AECOM

January 7, 2017

Georgia Department of Natural Resources
Land Protection Branch - Brownfields Unit
2 Martin Luther King, Jr. Dr. SE, Suite 1054
Atlanta, Georgia 30334

Re: Voluntary Remediation Program Compliance Status Report
North Decatur Road Site, HSI No. 10121
1784 North Decatur Road
Atlanta, DeKalb County, Georgia 30322

Dear Mr. McPherson:

On behalf of Emory University, AECOM is pleased to submit the enclosed Voluntary Remediation Program Compliance Status Report prepared for the above-referenced site.
If you have any questions, please contact Brent Jacobs at (678) 808-8915 or myself at (678) 808-8935.

Sincerely,
AECOM

Dale P. Voykin

Dale Voykin
Senior Hydrogeologist

cc: Scott Thomaston, Emory University

AECOM
One Midtown Plaza
1360 Peachtree Street, NE
Atlanta, Georgia 30309

VOLUNTARY REMEDIATION PROGRAM COMPLIANCE STATUS REPORT

NORTH DECATUR ROAD SITE,
HSI NO. 10121
1784 NORTH DECATUR ROAD
ATLANTA, DEKALB COUNTY, GEORGIA

January 7, 2017

Prepared For:

Emory University
Environmental Health and Safety Office
1762 Clifton Road, Suite 1200
Atlanta, Georgia 30322

Prepared By:

AECOM
One Midtown Plaza
1360 Peachtree Street NE, Suite 500
Atlanta, Georgia 30309

Brent Jacobs
Senior Project Manager

Dale P. Voykin
Dale P. Voykin, P.G. (No. 1220)
Senior Hydrogeologist

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FIGURES

APPENDICES

LIST OF ACRONYMS

BRL	Below Laboratory Method Reporting Limit
bgs	Below Ground Surface
CAER	Corrective Action Effectiveness Report
CSR	Compliance Status Report
EEI	Environmental Exploration Incorporated
GAEPD	Georgia Environmental Protection Division
NC	GAEPD HSRA Soil Notification Concentration
HSI	Hazardous Site Inventory
HSRA	Hazardous Site Response Act
MCL	Maximum Contaminant Level
mg/kg	Milligram per kilogram
NCs	Notification Concentrations
PCE	Tetrachloroethene
RRS	Risk Reduction Standard
SVE	Soil Vapor Extraction
TCE	Trichloroethene
URS	URS Corporation
USGS	United States Geologic Survey
VOC	Volatile organic compound
VRP	Voluntary Remediation Program

STATEMENT OF FINDINGS

Emory North Decatur Road [Hazardous Site Inventory (HSI) #10121)]; property tax ID #18 053 03-010 of DeKalb County, Georgia is located at 1784 North Decatur Road in Atlanta, DeKalb County, Georgia in Land Lot 52 and 53 of the 18th District of DeKalb County, Georgia (herein referred to as the Site). The North Decatur Road Site was accepted into the Georgia Voluntary Remediation Program (VRP) in a letter from the Georgia Environmental Protection Division (GAEPD) dated April 8, 2014. In accordance with the rules for the Georgia VRP Act, this VRP Compliance Status Report (VRP CSR) is being submitted on behalf of Emory University (owner of the property) to certify compliance of the site to applicable soil cleanup standards.

The GAEPD was notified of a release of tetrachloroethene (PCE) at the Site in 1989. The Site was listed on the Hazardous Site Inventory (HSI #10121) in 1994 for a release of PCE to soils exceeding a reportable quantity. The Site was not listed as a result of a release to groundwater exceeding a reportable quantity. Although PCE and daughter products were present in groundwater, the Site did not score above the Groundwater Pathway Threshold of "10" when the Reportable Quantities Screening Method was applied at the time of the HSI listing. These conditions are still applicable today; thus, the Site does not currently have a release exceeding a reportable quantity for groundwater. Pursuant to O.C.G.A. 12-8-107(g)(2) of the VRP Act, it is not necessary to perform corrective action nor certification of compliance for groundwater at this Site. Therefore, no additional corrective action is required at the Site per the VRP Act.

Prior to acceptance into the VRP, Emory University submitted a Corrective Action Plan (CAP) to GAEPD Hazardous Site Response Act (HSRA) outlining the installation of a soil vapor recovery system (SVE) and groundwater recovery system to remediate the site soils and groundwater, respectively. Tetrachloroethene (PCE) and its daughter products, the volatile organic compounds (VOCs) 1,1-dichloroethene, cis-1,2-dischloroethene, trans-1,2-dichloroethene, trichloroethene (TCE), and vinyl chloride are the chemicals of concern at the Site.

In 1995, the soil and groundwater remedial systems were installed in accordance with the original CAP, concurrent with the construction of the computer science building (referred to as the North Decatur Building on the Figures) at the site. The remedial systems consisted of fourteen soil vapor recovery wells and four groundwater recovery wells (RW-1, RW-2, RW-3, and RW-4). The remedial systems became fully operational in May 1995.

In July 1996, Emory University requested approval from GAEPD to discontinue the operation of the SVE system for soil remediation because the soils at the site met the Type I Risk Reduction Standards (RRS) (as described in GAEPD Rule 391-3 19.07). On August 15, 1996, the SVE system operation was shutdown after approval by GAEPD. In August 2000, Emory collected additional soil samples at the site to confirm the soils met the Type I RRS and the soil contamination had been delineated. Soil samples were collected at three (3) locations (GP-01, GP 02, and GP-03). At each location, two soil samples were collected: one at a depth of two (2) feet below ground surface (bgs) and the other at four (4) feet bgs, for a total of six soil samples. The six soil samples were analyzed by EPA Method 8260B for tetrachloroethene and its daughter products (trichloroethene, dichloroethenes, and vinyl chloride). Tetrachloroethene was detected in the six soil samples at concentrations ranged from 0.0101 mg/kg to 0.0238 mg/kg. The concentrations of tetrachloroethene in the six soil samples were all an order of magnitude below the Type 1 Risk Reduction Standard of 0.5 mg/kg. The daughter products 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride were not detected above the laboratory method detection limits in the six soil samples. Therefore, the soils met the Hazardous Substance Response Act (HSRA) Type 1 Risk Reduction Standards (RRS).

Additional soil samples were collected in December 2000 during the installation of monitoring wells MW-1, MW-2, MW-3 (later converted to recovery well RW-5) and MW-4. Specifically, three soil samples were collected from MW-1 (2 feet bgs, 5 feet bgs, and 10 feet bgs), MW-2 (2 feet bgs, 5 feet bgs, and 10 feet bgs), and MW-4 (2 feet bgs, 5 feet bgs, and 10 feet bgs) and in MW-3 at 2 feet bgs, 5 feet bgs, and 15 feet bgs. No constituents of concern were detected above the laboratory method detection limit except for the sample collected in MW-3 at 10 feet bgs. PCE was detected in this sample at a concentration of 0.0022 mg.kg, which was well below the Type I RRS.

The original groundwater recovery system (as installed in 1995) consisted of four groundwater recovery wells (RW-1, RW-2, RW-3, and RW-4) and a groundwater treatment system consisting of an air stripper and carbon filter system (added in 2000). In accordance with the revised October 2000 CAP, the groundwater recovery system was expanded in 2001 by installing an additional recovery well, RW-5 in response to the evaluation of data obtained from the installation of four new monitoring wells (MW-1, MW-2, MW-3, and MW-4). Emory University operated the groundwater recovery system until October 2014 and submitted either Semi-annual monitoring reports and/or Annual Corrective Action Effectiveness Reports to GAEPD during this timeframe.

On December 13, 2013, Emory University submitted an application to the Georgia VRP. In response to GAEPD's review of the application, Emory University submitted a Preliminary Remediation Plan and Conceptual Site Model in January 2014. This plan proposed to discontinue the pump and treat system used for groundwater remediation and instead, utilize groundwater use controls/limitations and natural attenuation processes to protect human health and the environment. The Site was accepted into the Georgia VRP in a letter dated April 8, 2014. In January 2015, at the request of GAEPD, Emory University submitted an updated groundwater model, a vapor intrusion evaluation, and an updated Conceptual Site Model. In April 2015, Emory University submitted a draft Uniform Environmental Covenant to GAEPD for review. On November 9, 2015, GAEPD notified Emory University that the Uniform Environmental Covenant, groundwater model, vapor intrusion evaluation, and Conceptual Site Model were approved.

There are two potential risks due to the presence of PCE and daughter products in groundwater at the Site. The first risk is from groundwater consumption if a water well was installed and the second risk is from vapor intrusion into the math/science building or a residence if constructed on the Site. In June 2016, Emory filed an Environmental Covenant with the DeKalb County Superior Court. It was recorded in Deed Book 25618 pages 662 through 675 (**Appendix A**).

The Environmental Covenant prohibits the use or extraction of groundwater at the Site and prohibits residential construction on the Site. In addition, the soil vapor modeling for the property (see Section 3) indicated that the probable vapor concentrations did not exceed the established risk levels for the property use (commercial).

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 who managed 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 the following parcel is in compliance with the Type I Risk Reduction Standards for soil.

Tax Parcel ID #18 053 03-010 of DeKalb County, Georgia

In accordance with Section 12-8-107(g)(2) of the VRP Act it is not necessary to certify compliance for groundwater at this Site.

Certified by:

Scott Thomaston

Scott Thomaston, Associate Director
Emory University, Environmental Health and Safety Office

1/3/2017
Date

GROUNDWATER SCIENTIST STATEMENT

I certify that I am a qualified groundwater scientist who has received a baccalaureate or post-graduate degree in natural sciences or engineering, and have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport. I further certify that this Voluntary Remediation Program Compliance Status Report prepared for the Emory University, located at 1784 North Decatur Road in DeKalb County, Atlanta, Georgia, was prepared by myself and appropriate qualified subordinates working under my direction.

Dale P. Voykin

Dale P. Voykin, P.G.
Georgia Registration No. 1220

DALE P. VOYKIN
GEORGIA REGISTERED PROFESSIONAL GEOLOGIST
No. 1220

1-3-2017
Date

PREFACE

AECOM, formerly URS Corporation (URS), has prepared this VRP CSR for the North Decatur Road Site located at 1784 North Decatur Road in Atlanta, Georgia. This VRP CSR is submitted on behalf of Emory University, the current owner of the property. The CSR relies in part on reports and data from previous activities at the Site. The description of those activities in this VRP CSR are based solely on information contained in those reports and not based on any first hand observations by Emory University or AECOM. Reports and data relied on in preparing this VRP CSR are included in the Appendices.

1.0 INTRODUCTION

This VRP Compliance Status Report (CSR) for the property located at 1784 North Decatur Road, Atlanta, DeKalb County, Georgia was prepared by AECOM, formerly URS, for submittal to the GAEPD.

This chapter provides a description of the property, a summary of the property history, investigation activities, and the organization of this status report. Previous reports and data relied on in preparing this CSR are provided in the Appendices.

1.1 Site Location and Description

The Site is located at 1784 North Decatur Road in Atlanta, DeKalb County, Georgia. The property address is 1722 - 1794 N. Decatur Road (north side of road). The owner is Emory University, 1762 Clifton Road Suite 1200, Atlanta, Georgia 30322. The Site is located in Land Lot 52 and 53 of the 18th District of DeKalb County, Georgia and was divided in the DeKalb County records by permit number 18883 (LDP No. 18784) as Lot #3. The Site is an irregularly shaped, 4.425-acre tract labeled “Lot #3” (property tax parcel ID 18-053-03). The Site (Lot #3) is bound to the south by North Decatur Road, and partially bound to the north by Gambrell Drive. A complete legal description of the property and a map of the Lot Division Plat illustrating Lot #3 is included as **Appendix B**.

1.2 Site History

In 1989, Emory University purchased property at the intersection of North Decatur and Burlington Roads in Atlanta, Georgia. A subsequent site assessment determined the property had likely been impacted by a dry cleaning operation that had previously operated at the property prior to Emory’s purchase. An automotive repair garage was also located on the property. The assessment detected PCE in the property soils and groundwater. The dry cleaner building and automotive garage building were subsequently removed during the redevelopment of the property and construction of a six-story math building. The former dry cleaners were located in front of the current location of the North Decatur Road math building in the vicinity of recovery well RW-2. The footprint of the former strip mall, including the dry cleaners, is shown on Figure 2.

In September 1993, Emory University submitted a CAP to GAEPD outlining the installation of a soil vapor recovery system (SVE) and groundwater recovery system to remediate the site soils and groundwater, and to meet the applicable risk reduction standards as described in EPD Rule 391-3-19.07. In 1994, the property was subsequently listed on the Georgia HSI.

In 1995, the remedial systems were installed in accordance with the original CAP, concurrent with the construction of the computer science building (referred to as the North Decatur Building on the Figures) at the site. The remedial systems consisted of four groundwater recovery wells (RW-1, RW-2, RW-3, and RW-4) and fourteen soil vapor recovery wells. Several of the SVE wells were installed beneath the computer science building. The SVE system became fully operational in May 1995 and the groundwater recovery system became fully operational in July 1995.

In July 1996, Emory University requested approval from GAEPD to discontinue the operation of the SVE system for soil remediation because the soils at the site met the Type I RRSs (as described in EPD Rule 391-3 19.07). On August 15, 1996, the SVE system operation was shutdown after approval by GAEPD. In August 2000 Emory collected additional soil samples at the site to confirm the soils met the Type I RRS and the soil contamination had been delineated. Soil samples were collected at three (3) locations (GP-01, GP 02, and GP-03). At each location, two soil samples were collected: one at a depth of two (2) feet below ground surface (bgs) and the other at four (4) feet bgs, for a total of six soil samples. The six soil samples were analyzed by EPA Method 8260B for tetrachloroethene and its daughter products (trichloroethene, dichloroethenes, and vinyl chloride). The analytical results for the six soil samples were below the Georgia Hazardous Site response Act (HSRA) soil notification threshold. The concentrations of tetrachloroethene in the six soil samples were also an order of magnitude below the HSRA Type 1 RRS. The soil vapor extraction carbon cells were removed from the treatment area during October 2001 to complete the shutdown of the SVE system. The carbon cells were sent to MKC Enterprises Inc. in Doraville, Georgia for disposal.

In October 2000, Emory University submitted a revised CAP for the remediation of the groundwater at the site. In December 2000 and January 2001, four additional monitoring wells were installed at the site in accordance with the revised October 2000 CAP. The locations of the monitoring wells, MW-1, MW-2, MW-3 (subsequently relabeled as recovery well RW-5), and MW-4, are shown on Figure 1. The installation and construction of the wells were summarized in a report titled Well Installation Report, May 15, 2001 that was previously submitted to the Georgia EPD. Monitoring well MW-3 was converted to a recovery well and relabeled RW-5, since PCE was detected at a low concentration in this well. Recovery well RW-5 was connected to the groundwater treatment system and placed into operation on August 6, 2001. Soil samples were collected during the installation of monitoring wells MW-1, MW-2, MW-3 (later converted to recovery well RW-5) and MW-4. Specifically, three soil samples were collected from MW-1 (2 feet bgs, 5 feet bgs, and 10 feet bgs), MW-2 (2 feet bgs, 5 feet bgs, and 10 feet bgs), and MW-4 (2 feet bgs, 5 feet bgs, and 10 feet bgs) and in MW-3 at 2 feet bgs, 5 feet bgs, and 15 feet bgs. No constituents of concern were detected above the laboratory method detection limit except for the sample collected in MW-3 at 10 feet bgs. PCE was detected in this sample at a concentration of 0.0022 mg.kg which was well below the Type I RRS.

