAY • ATLANTA, GEORGIA 30340 • TEL: (770) 457-8177 • FAX: (770)457-8188

ANALYTICAL ENVIRONMENTAL SERVICES, INC

3785 Presidential Parkway, Atlanta GA 30340-3704

AES TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

CHAIN OF CUSTODY

Work Order: 1107E86

Date: _____ Page _____ of _____

COMPANY: EMA/BL

ADDRESS:

PHONE:

FAX:

SAMPLED BY: B. Corkellon

SIGNATURE: [signature]

ANALYSIS REQUESTED: PCE

PRESERVATION (See codes)

Visit our website www.aesatlanta.com to check on the status of your results, place bottle orders, etc.

#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	Grab	Composite	Matrix (See codes)	PCE	REMARKS	No # of Containers
1	BH-X	7-21-11	10:30	X			X	tetrachloroethene only	
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1: [signature]	7/21/11 1225	1. [signature]	7/21/11
2.		2	12:30
3		3:	

SPECIAL INSTRUCTIONS/COMMENTS:

SHIPMENT METHOD

OUT / / VIA:

IN / / VIA:

CLIENT FedEx UPS MAIL COURIER

GREYHOUND OTHER_____

PROJECT INFORMATION

PROJECT NAME: BH-X

PROJECT #: —

SITE ADDRESS:

SEND REPORT TO:

INVOICE TO:
(IF DIFFERENT FROM ABOVE)

QUOTE #: _____ PO#: _____

RECEIPT

Total # of Containers: 3dg T/A

Turnaround Time Request

- ~~Standard 5 Business Days~~
- 2 Business Day Rush
- Next Business Day Rush
- Same Day Rush **(auth req.)**
- Other _____

STATE PROGRAM (if any): _____

E-mail? Y / N; Fax? Y / N

DATA PACKAGE: I II III IV

SAMPLES RECEIVED AFTER 3PM OR ON SATURDAY ARE CONSIDERED RECEIVED THE NEXT BUSINESS DAY. IF TURNAROUND TIME IS NOT INDICATED, AES WILL PROCEED WITH STANDARD TAT OF SAMPLES. SAMPLES ARE DISPOSED 30 DAYS AFTER REPORT COMPLETION UNLESS OTHER ARRANGEMENTS ARE MADE.

MATRIX CODES: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) DW = Drinking Water (Blanks) O = Other (specify) WW = Waste Water

PRESERVATIVE CODES: H+I = Hydrochloric acid + ice I = Ice only N = Nitric acid S+I = Sulfuric acid + ice S/M+I = Sodium Bisulfate/Methanol + ice O = Other (specify) NA = None

White Copy - Original; Yellow Copy - Client

Analytical Environmental Services, Inc

Date: 29-Jul-11

Client: Environmental Management Associates, LLC
Project: 2040 Beaver Ruin Road
Lab ID: 1107E86

Case Narrative

Per Brent Cortelloni 7/26/11, project name is 2040 Beaver Ruin Road.

Sample Receiving Nonconformance:

MEOH Preserved soil vials in accordance with Method 5035 were for sample(s) [1107E86]. Preserved soil vials were prepared at the laboratory from the sample jar.

Analytical Environmental Services, Inc **Date:** 27-Jul-11

Client:	Environmental Management Associates, LLC	**Client Sample ID:**	BH-X
Project Name:	2040 Beaver Ruin Road	**Collection Date:**	7/21/2011 10:30:00 AM
Lab ID:	1107E86-001	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5035)**				
Tetrachloroethene	33	3.2		ug/Kg-dry	149421	1	07/23/2011 02:05	JE
Surr: 4-Bromofluorobenzene	94.7	56-137		%REC	149421	1	07/23/2011 02:05	JE
Surr: Dibromofluoromethane	110	73.7-137		%REC	149421	1	07/23/2011 02:05	JE
Surr: Toluene-d8	89.5	69.2-126		%REC	149421	1	07/23/2011 02:05	JE
PERCENT MOISTURE D2216								
Percent Moisture	16.4	0		wt%	R201798	1	07/25/2011 17:30	AS

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	NC	Not confirmed
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc.

Sample/Cooler Receipt Checklist

Client EMA/BC Work Order Number 1107E86

Checklist completed by [signature] 7/21/11
Signature Date

Carrier name: FedEx __ UPS __ Courier __ Client ✓ US Mail __ Other _____

Shipping container/cooler in good condition? Yes ✓ No __ Not Present __

Custody seals intact on shipping container/cooler? Yes __ No __ Not Present ✓

Custody seals intact on sample bottles? Yes __ No __ Not Present ✓

Container/Temp Blank temperature in compliance? (4°C±2)* Yes ✓ No __

Cooler #1 3.7 Cooler #2 _____ Cooler #3 _____ Cooler #4 _____ Cooler#5 _____ Cooler #6 _____

Chain of custody present? Yes ✓ No __

Chain of custody signed when relinquished and received? Yes ✓ No __

Chain of custody agrees with sample labels? Yes ✓ No __

Samples in proper container/bottle? Yes ✓ No __

Sample containers intact? Yes __ No ✓

Sufficient sample volume for indicated test? Yes ✓ No __

All samples received within holding time? Yes ✓ No __

Was TAT marked on the COC? Yes ✓ No __

Proceed with Standard TAT as per project history? Yes __ No __ Not Applicable ✓

Water - VOA vials have zero headspace? No VOA vials submitted ✓ Yes __ No __

Water - pH acceptable upon receipt? Yes __ No __ Not Applicable ✓

Adjusted? _____ Checked by _____

Sample Condition: Good __ Other(Explain) Received a broken vial

(For diffusive samples or AIHA lead) Is a known blank included? Yes __ No ✓

See Case Narrative for resolution of the Non-Conformance.

* Samples do not have to comply with the given range for certain parameters.

\L\Quality Assurance\Checklists Procedures Sign-Off Templates\Checklists\Sample Receipt Checklists\Sample_Cooler_Receipt_Checklist

Analytical Environmental Services, Inc

Date: 27-Jul-11

Client: Environmental Management Associates, LLC
Project: 2040 Beaver Ruin Road
Lab Order: 1107E86

Dates Report

Lab Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	TCLP Date	Prep Date	Analysis Date
1107E86-001A	BH-X	7/21/2011 10:30:00AM	Soil	TCL VOLATILE ORGANICS		07/22/2011	07/23/2011
1107E86-001B	BH-X	7/21/2011 10:30:00AM	Soil	PERCENT MOISTURE			07/25/2011

Analytical Environmental Services, Inc

Date: 29-Jul-11

Client: Environmental Management Associates, LLC
Project Name: 2040 Beaver Ruin Road
Workorder: 1107E86

ANALYTICAL QC SUMMARY REPORT

BatchID: 149421

Sample ID: **MB-149421** Client ID: Units: **ug/Kg** Prep Date: **07/22/2011** Run No: **201697**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **149421** Analysis Date: **07/22/2011** Seq No: **4212868**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2,2-Tetrachloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2,4-Trichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromo-3-chloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromoethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,3-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,4-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
2-Butanone	BRL	50	0	0	0	0	0	0	0	0	
2-Hexanone	BRL	10	0	0	0	0	0	0	0	0	
4-Methyl-2-pentanone	BRL	10	0	0	0	0	0	0	0	0	
Acetone	BRL	100	0	0	0	0	0	0	0	0	
Benzene	BRL	5.0	0	0	0	0	0	0	0	0	
Bromodichloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Bromoform	BRL	5.0	0	0	0	0	0	0	0	0	
Bromomethane	BRL	5.0	0	0	0	0	0	0	0	0	
Carbon disulfide	BRL	10	0	0	0	0	0	0	0	0	
Carbon tetrachloride	BRL	5.0	0	0	0	0	0	0	0	0	
Chlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Chloroethane	BRL	10	0	0	0	0	0	0	0	0	
Chloroform	BRL	5.0	0	0	0	0	0	0	0	0	
Chloromethane	BRL	10	0	0	0	0	0	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: 2040 Beaver Ruin Road
Workorder: 1107E86

ANALYTICAL QC SUMMARY REPORT

BatchID: 149421

Sample ID: **MB-149421** Client ID: Units: **ug/Kg** Prep Date: **07/22/2011** Run No: **201697**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **149421** Analysis Date: **07/22/2011** Seq No: **4212868**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
cis-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Cyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Dibromochloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Dichlorodifluoromethane	BRL	10	0	0	0	0	0	0	0	0	
Ethylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Freon-113	BRL	10	0	0	0	0	0	0	0	0	
Isopropylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
m,p-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl acetate	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl tert-butyl ether	BRL	5.0	0	0	0	0	0	0	0	0	
Methylcyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Methylene chloride	BRL	5.0	0	0	0	0	0	0	0	0	
o-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Styrene	BRL	5.0	0	0	0	0	0	0	0	0	
Tetrachloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Toluene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichlorofluoromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Vinyl chloride	BRL	10	0	0	0	0	0	0	0	0	
Surr: 4-Bromofluorobenzene	45.89	0	50	0	91.8	56	137	0	0	0	
Surr: Dibromofluoromethane	48.62	0	50	0	97.2	73.7	137	0	0	0	
Surr: Toluene-d8	47.25	0	50	0	94.5	69.2	126	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: 2040 Beaver Ruin Road
Workorder: 1107E86

ANALYTICAL QC SUMMARY REPORT

BatchID: 149421

Sample ID: **LCS-149421** Client ID: Units: **ug/Kg** Prep Date: **07/22/2011** Run No: **201697**
SampleType: **LCS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **149421** Analysis Date: **07/22/2011** Seq No: **4212872**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	53.58	5.0	50	0	107	60	140	0	0	0	
Benzene	58.18	5.0	50	0	116	70	130	0	0	0	
Chlorobenzene	57.62	5.0	50	0	115	70	130	0	0	0	
Toluene	56.45	5.0	50	0	113	70	130	0	0	0	
Trichloroethene	59.18	5.0	50	0	118	70	130	0	0	0	
Surr: 4-Bromofluorobenzene	45.82	0	50	0	91.6	56	137	0	0	0	
Surr: Dibromofluoromethane	47.61	0	50	0	95.2	73.7	137	0	0	0	
Surr: Toluene-d8	47.56	0	50	0	95.1	69.2	126	0	0	0	

Sample ID: **1107E20-001AMS** Client ID: Units: **ug/Kg-dry** Prep Date: **07/22/2011** Run No: **201697**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **149421** Analysis Date: **07/22/2011** Seq No: **4212877**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	64.35	6.5	65.01	0	99	55.2	163	0	0	0	
Benzene	72.36	6.5	65.01	0	111	67.4	144	0	0	0	
Chlorobenzene	73.31	6.5	65.01	0	113	73.6	140	0	0	0	
Toluene	72.03	6.5	65.01	0	111	64.6	145	0	0	0	
Trichloroethene	73.97	6.5	65.01	0	114	70.1	149	0	0	0	
Surr: 4-Bromofluorobenzene	57.41	0	65.01	0	88.3	56	137	0	0	0	
Surr: Dibromofluoromethane	62.67	0	65.01	0	96.4	73.7	137	0	0	0	
Surr: Toluene-d8	61.97	0	65.01	0	95.3	69.2	126	0	0	0	

Sample ID: **1107E20-001AMSD** Client ID: Units: **ug/Kg-dry** Prep Date: **07/22/2011** Run No: **201697**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **149421** Analysis Date: **07/22/2011** Seq No: **4212881**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	61.59	6.5	65.01	0	94.7	55.2	163	64.35	4.38	34.9	
Benzene	71.40	6.5	65.01	0	110	67.4	144	72.36	1.34	27.2	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Analytical Environmental Services, Inc

Date: 29-Jul-11

Client: Environmental Management Associates, LLC
Project Name: 2040 Beaver Ruin Road
Workorder: 1107E86

ANALYTICAL QC SUMMARY REPORT

BatchID: **149421**

Sample ID: **1107E20-001AMSD** Client ID: Units: **ug/Kg-dry** Prep Date: **07/22/2011** Run No: **201697**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **149421** Analysis Date: **07/22/2011** Seq No: **4212881**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chlorobenzene	68.43	6.5	65.01	0	105	73.6	140	73.31	6.88	33.4	
Toluene	68.80	6.5	65.01	0	106	64.6	145	72.03	4.6	26.8	
Trichloroethene	69.88	6.5	65.01	0	107	70.1	149	73.97	5.69	34	
Surr: 4-Bromofluorobenzene	58.47	0	65.01	0	89.9	56	137	57.41	0	0	
Surr: Dibromofluoromethane	63.40	0	65.01	0	97.5	73.7	137	62.67	0	0	
Surr: Toluene-d8	61.70	0	65.01	0	94.9	69.2	126	61.97	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

AES

September 17, 2012

Brent Cortelloni
Environmental Management Associates, LLC
5262 Belle Wood Court
Buford Georgi30518

TEL: (770) 271-4628
FAX: (770) 271-8944

RE: Professional Cleaners

Dear Brent Cortelloni: Order No: 1209550

Analytical Environmental Services, Inc. received 3 samples on 9/10/2012 10:00:00 AM for the analyses presented in following report.

No problems were encountered during the analyses. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits. Any discrepancies associated with the analyses contained herein will be noted and submitted in the form of a project Case Narrative.
AES' certifications are as follows:
-NELAC/Florida Certification number E87582 for analysis of Environmental Water, soil/hazardous waste, and Drinking Water Microbiology, effective 07/01/12-06/30/13.
-AIHA Certification ID #100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) effective until 09/01/13.

These results relate only to the items tested. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

Mirzeta Kararic

Mirzeta Kararic
Project Manager

ANALYTICAL ENVIRONMENTAL SERVICES, INC
3785 Presidential Parkway, Atlanta GA 30340-3704
AES TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

CHAIN OF CUSTODY

Work Order: 1209550

Date: _____ Page _____ of _____

COMPANY: EMA/BC

ADDRESS:

PHONE:

FAX:

SAMPLED BY: P. Corbellay

SIGNATURE:

ANALYSIS REQUESTED: PCS

Visit our website www.aesatlanta.com to check on the status of your results, place bottle orders, etc.

#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	Grab	Composite	Matrix (See codes)	PRESERVATION (See codes)	REMARKS	No # of Containers
1	Pond	9-10-12	6:00	~~X~~	X	S	X	Same Day T/A	
2	IDW	↓	8:15	X		S	X	5 day T/A	
3	S-BC-1	↓	8:30	X		S		Archive	
4	Trip Blank						X		
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1:	9-10-12 / 1200	1:	9/10/12 1500
2:		2:	
3:		3:	

PROJECT INFORMATION

PROJECT NAME: PC

PROJECT #: 559

SITE ADDRESS:

SEND REPORT TO:

INVOICE TO: (IF DIFFERENT FROM ABOVE)

QUOTE #: _____ PO#: _____

RECEIPT

Total # of Containers

See above

Turnaround Time Request

- ○ Standard 5 Business Days
- ○ 2 Business Day Rush
- ○ Next Business Day Rush
- ○ Same Day Rush **(auth req.)**
- ○ Other _____

STATE PROGRAM (if any): _____

E-mail? Y / N; Fax? Y / N

DATA PACKAGE: I II III IV

SPECIAL INSTRUCTIONS/COMMENTS:

SHIPMENT METHOD

OUT / / VIA:

IN / / VIA:

CLIENT FedEx UPS MAIL COURIER

GREYHOUND OTHER_____

SAMPLES RECEIVED AFTER 3PM OR ON SATURDAY ARE CONSIDERED RECEIVED THE NEXT BUSINESS DAY. IF TURNAROUND TIME IS NOT INDICATED, AES WILL PROCEED WITH STANDARD TAT OF SAMPLES. SAMPLES ARE DISPOSED 30 DAYS AFTER REPORT COMPLETION UNLESS OTHER ARRANGEMENTS ARE MADE.