GAEPD agreed in a Consent Order dated June 7, 2001 that Emory University could continue corrective action for groundwater at the site prior to submittal of a Compliance Status Report. In December 2001, the first Annual Corrective Action Effectiveness Report (CAER) (dated December 7, 2001) was submitted to Georgia EPD in accordance with the revised October 2000 CAP. The 2001 CAER report recommended sampling all monitoring wells and recovery wells on the same date on a semi-annual basis, reducing the influent sampling from bi-monthly to quarterly, and abandoning temporary piezometers TP-2 and TP-4 because these piezometers were dry and were not needed for potentiometric contouring purposes. GAEPD reviewed the 2001 CAER and approved these recommendations on October 7, 2002. CAER reports were subsequently submitted for the years 2002 through 2013 to GAEPD for review

The original groundwater recovery system (as installed in 1995) consisted of four groundwater recovery wells (RW-1, RW-2, RW-3, and RW-4) and a groundwater treatment system consisting of an air stripper. In October 2000, a carbon filter system was added to the treatment system to treat vapors from the air stripper. In accordance with the revised October 2000 CAP, the groundwater recovery system was expanded in 2001 by installing an additional recovery well, RW-5 in response to the evaluation of data obtained from the installation of four new monitoring wells (MW-1, MW-2, MW-3, and MW-4). Monitoring well MW 3 was converted to recovery well RW-5 in August 2001. Recovery well RW-4 was converted to a monitoring well in June 2006, after years of being inoperable. The impacted groundwater was removed by the recovery wells and piped to the treatment system (Figure 1) for treatment by an air stripper and subsequent discharge to the DeKalb County sewer system in accordance with Publicly-Owned Treatment Work Permit No. DK00086.

On December 13, 2013, Emory University submitted an application to the VRP. In January 2014, Emory University submitted a Preliminary Remediation Plan and Conceptual Site Model. This plan proposed to discontinue the pump and treat remediation and utilize groundwater use controls/limitations and natural attenuation processes to protect human health and the environment. In May 2014, Emory submitted a draft uniform environmental covenant to GA EPD for review. In August and October 2014, URS performed sampling of the site monitoring wells at the request of GAEPD to update the groundwater model. On October 19 and 20, 2014, URS dismantled the groundwater extraction system after approval from GAEPD. The groundwater treatment compound was dismantled, including all equipment (air stripper, air treatment unit, primary sump tank, pumps, and electrical controls, fencing, and concrete containment pad) by A&D Environmental. The groundwater pumps, controllers, and wiring were removed from within the recovery wells as part of the dismantling process. The groundwater discharge point to the DeKalb County Sewer was properly capped below ground. DeKalb County was subsequently notified the NPDES permit for the system was no longer needed. In addition, the former SVE well vaults were removed after the SVE wells were first abandoned by Environmental Exploration, Inc. (EEI). The former locations of the vaults were backfilled with soil and the surface graded to match the existing conditions (grass or pine bark).

In January 2015, URS submitted an updated groundwater model, a vapor intrusion evaluation, and an updated Conceptual Site Model. A copy of the documents are included as **Appendix C.** On April 8, 2015, AECOM (formerly URS) conducted an annual groundwater gauging and sampling event. On November 9, 2015 GAEPD notified Emory that the Uniform Environmental Covenant, groundwater model, vapor intrusion evaluation, and Conceptual Site Model were approved.

In January 2016, Emory provided a copy of the draft covenant to the adjacent property owners and the municipality (DeKalb County) for the 30 day comment period prior to GAEPDs signature. Copies of the notices and proof of delivery are included in **Appendix D.** On May 26, after receiving no comments to the draft covenant, GEPD signed the covenant. On June 17, 2016, the Environmental Covenant was recorded in Deed Book 25618 pages 662 through 675 at the Clerk of Superior Court in DeKalb County, Georgia. A copy of the file-stamped recorded covenant is included in **Appendix A.**

In April 2016, AECOM performed the annual groundwater gauging and sampling event. The results of the 2016 groundwater monitoring are presented in **Appendix E** in the report entitled “Voluntary Remediation Program, 2016 Annual Progress Report”.

1.3 Organization of the Compliance Status Report

This CSR is organized to address the items specified in the Rules of the Georgia Department of Natural Resources Environmental Protection Division (Rules), Chapter 391-3-19, Hazardous Site Response, Section 391-3-19-.06(3) titled Compliance Status Report. The organization is as follows:

- Section 1.0 Introduction
- Section 2.0 Source Description
- Section 3.0 Previous Investigations
- Section 4.0 Potential Receptors and Exposure Pathways
- Section 5.0 Compliance with Risk Reduction Standards
- Section 6.0 Affected Property Owners
- Section 7.0 References
- Section 8.0 Responsible Parties

1.4 Chemicals of interest

Tetrachloroethene and its daughter products (1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride).

2.0 SOURCE DESCRIPTION

This section of the VRP CSR provides a description of each known source which has contributed or is contributing to a release as required by Section 391-3-19-.06(3)(b)(1) of the rules.

The following potential contamination source was identified.

- Former dry cleaners located at the intersection of North Decatur Road and Burlington Road.

3.0 PREVIOUS REPORTS

The following previous environmental investigations have been conducted at the site. Copies of the reports are on file at GAEPD's office.

Corrective Action Plan, for Perchloroethylene (PCE) Impacts, Former Dry Cleaners Site, Adjacent to ASR Facility, Emory University, Atlanta, Georgia, prepared by Willmer Engineering Inc., 1993.

Soil Sampling Report, 1784 North Decatur Road Building, Emory University, prepared by URS Corporation, January 19, 2001.

Installation of Four Monitoring Wells, Sampling, and Analysis, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, May 15, 2001.

First Semi-annual Sampling Report, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, November 14, 2001.

2001 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, December 7, 2001.

Second Semi-annual Sampling Report, February 2002, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, April 30, 2002.

Semi-annual Sampling Report, May 2002, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, August 18, 2002.

Semi-annual Sampling Report, July 2002, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, August 20, 2002.

Semi-annual Sampling Report, December 2002, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, December 17, 2002.

Semi-annual Sampling Report, January 2003, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, April 2, 2003.

Semi-annual Sampling Report, June 2003, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, July 11, 2003.

Revised 2002 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, dated December 8, 2003.

2003 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, dated December 15, 2003.

Semi-annual Sampling Report, January 2004, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, March 12, 2004.

Semi-annual Sampling Report, June 2004, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, July 21, 2004.

2004 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, December 15, 2004.

Semi-annual Sampling Report, January 2005, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, March 17, 2005.

Semi-annual Sampling Report, July 2005, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, July 11, 2005.

2005 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, December 20, 2005.

Semi-annual Sampling Report, February 2006, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, February 22, 2005.

Semi-annual Sampling Report, June 2006, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, July 7, 2005.

2006 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, December 22, 2006.

Semi-annual Sampling Report, February 2007, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, March 12, 2007.

Semi-annual Sampling Report, June 2007, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, July 5, 2007.

2007 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, December 10, 2007.

Semi-annual Sampling Report, February 2008, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, March 27, 2008.

Semi-annual Sampling Report, June 2008, Emory University, 1784 North Decatur Road, Atlanta, Georgia, prepared by URS Corporation, July 25, 2008.

2008 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, January 9, 2009.

2009 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, January 4, 2010.

2010 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, February 4, 2011.

2011 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, January 27, 2012.

2012 Corrective Action Effectiveness Report, Emory University, North Decatur Road Site, HSI Site No. 10121, Atlanta, Georgia, prepared by URS Corporation, March 14, 2013.

Voluntary Remediation Program Application, North Decatur Road Site, HSI No. 10121, Atlanta, Georgia, prepared by URS Corporation, December 10, 2013.

Preliminary Remediation Plan and Preliminary Conceptual Site Model, North Decatur Road/Burlington Road, prepared by URS Corporation, January 13, 2014.

Conceptual Site Model, Updated Groundwater Model, and Vapor Intrusion Evaluation North Decatur Road/Burlington Road Site, HSI Site Number 10121, prepared by URS Corporation, December 30, 2014.

Draft Uniform Environmental Covenant, Emory University, North Decatur Road Site, HSI Site No 10121, Atlanta, Georgia, prepared by URS Corporation, May 14, 2015.

Voluntary Remediation Program, 2015 Annual Progress Report, Emory University, North Decatur Road Site, HSI Site No 10121, Atlanta, Georgia, prepared by URS Corporation, December 4, 2015.

Public Notice Letters to DeKalb and Adjacent Property Owners, prepared by URS Corporation, January 2016

Final Uniform Environmental Covenant, Emory University, North Decatur Road Site, HSI Site No 10121, Atlanta, Georgia, prepared by URS Corporation, May 26, 2016.

4.0 POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS

4.1 Conceptual Model

A Conceptual Site Model for the Site was prepared and submitted to GA EPD on December 30, 2015. GA EPD approved the Conceptual Model on November 9, 2015. A copy of the approved conceptual model is included in **Appendix C.**

4.2 Fate and Transport Model

On December 20, 2014, AECOM submitted an updated groundwater model (BIOCHLOR) with additional groundwater data collected in October 2014 per GAEPD's request. The groundwater model was approved in a letter dated November 9, 2015. AECOM has updated the groundwater model with the 2016 annual groundwater sampling data and the results are presented in **Appendix F.**

In summary, comparison of the current (2106) BIOCHLOR model output to that previously performed on the 2104 data indicates much similarity. The earlier 2014 model output predicted that, in 2039, maximum PCE concentrations on the order of 5 to 6 ug/L would only be present in groundwater at the source area (vicinity of RW-3). The more-recent (2016) model predicts a source-area groundwater PCE concentration of about 8 ug/L in 2040, with groundwater PCE concentrations less that the Maximum Contaminant Level (MCL) noted at all locations by 2043.

4.3 Vapor Intrusion Evaluation

On December 20, 2014, AECOM submitted a vapor intrusion evaluation per EPD's request. The vapor intrusion evaluation concluded that vapor intrusion from groundwater to indoor air was not a concern based on historic depths to groundwater, the groundwater flow pathway, and the location of the historically highest PCE concentrations in groundwater in relation to the position of the math/science building. The vapor intrusion evaluation has been updated with the 2016 groundwater data. A copy of the vapor intrusion evaluation is included in **Appendix G.**

5.0 COMPLIANCE WITH RISK REDUCTION STANDARDS

5.1 Soils

In 1989, Emory University purchased property at the intersection of North Decatur and Burlington Roads in Atlanta, Georgia. A subsequent site assessment determined the property had been impacted by a dry cleaning operation that had previously operated at the property prior to Emory's purchase. In September 1993, Emory University submitted a CAP to GAEPD outlining the installation of a soil vapor recovery system (SVE) to remediate the site soils, and to meet the applicable risk reduction standards as described in EPD Rule 391-3-19.07. In 1995, the SVE remedial system was installed in accordance with the original CAP, concurrent with the construction of the computer math/science at the Site. The remedial system consisted of fourteen soil vapor recovery wells. The SVE system became fully operational in May 1995.

In July 1996, Emory University requested approval from GAEPD to discontinue the operation of the SVE system for soil remediation because the soils at the site met the Type I Risk Reduction Standards (RRS) (as described in EPD Rule 391-3 19.07). On August 15, 1996, the SVE system operation was shut down after approval by GAEPD. In August 2000, Emory collected additional soil samples at the site to confirm the soils met the Type I RRS and the soil contamination had been delineated. The six soil samples were analyzed by EPA Method 8260B for tetrachloroethene and its daughter products (trichloroethene, dichloroethenes, and vinyl chloride). Tetrachloroethene was detected in the six soil samples at concentrations ranging from 0.0101 mg/kg to 0.0238 mg/kg. The concentrations of tetrachloroethene in the six soil samples were all an order of magnitude below the Type 1 Risk Reduction Standard of 0.5 mg/kg. The daughter products 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride were not detected above the laboratory method detection limits in any of the six soil samples. Therefore, the soils met the HSRA Type 1 RRSs. A copy of the soil sampling report is included in **Appendix H.**

Additional soil samples were collected in December 2000 during the installation of monitoring wells MW-1, MW-2, MW-3 (later converted to recovery well RW-5) and MW-4. Specifically, three soil samples were collected from MW-1 (2 feet bgs, 5 feet bgs, and 10 feet bgs), MW-2 (2 feet bgs, 5 feet bgs, and 10 feet bgs), and MW-4 (2 feet bgs, 5 feet bgs, and 10 feet bgs) and in MW-3 at 2 feet bgs, 5 feet bgs, and 15 feet bgs. No constituents of concern were detected above the laboratory method detection limit except for the sample collected in MW-3 at 10 feet bgs. PCE was detected in this soil sample at a concentration of 0.0022 mg.kg, which was well below the Type I RRS.

5.2 Groundwater

The Site was listed on the HSI as a result of a release to soil exceeding a reportable quantity, but was not listed as a result of a release to groundwater exceeding a reportable quantity. Therefore, pursuant to O.C.G.A. 12-8-107(g)(2) in the VRP Act, neither corrective action nor certification of compliance for groundwater is required. According to Section 12-8-107(g)(2) of the VRP Act:

> "The participant shall not be required to perform corrective action or to certify compliance for groundwater if the voluntary remediation property was listed on the

> inventory as a result of a release to soil exceeding a reportable quantity for soil but was not listed on the inventory as a result of a release to groundwater exceeding a reportable quantity, and if the participant further demonstrates to the director at the time of enrollment that a release exceeding a reportable quantity for groundwater does not exist at the voluntary remediation property; and the groundwater protection requirements for soils shall be based on protection of established point of exposure for groundwater as provided under this part."

Although PCE and daughter products were present in groundwater, the Site did not score above the Groundwater Pathway Threshold of "10" when applying the Reportable Quantities Screening Method at the time of the HSI listing. These conditions are still applicable today; thus, the Site does not currently have a release exceeding a reportable quantity for groundwater. Additionally, concentrations in soil are below the Type I RRS and are, thus, protective of groundwater quality. The updated groundwater model also predicts the groundwater concentrations at the site will continue to decrease to below MCLs by the year 2043.

There are two potential risks due to the presence of PCE and daughter products in groundwater at the Site. The first risk is from groundwater consumption if a water well was installed and the second risk is from vapor intrusion into the math/science building or a residence if constructed on the Site. In June 2016, Emory filed an Environmental Covenant with the DeKalb County Superior Court that prohibits the use or extraction of groundwater at the Site and prohibits residential construction on the Site.

6.0 AFFECTED PROPERTY OWNER INFORMATION

This section of the VRP CSR provides a description of all properties which are part of the HSRA-regulated Site, including the address and location of such property, its legal description, and the property owner name, address and telephone number, as required by Section 391-3-19-.02(2)(v), the “Site means that portion of the owner’s contiguous property and any other owner’s property affected by a release exceeding a reportable quantity.”

The property is addressed as 1722 - 1794 N. Decatur Road (north side of road). The owner is Emory University, 1762 Clifton Road Suite 1200, Atlanta, Georgia 30322. The owners contact is Mr. Scott Thomaston (404.727.1349). This tract of land was conveyed on February 10, 1988 from H. B. Hutchinson, Jr. (deceased) to Emory University recorded in Deed Book 6058, Page 449, DeKalb County Records. The area Property is located in Land Lot 52 and 53 of the 18th District of DeKalb County, Georgia and was divided in the DeKalb County records by permit number 18883 (LDP No. 18784) as Lot #3. The Property is an irregularly shaped, 4.425-acre tract labeled “Lot #3” (property tax parcel ID 18-053-03). The Property (Lot #3) is bound to the south by North Decatur Road, and partially bound to the north by Gambrell Drive. A complete legal description of the area property and a map of the Lot Division Plat illustrating Lot #3 is included as **Appendix B**.

The municipality adjacent properties and the respective owner’s addresses are listed below. The adjacent properties are shown on **Figure 3.** In January 2016, Emory provided a copy of the draft covenant to the adjacent property owners and the municipality (DeKalb County) for the 30 day comment period prior to EPDs signature. Copies of the notices and proof of delivery are included in **Appendix D.**

DeKalb County Tax Assessors Office
120 W Trinity Pl #209
Decatur, GA 30030

1779 North Decatur Road, Decatur, GA
Isabel Thompson
13 White Street Extension
Watkinsville, GA 30677

1793 North Decatur Road, Decatur Georgia
Richard Larson and Jason Cohen
2941 W. Cypress Creek Road #102
Fort Lauderdale, FL 33309-1762

1767/1775/1785 North Decatur Road, Decatur, GA
Thibadeau Holdings, LLC
1448 Mcclendon Drive #8
Decatur, GA 30033-1805

7.0 RESPONSIBLE PARTIES

This section of the VRP CSR provides, as required by Section 391-3-19-.06(3)(b)(6) of the Rules, the name, address and telephone number of any other person who may be a responsible party for the Site, and a description of the type and amount of regulated substances such party may have contributed to a release.

The following is the responsible party at this Site:

- Emory University
  1762 Clifton Road Suite 1200
  Atlanta, Georgia 30322
  (404) 727-1349
  Attn: Scott Thomaston

8.0 ANNUAL VRP PROGRESS REPORT

On March 30, 2016, AECOM performed the annual groundwater gauging and sampling event. The 2016 monitoring event report is provided in **Appendix E.** PCE and its daughter products (1,1-dichloroethene, cis-1,2-dichloroethene, trans –1,2-dichloroethene, trichloroethene, and vinyl chloride) were not detected above the laboratory detection limit in monitoring wells MW-1 and MW-2 during the 2016 sampling event. PCE was detected at varying concentrations in monitoring wells MW-4 and RW-4 and former recovery wells RW-1, RW-2, RW-3, and RW-5 during the groundwater sampling event. However, no daughter products were detected in monitoring wells MW-4 and RW-4 and former recovery well RW-5 during the groundwater sampling event. The daughter product trichloroethene was detected in former recovery wells RW-2, at a concentration of 12 ug/l and former recovery well RW-3 at a concentration of 8.9 ug/L,. The PCE concentration in the furthest downgradient well, MW-4 showed a slight decrease in concentration from 33 ug/L during the April 2015 sampling event to a concentration of 29 ug/L during the March 2016 sampling event. Overall, the March 2016 groundwater results are consistent with the previous 2015 groundwater results and the groundwater model output.

9.0 REFERENCES

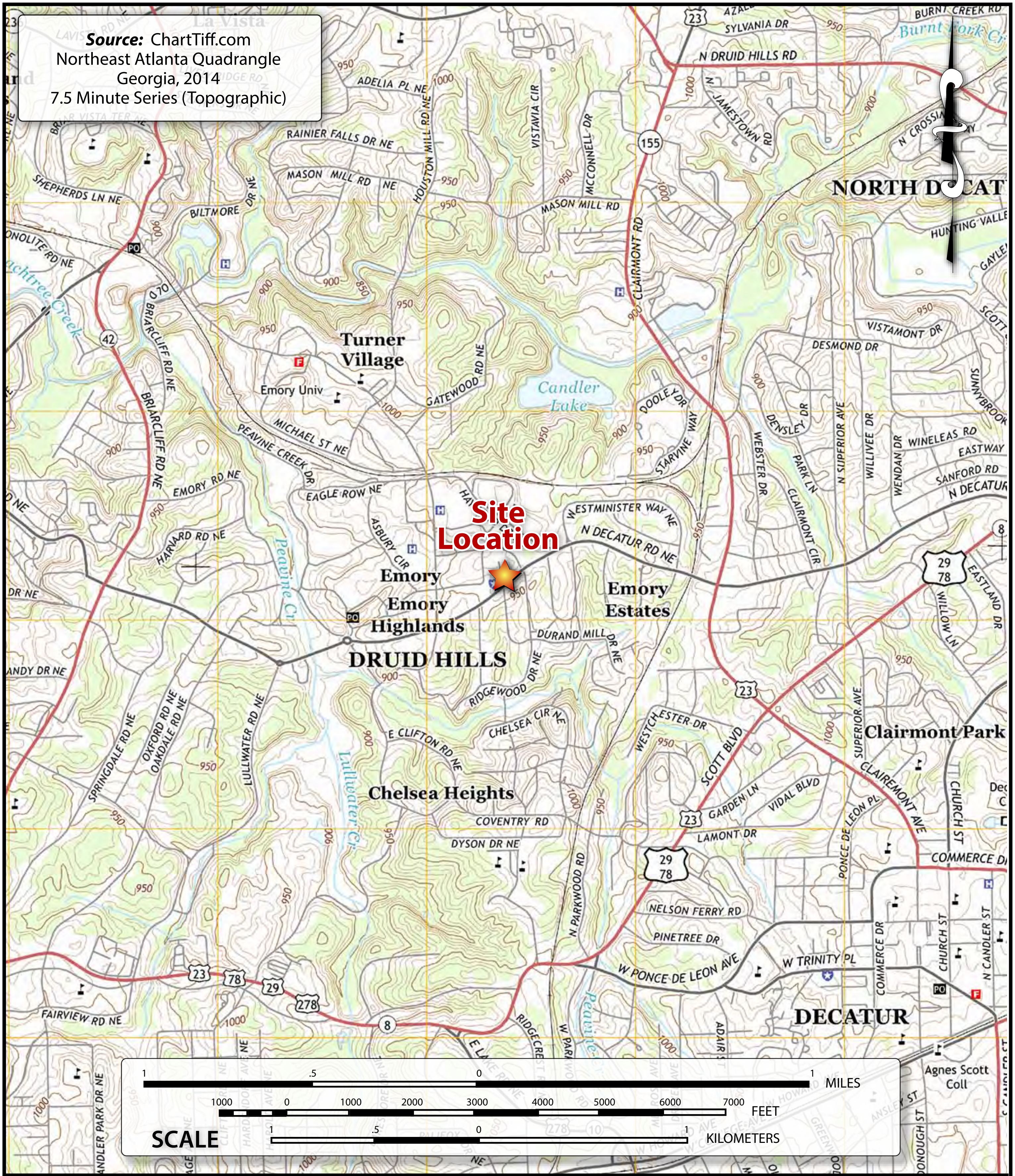
Georgia Department of Natural Resources Environmental Protection Division (GAEPD) Hazardous Site Response Program, 1995. Publication: *"Guidance of Target Soil Concentrations for Type 1 and Type 3 Risk Reduction Standards,"* March 1995.

GAEPD, 2015. Website: "Comparison of Existing Contamination to Risk Reduction Standards 391-3-19-.07", Accessed January 2015.

United States Department of Agriculture (USDA) Natural Resources Conservation Service, 1973. *Soil Survey of DeKalb County, Georgia*.

United States Geological Survey (USGS), Northeast 7.5-Minute Series Topographic Quadrangle, *Georgia*, 2014.

FIGURES



Source: ChartTiff.com
Northeast Atlanta Quadrangle
Georgia, 2014
7.5 Minute Series (Topographic)

CLIENT:
Emory University

PROJECT:
North Decatur Road Site, Atlanta, Georgia

DATE: October 2016

SCALE: 1:24,000

FILE: H:\proj\EmoryUniversity\VRP2016\EmoryTopoMap.ai

DESIGNED BY:

DRAWN BY: J. Gross

CHECKED BY: B. Jacobs

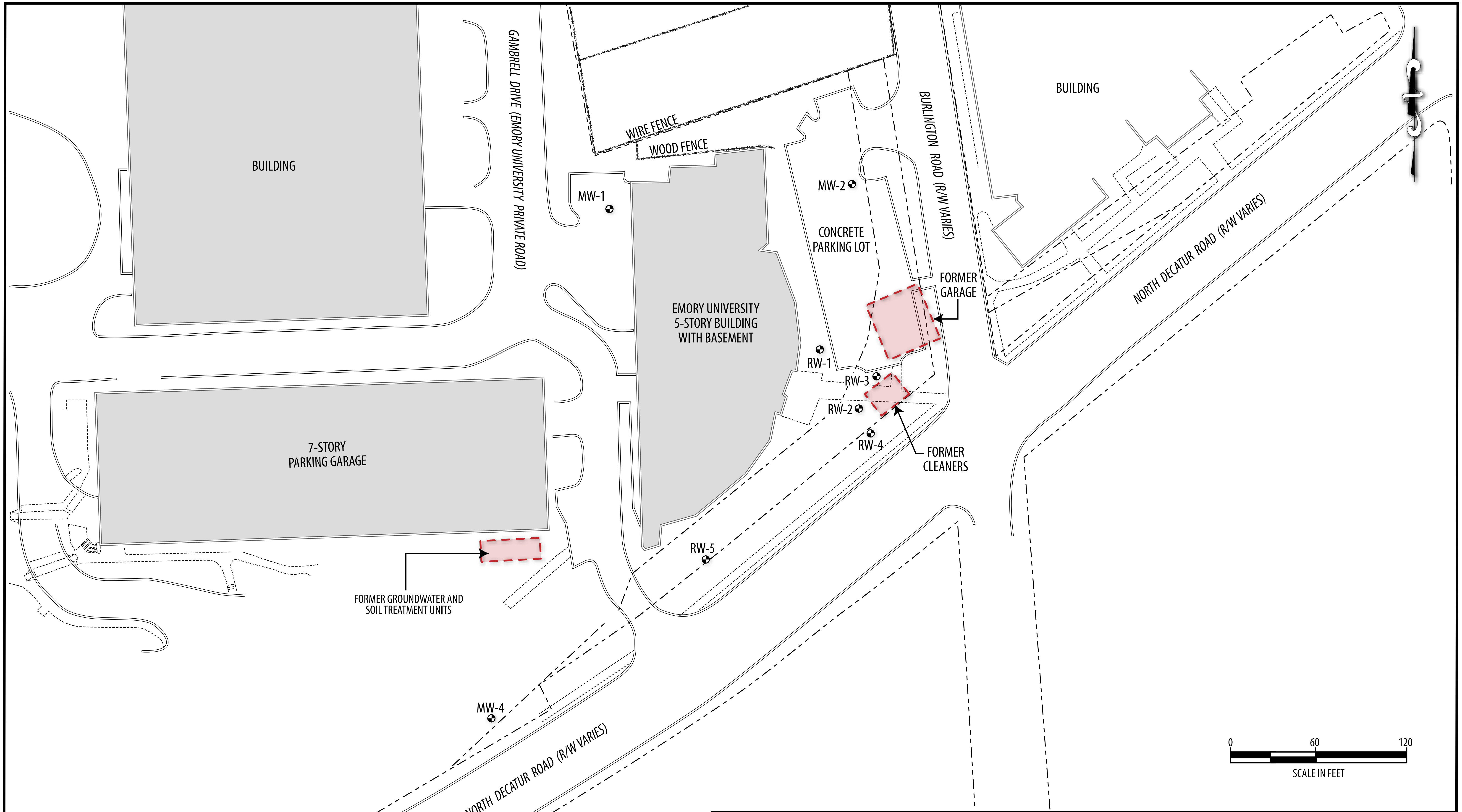
TITLE:
Site Location Map

AECOM

PROJ NO.: 60401439

TASK: 01

FIGURE: 1



LEGEND

● - Well Location

CLIENT:	Emory University		
PROJECT:	North Decatur Road Site, Atlanta, Georgia		
DATE:	November 2016	SOURCE:	URS
SCALE:	As Shown	DRAWN BY:	J. Gross
FILE:	H:\Proj\EmoryUniversity\VRP2016\WellLocationMap.ai	CHKD BY:	B. Jacobs

TITLE:

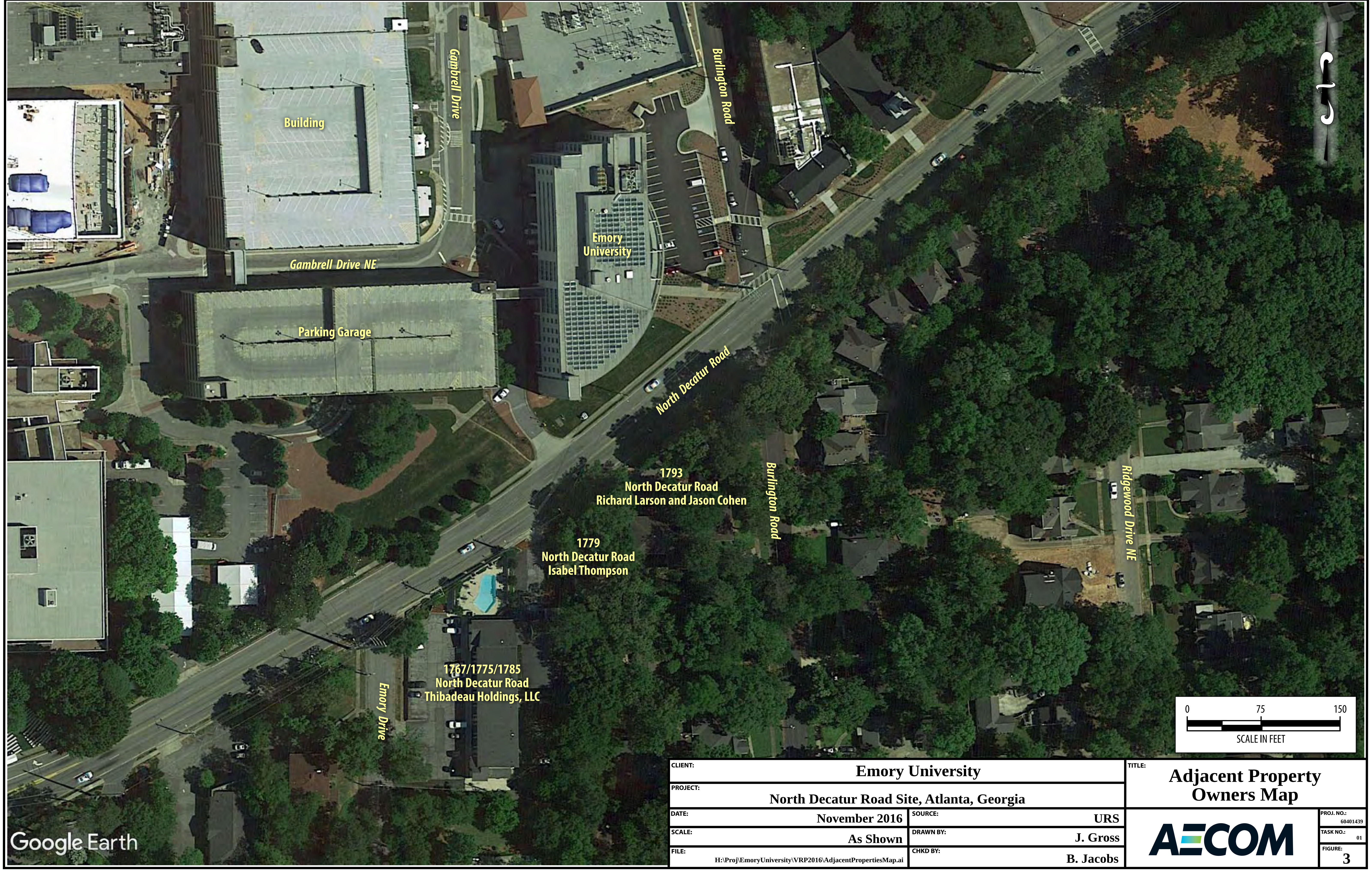
Site Map

AECOM

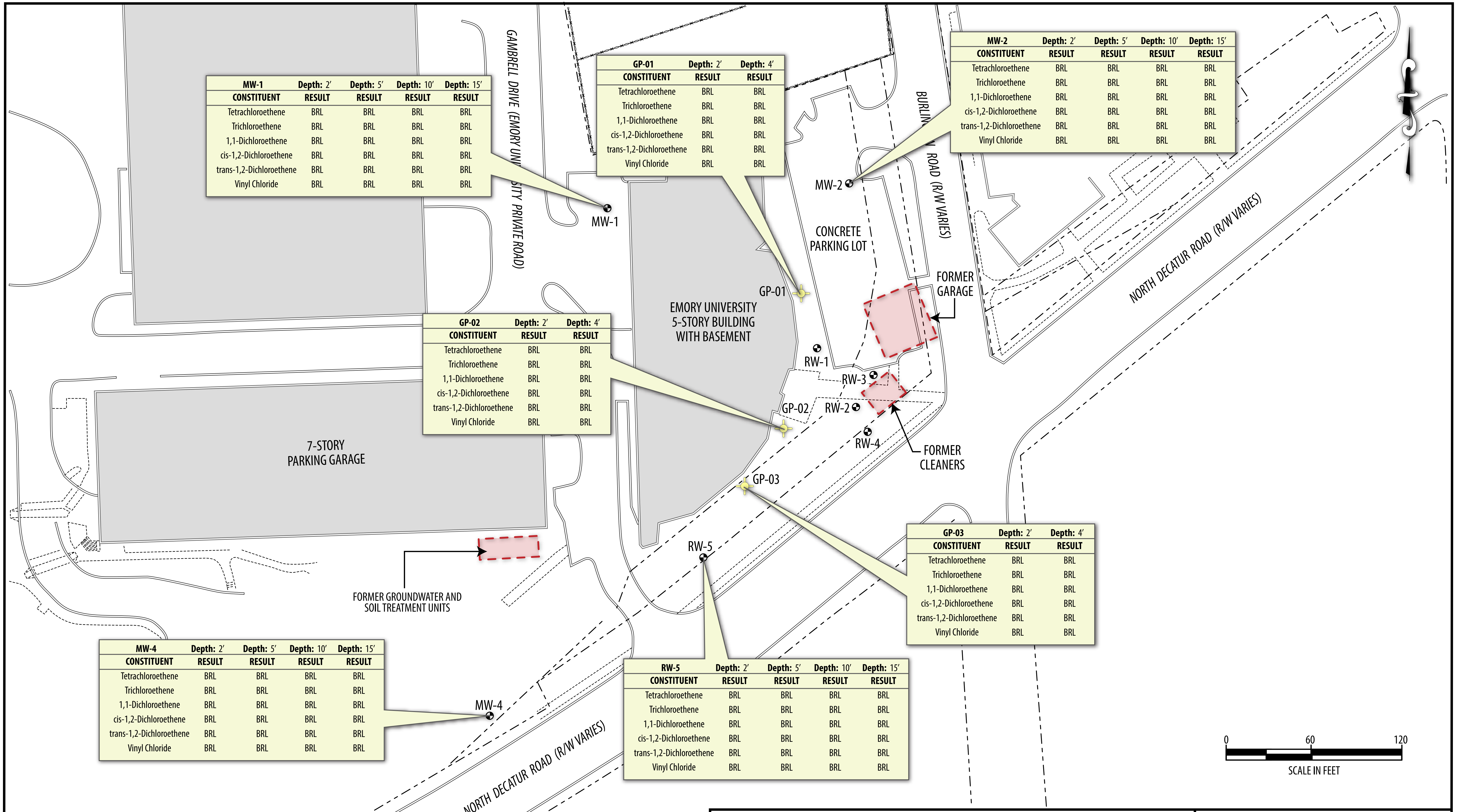
PROJ. NO.: 60401439

TASK NO.: 01

FIGURE: 2



CLIENT: Emory University		TITLE: Adjacent Property Owners Map	
PROJECT: North Decatur Road Site, Atlanta, Georgia			
DATE: November 2016	SOURCE: URS	AECOM	PROJ. NO.: 60401439
SCALE: As Shown	DRAWN BY: J. Gross		TASK NO.: 01
FILE: H:\Proj\EmoryUniversity\VRP2016\AdjacentPropertiesMap.ai	CHKD BY: B. Jacobs		FIGURE: 3



MW-1	Depth: 2′	Depth: 5′	Depth: 10′	Depth: 15′
CONSTITUENT	RESULT	RESULT	RESULT	RESULT
Tetrachloroethene	BRL	BRL	BRL	BRL
Trichloroethene	BRL	BRL	BRL	BRL
1,1-Dichloroethene	BRL	BRL	BRL	BRL
cis-1,2-Dichloroethene	BRL	BRL	BRL	BRL
trans-1,2-Dichloroethene	BRL	BRL	BRL	BRL
Vinyl Chloride	BRL	BRL	BRL	BRL

GP-01	Depth: 2′	Depth: 4′
CONSTITUENT	RESULT	RESULT
Tetrachloroethene	BRL	BRL
Trichloroethene	BRL	BRL
1,1-Dichloroethene	BRL	BRL
cis-1,2-Dichloroethene	BRL	BRL
trans-1,2-Dichloroethene	BRL	BRL
Vinyl Chloride	BRL	BRL

MW-2	Depth: 2′	Depth: 5′	Depth: 10′	Depth: 15′
CONSTITUENT	RESULT	RESULT	RESULT	RESULT
Tetrachloroethene	BRL	BRL	BRL	BRL
Trichloroethene	BRL	BRL	BRL	BRL
1,1-Dichloroethene	BRL	BRL	BRL	BRL
cis-1,2-Dichloroethene	BRL	BRL	BRL	BRL
trans-1,2-Dichloroethene	BRL	BRL	BRL	BRL
Vinyl Chloride	BRL	BRL	BRL	BRL

GP-02	Depth: 2′	Depth: 4′
CONSTITUENT	RESULT	RESULT
Tetrachloroethene	BRL	BRL
Trichloroethene	BRL	BRL
1,1-Dichloroethene	BRL	BRL
cis-1,2-Dichloroethene	BRL	BRL
trans-1,2-Dichloroethene	BRL	BRL
Vinyl Chloride	BRL	BRL

GP-03	Depth: 2′	Depth: 4′
CONSTITUENT	RESULT	RESULT
Tetrachloroethene	BRL	BRL
Trichloroethene	BRL	BRL
1,1-Dichloroethene	BRL	BRL
cis-1,2-Dichloroethene	BRL	BRL
trans-1,2-Dichloroethene	BRL	BRL
Vinyl Chloride	BRL	BRL

MW-4	Depth: 2′	Depth: 5′	Depth: 10′	Depth: 15′
CONSTITUENT	RESULT	RESULT	RESULT	RESULT
Tetrachloroethene	BRL	BRL	BRL	BRL
Trichloroethene	BRL	BRL	BRL	BRL
1,1-Dichloroethene	BRL	BRL	BRL	BRL
cis-1,2-Dichloroethene	BRL	BRL	BRL	BRL
trans-1,2-Dichloroethene	BRL	BRL	BRL	BRL
Vinyl Chloride	BRL	BRL	BRL	BRL

RW-5	Depth: 2′	Depth: 5′	Depth: 10′	Depth: 15′
CONSTITUENT	RESULT	RESULT	RESULT	RESULT
Tetrachloroethene	BRL	BRL	BRL	BRL
Trichloroethene	BRL	BRL	BRL	BRL
1,1-Dichloroethene	BRL	BRL	BRL	BRL
cis-1,2-Dichloroethene	BRL	BRL	BRL	BRL
trans-1,2-Dichloroethene	BRL	BRL	BRL	BRL
Vinyl Chloride	BRL	BRL	BRL	BRL

LEGEND

- ⊕ - Well Location
- ✦ - Soil Sample Location
- **BRL** - Not detected above laboratory reporting limits

CLIENT: **Emory University**
PROJECT: **North Decatur Road Site, Atlanta, Georgia**
DATE: **November 2016**
SOURCE: **URS**
SCALE: **As Shown**
DRAWN BY: **J. Gross**
FILE: H:\Proj\EmoryUniversity\VRP2016\2001SoilSampleResults.ai
CHKD BY: **B. Jacobs**
TITLE: **2001 Soil Sample Results**
AECOM
PROJ. NO.: 60401439
TASK NO.: 01
FIGURE: 4

APPENDIX A

Recorded Environmental Covenant

After Recording Return to:

Georgia Environmental Protection Division
Response and Remediation Program
2 Martin Luther King, Jr. Drive, SE
Suite 1462 East
Atlanta, Georgia 30334

2016091383 DEED BOOK 25618 Pg 662
Filed and Recorded:
6/17/2016 9:38:13 AM
Debra DeBerry
Clerk of Superior Court
DeKalb County, Georgia

Environmental Covenant

This instrument is an Environmental Covenant executed pursuant to the Georgia Uniform Environmental Covenants Act, OCGA § 44-16-1, *et seq.* This Environmental Covenant subjects the Property identified below to the activity and/or use limitations specified in this document. The effective date of this Environmental Covenant shall be the date upon which the fully executed Environmental Covenant has been recorded in accordance with OCGA § 44-16-8(a).

Fee Owner of Property/Grantor:

Emory University
c/o Mr. Michael J. Mandl,
Executive Vice President for Business and Administration
408 Administration Building
201 Dowman Drive
Atlanta, GA 30322

Grantee/Holder:

Emory University
c/o Mr. Michael J. Mandl,
Executive Vice President for Business and Administration
408 Administration Building
201 Dowman Drive
Atlanta, GA 30322

Grantee/Entity with express power to enforce:

State of Georgia
Department of Natural Resources
Environmental Protection Division
2 Martin Luther King Jr. Drive, SE
Suite 1456 East Tower
Atlanta, GA 30334

Parties with interest in the Property: None

Property:

The property subject to this Environmental Covenant is the Emory North Decatur Road Site, Georgia Hazardous Site Response Act (HSRA) Hazardous Site Inventory (HSI) Site Number 10121 (hereinafter "Property"), located at 1784 North Decatur Road in Atlanta, DeKalb County, Georgia. This tract of land was conveyed on February 10, 1988 from H. B. Hutchinson, Jr. (deceased) to Emory University recorded in Deed Book 6058, Page 449, DeKalb County Records. The Property is located in Land Lot 52 and 53 of the 18th District of DeKalb County, Georgia and was divided in the DeKalb County records by permit number 18883 (LDP No. 18784) as Lot #3.

The Property is an irregularly shaped, 4.425-acre tract labeled "Lot #3" (property tax parcel ID 18-053-03). The Property (Lot #3) is bound to the south by North Decatur Road, and partially bound to the north by Gambrell Drive. A complete legal description of the property is attached as Exhibit A and a map of the Lot Division Plat illustrating Lot #3 is attached as Exhibit B.

Tax Parcel Number(s):
18 053 03-010 of DeKalb County, Georgia

Name and Location of Administrative Records:

The corrective action at the Property that is the subject of this Environmental Covenant is described in the following document[s]:

- Corrective Action Plan (CAP) for Perchloroethylene (PCE) Impacts, Former Dry Cleaner Site Adjacent to Automotive Repair and Servicing Facility, Emory University dated September 1993;
- Revised Corrective Action Plan dated 2000;
- 2012 Corrective Action Effectiveness Report dated March 14, 2013; and,
- Voluntary Remediation Program Application and Remediation Plan dated January 2014, VRP CSR.
- These documents are available at the following locations:

  Georgia Environmental Protection Division
  Response and Remediation Program
  2 Martin Luther King (MLK) Jr. Drive, SE, Suite 1054 East Tower
  Atlanta, GA 30334
  M-F 8:00 AM to 4:30 PM excluding state holidays

Description of Contamination and Corrective Action:

This Property has been listed on the state's hazardous site inventory and has been designated as needing corrective action due to the presence of hazardous wastes, hazardous constituents, or hazardous substances regulated under state law. The Emory North Decatur Road site is currently listed on the Georgia HSI No. 10121 pursuant to the HSRA program administered by the Georgia Environmental Protection Division (hereinafter "EPD"), due to a release of tetrachloroethylene (PCE) along with its associated degradation products to soil and groundwater. In 1995, the soil and groundwater remedial systems were installed in accordance with the original Corrective Action Plan (CAP). The remedial systems consisted of fourteen soil vapor recovery wells and four groundwater recovery wells. In July 1996, Emory University requested approval from EPD to discontinue the operation of the soil vapor extraction (SVE) system for soil remediation because the soils at the site met the Type 1 Risk Reduction Standards (RRS). Emory has continued to operate a pump and treat groundwater remediation system at the site since 1995 to remediate the PCE impacted groundwater. In 2014, Emory applied to the VRP and submitted a remediation plan. The VRP remediation plan proposes to discontinue the pump and treat remediation and utilize groundwater use controls/limitations and natural attenuation processes to protect human health and the environment. Contact the property owner or the EPD for further information concerning this Property. This notice is provided in compliance with the Georgia Hazardous Site Response Act.

This Declaration of Covenant is made pursuant to the Georgia Uniform Environmental Covenants Act, O.C.G.A. § 44-16-1 *et seq.* by Emory University, its successors and assigns, Emory University and the State of Georgia, Department of Natural Resources, Environmental Protection Division (hereinafter "EPD"), its successors and assigns. This Environmental Covenant is required because a release of PCE occurred on the Property. PCE is a "regulated substance" as defined under the Georgia Hazardous Site Response Act, O.C.G.A. § 12-8-90 *et seq.*, and the rules promulgated thereunder (hereinafter "HSRA" and "Rules", respectively). The Corrective Action consists of the installation and maintenance of institutional controls (limitation on use of groundwater at site) to protect human health and the environment.

Grantor, Emory University (hereinafter "Emory"), hereby binds Grantor, its successors and assigns to the activity and use restriction(s) for the Property identified herein and grants such other rights under this Environmental Covenant in favor of Emory and EPD. EPD shall have full right of enforcement of the rights conveyed under this Environmental Covenant pursuant to HSRA, O.C.G.A. § 12-8-90 *et seq.*, and the rules promulgated thereunder. Failure to timely enforce compliance with this Environmental Covenant or the use or activity limitations contained herein by any person shall not bar subsequent enforcement by such person and shall not be deemed a waiver of the person's right to take action to enforce any non-compliance. Nothing in this Environmental Covenant shall restrict EPD from excising any authority under applicable law.

Emory makes the following declaration as to limitations, restrictions, and uses to which the Property may be put and specifies that such declarations shall constitute covenants to run with the land, pursuant to O.C.G.A. § 44-16-5(a); is perpetual, unless modified or terminated pursuant to the terms of this Environmental Covenant pursuant to O.C.G.A. § 44-16-9 and 10; and shall be binding on all parties and all persons claiming under them, including all current and future owners of any portion of or interest in the Property (hereinafter "Owner"). Should a transfer or sale of the Property occur before such time as this Environmental Covenant has been amended or revoked then said Environmental Covenant shall be binding on the transferee(s) or purchaser(s).

The Environmental Covenant shall inure to the benefit of Emory, EPD and their respective successors and assigns and shall be enforceable by the Director or his agents or assigns, its successors and assigns, Emory or its successors and assigns, and other party(ies) as provided for in O.C.G.A. § 44-16-11 in a court of competent jurisdiction.

Activity and/or Use Limitation(s)

1. Registry. Pursuant to O.C.G.A. § 44-16-12, this Environmental Covenant and any amendment or termination thereof, may be contained in EPD's registry for environmental covenants.

2. Notice. The Owner of the Property must give thirty (30) day written notice to EPD subsequent to conveyance of any title in the Property. No conveyance of title, easement, lease, or other interest in the Property shall be consummated by the Owner without adequate and complete provision for continued monitoring, operation, and maintenance of the Corrective Action.

3. Activity and Use Limitation(s). The Property shall be used only for non-residential uses, as defined in Section 391-3-19-.02 of the Rules and defined in and allowed under the DeKalb County's zoning regulations as of the date of this Environmental Covenant. Any residential use on the Property shall be prohibited. Any activity on the Property that may result in the release or exposure to the regulated substances that were contained as part of the Corrective Action, or create a new exposure pathway, is prohibited.