MATRIX CODES: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) DW = Drinking Water (Blanks) O = Other (specify) WW = Waste Water

PRESERVATIVE CODES: H+I = Hydrochloric acid + ice I = Ice only N = Nitric acid S+I = Sulfuric acid + ice S/M+I = Sodium Bisulfate/Methanol + ice O = Other (specify) NA = None

White Copy - Original; Yellow Copy - Client

Client: Environmental Management Associates, LLC
Project: Professional Cleaners
Lab ID: 1209550

Case Narrative

Volatile Organic Compounds Analysis by Method 8260B:

Percent recovery for the internal standard compound 1,4-Dichlorobenzene-d4 on sample 1209550-001A was outside control limits biased low due to suspected matrix interference.

Analytical Environmental Services, Inc **Date:** 17-Sep-12

Client:	Environmental Management Associates, LLC	**Client Sample ID:**	POND
Project Name:	Professional Cleaners	**Collection Date:**	9/10/2012 8:00:00 AM
Lab ID:	1209550-001	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5035)**				
Tetrachloroethene	BRL	4.3		ug/Kg-dry	166230	1	09/10/2012 14:44	JE
Surr: 4-Bromofluorobenzene	84.8	56.5-134		%REC	166230	1	09/10/2012 14:44	JE
Surr: Dibromofluoromethane	130	71.8-135		%REC	166230	1	09/10/2012 14:44	JE
Surr: Toluene-d8	109	77.1-117		%REC	166230	1	09/10/2012 14:44	JE
PERCENT MOISTURE D2216								
Percent Moisture	18.5	0		wt%	R228612	1	09/10/2012 11:30	AS

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	NC	Not confirmed
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 17-Sep-12

Client:	Environmental Management Associates, LLC	**Client Sample ID:**	IDW
Project Name:	Professional Cleaners	**Collection Date:**	9/10/2012 8:15:00 AM
Lab ID:	1209550-002	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5035)**				
Tetrachloroethene	BRL	3.6		ug/Kg-dry	166230	1	09/10/2012 15:09	JE
Surr: 4-Bromofluorobenzene	83.8	56.5-134		%REC	166230	1	09/10/2012 15:09	JE
Surr: Dibromofluoromethane	128	71.8-135		%REC	166230	1	09/10/2012 15:09	JE
Surr: Toluene-d8	103	77.1-117		%REC	166230	1	09/10/2012 15:09	JE
PERCENT MOISTURE D2216								
Percent Moisture	17.0	0		wt%	R229014	1	09/14/2012 11:30	AS

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	NC	Not confirmed
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 17-Sep-12

Client:	Environmental Management Associates, LLC	**Client Sample ID:**	TRIP BLANK
Project Name:	Professional Cleaners	**Collection Date:**	9/10/2012
Lab ID:	1209550-004	**Matrix:**	Aqueous

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
Tetrachloroethene	BRL	5.0		ug/L	166213	1	09/10/2012 15:29	GK
Surr: 4-Bromofluorobenzene	94.2	67.4-123		%REC	166213	1	09/10/2012 15:29	GK
Surr: Dibromofluoromethane	120	75.5-128		%REC	166213	1	09/10/2012 15:29	GK
Surr: Toluene-d8	97.5	70-120		%REC	166213	1	09/10/2012 15:29	GK

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	NC	Not confirmed
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc.

Sample/Cooler Receipt Checklist

Client EMA IBC Work Order Number 1209550

Checklist completed by [signature] 9/10/12
Signature Date

Carrier name: FedEx __ UPS __ Courier __ Client ✓ US Mail __ Other _____

Shipping container/cooler in good condition? Yes __ No ✓ Not Present __

Custody seals intact on shipping container/cooler? Yes __ No __ Not Present ✓

Custody seals intact on sample bottles? Yes __ No __ Not Present ✓

Container/Temp Blank temperature in compliance? (4°C±2)* Yes ✓ No __

Cooler #1 3.4°C Cooler #2 _____ Cooler #3 _____ Cooler #4 _____ Cooler#5 _____ Cooler #6 _____

Chain of custody present? Yes ✓ No __

Chain of custody signed when relinquished and received? Yes ✓ No __

Chain of custody agrees with sample labels? Yes ✓ No __

Samples in proper container/bottle? Yes ✓ No __

Sample containers intact? Yes ✓ No __

Sufficient sample volume for indicated test? Yes ✓ No __

All samples received within holding time? Yes ✓ No __

Was TAT marked on the COC? Yes ✓ No __

Proceed with Standard TAT as per project history? Yes __ No __ Not Applicable ✓

Water - VOA vials have zero headspace? No VOA vials submitted __ Yes ✓ No __

Water - pH acceptable upon receipt? Yes ✓ No __ Not Applicable __

Adjusted? _____ Checked by _____

Sample Condition: Good ✓ Other(Explain) _____

(For diffusive samples or AIHA lead) Is a known blank included? Yes __ No ✓

See Case Narrative for resolution of the Non-Conformance.

* Samples do not have to comply with the given range for certain parameters.

\L\Quality Assurance\Checklists Procedures Sign-Off Templates\Checklists\Sample Receipt Checklists\Sample_Cooler_Receipt_Checklist

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: **166213**

Sample ID: **MB-166213** Client ID: Units: **ug/L** Prep Date: **09/10/2012** Run No: **228575**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166213** Analysis Date: **09/10/2012** Seq No: **4784494**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2,2-Tetrachloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2,4-Trichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromo-3-chloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromoethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,3-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,4-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
2-Butanone	BRL	50	0	0	0	0	0	0	0	0	
2-Hexanone	BRL	10	0	0	0	0	0	0	0	0	
4-Methyl-2-pentanone	BRL	10	0	0	0	0	0	0	0	0	
Acetone	BRL	50	0	0	0	0	0	0	0	0	
Benzene	BRL	5.0	0	0	0	0	0	0	0	0	
Bromodichloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Bromoform	BRL	5.0	0	0	0	0	0	0	0	0	
Bromomethane	BRL	5.0	0	0	0	0	0	0	0	0	
Carbon disulfide	BRL	5.0	0	0	0	0	0	0	0	0	
Carbon tetrachloride	BRL	5.0	0	0	0	0	0	0	0	0	
Chlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Chloroethane	BRL	10	0	0	0	0	0	0	0	0	
Chloroform	BRL	5.0	0	0	0	0	0	0	0	0	
Chloromethane	BRL	10	0	0	0	0	0	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: 166213

Sample ID: **MB-166213** Client ID: Units: **ug/L** Prep Date: **09/10/2012** Run No: **228575**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166213** Analysis Date: **09/10/2012** Seq No: **4784494**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
cis-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Cyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Dibromochloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Dichlorodifluoromethane	BRL	10	0	0	0	0	0	0	0	0	
Ethylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Freon-113	BRL	10	0	0	0	0	0	0	0	0	
Isopropylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
m,p-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl acetate	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl tert-butyl ether	BRL	5.0	0	0	0	0	0	0	0	0	
Methylcyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Methylene chloride	BRL	5.0	0	0	0	0	0	0	0	0	
o-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Styrene	BRL	5.0	0	0	0	0	0	0	0	0	
Tetrachloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Toluene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichlorofluoromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Vinyl chloride	BRL	2.0	0	0	0	0	0	0	0	0	
Surr: 4-Bromofluorobenzene	48.34	0	50	0	96.7	67.4	123	0	0	0	
Surr: Dibromofluoromethane	63.04	0	50	0	126	75.5	128	0	0	0	
Surr: Toluene-d8	48.20	0	50	0	96.4	70	120	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: 166213

Sample ID: **LCS-166213** Client ID: Units: **ug/L** Prep Date: **09/10/2012** Run No: **228575**
SampleType: **LCS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166213** Analysis Date: **09/10/2012** Seq No: **4784643**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	49.64	5.0	50	0	99.3	60	140	0	0	0	
Benzene	48.09	5.0	50	0	96.2	70	130	0	0	0	
Chlorobenzene	45.45	5.0	50	0	90.9	70	130	0	0	0	
Toluene	47.25	5.0	50	0	94.5	70	130	0	0	0	
Trichloroethene	49.74	5.0	50	0	99.5	70	130	0	0	0	
Surr: 4-Bromofluorobenzene	50.24	0	50	0	100	67.4	123	0	0	0	
Surr: Dibromofluoromethane	59.32	0	50	0	119	75.5	128	0	0	0	
Surr: Toluene-d8	47.93	0	50	0	95.9	70	120	0	0	0	

Sample ID: **1209548-001AMS** Client ID: Units: **ug/L** Prep Date: **09/10/2012** Run No: **228575**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166213** Analysis Date: **09/10/2012** Seq No: **4784797**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	5224	500	5000	0	104	50.1	179	0	0	0	
Benzene	5373	500	5000	0	107	61.2	150	0	0	0	
Chlorobenzene	4800	500	5000	0	96	72.1	140	0	0	0	
Toluene	5392	500	5000	0	108	58.7	154	0	0	0	
Trichloroethene	18970	500	5000	12410	131	68.3	149	0	0	0	
Surr: 4-Bromofluorobenzene	5008	0	5000	0	100	67.4	123	0	0	0	
Surr: Dibromofluoromethane	6285	0	5000	0	126	75.5	128	0	0	0	
Surr: Toluene-d8	5178	0	5000	0	104	70	120	0	0	0	

Sample ID: **1209548-001AMSD** Client ID: Units: **ug/L** Prep Date: **09/10/2012** Run No: **228575**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166213** Analysis Date: **09/10/2012** Seq No: **4784798**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	4836	500	5000	0	96.7	50.1	179	5224	7.71	23.3	
Benzene	4922	500	5000	0	98.4	61.2	150	5373	8.76	19	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: **166213**

Sample ID: **1209548-001AMSD** Client ID: Units: **ug/L** Prep Date: **09/10/2012** Run No: **228575**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166213** Analysis Date: **09/10/2012** Seq No: **4784798**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chlorobenzene	4779	500	5000	0	95.6	72.1	140	4800	0.438	21.5	
Toluene	5066	500	5000	0	101	58.7	154	5392	6.23	20	
Trichloroethene	17430	500	5000	12410	100	68.3	149	18970	8.48	17.7	
Surr: 4-Bromofluorobenzene	5176	0	5000	0	104	67.4	123	5008	0	0	
Surr: Dibromofluoromethane	6037	0	5000	0	121	75.5	128	6285	0	0	
Surr: Toluene-d8	4884	0	5000	0	97.7	70	120	5178	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: 166230

Sample ID: **MB-166230** Client ID: Units: **ug/Kg** Prep Date: **09/10/2012** Run No: **228576**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166230** Analysis Date: **09/10/2012** Seq No: **4785236**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2,2-Tetrachloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2,4-Trichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromo-3-chloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromoethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,3-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,4-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
2-Butanone	BRL	50	0	0	0	0	0	0	0	0	
2-Hexanone	BRL	10	0	0	0	0	0	0	0	0	
4-Methyl-2-pentanone	BRL	10	0	0	0	0	0	0	0	0	
Acetone	BRL	100	0	0	0	0	0	0	0	0	
Benzene	BRL	5.0	0	0	0	0	0	0	0	0	
Bromodichloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Bromoform	BRL	5.0	0	0	0	0	0	0	0	0	
Bromomethane	BRL	5.0	0	0	0	0	0	0	0	0	
Carbon disulfide	BRL	10	0	0	0	0	0	0	0	0	
Carbon tetrachloride	BRL	5.0	0	0	0	0	0	0	0	0	
Chlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Chloroethane	BRL	10	0	0	0	0	0	0	0	0	
Chloroform	BRL	5.0	0	0	0	0	0	0	0	0	
Chloromethane	BRL	10	0	0	0	0	0	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: 166230

Sample ID: **MB-166230** Client ID: Units: **ug/Kg** Prep Date: **09/10/2012** Run No: **228576**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166230** Analysis Date: **09/10/2012** Seq No: **4785236**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
cis-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Cyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Dibromochloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Dichlorodifluoromethane	BRL	10	0	0	0	0	0	0	0	0	
Ethylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Freon-113	BRL	10	0	0	0	0	0	0	0	0	
Isopropylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
m,p-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl acetate	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl tert-butyl ether	BRL	5.0	0	0	0	0	0	0	0	0	
Methylcyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Methylene chloride	BRL	5.0	0	0	0	0	0	0	0	0	
o-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Styrene	BRL	5.0	0	0	0	0	0	0	0	0	
Tetrachloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Toluene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichlorofluoromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Vinyl chloride	BRL	10	0	0	0	0	0	0	0	0	
Surr: 4-Bromofluorobenzene	41.86	0	50	0	83.7	56.5	134	0	0	0	
Surr: Dibromofluoromethane	58.95	0	50	0	118	71.8	135	0	0	0	
Surr: Toluene-d8	54.50	0	50	0	109	77.1	117	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: 166230

Sample ID: **LCS-166230** Client ID: Units: **ug/Kg** Prep Date: **09/10/2012** Run No: **228576**
SampleType: **LCS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166230** Analysis Date: **09/10/2012** Seq No: **4785589**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	60.30	5.0	50	0	121	60	140	0	0	0	
Benzene	48.45	5.0	50	0	96.9	70	130	0	0	0	
Chlorobenzene	41.09	5.0	50	0	82.2	70	130	0	0	0	
Toluene	45.87	5.0	50	0	91.7	70	130	0	0	0	
Trichloroethene	44.06	5.0	50	0	88.1	70	130	0	0	0	
Surr: 4-Bromofluorobenzene	52.83	0	50	0	106	56.5	134	0	0	0	
Surr: Dibromofluoromethane	54.27	0	50	0	109	71.8	135	0	0	0	
Surr: Toluene-d8	51.33	0	50	0	103	77.1	117	0	0	0	

Sample ID: **1209550-001AMS** Client ID: **POND** Units: **ug/Kg-dry** Prep Date: **09/10/2012** Run No: **228576**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166230** Analysis Date: **09/10/2012** Seq No: **4785587**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	86.89	6.1	61.36	0	142	51	159	0	0	0	
Benzene	71.20	6.1	61.36	0	116	67.6	139	0	0	0	
Chlorobenzene	59.03	6.1	61.36	0	96.2	73.6	135	0	0	0	
Toluene	68.13	6.1	61.36	0	111	63.5	140	0	0	0	
Trichloroethene	66.13	6.1	61.36	0	108	67.6	145	0	0	0	
Surr: 4-Bromofluorobenzene	62.11	0	61.36	0	101	56.5	134	0	0	0	
Surr: Dibromofluoromethane	69.69	0	61.36	0	114	71.8	135	0	0	0	
Surr: Toluene-d8	64.26	0	61.36	0	105	77.1	117	0	0	0	

Sample ID: **1209550-001AMSD** Client ID: **POND** Units: **ug/Kg-dry** Prep Date: **09/10/2012** Run No: **228576**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166230** Analysis Date: **09/10/2012** Seq No: **4785588**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	87.21	6.1	61.36	0	142	51	159	86.89	0.367	25.7	
Benzene	75.46	6.1	61.36	0	123	67.6	139	71.20	5.81	18.5	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1209550

ANALYTICAL QC SUMMARY REPORT

BatchID: **166230**

Sample ID: **1209550-001AMSD** Client ID: **POND** Units: **ug/Kg-dry** Prep Date: **09/10/2012** Run No: **228576**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **166230** Analysis Date: **09/10/2012** Seq No: **4785588**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chlorobenzene	59.08	6.1	61.36	0	96.3	73.6	135	59.03	0.083	18.5	
Toluene	71.07	6.1	61.36	0	116	63.5	140	68.13	4.21	18.8	
Trichloroethene	68.99	6.1	61.36	0	112	67.6	145	66.13	4.23	20.7	
Surr: 4-Bromofluorobenzene	60.99	0	61.36	0	99.4	56.5	134	62.11	0	0	
Surr: Dibromofluoromethane	72.40	0	61.36	0	118	71.8	135	69.69	0	0	
Surr: Toluene-d8	65.59	0	61.36	0	107	77.1	117	64.26	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

AES

April 08, 2013

Brent Cortelloni
Environmental Management Associates, LLC
5262 Belle Wood Court
Buford Georgi30518

TEL: (770) 271-4628
FAX: (770) 271-8944

RE: Professional Cleaners

Dear Brent Cortelloni: Order No: 1304336

Analytical Environmental Services, Inc. received 1 samples on 4/4/2013 10:25:00 AM for the analyses presented in following report.

No problems were encountered during the analyses. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits. Any discrepancies associated with the analyses contained herein will be noted and submitted in the form of a project Case Narrative.
AES' certifications are as follows:
-NELAC/Florida Certification number E87582 for analysis of Environmental Water, soil/hazardous waste, and Drinking Water Microbiology, effective 07/01/12-06/30/13.
-AIHA Certification ID #100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) effective until 09/01/13.

These results relate only to the items tested. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

Mirzeta Kararic

Mirzeta Kararic
Project Manager

ANALYTICAL ENVIRONMENTAL SERVICES, INC
3785 Presidential Parkway, Atlanta GA 30340-3704
AES TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

CHAIN OF CUSTODY

Work Order: 1304336

Date: _____ Page _____ of _____

COMPANY: EMA/BC

ADDRESS:

PHONE:

FAX:

SAMPLED BY: B. Costello

SIGNATURE:

ANALYSIS REQUESTED: PCE

Visit our website www.aesatlanta.com to check on the status of your results, place bottle orders, etc.

#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	Grab	Composite	Matrix (See codes)	PRESERVATION (See codes)	REMARKS	No # of Containers
1	MW-2D	4-4-13	1010	X		GW	X		
2									
3								Send data	
4									
5								T/A	
6									
7									
8									
9									
10									
11									
12									
13									
14									

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1:	04-4-13	1:	4/4/13 1022T
2:		2:	
3:		3:	

PROJECT INFORMATION
PROJECT NAME: Professional Cleaners
PROJECT #: 559
SITE ADDRESS:
SEND REPORT TO:
INVOICE TO: (IF DIFFERENT FROM ABOVE)
QUOTE #: PO#:

RECEIPT
Total # of Containers

Turnaround Time Request
- Standard 5 Business Days
- 2 Business Day Rush
- Next Business Day Rush
- Same Day Rush (auth req.)
- Other _____

STATE PROGRAM (if any): _____
E-mail? Y / N; Fax? Y / N
DATA PACKAGE: I II III IV

SPECIAL INSTRUCTIONS/COMMENTS:

SHIPMENT METHOD
OUT / / VIA:
IN / / VIA:
CLIENT FedEx UPS MAIL COURIER
GREYHOUND OTHER_____

SAMPLES RECEIVED AFTER 3PM OR ON SATURDAY ARE CONSIDERED RECEIVED THE NEXT BUSINESS DAY. IF TURNAROUND TIME IS NOT INDICATED, AES WILL PROCEED WITH STANDARD TAT OF SAMPLES. SAMPLES ARE DISPOSED 30 DAYS AFTER REPORT COMPLETION UNLESS OTHER ARRANGEMENTS ARE MADE.

MATRIX CODES: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) DW = Drinking Water (Blanks) O = Other (specify) WW = Waste Water
PRESERVATIVE CODES: H+I = Hydrochloric acid + ice I = Ice only N = Nitric acid S+I = Sulfuric acid + ice S/M+I = Sodium Bisulfate/Methanol + ice O = Other (specify) NA = None

White Copy - Original; Yellow Copy - Client

Analytical Environmental Services, Inc

Date: 8-Apr-13

Client:	Environmental Management Associates, LLC	**Client Sample ID:**	MW-2D
Lab Order	1304336	**Tag Number:**	
Project:	Professional Cleaners	**Collection Date:**	4/4/2013 10:10:00 AM
Lab ID:	1304336-001A	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
Tetrachloroethene	BRL	5.0		ug/L	174416	1	04/04/2013 15:29	YT
Surr: 4-Bromofluorobenzene	88.7	64.6-123		%REC	174416	1	04/04/2013 15:29	YT
Surr: Dibromofluoromethane	104	76.6-133		%REC	174416	1	04/04/2013 15:29	YT
Surr: Toluene-d8	95.9	77.8-120		%REC	174416	1	04/04/2013 15:29	YT

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	NC	Not confirmed
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc.

Sample/Cooler Receipt Checklist

Client EMA /BC Work Order Number 1304336

Checklist completed by PR 4/4/13
Signature Date

Carrier name: FedEx __ UPS __ Courier __ Client ✓ US Mail __ Other _____

Shipping container/cooler in good condition? Yes ✓ No __ Not Present __

Custody seals intact on shipping container/cooler? Yes __ No __ Not Present ✓

Custody seals intact on sample bottles? Yes __ No __ Not Present ✓

Container/Temp Blank temperature in compliance? (4°C±2)* Yes ✓ No __

Cooler #1 3.4 Cooler #2 _____ Cooler #3 _____ Cooler #4 _____ Cooler#5 _____ Cooler #6 _____

Chain of custody present? Yes ✓ No __

Chain of custody signed when relinquished and received? Yes ✓ No __

Chain of custody agrees with sample labels? Yes ✓ No __

Samples in proper container/bottle? Yes ✓ No __

Sample containers intact? Yes ✓ No __

Sufficient sample volume for indicated test? Yes ✓ No __

All samples received within holding time? Yes ✓ No __

Was TAT marked on the COC? Yes ✓ No __

Proceed with Standard TAT as per project history? Yes __ No __ Not Applicable ✓

Water - VOA vials have zero headspace? No VOA vials submitted __ Yes ✓ No __

Water - pH acceptable upon receipt? Yes ✓ No __ Not Applicable __

Adjusted? _____ Checked by _____

Sample Condition: Good ✓ Other(Explain) _____

(For diffusive samples or AIHA lead) Is a known blank included? Yes __ No ✓

See Case Narrative for resolution of the Non-Conformance.

* Samples do not have to comply with the given range for certain parameters.

\L\Quality Assurance\Checklists Procedures Sign-Off Templates\Checklists\Sample Receipt Checklists\Sample_Cooler_Receipt_Checklist

Analytical Environmental Services, Inc

Date: 8-Apr-13

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1304336

ANALYTICAL QC SUMMARY REPORT

BatchID: 174416

Sample ID: **MB-174416** Client ID: Units: **ug/L** Prep Date: **04/04/2013** Run No: **241466**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **174416** Analysis Date: **04/04/2013** Seq No: **5055858**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1,1-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2,2-Tetrachloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1,2-Trichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,1-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2,4-Trichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromo-3-chloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dibromoethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloroethane	BRL	5.0	0	0	0	0	0	0	0	0	
1,2-Dichloropropane	BRL	5.0	0	0	0	0	0	0	0	0	
1,3-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
1,4-Dichlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
2-Butanone	BRL	50	0	0	0	0	0	0	0	0	
2-Hexanone	BRL	10	0	0	0	0	0	0	0	0	
4-Methyl-2-pentanone	BRL	10	0	0	0	0	0	0	0	0	
Acetone	BRL	50	0	0	0	0	0	0	0	0	
Benzene	BRL	5.0	0	0	0	0	0	0	0	0	
Bromodichloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Bromoform	BRL	5.0	0	0	0	0	0	0	0	0	
Bromomethane	BRL	5.0	0	0	0	0	0	0	0	0	
Carbon disulfide	BRL	5.0	0	0	0	0	0	0	0	0	
Carbon tetrachloride	BRL	5.0	0	0	0	0	0	0	0	0	
Chlorobenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Chloroethane	BRL	10	0	0	0	0	0	0	0	0	
Chloroform	BRL	5.0	0	0	0	0	0	0	0	0	
Chloromethane	BRL	10	0	0	0	0	0	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1304336

ANALYTICAL QC SUMMARY REPORT

BatchID: 174416

Sample ID: **MB-174416** Client ID: Units: **ug/L** Prep Date: **04/04/2013** Run No: **241466**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **174416** Analysis Date: **04/04/2013** Seq No: **5055858**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
cis-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Cyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Dibromochloromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Dichlorodifluoromethane	BRL	10	0	0	0	0	0	0	0	0	
Ethylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
Freon-113	BRL	10	0	0	0	0	0	0	0	0	
Isopropylbenzene	BRL	5.0	0	0	0	0	0	0	0	0	
m,p-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl acetate	BRL	5.0	0	0	0	0	0	0	0	0	
Methyl tert-butyl ether	BRL	5.0	0	0	0	0	0	0	0	0	
Methylcyclohexane	BRL	5.0	0	0	0	0	0	0	0	0	
Methylene chloride	BRL	5.0	0	0	0	0	0	0	0	0	
o-Xylene	BRL	5.0	0	0	0	0	0	0	0	0	
Styrene	BRL	5.0	0	0	0	0	0	0	0	0	
Tetrachloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Toluene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,2-Dichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
trans-1,3-Dichloropropene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichloroethene	BRL	5.0	0	0	0	0	0	0	0	0	
Trichlorofluoromethane	BRL	5.0	0	0	0	0	0	0	0	0	
Vinyl chloride	BRL	2.0	0	0	0	0	0	0	0	0	
Surr: 4-Bromofluorobenzene	44.18	0	50	0	88.4	64.6	123	0	0	0	
Surr: Dibromofluoromethane	49.10	0	50	0	98.2	76.6	133	0	0	0	
Surr: Toluene-d8	49.76	0	50	0	99.5	77.8	120	0	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1304336

ANALYTICAL QC SUMMARY REPORT

BatchID: 174416

Sample ID: **LCS-174416** Client ID: Units: **ug/L** Prep Date: **04/04/2013** Run No: **241466**
SampleType: **LCS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **174416** Analysis Date: **04/04/2013** Seq No: **5055746**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	53.38	5.0	50	0	107	61.1	142	0	0	0	
Benzene	44.05	5.0	50	0	88.1	73.5	130	0	0	0	
Chlorobenzene	42.99	5.0	50	0	86	72.4	123	0	0	0	
Toluene	43.37	5.0	50	0	86.7	73.6	130	0	0	0	
Trichloroethene	43.44	5.0	50	0	86.9	70	135	0	0	0	
Surr: 4-Bromofluorobenzene	44.15	0	50	0	88.3	64.6	123	0	0	0	
Surr: Dibromofluoromethane	50.14	0	50	0	100	76.6	133	0	0	0	
Surr: Toluene-d8	50.05	0	50	0	100	77.8	120	0	0	0	

Sample ID: **1303N30-001AMS** Client ID: Units: **ug/L** Prep Date: **04/04/2013** Run No: **241466**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **174416** Analysis Date: **04/04/2013** Seq No: **5055914**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	54.03	5.0	50	0	108	60	168	0	0	0	
Benzene	49.81	5.0	50	0	99.6	66.6	148	0	0	0	
Chlorobenzene	47.94	5.0	50	0	95.9	71.9	135	0	0	0	
Toluene	49.75	5.0	50	0	99.5	68	149	0	0	0	
Trichloroethene	49.76	5.0	50	0	99.5	71.1	154	0	0	0	
Surr: 4-Bromofluorobenzene	46.59	0	50	0	93.2	64.6	123	0	0	0	
Surr: Dibromofluoromethane	51.19	0	50	0	102	76.6	133	0	0	0	
Surr: Toluene-d8	50.15	0	50	0	100	77.8	120	0	0	0	

Sample ID: **1303N30-001AMSD** Client ID: Units: **ug/L** Prep Date: **04/04/2013** Run No: **241466**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **174416** Analysis Date: **04/04/2013** Seq No: **5056003**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	55.41	5.0	50	0	111	60	168	54.03	2.52	18.6	
Benzene	48.86	5.0	50	0	97.7	66.6	148	49.81	1.93	20	

Qualifiers:
- > Greater than Result value
- BRL Below reporting limit
- J Estimated value detected below Reporting Limit
- Rpt Lim Reporting Limit
- < Less than Result value
- E Estimated (value above quantitation range)
- N Analyte not NELAC certified
- S Spike Recovery outside limits due to matrix
- B Analyte detected in the associated method blank
- H Holding times for preparation or analysis exceeded
- R RPD outside limits due to matrix

Analytical Environmental Services, Inc

Date: 8-Apr-13

Client: Environmental Management Associates, LLC
Project Name: Professional Cleaners
Workorder: 1304336

ANALYTICAL QC SUMMARY REPORT

BatchID: 174416

Sample ID: **1303N30-001AMSD** Client ID: Units: **ug/L** Prep Date: **04/04/2013** Run No: **241466**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **174416** Analysis Date: **04/04/2013** Seq No: **5056003**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chlorobenzene	48.00	5.0	50	0	96	71.9	135	47.94	0.125	20	
Toluene	48.60	5.0	50	0	97.2	68	149	49.75	2.34	20	
Trichloroethene	49.38	5.0	50	0	98.8	71.1	154	49.76	0.767	20	
Surr: 4-Bromofluorobenzene	46.27	0	50	0	92.5	64.6	123	46.59	0	0	
Surr: Dibromofluoromethane	51.17	0	50	0	102	76.6	133	51.19	0	0	
Surr: Toluene-d8	50.22	0	50	0	100	77.8	120	50.15	0	0	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

APPENDIX C

STRATIGRAPHIC AND INSTRUMENTATION LOGS

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA

Stratigraphic & Instrumentation Log MW-1

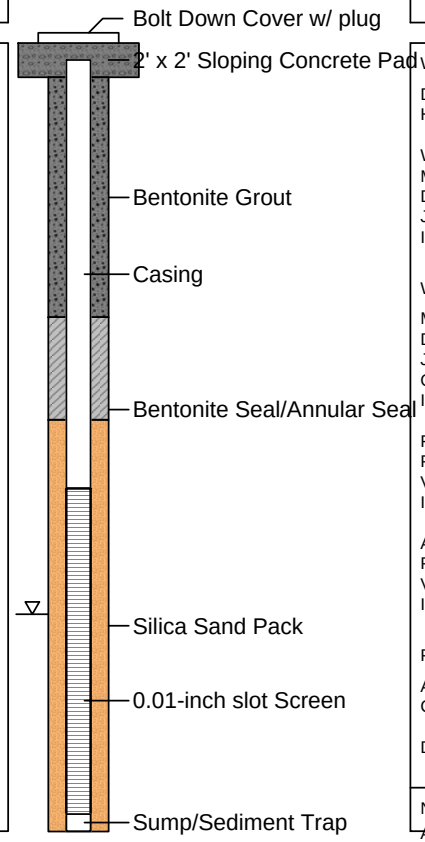
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 6/20/11 @1000	Driller/Equipment	: CME 55
Northing Coordinate	:	Surface Elev.	: 99.59
Easting Coordinate	:	Top of Casing elev.	: 99.18
Survey By	: EMA, LLC	Logged By	: B. Cortelloni

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	99.59	FB	Asphalt				
2	97.59	ML	ML- SILT, sand, medium density,fine to medium grain, brown/tan, dry				
4	95.59						
6	93.59						
8	91.59	ML/SC	ML/SC- SILT, CLAYEY SAND, moist				
10	89.59	ML	ML-SILT, very fine sand grades to saprolite, wet				
12	87.59						
14	85.59						
16	83.59						
18	81.59						
20	79.59						
22	77.59						
24			End of boring				