4. Groundwater Limitation. The use or extraction of groundwater beneath the Property for drinking water or for any other use shall be prohibited until HSRA regulated substances are treated to below the applicable RRS for groundwater. Any extracted groundwater from construction or utility work dewatering activities should be managed and disposed of in accordance with applicable rules and regulations. Should any dewatering of groundwater construction or utility work purposes be necessary, a sanitary sewer system discharge permit should be acquired from DeKalb County. The extracted water should be pretreated to DeKalb County requirements prior to discharge into the sanitary sewer system. Extracted groundwater should not be discharged into the storm water system or surface waters. All management of impacted groundwater should be done in accordance with all applicable local, state and federal rules and regulations governing the management of such material. Prior to conducting construction or subsurface utility work that may result in exposure to groundwater, a worker must have appropriate HAZWOPER training per OSHA's Hazardous Waste Operations and Emergency Response Standard 29 CFR 1910.120, and perform the work in accordance with a Health and Safety Plan prepared by a qualified safety professional.

5. Groundwater Monitoring. The Owner shall sample and analyze select wells annually for two (2) years or a lesser period if approved by EPD unless the Director determines that further monitoring is necessary to protect human health and the environment. Test results shall be submitted to EPD on December 31 of each year.

6. Right of Access. In addition to any rights already possessed by EPD and/or Emory, the Owner shall allow authorized representatives of EPD the right to enter the Property at reasonable times for the purpose of evaluating the Corrective Action; to take samples, to inspect the Corrective Action conducted at the Property, to determine compliance with this Environmental Covenant, and to inspect records that are related to the Corrective Action.

7. Recording of Environmental Covenant and Proof of Notification. Within thirty (30) days after the date of the Director's signature, the Owner shall file this Environmental Covenant with the Recorders of Deeds for each County in which the Property is located, and send a file stamped copy of this Environmental Covenant to EPD within thirty (30) days of recording. Within that time period, the Owner shall also send a file-stamped copy to each of the following: (1) each person holding a recorded interest in the Property subject to the covenant, (2) each person in possession of the real property subject to the covenant, (3) each municipality, county, consolidated government, or other unit of local government in which real property subject to the covenant is located, and (4) each owner in fee simple whose property abuts the property subject to the Environmental Covenant.

8. Termination or Modification. The Environmental Covenant shall remain in full force and effect in accordance with O.C.G.A. § 44-5-60, unless and until the Director determines that the Property is in

compliance with the Type 1, 2, 3, or 4 Risk Reduction Standards, as defined in Georgia Rules of Hazardous Site Response (Rules) Section 391-3-19-.07 and removes the Property from the Hazardous Site Inventory, whereupon the Environmental Covenant may be amended or revoked in accordance with Section 391-3-19-08(7) of the Rules and O.C.G.A. § 44-16-1 *et seq.*

9. Severability. If any provision of this Environmental Covenant is found to be unenforceable in any respect, the validity, legality, and enforceability of the remaining provisions shall not in any way be affected or impaired.

10. No EPD Interest in Property Created. This Environmental Covenant does not in any way create any interest by EPD in the Property that is subject to the Environmental Covenant. Furthermore, the act of approving this Environmental Covenant does not in any way create any interest by EPD in the Property in accordance with O.C.G.A. § 44-16-3(b).

Representations and Warranties.

Grantor hereby represents and warrants to the other signatories hereto:

a) That the Grantor has the power and authority to enter into this Environmental Covenant, to grant the rights and interests herein provided and to carry out all obligations hereunder;
b) That the Grantor is the sole owner of the Property and holds fee simple title which is free, clear and unencumbered;
c) That the Grantor has identified all other parties that hold any interest (e.g., encumbrance) in the Property and notified such parties of the Grantor's intention to enter into this Environmental Covenant;
d) That this Environmental Covenant will not materially violate, contravene, or constitute a material default under any other agreement, document or instrument to which Grantor is a party, by which Grantor may be bound or affected;
e) That the Grantor has served each of the people or entities referenced in Activity 8 above with an identical copy of this Environmental Covenant in accordance with O.C.G.A. § 44-16-4(d);
f) That this Environmental Covenant will not materially violate or contravene any zoning law or other law regulating use of the Property; and
g) That this Environmental Covenant does not authorize a use of the Property that is otherwise prohibited by a recorded instrument that has priority over the Environmental Covenant.

Notices.
Any document or communication required to be sent pursuant to the terms of this Environmental Covenant shall be sent to the following persons:

Georgia Environmental Protection Division
Branch Chief
Land Protection Branch
2 Martin Luther King Jr. Drive SE
Suite 1054 East Tower
Atlanta, GA 30334

Emory University
c/o Scott Thomaston
1762 Clifton Road
Suite 1200
Atlanta, GA 30322

With copies to:

Emory University
Office of the General Counsel
c/o Mr. Adrian L. Jackson, Esq.
201 Dowman Drive
103 Administration Building
Atlanta, GA 30322

Grantor has caused this Environmental Covenant to be executed pursuant to The Georgia Uniform Environmental Covenants Act, on the 26 day of May, 2016.

Signed, sealed, and delivered in the presence of:

Daniel Tucker
Unofficial Witness (*Signature*)

Daniel Tucker
Unofficial Witness Name (*Print*)

201 Dowman Drive
Atlanta, GA 30322
Unofficial Witness Address (*Print*)

Sacha L. Hand
Notary Public (*Signature*)

My Commission Expires: 09/15/2017

For the Grantor:

Emory University
Name of Grantor (*Print*)

Grantor's Authorized Representative (*Signature*) (Seal)

Michael J. Mandl
Authorized Representative Name (*Print*)

Executive Vice President for Business Administration
Title of Authorized Representative (*Print*)

Dated: 12/2/2015
(NOTARY SEAL)

SACHA L. HAND
Comm. Exp. 09/15/17

Signed, sealed, and delivered in the presence of:

Unofficial Witness (*Signature*)

Doralyn S Kirkland
Unofficial Witness Name (*Print*)

2 Martin Luther King Jr Dr
Atlanta Georgia 30334

Unofficial Witness Address (*Print*)

Darlene Blunt
Notary Public (*Signature*)

My Commission Expires: 5/18/2019

For the State of Georgia
Environmental Protection Division:

Judson H Turner
(*Signature*) (Seal)

Judson H. Turner
Director

Dated: 5/26/2016

(NOTARY SEAL)

DARLENE BLUNT
EXPIRES May 18, 2019

<SIGNATURE BLOCK FOR HOLDER OR OTHER APPLICABLE PARTIES>

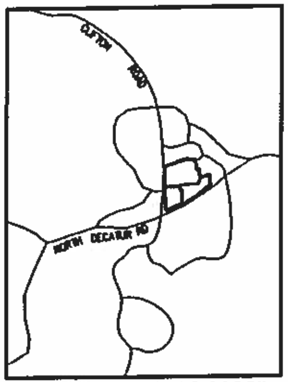
Exhibit A
Legal Description

ALL THAT TRACT or parcel of land lying and being in Land Lot 52 and 53 of the 18th District, DeKalb County, Georgia and being more particularly described as follows:

COMMENCING at a point on the mitered intersection of the Northwesterly right-of-way of North Decatur Road and the Easterly right-of-way of Clifton Road; THENCE proceeding NORTH 65 DEGREES 42 MINUTES 17 SECONDS EAST a distance of 322.87 feet to a point; THENCE proceeding SOUTH 28 DEGREES 18 MINUTES 45 SECONDS EAST a distance of 20.20 feet to a point; THENCE proceeding NORTH 61 DEGREES 30 MINUTES 02 SECONDS EAST a distance of 25.20 feet to a point and POINT OF BEGINNING; THENCE proceeding NORTH 00 DEGREES 41 MINUTES 24 SECONDS WEST a distance of 314.05 feet to a point; THENCE proceeding SOUTH 89 DEGREES 23 MINUTES 49 SECONDS WEST a distance of 38.95 feet to a point; THENCE proceeding NORTH 00 DEGREES 40 MINUTES 15 SECONDS WEST a distance of 110.00 feet to a point; THENCE proceeding NORTH 87 DEGREES 53 MINUTES 28 SECONDS EAST a distance of 364.22 feet to a point; THENCE along a curve to the left an arc length of 64.19 feet and having a radius of 50.00 feet and a chord bearing of NORTH 51 DEGREES 06 MINUTES 57 SECONDS EAST , and a chord distance of 59.87 feet; THENCE proceeding NORTH 14 DEGREES 20 MINUTES 26 SECONDS EAST a distance of 107.50 feet to a point; THENCE proceeding NORTH 71 DEGREES 41 MINUTES 12 SECONDS EAST a distance of 203.48 feet to a point; THENCE proceeding SOUTH 09 DEGREES 11 MINUTES 37 SECONDS EAST a distance of 211.45 feet to a point; THENCE along a curve to the right an arc length of 229.78 feet having a radius of 2352.84 feet and a chord bearing of SOUTH 50 DEGREES 38 MINUTES 06 SECONDS WEST and a chord distance of 229.69 feet; THENCE proceeding SOUTH 52 DEGREES 28 MINUTES 57 SECONDS WEST a distance of 12.66 feet to a point; THENCE proceeding SOUTH 52 DEGREES 54 MINUTES 25 SECONDS WEST a distance of 36.74 feet to a point; THENCE proceeding SOUTH 53 DEGREES 19 MINUTES 31 SECONDS WEST a distance of 10.17 feet to a point; THENCE proceeding SOUTH 57 DEGREES 12 MINUTES 27 SECONDS WEST a distance of 47.02 feet to a point; THENCE proceeding SOUTH 32 DEGREES 08 MINUTES 02 SECONDS EAST a distance of 20.10 feet to a point; THENCE proceeding SOUTH 58 DEGREES 38 MINUTES 18 SECONDS WEST a distance of 37.23 feet to a point; THENCE proceeding SOUTH 59 DEGREES 31 MINUTES 45 SECONDS WEST a distance of 78.24 feet to a point; THENCE proceeding SOUTH 60 DEGREES 30 MINUTES 47 SECONDS WEST a distance of 79.21 feet to a point; THENCE proceeding SOUTH 60 DEGREES 26 MINUTES 42 SECONDS WEST a distance of 206.57 feet to a point; THENCE proceeding SOUTH 61 DEGREES 39 MINUTES 44 SECONDS WEST a distance of 20.86 feet to a point; THENCE proceeding SOUTH 61 DEGREES 30 MINUTES 02 SECONDS WEST a distance of 25.20 feet to a point; THENCE proceeding NORTH 28 DEGREES 18 MINUTES 45 SECONDS WEST a distance of 20.20 feet to a point; THENCE proceeding SOUTH 65 DEGREES 42 MINUTES 17 SECONDS WEST a distance of 322.87 feet to a point and POINT OF BEGINNING.

Said parcel contains 192,734 Square Feet or 4.425 Acres and being Lot 3 on that certain lot consolidation plat for Emory University recorded in Plat Book 227, Page 96, DeKalb County, Georgia records.

Exhibit B
Lot Division Plat
With Property Labeled "Lot #3"



VICINITY MAP (1"=2000')

REFERENCES:

1) SUBDIVISION OF WOODLAND PARK PREPARED BY GORDON MALLEY DATED OCTOBER, 1940. SAID PLAT IS UNRECORDED.

2) SURVEY AND PLAT OF PROPERTY LOCATED IN LAND LOTS 52 & 53, 18TH DISTRICT, DEKALB COUNTY, GEORGIA PREPARED BY SHIRLEY, NELSON, & ASSOCIATES DATED JUNE 17, 1964 AND RECORDED IN DEED BOOK 2013, PAGE 463, FULTON COUNTY RECORDS.

3) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 3, 2008. SAID PLAT IS UNRECORDED.

4) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 20, 2009. SAID PLAT IS UNRECORDED.

LOT DIVISION PLAT OF:

PROPERTY OF EMORY UNIVERSITY

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA

SITE DATA

OWNER:	EMORY UNIVERSITY 1380 OXFORD ROAD ATLANTA, GEORGIA 30322 PH: (404) 686-2422
SUBDIVIDER:	URS CORPORATION 400 NORTHPARK TOWN CENTER 1000 ABERNATHY ROAD NE, SUITE 900 ATLANTA, GEORGIA 30328 PH: (678) 808-8815
ENGINEER & SURVEYOR:	SOUTHEASTERN ENGINEERING, INC 2470 SANDY PLAINS ROAD MARIETTA, GEORGIA 30066 PH: (770) 321-3936
PERMIT NUMBER:	18883 (LDP NO. 18784)
TAX MAP I.D. NUMBERS:	18 053 03 01, 02, 03, 06, 07 & 010
BOUNDARY REFERENCE:	SEI, DATED AUGUST 2013
SITE ACREAGE:	LOT 1: 3.609 AC LOT 2: 8.653 AC LOT 3: 4.425 AC TOTAL: 16.687 AC
TOTAL # OF LOTS:	3 LOTS
WATER AND SEWER SERVICE:	DeKALB COUNTY
RECEIVING WATERS:	PEAVINE CREEK

THE FOLLOWING REQUIREMENTS SHALL APPLY TO ALL LOTS AND STRUCTURES IN THE O-I (OFFICE-INSTITUTION) DISTRICT:
(A) LOT WIDTH: ALL LOTS SHALL HAVE AT LEAST ONE HUNDRED (100) FEET OF FRONTAGE AS MEASURED ALONG THE PUBLIC STREET FRONTAGE.
(B) MINIMUM LOT AREA: TWENTY THOUSAND (20,000) SQUARE FEET.
(C) MINIMUM SETBACK REQUIREMENTS:
  (1) FROM PUBLIC STREET: FIFTY (50) FEET.
  A. FRONT YARD: FIFTY (50) FEET.
  B. SIDE YARD: TWENTY (20) FEET.
  C. SIDE YARD ALONG SIDE STREET ON CORNER LOT: FIFTY (50) FEET.
  (2) INTERIOR SIDE YARD SETBACK: TWENTY (20) FEET.
  (3) REAR YARD: THIRTY (30) FEET.

DEKALB COUNTY
PLANNING/DEVELOPMENT DEPT
REVIEWED
DATE: Jan 8 2014

Cash for [illegible]

2014019039 PLAT BOOK 227 Pg 96
Filed and Recorded
1/17/2014 10:07:00 AM
Debra DeBerry
Clerk of Superior Court
DeKalb County, Georgia

SEI
SOUTHEASTERN ENGINEERING, INC.

2470 Sandy Plains Road
Suite A
Marietta, GA 30066
(office) 770-321-3936
(facsimile) 770-321-3935
[illegible]

AUTHORIZED AGENT FORM

Date 11/20/13

Adrian L. Johnson, Associate General Counsel of Emory University
(Name) (Business Name)

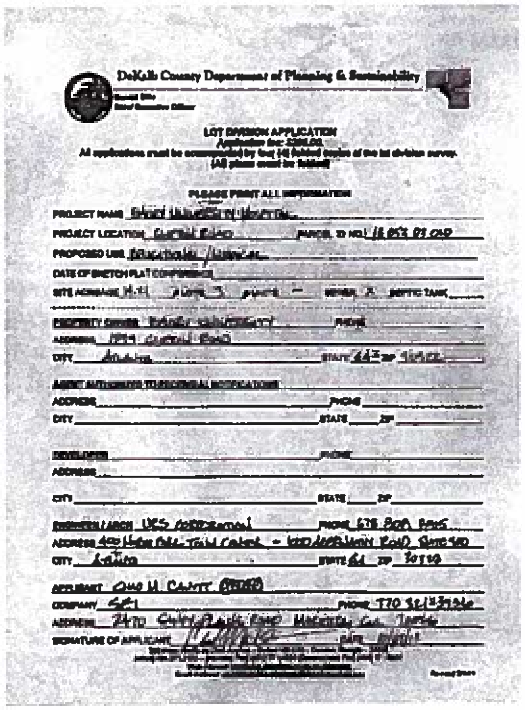
DO HEREBY AUTHORIZE THE FOLLOWING TO ACT AS MY AGENT(S) IN SUBMITTING SUBDIVISION PLATS AND APPLICATIONS:

1. Chris Amos Adams 2. Chad M. Cantt
3. James Hinkle

I UNDERSTAND THAT I AM RESPONSIBLE FOR THE APPLICATION BY MY AGENT(S), AS REFERENCED ABOVE. I FURTHER UNDERSTAND THAT EACH TIME MY AGENT(S) SUBMITS A PLAT OR APPLICATION, OR SIGNS ANY REQUIRED DOCUMENTS, THAT THE INDIVIDUAL MUST EXHIBIT THIS AUTHORIZATION FOR TO THE PERMITTING STAFF, UPON REQUEST. I FURTHER ACKNOWLEDGE THAT THIS ORIGINAL AUTHORIZATION FORM IS LICENSE OR QUALIFICATION FILE FOR LEGAL REFERENCE PURPOSES.

Adrian L. Johnson, Esq., Associate General Counsel
Signature

11/20/13
Date



DeKalb County Department of Planning & Sustainability

LOT DIVISION APPLICATION
Application fee: $[illegible]
All applications must be accompanied by four (4) folded copies of the lot division survey.
(All plans must be folded)

PLEASE PRINT ALL INFORMATION

PROJECT NAME Emory University Hospital
PROJECT LOCATION Clifton Road PARCEL ID NO. 18 053 03 010
PROPOSED USE Educational/Medical
DATE OF SKETCH PLAT CONFERENCE
SITE ACREAGE 16.69 # LOTS 3 # UNITS – SEWER X SEPTIC TANK ____
PROPERTY OWNER Emory University PHONE
ADDRESS 1599 Clifton Road
CITY Atlanta STATE GA ZIP 30322
AGENT AUTHORIZED TO RECEIVE ALL NOTIFICATIONS
ADDRESS ____ PHONE ____
CITY ____ STATE ____ ZIP ____
DEVELOPER ____ PHONE ____
ADDRESS ____
CITY ____ STATE ____ ZIP ____
ENGINEER/ARCH. URS Corporation PHONE 678 808 8815
ADDRESS 400 Northpark Town Center – 1000 Abernathy Road Suite 900
CITY Atlanta STATE GA ZIP 30328
APPLICANT Chad M. Cantt (SEI)
COMPANY SEI PHONE 770 321 3936
ADDRESS 2470 Sandy Plains Road Marietta, GA 30066
SIGNATURE OF APPLICANT DATE [illegible]

DEKALB COUNTY GOVERNMENT
Engineering Services
[illegible]

CERTIFICATE OF CONFORMITY

I, Chris Amos Adams, the engineer/surveyor for the Subdivision known as Emory University, located in Land Lot 52 & 53 of the 18th District, hereby certify that no lots platted within the subdivision are non-conforming or will result in any non-conforming lots.

Chris Adams
SIGNATURE

Chris Amos Adams
NAME (PLEASE PRINT)

2470 Sandy Plains Road
ADDRESS

Marietta, GA 30066
CITY, STATE, ZIP

DEKALB COUNTY DEVELOPMENT DEPARTMENT IS NOT RESPONSIBLE FOR ANY ERRORS OR OMISSIONS BY ENGINEERS OR OTHER DESIGN PROFESSIONALS ON DESIGN OR COUNTY CODE REQUIREMENTS OF THIS PROJECT.

LOT DIVISION PLAT FOR:

URS CORPORATION

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA
DeKALB COUNTY PLANNING
AND SUSTAINABILITY FILE
18883.

PLAT INFORMATION:

SCALE 1"=100' DATE: 10/03/13

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE OF 1 FOOT IN 83,557 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT AND WAS ADJUSTED USING THE LEAST SQUARES METHOD. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND FOUND TO BE ACCURATE TO 1 FOOT IN 198,857 FEET. AN ELECTRONIC TOTAL STATION WAS USED TO GATHER THE INFORMATION USED IN THE PREPARATION OF THIS PLAT.

THIS PLAT WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS OR ENTITY NAMED HEREON. THIS PLAT DOES NOT EXTEND TO ANY UNNAMED PERSON, PERSONS OR ENTITY WITHOUT EXPRESS RECERTIFICATION BY THE SURVEYOR NAMING SAID PERSON, PERSONS OR ENTITY.

No.	REVISION	DATE

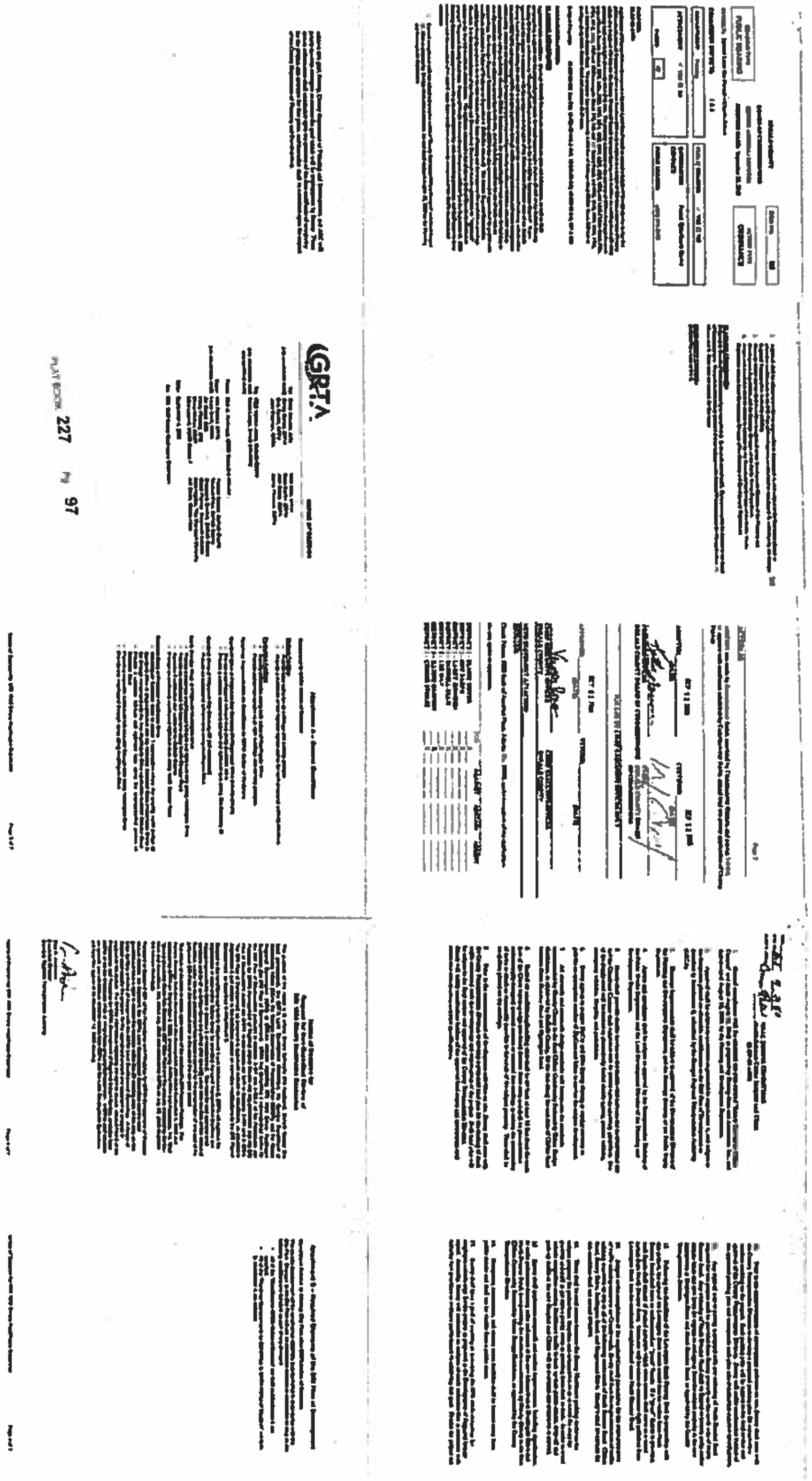
SEI
SOUTHEASTERN ENGINEERING, INC.
2470 Sandy Plains Road Marietta, Georgia 30066
tel: 770 321 3936 fax: 770 321 3935
www.seengineering.com

MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA (SAMSOG)
ALL MATTERS OF TITLE ARE EXCEPTED. © 2013
[illegible]

SURVEYED: ML DRAFTED: SD CHECKED: CAA

GEORGIA REGISTERED LAND SURVEYOR No. 2796 CHRIS AMOS ADAMS

JOB No.: 481-13-117
SHEET NO. 1 OF 4



PLAT BOOK 227 Pg 97

JOB No.: 481-13-117

SHEET NO. 2 OF 4

No. 2796
CHRIS ADAMS

LOT DIVISION PLAT FOR:

URS CORPORATION

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA

DeKALB COUNTY PLANNING AND SUSTAINABILITY FILE 18883.

PLAT INFORMATION:

SCALE 1"=100'

DATE: 10/03/13

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE OF 1 FOOT IN 63,557 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT AND WAS ADJUSTED USING THE LEAST SQUARES METHOD. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND FOUND TO BE ACCURATE TO 1 FOOT IN 198,857 FEET. AN ELECTRONIC TOTAL STATION WAS USED TO GATHER THE INFORMATION USED IN THE PREPARATION OF THIS PLAT.

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No.	REVISION	DATE

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2470 Sandy Plains Road Marietta, Georgia 30066
tel: 770-321-3936 fax: 770-321-3933
www.seiengineering.com

MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA (SAMSOG)

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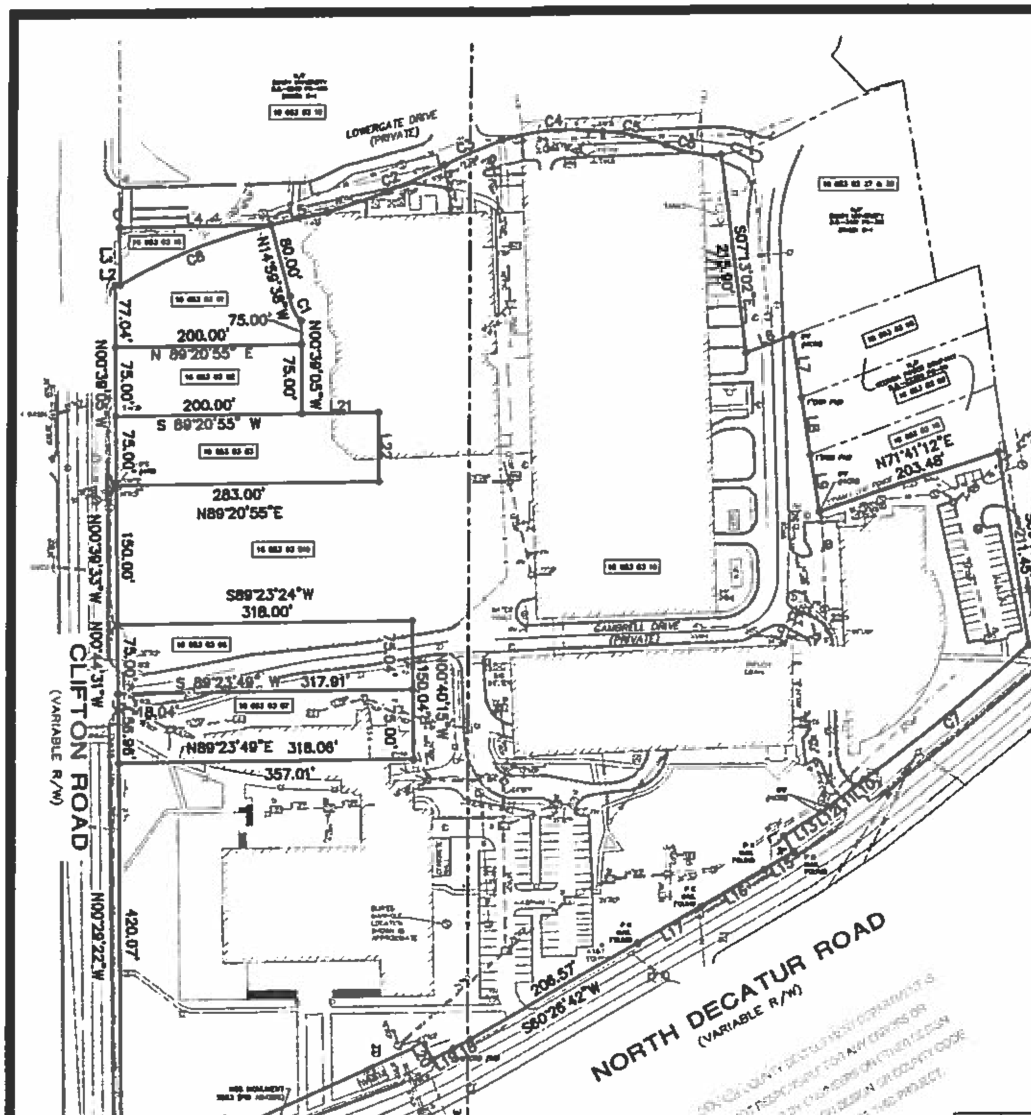
Deuteronomy 19:14 Do not move your neighbor's boundary stone set up by your predecessors...

SURVEYED: ML DRAFTED: SEI CHECKED: CAA



100' 0' 50' 100' 200'

GRAPHIC SCALE 1 inch = 100 feet

CURVE	RADIUS	ARC LENGTH	CHORD BEARING	CHORD LENGTH
C1	38.86'	30.16'	N24°15'35"W	29.40'
C2	719.31'	135.62'	N68°10'03"E	135.42'
C3	559.16'	67.07'	N66°21'10"E	67.03'
C4	233.50'	110.17'	N65°38'32"E	109.30'
C5	224.56'	69.74'	S77°38'19"E	69.46'
C6	125.29'	61.72'	S79°27'09"E	61.09'
C7	2152.84'	229.78'	S50°38'06"W	229.69'
C8	583.31'	175.00'	N68°29'38"E	174.35'

LINE	BEARING	DISTANCE
L1	N 60°59'48" W	35.65'
L2	S 89°20'55" W	5.48'
L3	S 00°41'14" E	61.97'
L4	N 89°18'46" E	182.97'
L5	N 77°35'23" E	62.59'
L6	N 89°32'47" E	53.22'
L7	S 06°50'07" E	67.28'
L8	S 08°50'56" E	62.73'
L9	S 09°15'11" E	62.56'
L10	N 52°28'57" E	12.66'
L11	S 52°54'25" W	36.74'
L12	N 53°19'31" E	10.17'
L13	S 57°12'27" W	47.02'
L14	S 32°08'02" E	20.10'
L15	S 58°38'16" W	37.23'
L16	S 59°31'45" W	78.24'
L17	S 60°30'47" W	79.21'
L18	N 61°39'44" E	20.86'
L19	S 61°30'02" W	25.20'
L20	N 28°18'45" W	20.20'
L21	N 89°20'55" E	83.00'
L22	S 00°39'05" E	75.00'

REFERENCES:

1) SUBDIVISION OF WOODLAND PARK PREPARED BY GORDON MALLEY DATED OCTOBER, 1940. SAID PLAT IS UNRECORDED.

2) SURVEY AND PLAT OF PROPERTY LOCATED IN LAND LOTS 52 & 53, 18TH DISTRICT, DEKALB COUNTY, GEORGIA PREPARED BY SHIRLEY, NELSON, & ASSOCIATES DATED JUNE 17, 1964 AND RECORDED IN DEED BOOK 2033, PAGE 483, FULTON COUNTY RECORDS.

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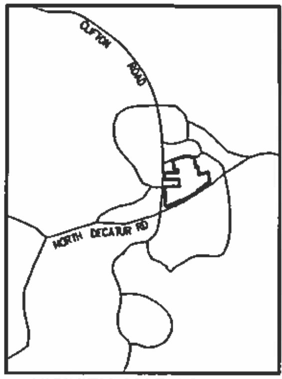
4) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 30, 2008. SAID PLAT IS UNRECORDED.