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 4-1/4 inch ID HSA
Hole Diameter	: Nominal 8-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0.5-13

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 13-23

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Gravity feed
Volume	: 1.5 cubic ft.
Interval (ft. bgs)	: 11-23

ANNULUS SEAL	: Bentonite Pellets/Bentonite grout
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.25 / 0.5 cubic ft.
Interval (ft. bgs)	: 8-11, 0.5-8

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Bailer -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual
for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA

Stratigraphic & Instrumentation Log MW-2

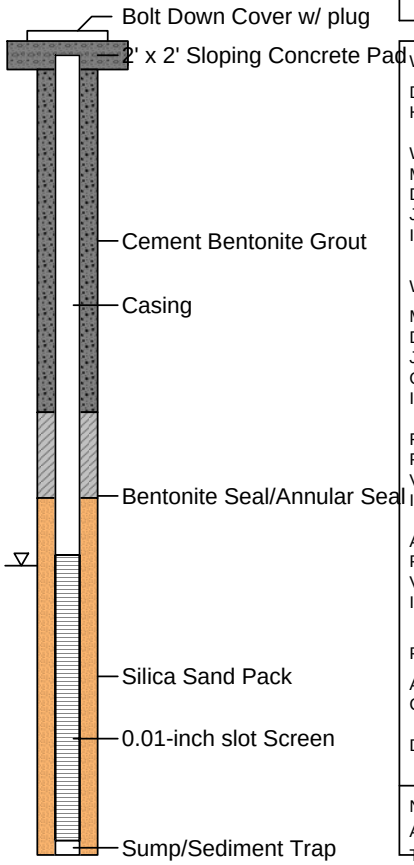
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 6/20/11 @1200	Driller/Equipment	: CME 55
Northing Coordinate	:	Surface Elev.	: 98.53
Easting Coordinate	:	Top of Casing elev.	: 97.96
Survey By	: EMA, LLC	Logged By	: B. Cortelloni

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	98.53	FB	Asphalt				
2	96.53	ML	ML- SILT, sand, medium density,fine to medium grain, brown/tan, dry				
4	94.53						
6	92.53						
8	90.53						
10	88.53						
12	86.53	ML/SC	ML/SC - SILT, CLAYEY SAND, moist				
14	84.53	ML	ML - SILT, very fine sand, grades to saprolite, moist to wet				
16	82.53						
18	80.53						
20	78.53						
22	76.53						
24	74.53						
26	72.53						
28	70.53						
30			End of boring				



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 4-1/4 inch ID HSA
Hole Diameter	: Nominal 8-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0.3-18

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 18-28

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Gravity feed
Volume	: 1.5 cubic ft.
Interval (ft. bgs)	: 16-28.5

ANNULUS SEAL	: Bentonite Pellets/Bentonite grout
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.5 / 1.0 cubic ft.
Interval (ft. bgs)	: 13-16, 0.5-13

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Bailer -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA 30518

Stratigraphic & Instrumentation Log MW-2D

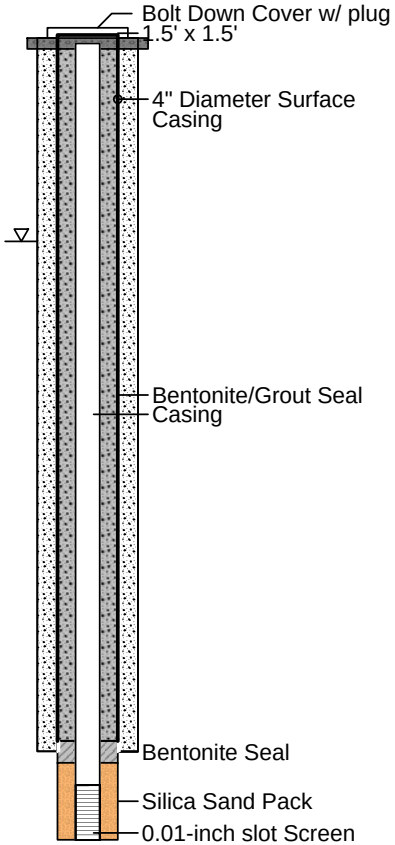
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 3/28/13 @ 1700	Driller/Equipment	: CME 75
Northing Coordinate	:	Surface Elev.	: 99.58 ft AMSL
Easting Coordinate	:	Top of Casing elev.	: 99.33 ft AMSL
Survey By	: EMA, LLC	Logged By	: J. Schwaller

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	GRAPHIC	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	99.58	ML		ML- SILT, some fine sand, loose, brown dry				
5	94.58							
10	89.58							
15	84.58							
20	79.58	ML		increasing clay content, gray				
25	74.58	ML		increasing sand content, fine to coarse, wet at 23				
30	69.58							
35	64.58							
40	59.58							
45	54.58							
50	49.58							
55	44.58	PWR		Partially weathered rock				
60	39.58	BR		Bedrock - Granitic Gneiss, likely Atlanta Group				
65	34.58	BR		slight fracture, water producing				
70	29.58	BR		good fracture - good water yield				
75				End of boring				



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 6.25 ID HSA/4" Air Rotary
Hole Diameter	: 10" / 4"

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 4" Outer / 2" Inner
Joints	: Flush Treaded
Interval (ft. bgs)	: 64 / 0-68

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 68-73 Pre-Packed

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Pre-Packed
Volume	:
Interval (ft. bgs)	: 68-73

ANNULUS SEAL	: Bentonite Pellets/Bent. Grout
Placement Method	: Gravity Fed/Pressure
Volume	: 0.5/14 cubic feet
Interval (ft. bgs)	: 64-66/0-64

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Peristaltic pump -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA

Stratigraphic & Instrumentation Log MW-3

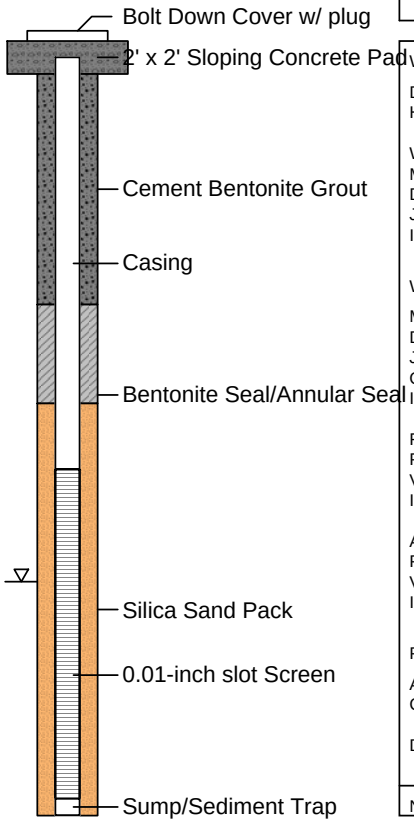
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 6/20/11 @1400	Driller/Equipment	: CME 55
Northing Coordinate	:	Surface Elev.	: 98.43
Easting Coordinate	:	Top of Casing elev.	: 98.00
Survey By	: EMA, LLC	Logged By	: B. Cortelloni

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	GRAPHIC	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	98.43	FB		Asphalt				
2	96.43	ML		ML- SILT, sand, medium density,fine to medium grain, brown/tan, dry				
4	94.43							
6	92.43							
8	90.43	ML/SC		ML-SC - SILT, CLAYEY SAND, moist				
10	88.43	ML		ML-SILT, very fine sand, grades to saprolite with depth, moist				
12	86.43							
14	84.43							
16	82.43							
18	80.43							
20	78.43							
22	76.43							
24	74.43			End of boring				
26								



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 4-1/4 inch ID HSA
Hole Diameter	: Nominal 8-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0.3-13

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 13-23

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Gravity feed
Volume	: 1.0 cubic ft.
Interval (ft. bgs)	: 11-23.5

ANNULUS SEAL	: Bentonite Pellets/Bentonite grout
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.25 / 0.5 cubic ft.
Interval (ft. bgs)	: 8-11, 0.5-8

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Bailer -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA

Stratigraphic & Instrumentation Log MW-4

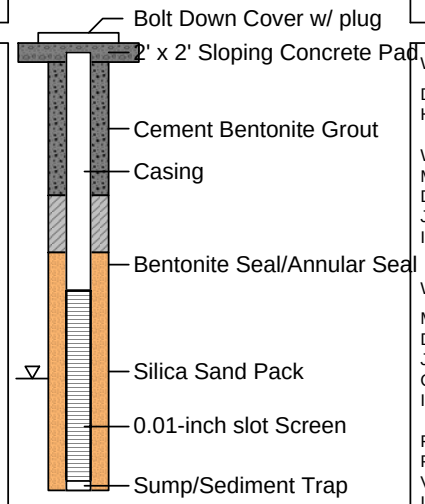
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 7/21/11 @1100	Driller/Equipment	: GeoProbe 6600 DT
Northing Coordinate	:	Surface Elev.	: 96.97
Easting Coordinate	:	Top of Casing elev.	: 96.55
Survey By	: EMA, LLC	Logged By	: J. Schwaller

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	GRAPHIC	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	96.97	FB		Asphalt				
2	94.97	ML		ML- SILT, some clay, trace fine sand, medium density,fine to medium grain, orange, yellow, dry				
4	92.97							
6	90.97							
8	88.97	ML		increasing clay				
10	86.97							
12	84.97							
14	82.97							
16	80.97	ML		moist				
18	78.97	ML/SC		ML/SC - SILT, CLAYEY SAND, moist to wet				
20	76.97							
22	74.97	ML		fine to medium sand				
24	72.97							
26	70.97							
28	68.97	ML/SP		ML/SP - SILT grades to SAND, Poorly Graded, trace clay, medium dense, some coarse sand, saprolitic, wet				
30	66.97							
32	64.97							
34	62.97							
36	60.97							
38	58.97							
40	56.97							
42	54.97							
44				End of Boring - Refusal				



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 4-1/4 inch ID HSA
Hole Diameter	: Nominal 8-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0.3-13

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 13-23

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Gravity feed
Volume	: 1.0 cubic ft.
Interval (ft. bgs)	: 11-23.5

ANNULUS SEAL	: Bentonite Pellets/Bentonite grout
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.25 / 0.5 cubic ft.
Interval (ft. bgs)	: 8-11, 0.5-8

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Bailer -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA

Stratigraphic & Instrumentation Log MW-5

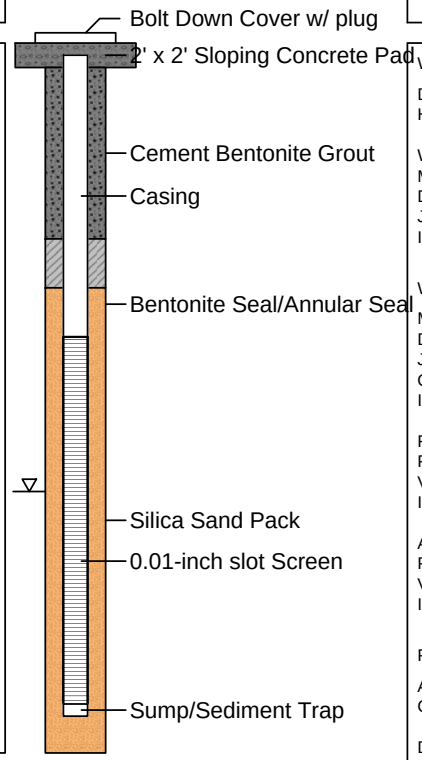
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 3/15/12 @1000	Driller/Equipment	: GeoLab/GeoProbe 6600 DT
Northing Coordinate	:	Surface Elev.	: 100.67 ft. AMSL
Easting Coordinate	:	Top of Casing elev.	: 100.34 ft. AMSL
Survey By	: EMA, LLC	Logged By	: B. Cortelloni

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	96.97	FB	Asphalt				
2	94.97	ML	ML- SILT, some clay, trace fine sand, medium density,fine to medium grain, orange, yellow, dry				
4	92.97						
6	90.97						
8	88.97	ML	increasing clay				
10	86.97						
12	84.97						
14	82.97						
16	80.97	ML	moist				
18	78.97	ML/SC	ML/SC - SILT, CLAYEY SAND, moist to wet				
20	76.97						
22	74.97	ML	fine to medium sand				
24	72.97						
26	70.97	ML/SP	ML/SP - SILT grades to SAND, Poorly Graded, trace clay, medium dense, some coarse sand, saprolitic, wet				
28	68.97						
30	66.97		End of boring				
32	64.97						
34							



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 4-1/4 inch ID HSA
Hole Diameter	: Nominal 8-inch
WELL CASING	:
Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0.3-12
WELL SCREEN	
Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 12-27
FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Gravity feed
Volume	: 1.0 cubic ft.
Interval (ft. bgs)	: 10-29
ANNULUS SEAL	: Bentonite Pellets/Bentonite grout
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.25 / 0.5 cubic ft.
Interval (ft. bgs)	: 8-10, 0.5-8
PROTECTIVE CASING	
Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug
DEVELOPMENT	: Bailer -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA

Stratigraphic & Instrumentation Log MW-6

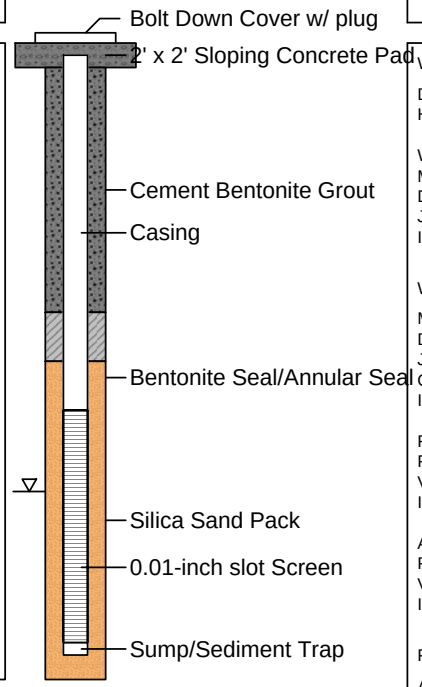
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 3/15/12 @1000	Driller/Equipment	: GeoLab/GeoProbe 6600 DT
Northing Coordinate	:	Surface Elev.	: 97.21 ft AMSL
Easting Coordinate	:	Top of Casing elev.	: 96.81 ft. AMSL
Survey By	: EMA, LLC	Logged By	: B. Cortelloni

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	96.97	FB	Asphalt				
2	94.97	ML	ML- SILT, some clay, trace fine sand, medium density,fine to medium grain, orange, yellow, dry				
4	92.97						
6	90.97						
8	88.97	ML	increasing clay				
10	86.97						
12	84.97						
14	82.97						
16	80.97	ML	moist				
18	78.97	ML/SC	ML/SC - SILT, CLAYEY SAND, moist to wet				
20	76.97						
22	74.97	ML	fine to medium sand				
24	72.97						
26	70.97	ML/SP	ML/SP - SILT grades to SAND, Poorly Graded, trace clay, medium dense, some coarse sand, saprolitic, wet				
28	68.97						
30	66.97		End of boring				
32	64.97						
34							



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 4-1/4 inch ID HSA
Hole Diameter	: Nominal 8-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0.3-15

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 2-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 15-25

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Gravity feed
Volume	: 1.0 cubic ft.
Interval (ft. bgs)	: 13-26

ANNULUS SEAL	: Bentonite Pellets/Bentonite grout
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.25 / 0.5 cubic ft.
Interval (ft. bgs)	: 11-13, 0.5-11

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Bailer -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA

Stratigraphic & Instrumentation Log MW-7

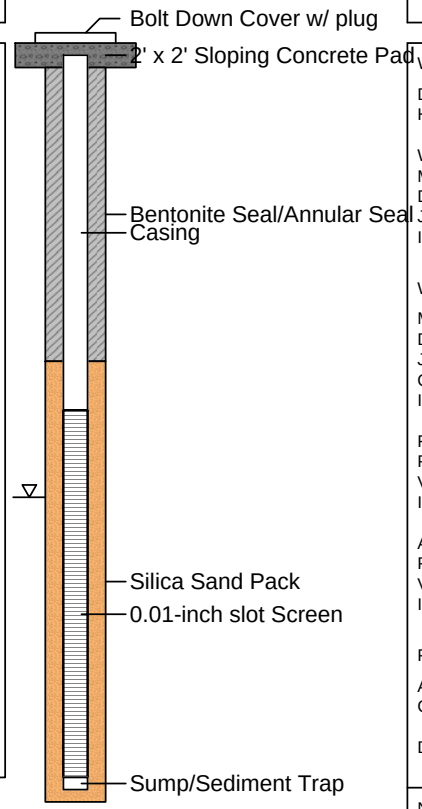
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 3/16/12 @1100	Driller/Equipment	: GeoLab/GeoProbe 6600 DT
Northing Coordinate	:	Surface Elev.	: 100.89 ft. AMSL
Easting Coordinate	:	Top of Casing elev.	: 100.69 ft. AMSL
Survey By	: EMA, LLC	Logged By	: B. Cortelloni

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	96.97	FB	Asphalt				
2	94.97	ML	ML- SILT, some clay, trace fine sand, medium density,fine to medium grain, orange, yellow, dry				
4	92.97						
6	90.97						
8	88.97	ML	some clay				
10	86.97						
12	84.97						
14	82.97						
16	80.97	ML	moist				
18	78.97	ML/SC	ML/SC - SILT, CLAYEY SAND, moist to wet				
20	76.97	ML	fine to medium sand				
22	74.97						
24	72.97						
26	70.97						
28	68.97	ML/SP	ML/SP - SILT grades to SAND, Poorly Graded, trace clay, medium dense, some coarse sand, saprolitic, wet				
30	66.97						
32	64.97		End of boring				
34							



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 2-1/4 inch ID HSA
Hole Diameter	: Nominal 8-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 1-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0.3-15

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 1-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 15-30

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Gravity feed
Volume	: 0.75 cubic ft.
Interval (ft. bgs)	: 13-30

ANNULUS SEAL	: Bentonite Pellets
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.5 cubic feet
Interval (ft. bgs)	: 0.3-13

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Bailer -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA 30518

Stratigraphic & Instrumentation Log MW-8

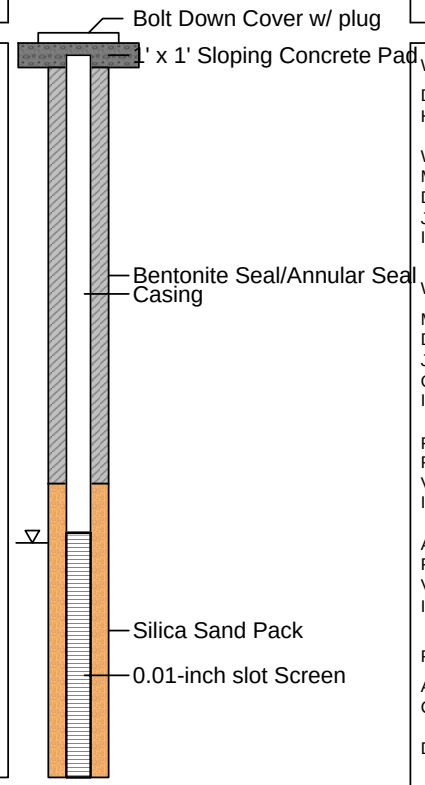
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 12/10/12 @ 1000	Driller/Equipment	: GeoLab/GeoProbe 6600 DT
Northing Coordinate	:	Surface Elev.	: 98.78 ft. AMSL
Easting Coordinate	:	Top of Casing elev.	: 98.65 ft. AMSL
Survey By	: EMA, LLC	Logged By	: J. Schwaller

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	98.78	FB	Asphalt				
2	96.78	CL	CL- CLAY, trace fine sand, medium density, red/orange dry				
4	94.78						
6	92.78						
8	90.78						
10	88.78	ML	ML - SILT, some clay, stiff, orange, dry				
12	86.78						
14	84.78						
16	82.78						
18	80.78	SC	SC - SAND, clay, very fine grained, tan, dry				
20	78.78	ML/SC	ML/SC - SILT, CLAYEY SAND, moist to wet at 22				
22	76.78						
24	74.78						
26	72.78						
28	70.78						
30	68.78		End of boring				
32	66.78						
34							



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 2-1/4 inch ID DPT
Hole Diameter	: Nominal 3-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 3/4-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0-20

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 3/4-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 20-30 Pre-Packed

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Pre-Packed
Volume	:
Interval (ft. bgs)	: 18-30

ANNULUS SEAL	: Bentonite Pellets
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.5 cubic feet
Interval (ft. bgs)	: 0.3-18

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Peristaltic pump -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA 30518

Stratigraphic & Instrumentation Log MW-9

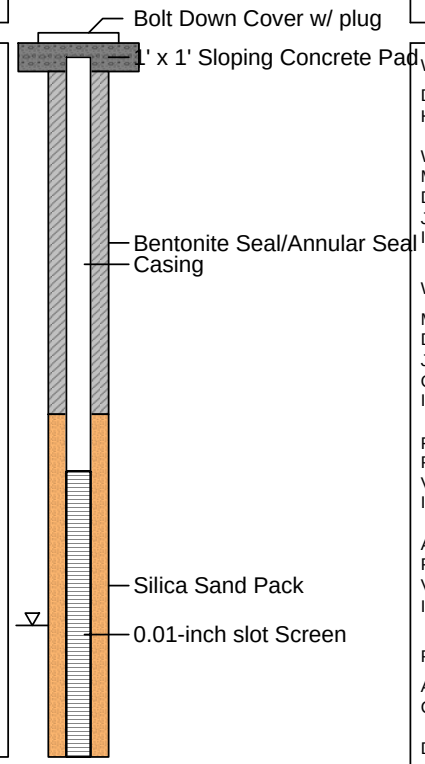
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 12/10/12 @ 1100	Driller/Equipment	: GeoLab/GeoProbe 6600 DT
Northing Coordinate	:	Surface Elev.	: 98.78 ft. AMSL
Easting Coordinate	:	Top of Casing elev.	: 98.63 ft. AMSL
Survey By	: EMA, LLC	Logged By	: J. Schwaller

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	GRAPHIC	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0	98.78							
2	96.78							
4	94.78							
6	92.78							
8	90.78	ML		ML- SILT, some fine sand, loose, brown dry				
10	88.78							
12	86.78							
14	84.78							
16	82.78							
18	80.78							
20	78.78	ML		increasing clay content, gray				
22	76.78							
24	74.78	ML		increasing sand content, fine to coarse, wet at 23				
26	72.78			End of boring				
28	70.78							
30								



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 2-1/4 inch ID DPT
Hole Diameter	: Nominal 3-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 3/4-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0-15

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 3/4-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 15-25 Pre-Packed

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Pre-Packed
Volume	:
Interval (ft. bgs)	: 13-25

ANNULUS SEAL	: Bentonite Pellets
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.5 cubic feet
Interval (ft. bgs)	: 0.3-13

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Peristaltic pump -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

EMA, LLC
5262 Belle Wood Court, Ste A
Buford, GA 30518

Stratigraphic & Instrumentation Log MW-10

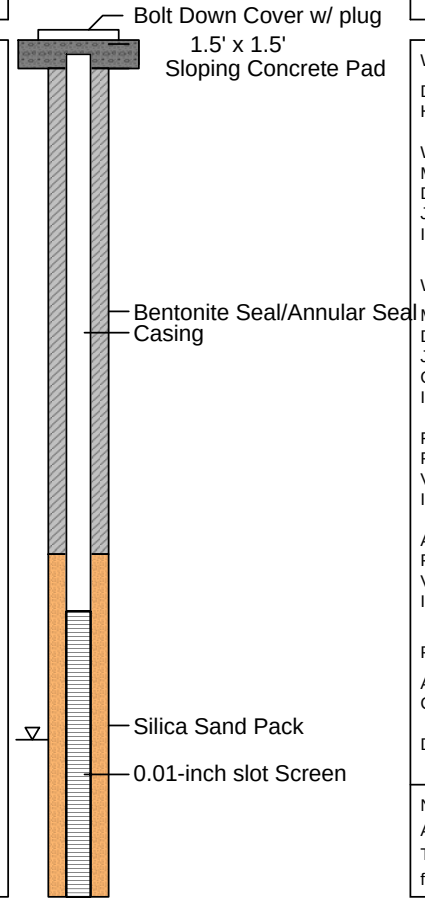
2040 Beaver Ruin Rd
Norcross, GA

Project # 559

Date Completed	: 2/11/13 @ 1100	Driller/Equipment	: GeoLab/GeoProbe 6600 DT
Northing Coordinate	:	Surface Elev.	: 100.89 ft AMSL
Easting Coordinate	:	Top of Casing elev.	: 100.77 ft. AMSL
Survey By	: EMA, LLC	Logged By	: B. Cortelloni

Water Levels
▼ During Drilling
▽ After Completion

Depth in Feet	Surf. Elev.	USCS	GRAPHIC	DESCRIPTION	Sample ID	Blow Count	PID Reading (ppm)	Lab No.
0		ML		ML- SILT, some fine sand, loose, brown dry				
2								
4								
6								
8								
10								
12								
14								
16								
18		ML		increasing clay content, gray				
20								
22								
24		ML		increasing sand content, fine to coarse, wet at 23				
26								
28								
30								



Well Construction Information

WELL CONSTRUCTION

Drilling Method	: 2-1/4 inch ID DPT
Hole Diameter	: Nominal 3-inch

WELL CASING :

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 3/4-inch
Joints	: Flush Treaded
Interval (ft. bgs)	: 0-20

WELL SCREEN

Material	: SCH 40 ASTM D1784/5 F480 NSF Rated
Diameter	: 3/4-inch
Joints	: Flush Treaded
Opening	: 0.01-inch
Interval (ft. bgs)	: 20-30 Pre-Packed

FILTER PACK	: 20/40 NSF Silica Sand
Placement Method	: Pre-Packed
Volume	:
Interval (ft. bgs)	: 18-30

ANNULUS SEAL	: Bentonite Pellets
Placement Method	: Gravity Fed/Hydrate
Volume	: 0.5 cubic feet
Interval (ft. bgs)	: 0.3-18

PROTECTIVE CASING

Above/Flush	: Flush mount bolt down/sloping pad
Cap	: Locking Expansion Plug

DEVELOPMENT : Peristaltic pump -sediment free

NOTES:
All equipment steam cleaned prior to use or new.
This monitoring well installation complies with EPD Manual for Groundwater Monitoring Manual, September 1991

APPENDIX D

VAPOR INTRUSION MODEL

TABLE 1

OCCUPATIONAL ASSUMPTIONS USED IN JOHNSON ETTINGER MODEL (SL-ADV)

Parameter	Value	Justification
Average Water temp	19.4 ^{0} C	Regional default
Depth below Grade to Enclosed Floor Space	15 cm	Slab on grade foundation
Depth below Grade to Top of Contaminatn	45 cm	Detections in soil below floor
Depth below grade to bottom of contamination	503 cm	Depth of groundwater table (conservative assumption.)
SCS Soil Type	SC	Clayey sand
Soil Dry Bulk Denisty	1.38 g/cm^3	Model Value
Soil Total Porosity	0.481 unitless	Model Value
Soil Water-Filled Porosity	0.216 cm^3/cm^3	Model Value
Enclosed Space Floor Thickness	15.24 cm	6 inches
Soil-Building Pressure Differential	40 g/cm-s^2	Model default
Enclosed Space Floor length	2286 cm	Dry Cleaning Business enclosed area length (75 ft)
Enclosed Space Floor Width	762 cm	Dry Cleaning Business enclosed area width (25 ft)
Enclosed Space Height	487 cm	Dry Cleaning Business avg space heigth (15.3 ft)
Floor-Wall Seam Crack Width	0.1 cm	Model default
Indoor Air Exchange Rate	1.5	One half the Building Specific value(1)
Averaging Time, Carcinogens	70 years	Model default
Averaging Time, Non-Carcinogens	25 years	USEPA 1991
Exposure Duration	25 years	USEPA 1991
Exposure Frequency	250 days/year	Default for occupational
Target risk for Carcinogens	10^{-5}	Target Risk
Target risk for Non-carcinogens	1 Unitless	Target Hazard

Notes:
(1) The exhaust fan is a 36-inch fan with 0.5 horsepower motor with a reduction ratio of 1/6 which produces a conservative flow rate of 1500 cfm. Assuming the enclosed space is 28,687 ft^3, the indoor air exchange rate would be 3.1 per hour.

TABLE 1

OCCUPATIONAL ASSUMPTIONS USED IN JOHNSON ETTINGER MODEL (SL-ADV)

Parameter	Value	Justification
Average Water temp	19.4 ^{0} C	Regional default
Depth below Grade to Enclosed Floor Space	15 cm	Slab on grade foundation
Depth below Grade to Groundwater	503 cm	Depth of groundwater table (16.5 ft)
Thickness of Stratum	503 cm	Depth of groundwater table (16.5 ft)
SCS Soil Type	SC	Clayey sand
Soil Dry Bulk Denisty	1.38 g/cm^3	Model Value
Soil Total Porosity	0.481 unitless	Model Value
Soil Water-Filled Porosity	0.216 cm^3/cm^3	Model Value
Enclosed Space Floor Thickness	15.24 cm	6 inches
Soil-Building Pressure Differential	40 g/cm-s^2	Model default
Enclosed Space Floor length	2286 cm	Dry Cleaning Business enclosed area length (75 ft)
Enclosed Space Floor Width	762 cm	Dry Cleaning Business enclosed area width (25 ft)
Enclosed Space Height	487 cm	Dry Cleaning Business avg space heigth (15.3 ft)
Floor-Wall Seam Crack Width	0.1 cm	Model default
Indoor Air Exchange Rate	1.5	One half the Building Specific value(1)
Averaging Time, Carcinogens	70 years	Model default
Averaging Time, Non-Carcinogens	25 years	USEPA 1991
Exposure Duration	25 years	USEPA 1991
Exposure Frequency	250 days/year	Default for occupational
Target risk for Carcinogens	10^{-5}	Target Risk
Target risk for Non-carcinogens	1 Unitless	Target Hazard

Notes:
(1) The exhaust fan is a 36-inch fan with 0.5 horsepower motor with a reduction ratio of 1/6 which produces a conservative flow rate of 1500 cfm. Assuming the enclosed space is 28,687 ft^3, the indoor air exchange rate would be 3.1 per hour.

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184	3.10E+01	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
19.4	15	503	503	0	0	A	SC	SC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SC	1.63	0.385	0.197	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15	40	2286	762	487	0.1	1.5	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	250	1.0E-05	1
				Used to calculate risk-based groundwater concentration.	

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	2.6E-07	4.0E-02

END

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	488	0.188	0.244	0.244	0.299	1.77E-09	0.837	1.48E-09	30.00	0.385	0.030	0.355	6,096

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
3.53E+05	1.74E+06	3.50E-04	15	9,458	1.35E-02	5.63E-01	1.78E-04	1.86E-03	0.00E+00	0.00E+00	7.31E-06	1.12E-04	488

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.75E+04	0.10	2.23E+00	1.86E-03	6.10E+02	6.79E+12	9.61E-07	1.68E-02	2.6E-07	4.0E-02

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.1E-09	2.9E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

SL-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial soil conc., C_R (µg/kg)	Chemica
127184	7.10E+01	Tetrachloroethylene

MORE ↓

ENTER Average soil temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to top of contamination, L_t (cm)	ENTER Depth below grade to bottom of contamination, (enter value of 0 if value is unknown) L_b (cm)	ENTER Totals must add up to value of L_t (cell G28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
19.4	15	45	503	45	0	0	SC		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum A soil organic carbon fraction, f_{oc}^A (unitless)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum B soil organic carbon fraction, f_{oc}^B (unitless)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	ENTER Stratum C soil organic carbon fraction, f_{oc}^C (unitless)
SC	1.63	0.385	0.197	0.002		1.5	0.43		0.002		1.5	0.43		0.002

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
15.24	10	2286	762	487	0.1	1.5	

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	250	1.0E-05	1

Used to calculate risk-based soil concentration.