VICINITY MAP (1"=2000')

LEGEND:

IPS IRON PIN SET
IPF IRON PIN FOUND
OTP OPEN TOP PIPE
CTP CRIMP TOP PIPE
RB REINFORCING BAR
CRB CAPPED RE-BAR
R/W RIGHT-OF-WAY
LL LAND LOT
LLL LAND LOT LINE
L LINE
A ARC
R RADIUS
CH CHORD
C CURVE
CONC CONCRETE
GUY POLE
GAS VALVE
GAS METER
GAS MARKER
LAMP POLE
POWER POLE
FIBER OPTIC MARKER
IRRIGATION CONTROL VALVE
MONITORING WELL
PRESSURE RELEASE VALVE
PVC STUB
POWER STUB
ELECTRIC METER
WETLAND FLAG
CMP CORRUGATED METAL PIPE
RCP REINFORCED CONCRETE PIPE
CD CROSS DRAIN
—SS— SANITARY SEWER
FENCE
CMF CONCRETE MONUMENT FOUND
OVERHEAD UTILITY LINE(S)
DE DRAINAGE EASEMENT
CATCH BASIN
JUNCTION BOX
DRAINAGE MANHOLE
DROP INLET
HEAD WALL
FLARED END SECTION (FES)
TELEPHONE MANHOLE
TELEPHONE PEDESTAL
TELEPHONE BOX
SEWER MANHOLE
SSE SANITARY SEWER EASEMENT
SEWER CLEANOUT
FIRE HYDRANT
WATER VALVE
WATER METER
WATER SEEP
WATER SPIGOT
SIGN
TRAFFIC BOX
PEDESTRIAN SIGNAL
BOLLARD (ROUND)
BOLLARD (SQUARE)
CABLE BOX
CENTERLINE
BORE HOLE
FENCE POST
POB POINT OF BEGINNING
POC POINT OF COMMENCEMENT
PI POINT OF INTERSECTION

GENERAL NOTES:

1. PURSUANT TO RULE 180-6.09 OF THE GEORGIA STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS, THE TERM "CERTIFY" OR "CERTIFICATION" RELATING TO LAND SURVEYING SERVICES SHALL MEAN A SIGNED STATEMENT BASED ON FACTS AND KNOWLEDGE KNOWN TO THE LAND SURVEYOR AND IS NOT A GUARANTEE OR WARRANTY, EITHER EXPRESSED OR IMPLIED.
2. INFORMATION REGARDING THE REPUTED PRESENCE, SIZE, CHARACTER, AND LOCATION OF EXISTING UNDERGROUND UTILITIES AND STRUCTURES IS SHOWN HEREON. THERE IS NO CERTAINTY OF THE ACCURACY OF THIS INFORMATION AND IT SHALL BE CONSIDERED IN THAT LIGHT BY THOSE RELYING ON THIS PLAT. THE LOCATION AND ARRANGEMENT OF UNDERGROUND UTILITIES AND STRUCTURES SHOWN HEREON MAY BE INACCURATE AND UTILITIES AND STRUCTURES NOT SHOWN MAY BE ENCOUNTERED. THE OWNER, HIS EMPLOYEES, HIS CONSULTANTS, HIS CONTRACTORS, AND/OR HIS AGENTS SHALL HEREBY DISTINCTLY UNDERSTAND THAT THE SURVEYOR IS NOT RESPONSIBLE FOR THE CORRECTNESS OR SUFFICIENCY OF THIS INFORMATION SHOWN HEREON AS TO SUCH UNDERGROUND INFORMATION.
3. UNLESS OTHERWISE STATED HEREON, ONLY EVIDENCE OF EASEMENTS OR STRUCTURES [illegible] WHICH ARE READILY APPARENT FROM A CASUAL ABOVE GROUND VIEW OF PREMISES ARE SHOWN. NO LIABILITY IS ASSUMED BY THE UNDERSIGNED FOR LOSS RELATING TO THE EXISTENCE OF ANY EASEMENT NOT DISCOVERED FROM BY CASUAL, ABOVE GROUND VIEW OF THE PREMISES.
4. UNLESS STATED OTHERWISE, ENVIRONMENTAL, JURISDICTIONAL AREAS OR NEGATIVE EASEMENTS, IF ANY, WHICH MIGHT IMPACT ON THE USE OF THE PREMISES WERE NOT LOCATED. NO LIABILITY IS ASSUMED BY THE UNDERSIGNED FOR ANY LOSS RESULTING FROM THE EXERCISE OF ANY ENVIRONMENTAL JURISDICTION AFFECTING THE USE OF THE PREMISES.

I HAVE THIS DATE EXAMINED THE "FIA OFFICIAL FLOOD HAZARD MAP" AND FOUND THAT BY GRAPHIC PLOTTING ONLY, THE REFERENCE PARCEL IS NOT IN AN AREA HAVING SPECIAL FLOOD HAZARDS.

MAP ID 13089 C 0062 J EFFECTIVE DATE: 05/16/13

SITE DATA

OWNER:	EMORY UNIVERSITY 1380 OXFORD ROAD ATLANTA, GEORGIA 30322 PH: (404) 686-2422
SUBDIVIDER:	URS CORPORATION 400 NORTHPARK TOWN CENTER 1000 ABERNATHY ROAD NE, SUITE 900 ATLANTA, GEORGIA 30328 PH: (678) 808-8815
ENGINEER & SURVEYOR:	SOUTHEASTERN ENGINEERING, INC 2470 SANDY PLAINS ROAD MARIETTA, GEORGIA 30066 PH: (770) 321-3936
PERMIT NUMBER:	16883
TAX MAP I.D. NUMBERS:	18 053 03-01, 02, 03, 06, 07 & 010
BOUNDARY REFERENCE:	SEI, DATED AUGUST 2013
SITE AREA:	726,883 SQUARE FEET OR 16.687 ACRES
WATER AND SEWER SERVICE:	DeKALB COUNTY
RECEIVING WATERS:	PEAVINE CREEK

PARCEL EXHIBIT FOR:

URS CORPORATION

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA

PLAT INFORMATION:

SCALE 1"=100' DATE 10/03/13

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No.	REVISION	DATE

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MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA (SAMSOG)

ALL MATTERS OF TITLE ARE EXCEPTED. © 2013

Deuteronomy 19:14 Do not move your neighbor's boundary stone set up by your predecessors.

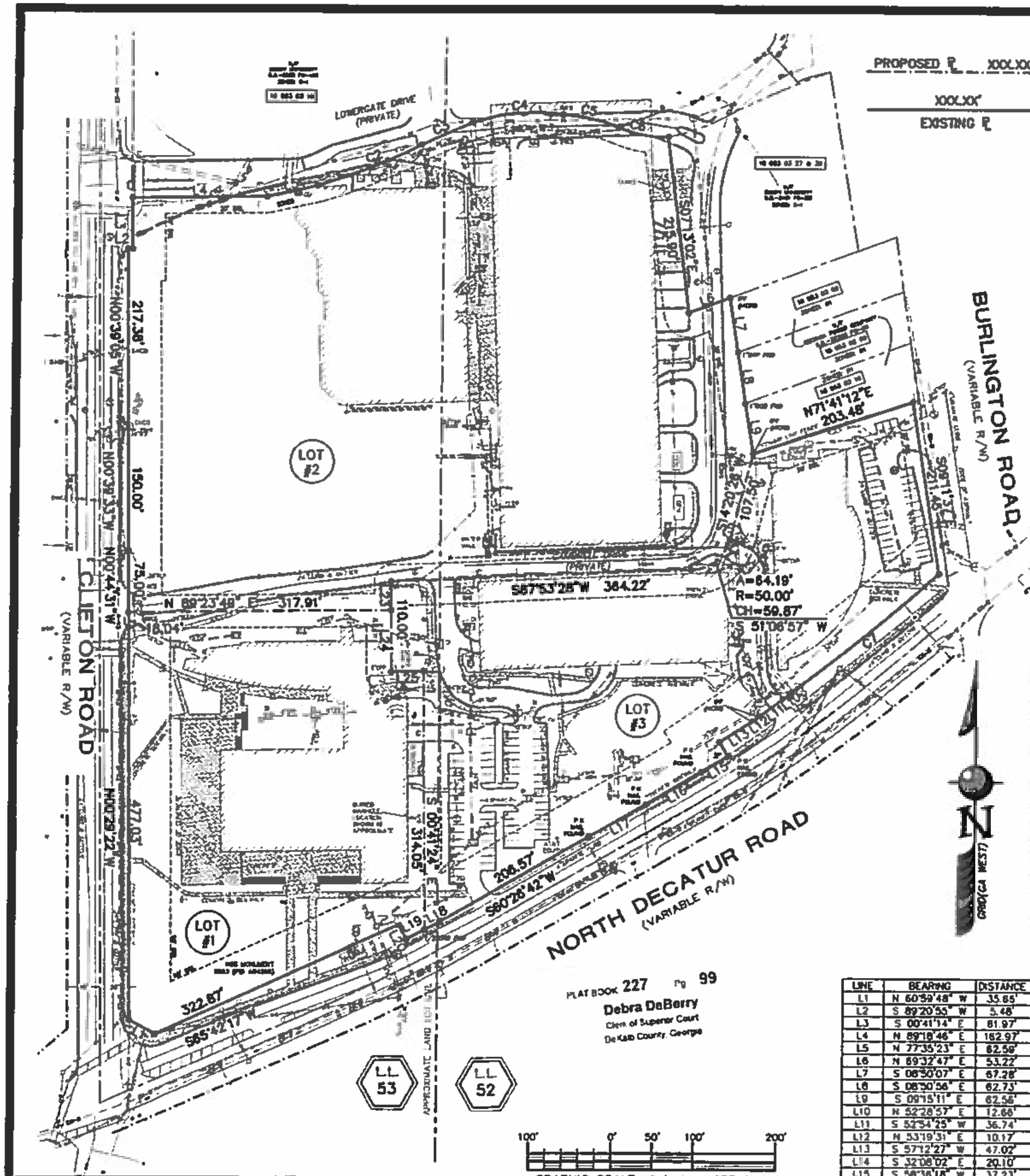
SURVEYED: ML DRAFTED: SEI CHECKED: CAA

No. 2798
CHRIS AMOS ADAMS

JOB No.: 481-13-117

SHEET NO. 3 OF 4

DEED BOOK 25618 Pg 675
Debra DeBerry
Clerk of Superior Court
DeKalb County, Georgia



PLAT BOOK 227 Pg 99
Debra DeBerry
Clerk of Superior Court
DeKalb County, Georgia

100' 0' 50' 100' 200'
GRAPHIC SCALE 1 inch = 100 feet

REFERENCES:

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4) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 30, 2008. SAID PLAT IS UNRECORDED.

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L8	S 08°30'56" E	62.73'
L9	S 09°15'11" E	62.56'
L10	N 52°28'57" E	12.68'
L11	S 52°54'25" W	36.74'
L12	N 53°19'31" E	10.17'
L13	S 57°12'27" W	47.02'
L14	S 32°08'02" E	20.10'
L15	S 58°38'18" W	37.23'
L16	S 59°31'45" W	78.24'
L17	S 60°30'47" W	79.21'
L18	N 61°39'44" E	20.88'
L19	S 61°30'02" W	25.20'
L20	N 28°18'45" W	20.20'
L21	N 89°20'55" E	83.00'
L22	S 00°39'05" E	75.00'
L23	N 00°40'15" W	35.00'
L24	S 00°40'15" E	75.00'
L25	S 89°23'49" W	38.93'

LEGEND:

- IPS IRON PIN SET
- IPF IRON PIN FOUND
- OTP OPEN TOP PIPE
- CTP CRIMP TOP PIPE
- RB REINFORCING BAR
- CRB CAPPED RE-BAR
- R/W RIGHT-OF-WAY
- LL LAND LOT
- LLL LAND LOT LINE
- L LINE
- A ARC
- R RADIUS
- CH CHORD
- C CURVE
- CONC CONCRETE
- GUY POLE
- GAS VALVE
- GAS METER
- GAS MARKER
- LAMP POLE
- POWER POLE
- FIBER OPTIC MARKER
- IRRIGATION CONTROL VALVE
- MONITORING WELL
- PRESSURE RELEASE VALVE
- PVC STUB
- POWER STUB
- ELECTRIC METER
- WETLAND FLAG
- DE DRAINAGE EASEMENT
- CATCH BASIN
- JUNCTION BOX
- DRAINAGE MANHOLE
- DROP INLET
- HEAD WALL
- FLARED END SECTION (FES)
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TELEPHONE BOX
- SEWER MANHOLE
- SSE SANITARY SEWER EASEMENT
- SEWER CLEANOUT
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- WATER SEEP
- WATER SPIGOT
- SIGN
- TRAFFIC SIGN
- PEDESTRIAN SIGNAL
- BOLLARD (ROUND)
- BOLLARD (SQUARE)
- CABLE BOX
- CENTERLINE
- BORE HOLE
- FENCE POST
- POB POINT OF BEGINNING
- POC POINT OF COMMENCEMENT
- PI POINT OF INTERSECTION
- CMP CORRUGATED METAL PIPE
- RCP REINFORCED CONCRETE PIPE
- CD CROSS DRAIN
- —SS— SANITARY SEWER
- —X—X— FENCE
- CMF CONCRETE MONUMENT FOUND
- —Z—Z— OVERHEAD UTILITY LINE(S)

GENERAL NOTES:

1. PURSUANT TO RULE 180-6-.09 OF THE GEORGIA STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS, THE TERM "CERTIFY" OR "CERTIFICATION" RELATING TO LAND SURVEYING SERVICES SHALL MEAN A SIGNED STATEMENT BASED ON FACTS AND KNOWLEDGE KNOWN TO THE LAND SURVEYOR AND IS NOT A GUARANTEE OR WARRANTY, EITHER EXPRESSED OR IMPLIED.
2. INFORMATION REGARDING THE REPORTED PRESENCE, SIZE, CHARACTER, AND LOCATION OF EXISTING UNDERGROUND UTILITIES AND STRUCTURES IS SHOWN HEREON. THERE IS NO CERTAINTY OF THE ACCURACY OF THIS INFORMATION AND IT SHALL BE CONSIDERED IN THAT LIGHT BY THOSE RELYING ON THIS PLAT. THE LOCATION AND ARRANGEMENT OF UNDERGROUND UTILITIES AND STRUCTURES SHOWN HEREON MAY BE INACCURATE AND UTILITIES AND STRUCTURES NOT SHOWN MAY BE ENCOUNTERED. THE OWNER, ITS EMPLOYEES, ITS CONSULTANTS, ITS CONTRACTORS, AND/OR ITS AGENTS SHALL HEREBY DISTINCTLY UNDERSTAND THAT THE SURVEYOR IS NOT RESPONSIBLE FOR THE CORRECTNESS OR SUFFICIENCY OF THIS INFORMATION SHOWN HEREON AS TO SUCH UNDERGROUND INFORMATION.
3. UNLESS OTHERWISE STATED HEREON, ONLY EVIDENCE OF EASEMENTS OR STRUCTURES THERETO WHICH ARE READILY APPARENT FROM A CASUAL, ABOVE GROUND VIEW OF PREMISES ARE SHOWN. NO LIABILITY IS ASSUMED BY THE UNDERSIGNED FOR LOSS RELATING TO THE EXISTENCE OF ANY EASEMENT NOT OBSERVED FROM MY CASUAL ABOVE GROUND VIEW OF THE PREMISES.
4. UNLESS STATED OTHERWISE, ENVIRONMENTAL, JURISDICTIONAL AREAS OR WETLAND EASEMENTS, IF ANY, WHICH MIGHT IMPACT ON THE USE OF THE PROPERTY WERE NOT LOCATED. NO LIABILITY IS ASSUMED BY THE UNDERSIGNED FOR ANY LOSS ARISING FROM THE EXERCISE OF ANY GOVERNMENTAL JURISDICTION AFFECTING THE USE OF THE PREMISES.