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Physical state at soil temperature, (S,L,G)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	2.6E-07	4.0E-02	L

END

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Initial soil concentration used, C_R ($\mu g/kg$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
7.88E+08	30	0.188	ERROR	ERROR	0.299	1.77E-09	0.837	1.48E-09	6,096	7.10E+01	3.53E+05

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)
1.74E+06	3.50E-04	15	9,458	1.35E-02	5.63E-01	1.78E-04	1.86E-03	0.00E+00	0.00E+00	1.86E-03	30	15

Soil-water partition coefficient, K_d (cm^3/g)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Finite source β term (unitless)	Finite source ψ term $(sec)^{-1}$	Time for source depletion, τ_D (sec)	Exposure duration > time for source depletion (YES/NO)
3.10E-01	8.07E+04	0.10	5.58E-01	1.86E-03	6.10E+02	1.82E+03	NA	NA	1.94E+02	1.44E-06	2.14E+09	NO

Finite source indoor attenuation coefficient, $<\alpha>$ (unitless)	Mass limit bldg. conc., $C_{building}$ ($\mu g/m^3$)	Finite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Final finite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1.55E-06	NA	1.25E-01	1.25E-01	2.6E-07	4.0E-02

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	NA	NA	9.92E+04	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
7.9E-09	2.1E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

APPENDIX E

GROUNDWATER FATE AND TRANSPORT MODEL

BIOCHLOR MODELING REPORT
Professional Cleaners & Linen Service
2040 Beaver Ruin Road, Norcross, Georgia
February 19, 2013

BIOCHLOR is a screening model that simulates fate and transport of dissolved chlorinated solvents in groundwater. The software, programmed in the Microsoft™ Excel spreadsheet environment and based on the Domenico analytical solute transport model, has the ability to simulate 1-D advection, 3-D dispersion, linear adsorption, and biotransformation via reductive dechlorination (the dominant biotransformation process at most chlorinated solvent sites). Dissolved solvent degradation is assumed to follow a sequential first order decay process.

BIOCHLOR includes three different model types:

1. Solute transport without decay;
2. Solute transport with biotransformation modeled as a sequential first-order decay process; and
3. Solute transport with biotransformation modeled as a sequential first-order decay process with 2 different reaction zones (i.e., each zone has a different set of rate coefficient values).

For the Professional Cleaners Site anaeorobic dechlorination has not been confirmed or observed to be occurring. As there is such a small data set available, the most conservative model using solute transport without decay has been utilized to determine contaminant fate and transport.

The objective of constructing the models is to determine the concentration and time frame when dissolved phase PCE in groundwater reaches the nearest hypothetical drinking water receptor located 1000 feet downgradient from the property boundary. The model was also be utilized to calculate a conservative Alternative Concentration Level (ACL).

<u>Model Construction Assumptions:</u>

The models are constructed with the following assumptions to construct as near a conservative prediction as could be expected. Please note, given the limited data set available, a good calibration could not be performed without drastically altering many

groundwater characteristics resulting in unreasonable seepage velocity or simulation time variations to make the model curve fit current conditions. The model input data is presented in the attached table.

- The models are constructed to predict the effects of the remaining contamination at the site since groundwater remediation by in-situ chemical oxidation occurred in 2012;
- Only PCE is addressed since this has been the only contaminant detected to date;
- Only the overburden groundwater aquifer is modeled;
- A simulation time, defined as period of time since the expected contaminant release date, has been defined as 8 years to mimic the approximate time period from the suspected release;
- Anaerobic dechlorination is assumed to not be occurring due to the lack of PCE daughter products;
- Sections 1, 2, 3 - All Advection and Adsorption parameters are either site specific or acceptable Georgia peer reviewed literature values used for modeling;
- Section 4 -Biotransformation rates, even though not used, are consistent with BIOCHLOR literature values and are not minimum or maximum expected values, extreme variations in values did not significantly effect the results of the modeling;
- Section 5 - General Parameters include an initial simulation time of 8 years from "release", a model width of 50 feet (no significance), and initial modeled length of 1152 feet (152 feet from the suspected source area to the property boundary plus 1000 feet to the hypothetical downgradient drinking water receptor);
- Section 6 - Source Data is using a continuous single planar source as a most conservative option. Currently, the source area data set is too small to determine a reasonable source decay rate. Source thickness of 26 feet – (maximum groundwater table thickness), source area width of 50 feet, and the baseline PCE concentration observed is 0.091 mg/L.
- Section 7 - Field Data entered from April 2012 sampling event (Baseline) prior to remediation and a downgradient unaffected monitoring well (MW-10).

As data is limited, a conservative approach of No Degradation occurring was used as a true source decay rate can not be determined and thus not allowing variable 1st Order Decay Coefficients to be utilized with confidence. This aids in removing the requirement to perform a sensitivity analysis when literature values are used or there is uncertainty in an input parameter. The point of exposure (POE) is defined as a

hypothetical drinking water receptor located 1,000 feet from the edge of property in a downgradient direction.

Models Included

1. Calibration Model – a best-fit attempt using field data and peer reviewed literature values using baseline data collected prior to any groundwater remediation activities;
2. Post –Remediation + 10 years - Model to determine concentration at point of exposure 1,000′ from edge of property after 10 years using the current source area concentration of 0.036 mg/L – 0.003 mg/L;
3. Post –Remediation + 20 years - Model to determine concentration at point of exposure 1,000′ from edge of property after 20 years using the current source area concentration of 0.036 mg/L – 0.003 mg/L;
4. Post –Remediation + 50 years - Model to determine concentration at point of exposure 1,000′ from edge of property after 50 years using the current source area concentration of 0.036 mg/L – 0.003 mg/L;
5. Post –Remediation + 100 years - Model to determine concentration at point of exposure 1,000′ from edge of property after 100 years using the current source area concentration of 0.036 mg/L – 0.003 mg/L; and
6. ACL + 100 years– Model to determine the ACL which would be the maximum concentration allowed at the source area before the Type I RRS for PCE of 0.005 mg/L is exceeded at the hypothetical downgradient drinking water receptor located 1000 feet from edge of the property after 100 years **– 0.070 mg/L** .

Model(s) Summation

Using the most conservative No Degradation models:

- The Type I groundwater RRS for PCE of 0.005 mg/L is never observed at the hypothetical drinking water receptor using the current concentrations observed at the source area of 0.036 mg/L
- The Type II groundwater RRS for PCE of 0.019 mg/L never exceeds the property boundary using the current concentrations observed at the source area of 0.036 mg/L
- An alternative concentration level (ACL) of 0.07 mg/L at the source area was determined. This is the maximum concentration which would be allowed at the source area before the Type I RRS for PCE of 0.005 mg/L is exceeded at the hypothetical downgradient drinking water receptor located 1000 feet from edge of the property after 100 years.

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

2040 Beaver Ruin Rc
Calibration Run
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	956.0	(ft/yr)
or			
Hydraulic Conductivity	K	1.3E-02	(cm/sec)
Hydraulic Gradient	i	0.014	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	25	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.5	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	10.59	(-)
TCE	130	(L/kg)	3.93	(-)
DCE	125	(L/kg)	3.81	(-)
VC	30	(L/kg)	1.67	(-)
ETH	302	(L/kg)	7.80	(-)
Common R (used in model)* =			**3.93**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	3.465	0.20	0.79
TCE → DCE	13.860	0.05	0.74
DCE → VC	3.850	0.18	0.64
VC → ETH	5.775	0.12	0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

λ HELP

5. GENERAL

Simulation Time*	8	(yr)
Modeled Area Width*	50	(ft)
Modeled Area Length*	1152	(ft)
Zone 1 Length*	1152	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous, Single Planar

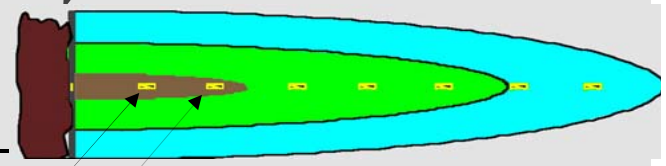
Source Options

Source Thickness in Sat. Zone* 26 (ft)

Width* (ft) Y1 15

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.091	0
TCE		0
DCE		0
VC		0
ETH		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	.091	.047	.011	.007							
TCE Conc. (mg/L)	.005	.005	.005								
DCE Conc. (mg/L)	.005	.005	.005								
VC Conc. (mg/L)	0.0	.002	.002								
ETH Conc. (mg/L)	0.0	.005	.005								
Distance from Source (ft)	0	63	122	280							
Date Data Collected	2012										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Professional Cleaners
Calibration Run

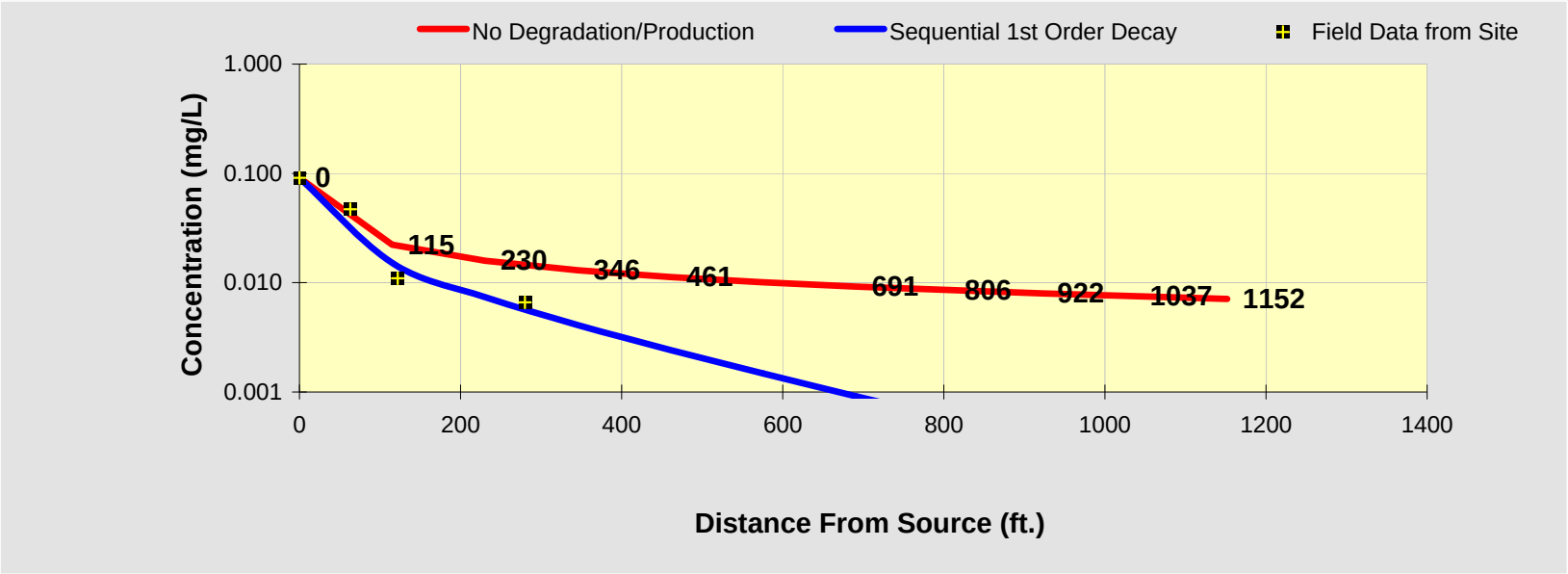
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

PCE	0	115	230	346	461	576	691	806	922	1037	1152
No Degradation	0.091	0.022	0.016	0.013	0.011	0.010	0.009	0.009	0.008	0.008	0.007
Biotransformation	0.0910	0.015	0.007	0.004	0.002	0.001	0.001	0.001	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	63	122	280							
Field Data from Site	0.091	0.047	0.011	0.007							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
8.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

2040 Beaver Ruin Rd
Post Remediation +10 YRS
Run Name

Data Input Instructions:

1. Enter value directly....or
2. Calculate by filling in gray cells. Press Enter, then C

115 *or* 0.02

(To restore formulas, hit "Restore Formulas" button)

Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	956.0	(ft/yr)
or			
Hydraulic Conductivity	K	1.3E-02	(cm/sec)
Hydraulic Gradient	i	0.014	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	25	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.5	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	10.59	(-)
TCE	130	(L/kg)	3.93	(-)
DCE	125	(L/kg)	3.81	(-)
VC	30	(L/kg)	1.67	(-)
ETH	302	(L/kg)	7.80	(-)
Common R (used in model)* =			**3.93**	

4. BIOTRANSFORMATION

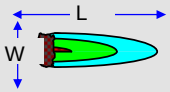
-1st Order Decay Coefficient*

	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	3.465	0.20	0.79
TCE → DCE	13.860	0.05	0.74
DCE → VC	3.850	0.18	0.64
VC → ETH	5.775	0.12	0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

λ HELP

5. GENERAL

Simulation Time*	18	(yr)
Modeled Area Width*	50	(ft)
Modeled Area Length*	1152	(ft)
Zone 1 Length*	1152	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous, Single Planar

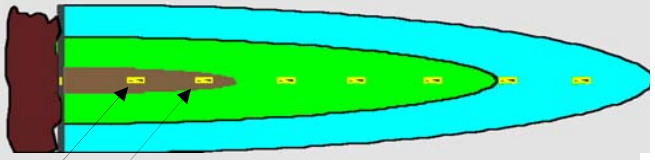
Source Options

Source Thickness in Sat. Zone* 26 (ft)

Width* (ft) Y1 15

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.036	0
TCE		0
DCE		0
VC		0
ETH		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)		.036	.011	.007							
TCE Conc. (mg/L)	.005	.005	.005								
DCE Conc. (mg/L)	.005	.005	.005								
VC Conc. (mg/L)	0.0	.002	.002								
ETH Conc. (mg/L)	0.0	.005	.005								
Distance from Source (ft)	0	63	122	280							
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Professional Cleaners
Post Remediation + 10 YRS

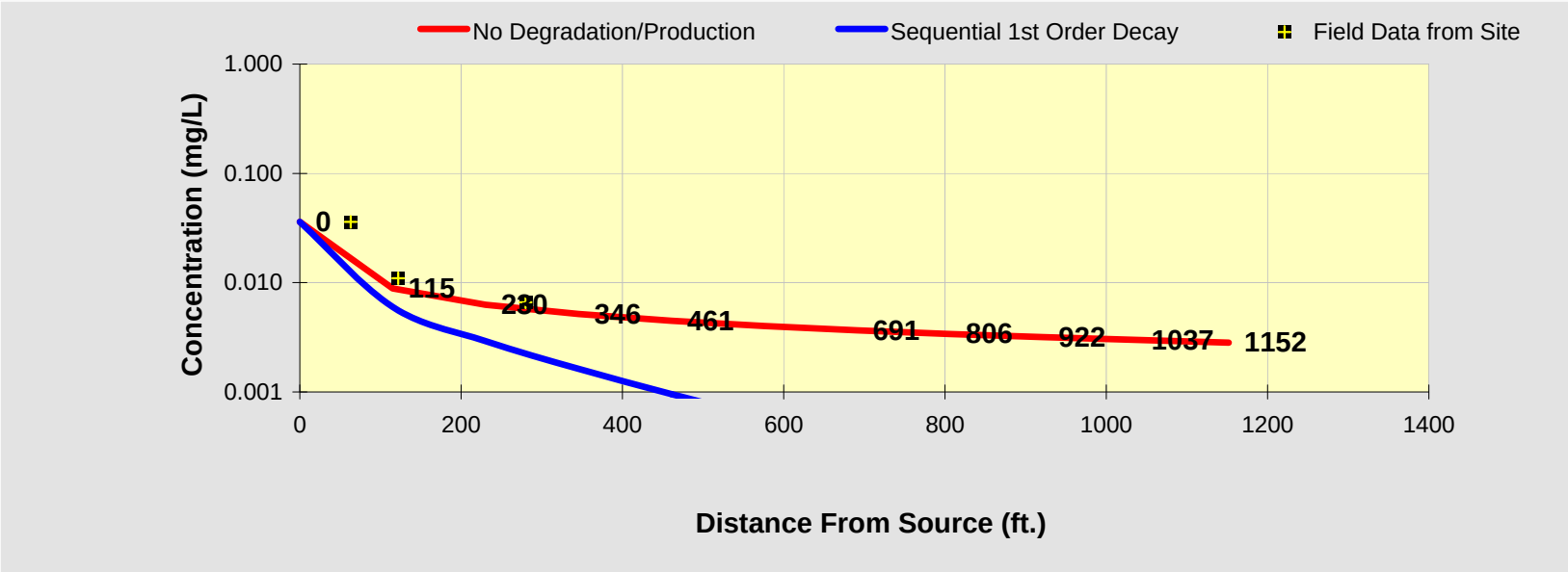
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

PCE	0	115	230	346	461	576	691	806	922	1037	1152
No Degradation	0.036	0.009	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003
Biotransformation	0.0360	0.006	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	63	122	280							
Field Data from Site		0.036	0.011	0.007							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
18.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

2040 Beaver Ruin Rd
Post Remediation +20 YRS
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or 2. Calculate by filling in gray cells. Press Enter, then C
0.02
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	956.0	(ft/yr)
or			
Hydraulic Conductivity	K	1.3E-02	(cm/sec)
Hydraulic Gradient	i	0.014	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	25	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

	Koc		R	
Soil Bulk Density, rho	1.5	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient				
PCE	426	(L/kg)	10.59	(-)
TCE	130	(L/kg)	3.93	(-)
DCE	125	(L/kg)	3.81	(-)
VC	30	(L/kg)	1.67	(-)
ETH	302	(L/kg)	7.80	(-)
Common R (used in model)* =			**3.93**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

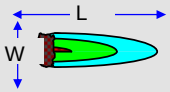
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	3.465	0.20	0.79
TCE → DCE	13.860	0.05	0.74
DCE → VC	3.850	0.18	0.64
VC → ETH	5.775	0.12	0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	28	(yr)
Modeled Area Width*	50	(ft)
Modeled Area Length*	1152	(ft)
Zone 1 Length*	1152	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous
Single Planar

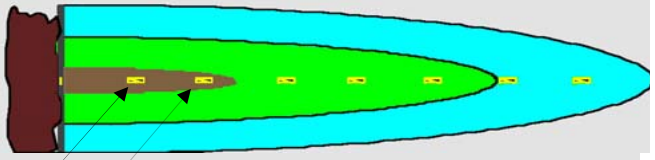
Source Options

Source Thickness in Sat. Zone* 26 (ft)

Width* (ft) Y1 15

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.036	0
TCE		0
DCE		0
VC		0
ETH		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)		.036	.011	.007							
TCE Conc. (mg/L)	.005	.005	.005								
DCE Conc. (mg/L)	.005	.005	.005								
VC Conc. (mg/L)	0.0	.002	.002								
ETH Conc. (mg/L)	0.0	.005	.005								
Distance from Source (ft)	0	63	122	280							
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Professional Cleaners
Post Remediation + 20 YRS

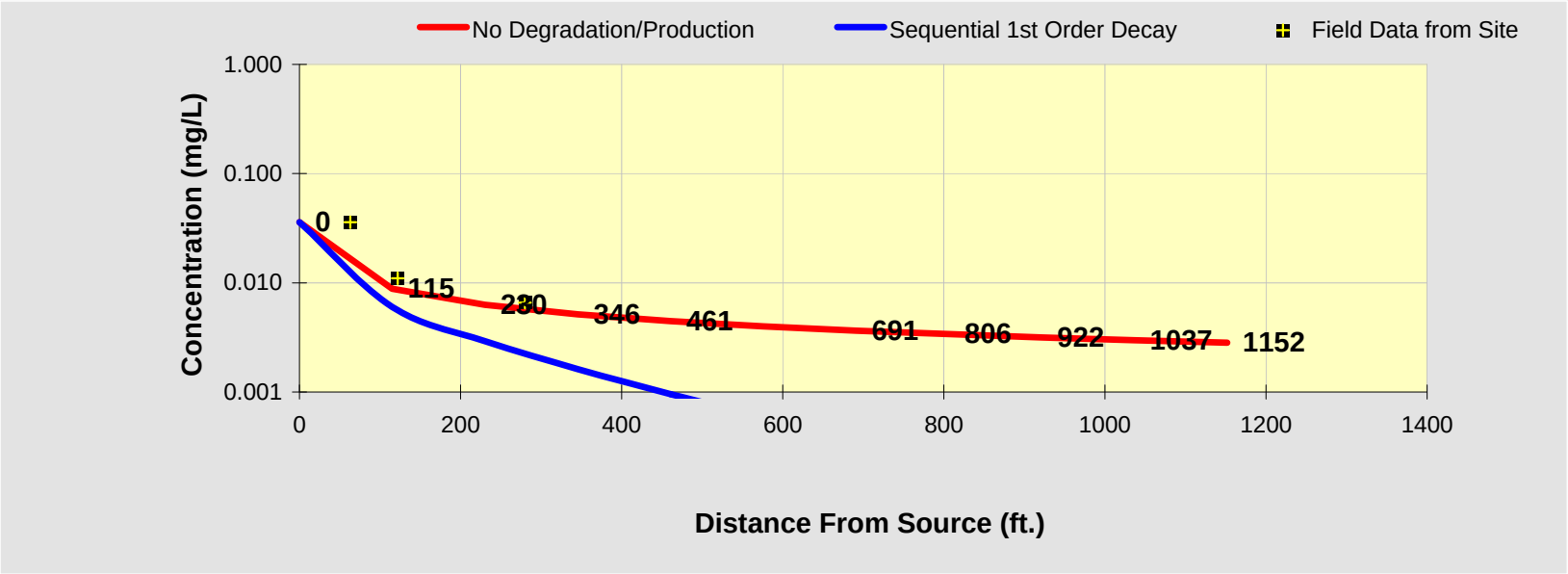
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

PCE	0	115	230	346	461	576	691	806	922	1037	1152
No Degradation	0.036	0.009	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003
Biotransformation	0.0360	0.006	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	63	122	280							
Field Data from Site		0.036	0.011	0.007							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
28.0 Years
Log ⇔ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

2040 Beaver Ruin Rd
Post Remediation +50 YRS
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or 2. Calculate by filling in gray cells. Press Enter, then C
0.02
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	956.0	(ft/yr)
or			
Hydraulic Conductivity	K	1.3E-02	(cm/sec)
Hydraulic Gradient	i	0.014	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	25	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

			R	
Soil Bulk Density, rho	1.5	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	10.59	(-)
TCE	130	(L/kg)	3.93	(-)
DCE	125	(L/kg)	3.81	(-)
VC	30	(L/kg)	1.67	(-)
ETH	302	(L/kg)	7.80	(-)
Common R (used in model)* =			**3.93**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

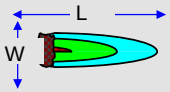
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	3.465	0.20	0.79
TCE → DCE	13.860	0.05	0.74
DCE → VC	3.850	0.18	0.64
VC → ETH	5.775	0.12	0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	58	(yr)
Modeled Area Width*	50	(ft)
Modeled Area Length*	1152	(ft)
Zone 1 Length*	1152	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous
Single Planar

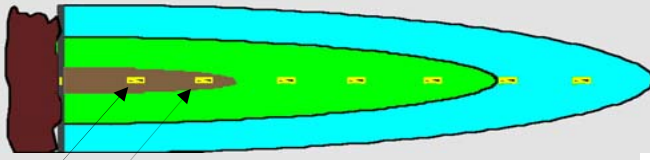
Source Options

Source Thickness in Sat. Zone* 26 (ft)

Width* (ft) Y1 15

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.036	0
TCE		0
DCE		0
VC		0
ETH		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)		.036	.011	.007							
TCE Conc. (mg/L)	.005	.005	.005								
DCE Conc. (mg/L)	.005	.005	.005								
VC Conc. (mg/L)	0.0	.002	.002								
ETH Conc. (mg/L)	0.0	.005	.005								
Distance from Source (ft)	0	63	122	280							
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

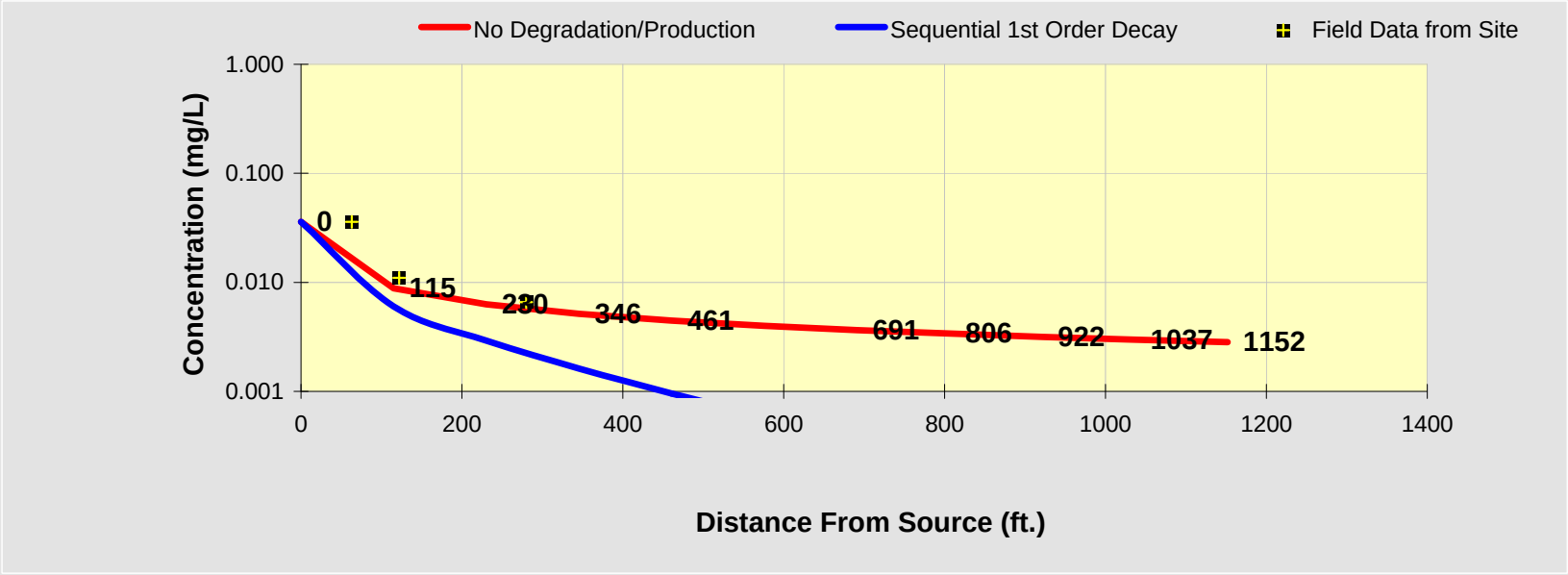
RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Professional Cleaners
Post Remediation + 50 YRS

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

PCE	Distance from Source (ft)										
	0	115	230	346	461	576	691	806	922	1037	1152
No Degradation	0.036	0.009	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003
Biotransformation	0.0360	0.006	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0	63	122	280							
Field Data from Site		0.036	0.011	0.007							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
58.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

2040 Beaver Ruin Rd
Post Remediation +50 YRS
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or 2. Calculate by filling in gray cells. Press Enter, then C
0.02
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	956.0	(ft/yr)
or			
Hydraulic Conductivity	K	1.3E-02	(cm/sec)
Hydraulic Gradient	i	0.014	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	25	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

			R	
Soil Bulk Density, rho	1.5	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	10.59	(-)
TCE	130	(L/kg)	3.93	(-)
DCE	125	(L/kg)	3.81	(-)
VC	30	(L/kg)	1.67	(-)
ETH	302	(L/kg)	7.80	(-)
Common R (used in model)* =			**3.93**	

4. BIOTRANSFORMATION

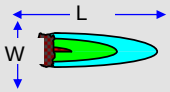
-1st Order Decay Coefficient*

	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	3.465	0.20	0.79
TCE → DCE	13.860	0.05	0.74
DCE → VC	3.850	0.18	0.64
VC → ETH	5.775	0.12	0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

λ HELP

5. GENERAL

Simulation Time*	108	(yr)
Modeled Area Width*	50	(ft)
Modeled Area Length*	1152	(ft)
Zone 1 Length*	1152	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous
Single Planar

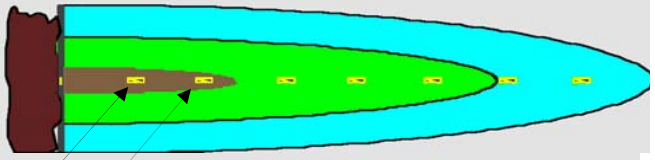
Source Options

Source Thickness in Sat. Zone* 26 (ft)

Width* (ft) Y1 15

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.036	0
TCE		0
DCE		0
VC		0
ETH		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)		.036	.011	.007							
TCE Conc. (mg/L)	.005	.005	.005								
DCE Conc. (mg/L)	.005	.005	.005								
VC Conc. (mg/L)	0.0	.002	.002								
ETH Conc. (mg/L)	0.0	.005	.005								
Distance from Source (ft)	0	63	122	280							
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Professional Cleaners
Post Remediation + 100 YRS

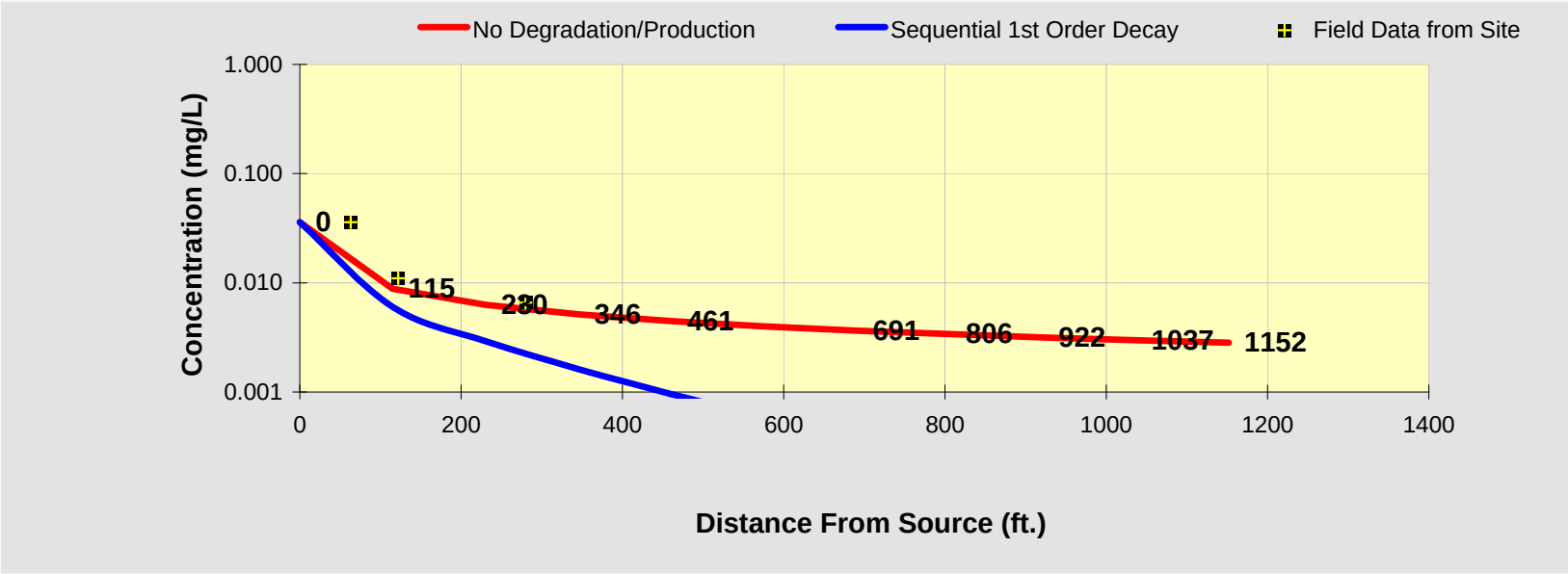
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

PCE	0	115	230	346	461	576	691	806	922	1037	1152
No Degradation	0.036	0.009	0.006	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003
Biotransformation	0.0360	0.006	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	63	122	280							
Field Data from Site		0.036	0.011	0.007							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
108.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

2040 Beaver Ruin Rc
ACL + 100 YRS
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	956.0	(ft/yr)
or			
Hydraulic Conductivity	K	1.3E-02	(cm/sec)
Hydraulic Gradient	i	0.014	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	25	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.5	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	10.59	(-)
TCE	130	(L/kg)	3.93	(-)
DCE	125	(L/kg)	3.81	(-)
VC	30	(L/kg)	1.67	(-)
ETH	302	(L/kg)	7.80	(-)
Common R (used in model)* =			**3.93**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

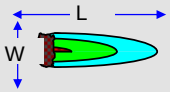
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	3.465	0.20	0.79
TCE → DCE	13.860	0.05	0.74
DCE → VC	3.850	0.18	0.64
VC → ETH	5.775	0.12	0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	108	(yr)
Modeled Area Width*	50	(ft)
Modeled Area Length*	1152	(ft)
Zone 1 Length*	1152	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous
Single Planar

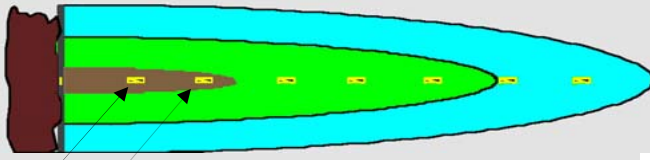
Source Options

Source Thickness in Sat. Zone* 26 (ft)

Width* (ft) Y1 15

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.07	0
TCE		0
DCE		0
VC		0
ETH		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)		.036	.011	.007							
TCE Conc. (mg/L)	.005	.005	.005								
DCE Conc. (mg/L)	.005	.005	.005								
VC Conc. (mg/L)	0.0	.002	.002								
ETH Conc. (mg/L)	0.0	.005	.005								
Distance from Source (ft)	0	63	122	280							
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Professional Cleaners
ACL + 100 YRS

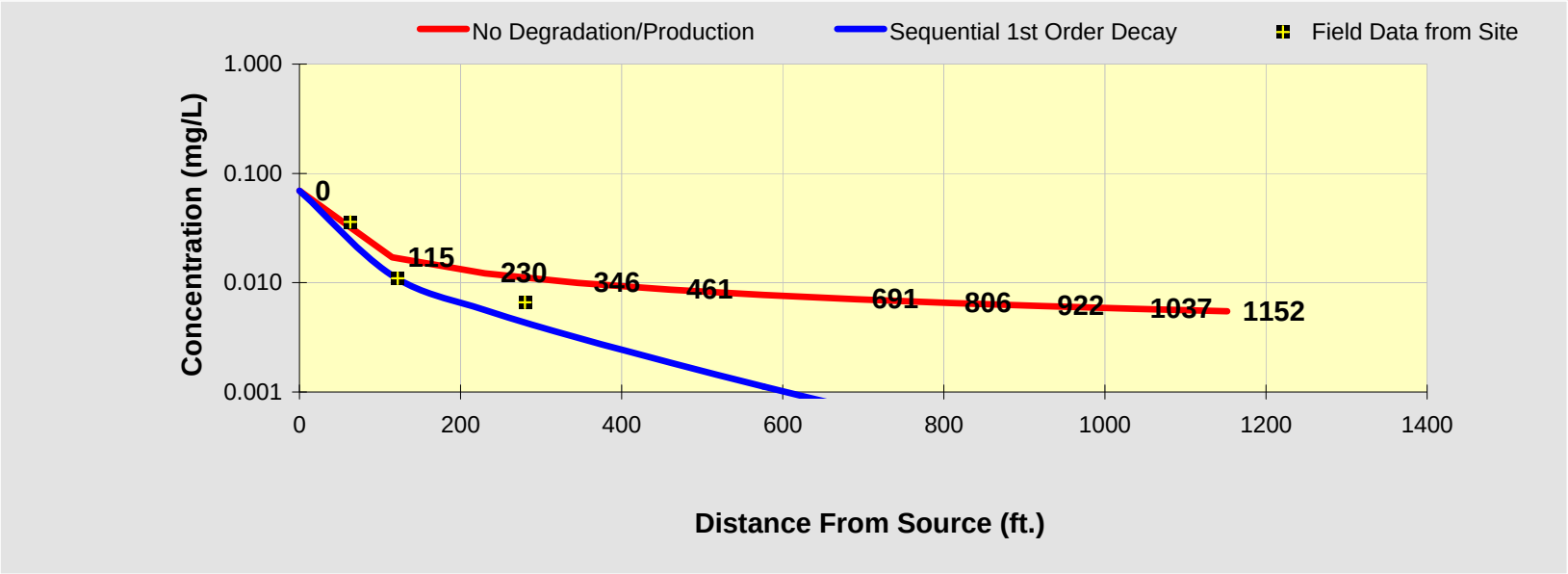
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

PCE	0	115	230	346	461	576	691	806	922	1037	1152
No Degradation	0.070	0.017	0.012	0.010	0.009	0.008	0.007	0.007	0.006	0.006	0.005
Biotransformation	0.0695	0.012	0.006	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	63	122	280							
Field Data from Site		0.036	0.011	0.007							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
108.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

APPENDIX F

RRS CALCULATION SPREADSHEETS

Carcinogenic effects *(Commercial/Residential Soil)* : RAGS equation 6

variable	units	Standardized Exposure Assumptions Type 1
TR target excess individual lifetime cancer risk	unitless	0.00001
Sfo, oral cancer slope factor	unitless	2.10E-03
Sfi, inhalation cancer slope factor	unitless	9.10E-04
BW, body weight	kg	70
AT, averaging time	years	70
EF, exposure frequency	days/yr	350
ED, exposure duration	yr	30
Ir_{soil}, soil ingestion rate	m3/day	114
Ir_{air}, daily inhalation rate	L/day	15
VF		2.64E+03
PEF, particulate emsiison factor	m3/kg	4.63E+09
K, water-to-air volatization factor	unitless	0.5
RRSo $\frac{TR*BW*AT*365}{EF*ED*(Sfo*1.0E-6*IRsoil)}$		7115.009747
RRSi $\frac{TR*BW*AT*365}{EF*ED*(Sfi*IRair*(1/VF+1/PEF))}$		329.8781406
$\frac{1}{1/RRSo + 1/RRSi}$	mg/kg	315.261
C(mg/Kg;risk-based)	mg/kg	**3.15E+02**

Non-Carcinogenic effects *(Commercial/Residential Soil)*: RAGS equation 7

variable	units	Standardized Exposure Assumptions Type 1
THI, target hazard index	unitless	1
RfD_o, oral chronic reference dose	unitless	6.00E-03
RfD_i, inhalation chronic reference dose	unitless	1.14E-02
BW, body weight	kg	70
AT, averaging time	years	30
EF, exposure frequency	days/yr	350
ED, exposure duration	yr	30
Irsoil, soil ingestion rate	m3/day	114
Irair, daily inhalation rate	L/day	15
VF, soil-to-air volatization factor	m3/kg	2.64E+03
PEF, particulate emission factor	m3/kg	4.63E+09
K, water-to-air volatization factor	unitless	0.5
RRSo $\frac{THI*BW*AT*365}{EF*ED*(1/Rfdo)*1.0E-6*IRsoil}$		3.84E+03
RRSi $\frac{THI*BW*AT*365}{EF*ED*(1/Rfdi)*IRair*(1/VF+1/PEF)}$		1.47E+02
$\frac{1.0000}{1/RRSo + 1/RRSi}$	mg/kg	1.42E+02
C(mg/kg;risk-based)	**mg/kg**	**1.42E+02**
Type 1 GW RRS x 100	mg/kg	0.5
Final Type 1 RRS (Soil)	**mg/kg**	**0.5**

VF (Soil-to-Air Volatization Factor)

	Units	**Defaults**
LS, length of side of contaminated area	(m)	45
V, wind speed (velocity) in mixing zone	(m/s)	2.25
DH, diffusion height	m	2
A, area of contamination	cm^2	2.03E+07
□ pi		3.14
♋	cm^2/s	0.002565071
T, exposure interval	s	7.90E+08
❒$_s$	g/cm^3	2.65
OC, soil organic carbon content fraction	unitless	0.02
D_{ei}, effective diffusivity	cm^2/s	0.03569
$D_{ia,}$ molecular diffusivity	cm^2/s	**5.05E-02**
E, total soil porosity	unitless	3.50E-01
K_{as}, soil/air partition coefficient	g soil/cm^3 air	0.38110
H', Henry's law constant	dimensionless	**7.24E-01**
$K_{d,}$ soil-water partition ceofficient	cm^3/g	1.90E+00
K_{oc}, organic carbon coefficient	cm^3/g(=L/kg)	**9.49E+01**
H, Henry's law constant	atm-m^3/mol	0.0177
	VF	**2.64E+03**

Carcinogenic effects *(Water)* : RAGS equation 1

variable	units	Standard Assumptions Type 1	Child Type 2	Adult Type 2	Standard Assumptions Type 3	Adult Type 4
TR target excess individual lifetime cancer risk	unitless	0.00001	0.00001	0.00001	0.00001	0.00001
Sfo, oral cancer slope factor	mg/kg-day	2.10E-03	2.10E-03	2.10E-03	2.10E-03	2.10E-03
Sfi, inhalation cancer slope factor	mg/kg-day	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04
BW, body weight	kg	70	15	70	70	70
AT, averaging time	years	70	70	70	70	70
EF, exposure frequency	days/yr	350	350	350	250	250
ED, exposure duration	yr	30	6	30	25	25
Ir_{air}, daily inhalation rate	m3/day	15	15	15	20	20
Ir_w, daily water ingestion rate	L/day	2	1	2	1	1
K, water to air volatization factor	unitless	0.5	0.5	0.5	0.5	0.5
RRSo TR*BW*AT*365 / EF*ED*(Sfo*IRw)		0.405555556	8.69E-01	0.405555556	1.362666667	1.36267
RRSi TR*BW*AT*365 / EF*ED*(Sfi*K*IRair)		0.24957265	2.67E-01	2.50E-01	3.14E-01	3.14E-01
1.0000 / 1/RRSo + 1/RRSi	mg/L	0.154	2.04E-01	1.54E-01	2.56E-01	2.56E-01
C(mg/L;risk-based)	**mg/L**	**0.154497**	**2.04E-01**	**1.54E-01**	**2.56E-01**	**2.56E-01**

Non-carcinogenic effects (*Water*) : RAGS equation 2

variable	units	Standard Assumptions Type 1	Child Type 2	Adult Type 2	Adult Type 3	Adult Type 4
THI, target hazard index	unitless	1	1	1	1	1
RfD_o, oral chronic reference dose	unitless	6.00E-03	6.00E-03	6.00E-03	6.00E-03	6.00E-03
RfD_i, inhalation chronic reference dose	unitless	1.14E-02	1.14E-02	1.14E-02	1.14E-02	1.14E-02
BW, body weight	kg	70	15	70	70	70
AT, averaging time	years	30	6	30	25	25
EF, exposure frequency	days/yr	350	350	350	250	250
ED, exposure duration	yr	30	6	30	25	25
Ir_{air}, daily inhalatiaon rate	m3/day	15	15	15	20	20
Ir_w, daily water ingestion rate	L/day	2	1	2	1	1
K, water-to-air volatization factor	unitless	0.5	0.5	0.5	0.5	0.5
RRSo THI*BW*AT*365 / EF*ED*(1/Rfdo*IRw)		0.219	0.0939	0.219	0.61	0.61
RRSi THI*BW*AT*365 / EF*ED*(1/Rfdi*K*IRair)		0.111	0.024	0.111	1.17E-01	0.11680
1 / 1/RRSo + 1/RRSi	mg/L	0.07365	0.0190	0.07377	0.0979	0.0981
C(mg/L;risk-based)	**mg/L**	**0.07365**	**1.90E-02**	**7.38E-02**	**9.791E-02**	**9.811E-02**

Final Type 2 RRS	**mg/L**	**1.90E-02**	
Final Type 4 RRS	**mg/L**		**9.811E-02**

APPENDIX G

SUMMARY OF PG OVERSITE HOURS AND EXPENSES TO COMPLETE

ESTIMATED COSTS
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

	Original					Updated Remaining Costs		
Activity	***Units***	***Unit Cost***	***Sub-Total***			***Units***	***Unit Cost***	***Sub-Total***
Consulting								
VRP Application/Report (completed)			$ 3,300.00					$ -
Additional Groundwater Delineation Investigations[1]			$ 10,000.00					$ -
Semiannual Sampling/Progress Reports [2]	4	$ 2,500.00	$ 10,000.00					$ -
File Deed Restriction			$ 2,500.00					$ 2,500.00
Voluntary CSR Report			$ 6,800.00					$ -
		sub-total	$ 32,600.00				sub-total	$ 2,500.00
Remediation								
ISCO Remediation (assumed complete)			$ 34,000.00	--	$ 46,000.00			$ -
Total Estimate Range			**$ 66,600.00**	**--**	**$ 78,600.00**			**$ 2,500.00**

Notes:
1) Originally based on only three additional wells. EPD asked for seven wells (MW-5, MW_6, MW-7, MW-8, MW-9, MW-10,and deeper well). Six wells have been installed.
2) 4 semiannual progress reports and sampling events were anticipated. Assuming remediation has been completed, a maximum of two more quarterly sampling events and one more semiannual report is required.

PG OVERSIGHT SUMMARY
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

PG Summary of Time	*Units*	*Unit Cost*	*Sub-Total*
3/5/13 to 5/15/13			
Install Well (2D)/Complete Log	28	$ 85.00	$ 2,380.00
Prepare VRP-CSR	17	$ 85.00	$ 1,445.00
		sub-total	$ 3,825.00

INVOICE SUMMARY SINCE LAST SUBMITTAL
PROFESSIONAL CLEANERS AND LINEN SERVICE
NORCROSS, GEORGIA

Invoice	*Amount*	*Scope of Work*
559-0413	$ 8,920.00	Install bedrock well/sample
559-0613	$ 6,800.00	Prepare VRP-CSR
	$ 15,720.00	**TOTAL**