I HAVE THIS DATE EXAMINED THE "FIA OFFICIAL FLOOD HAZARD MAP" AND FOUND THAT BY GRAPHIC PLOTTING ONLY, THE REFERENCE PARCEL IS NOT IN AN AREA HAVING SPECIAL FLOOD HAZARDS.

MAP ID 13089 C 0062 J EFFECTIVE DATE: 05/16/13

LOT DIVISION PLAT FOR:

URS CORPORATION

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA
DeKALB COUNTY PLANNING
AND SUSTAINABILITY FILE
18883.

PLAT INFORMATION:

SCALE 1"=100' DATE: 10/03/13

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE OF 1 FOOT IN 83,557 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT AND WAS ADJUSTED USING THE LEAST SQUARES METHOD. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND FOUND TO BE ACCURATE TO 1 FOOT IN 186,857 FEET. AN ELECTRONIC TOTAL STATION WAS USED TO GATHER THE INFORMATION USED IN THE PREPARATION OF THIS PLAT.
THIS PLAT WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS OR ENTITY NAMED HEREON. THIS PLAT DOES NOT EXTEND TO ANY UNNAMED PERSON, PERSONS OR ENTITY WITHOUT EXPRESS RECERTIFICATION BY THE SURVEYOR NAMING SAID PERSON, PERSONS OR ENTITY.

No.	REVISION	DATE

SEI
SOUTHEASTERN ENGINEERING, INC.
2470 Sandy Plains Road Marietta, Georgia 30066
tel: 770-321-3936 fax: 770-321-3935
www.seengineering.com
MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA (SAMSOG)
ALL MATTERS OF TITLE ARE EXCEPTED. © 2013
Deuteronomy 19:14 Do not move your neighbor's boundary stone set up by your predecessors...

SURVEYED: ML DRAFTED: SEI CHECKED: CAA

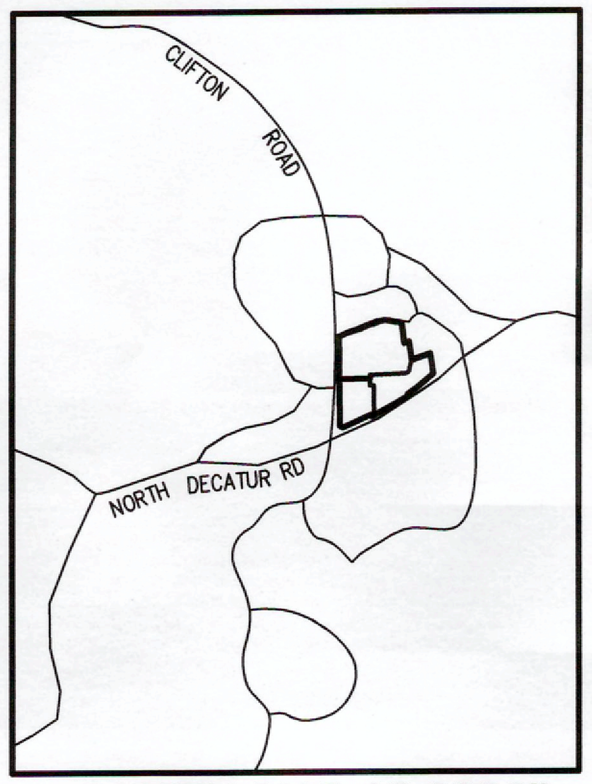
No. 2796
CHRIS AMOS ADAMS

JOB No.: 481-13-117

SHEET NO. 4 OF 4

APPENDIX B

Property Survey and Legal Description



VICINITY MAP (1"=2000')

REFERENCES:

1) SUBDIVISION OF WOODLAND PARK PREPARED BY GORDON NALLEY DATED OCTOBER, 1940. SAID PLAT IS UNRECORDED.

2) SURVEY AND PLAT OF PROPERTY LOCATED IN LAND LOTS 52 & 53, 18TH DISTRICT, DEKALB COUNTY, GEORGIA PREPARED BY SHIRLEY, NELSON, & ASSOCIATES DATED JUNE 17, 1964 AND RECORDED IN DEED BOOK 2033, PAGE 493, FULTON COUNTY RECORDS.

3) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 3, 2008. SAID PLAT IS UNRECORDED.

4) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 30, 2008. SAID PLAT IS UNRECORDED.

LOT DIVISION PLAT OF:

PROPERTY OF EMORY UNIVERSITY

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA

SITE DATA

OWNER:	EMORY UNIVERSITY 1380 OXFORD ROAD ATLANTA. GEORGIA 30322 PH: (404) 686-2422
SUBDIVIDER:	URS CORPORATION 400 NORTHPARK TOWN CENTER 1000 ABERNATHY ROAD NE, SUITE 900 ATLANTA, GEORGIA 30328 PH: (678) 808-8915
ENGINEER & SURVEYOR:	SOUTHEASTERN ENGINEERING, INC 2470 SANDY PLAINS ROAD MARIETTA, GEORGIA 30066 PH: (770) 321-3936
PERMIT NUMBER:	18883 (LDP NO. 18784)
TAX MAP I.D. NUMBERS:	18 053 03 01, 02, 03, 06, 07 & 010
BOUNDARY REFERENCE:	SEI, DATED AUGUST 2013
SITE ACREAGE:	LOT 1: 3.609 AC LOT 2: 8.653 AC LOT 3: 4.425 AC TOTAL: 16.687 AC
TOTAL # OF LOTS:	3 LOTS
WATER AND SEWER SERVICE:	DeKALB COUNTY
RECEIVING WATERS:	PEAVINE CREEK

THE FOLLOWING REQUIREMENTS SHALL APPLY TO ALL LOTS AND STRUCTURES IN THE O-I (OFFICE-INSTITUTION) DISTRICT:
(A) LOT WIDTH: ALL LOTS SHALL HAVE AT LEAST ONE HUNDRED (100) FEET OF FRONTAGE AS MEASURED ALONG THE PUBLIC STREET FRONTAGE.
(B) MINIMUM LOT AREA: TWENTY THOUSAND (20,000) SQUARE FEET.
(C) MINIMUM SETBACK REQUIREMENTS:
- (1) FROM PUBLIC STREET: FIFTY (50) FEET.
- A. FRONT YARD: FIFTY (50) FEET.
- B. SIDE YARD: TWENTY (20) FEET.
- C. SIDE YARD ALONG SIDE STREET ON CORNER LOT: FIFTY (50) FEET.
- (2) INTERIOR SIDE YARD SETBACK: TWENTY (20) FEET.
- (3) REAR YARD: THIRTY (30) FEET.

DEKALB COUNTY
PLANNING/DEVELOPMENT DEPT
REVIEWED
DATE: Jan. 8, 2014
Cash for DeKalb Co.

2014019039 PLAT BOOK 227 Pg 96
Filed and Recorded:
1/17/2014 10:07:59 AM
Debra DeBerry
Clerk of Superior Court
DeKalb County, Georgia

SOUTHEASTERN ENGINEERING, INC.

2470 Sandy Plains Road
Suite A
Marietta, GA 30066
(office) 770-321-3936
(facsimile) 770-321-3935
cadams@seengineering.com

AUTHORIZED AGENT FORM

Date 11/20/13

I, Adrian L. Jackson, Assoc. General Counsel OF Emory University
(Name) (Business Name)

DO HEREBY AUTHORIZE THE FOLLOWING TO ACT AS MY AGENT(s) IN SUBMITTING SUBDIVISION PLATS AND APPLICATIONS:

1. Chris Amos Adams 2. Chad M. Cavitt
3. James Higgins

I UNDERSTAND THAT I AM RESPONSIBLE FOR THE APPLICATION BY MY AGENT(s), AS REFERENCED ABOVE, I FURTHER UNDERSTAND THAT EACH TIME MY AGENT(s) SUBMITS A PLAT OR APPLICATION, OR SIGNS ANY REQUIRED DOCUMENTS, THAT THE INDIVIDUAL MUST EXHIBIT THIS AUTHORIZATION FOR TO THE PERMITTING STAFF, UPON REQUEST. I FURTHER ACKNOWLEDGE THAT THIS ORIGINAL AUTHORIZATION FORM IS LICENSE OR QUALIFICATION FILE FOR LEGAL REFERENCE PURPOSES.

Adrian L. Jackson, Esq., Associate General Counsel
Signature

11/20/13
Date

DeKalb County Department of Planning & Sustainability
Burrell Ellis
Chief Executive Officer

LOT DIVISION APPLICATION
Application fee: $200.00.
All applications must be accompanied by four (4) folded copies of the lot division survey.
(All plans must be folded)

PLEASE PRINT ALL INFORMATION

PROJECT NAME EMORY UNIVERSITY HOSPITAL
PROJECT LOCATION CLIFTON ROAD PARCEL ID NO.: 18 053 03 010
PROPOSED USE EDUCATIONAL/MEDICAL
DATE OF SKETCH PLAT CONFERENCE
SITE ACREAGE 14.21 # LOTS 3 # UNITS – SEWER X SEPTIC TANK

PROPERTY OWNER EMORY UNIVERSITY PHONE
ADDRESS 1599 CLIFTON ROAD
CITY ATLANTA STATE GA ZIP 30322

AGENT AUTHORIZED TO RECEIVE AL NOTIFICATIONS
ADDRESS PHONE
CITY STATE ZIP

DEVELOPER PHONE
ADDRESS
CITY STATE ZIP

ENGINEER / ARCH URS CORPORATION PHONE 678 808 8915
ADDRESS 400 NORTH PARK TOWN CENTER ~ 1000 ABERNATHY ROAD SUITE 900
CITY ATLANTA STATE GA ZIP 30328

APPLICANT CHAD M. CAVITT
COMPANY SEI PHONE 770 321 3936
ADDRESS 2470 SANDY PLAINS ROAD MARIETTA, GA. 30066
SIGNATURE OF APPLICANT DATE 10/07/13

330 West Ponce de Leon Avenue – Suites 100-500 – Decatur, Georgia – 30030
[voice] 404.371.2155 – [Planning Fax] (404) 371-4556 [Development Fax] (404) 371-3007
Web Address http://www.dekalbcountyga.gov/planning
Email Address: planninganddevelopment@dekalbcountyga.gov

Revised 2/1/11

DEKALB COUNTY GOVERNMENT
Engineering Services
Clark Harrison Building
330 W. Ponce De Leon Avenue, Suite 300-400
Decatur, GA 30030

CERTIFICATE OF CONFORMITY

I, CHRIS AMOS ADAMS, the engineer/surveyor for the Subdivision known as EMORY UNIVERSITY, located in Land Lot 52 & 53 of the 18TH District, hereby certify that no lots platted within the subdivision are non-conforming or will result in any non-conforming lots.

SIGNATURE

CHRIS AMOS ADAMS
NAME (PLEASE PRINT)

2470 SANDY PLAINS ROAD
ADDRESS

MARIETTA, GA 30066
CITY, STATE, ZIP

DEKALB COUNTY DEVELOPMENT DEPARTMENT IS NOT RESPONSIBLE FOR ANY ERRORS OR OMISSIONS BY ENGINEERS OR OTHER DESIGN PROFESSIONALS ON DESIGN OR COUNTY CODE REQUIREMENTS OF THIS PROJECT.

Revised 4/19/2011

Phone: (404) 371-2167 Fax: (404) 371-3007

SOUTHEASTERN ENGINEERING, INC.
2470 Sandy Plains Road Marietta, Georgia 30066
tel: 770-321-3936 fax: 770-321-3935
www.seengineering.com

MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA (SAMSOG)

ALL MATTERS OF TITLE ARE EXCEPTED. c 2013

Deuteronomy 19:14 Do not move your neighbor's boundary stone set up by your predecessors...

SURVEYED: ML DRAFTED:SEI CHECKED: CAA

No.	REVISION	DATE

PLAT INFORMATION:

SCALE 1"=100' DATE: 10/03/13

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE OF 1 FOOT IN 83,557 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT AND WAS ADJUSTED USING THE LEAST SQUARES METHOD. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND FOUND TO BE ACCURATE TO 1 FOOT IN 198,857 FEET. AN ELECTRONIC TOTAL STATION WAS USED TO GATHER THE INFORMATION USED IN THE PREPARATION OF THIS PLAT.
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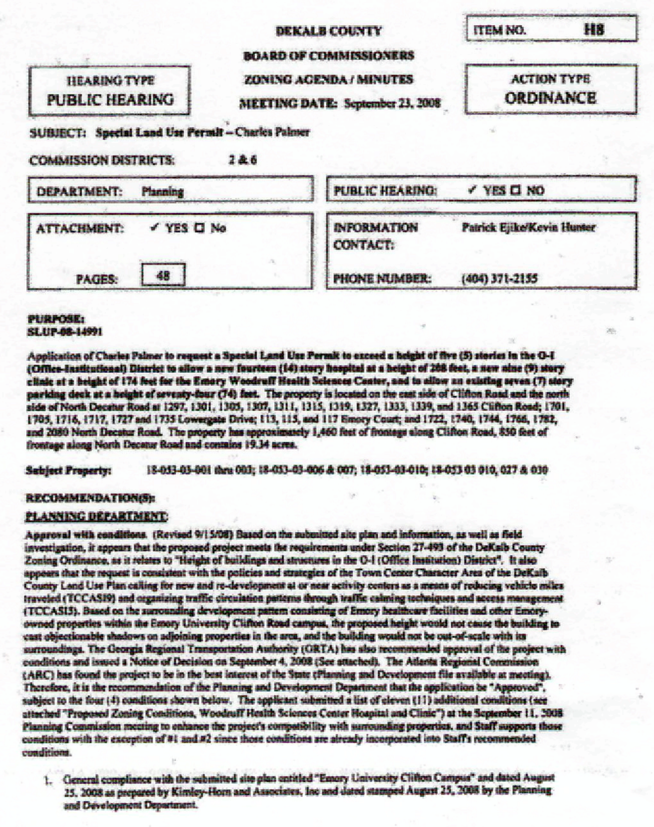
LOT DIVISION PLAT FOR:

URS CORPORATION

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA
DeKALB COUNTY PLANNING
AND SUSTAINABILITY FILE
18883.

No. 2796
CHRIS AMOS ADAMS

JOB No.: 481-13-117
SHEET NO. 1 OF 4



DEKALB COUNTY

BOARD OF COMMISSIONERS

ZONING AGENDA / MINUTES

MEETING DATE: September 23, 2008

ITEM NO. **H8**

HEARING TYPE **PUBLIC HEARING**

ACTION TYPE **ORDINANCE**

SUBJECT: Special Land Use Permit – Charles Palmer

COMMISSION DISTRICTS: 2 & 6

DEPARTMENT: Planning

PUBLIC HEARING: ✓ YES ☐ NO

ATTACHMENT: ✓ YES ☐ No

PAGES: 48

INFORMATION CONTACT: Patrick Ejike/Kevin Hunter

PHONE NUMBER: (404) 371-2155

PURPOSE:
SLUP-08-14991

Application of Charles Palmer to request a Special Land Use Permit to exceed a height of five (5) stories in the O-I (Office-Institutional) District to allow a new fourteen (14) story hospital at a height of 208 feet, a new nine (9) story clinic at a height of 174 feet for the Emory Woodruff Health Sciences Center, and to allow an existing seven (7) story parking deck at a height of seventy-four (74) feet. The property is located on the east side of Clifton Road and the north side of North Decatur Road at 1297, 1301, 1305, 1307, 1311, 1315, 1319, 1327, 1333, 1339, and 1365 Clifton Road; 1701, 1705, 1716, 1717, 1727 and 1735 Lowergate Drive; 113, 115, and 117 Emory Court; and 1722, 1740, 1744, 1766, 1782, and 2080 North Decatur Road. The property has approximately 1,460 feet of frontage along Clifton Road, 850 feet of frontage along North Decatur Road and contains 19.34 acres.

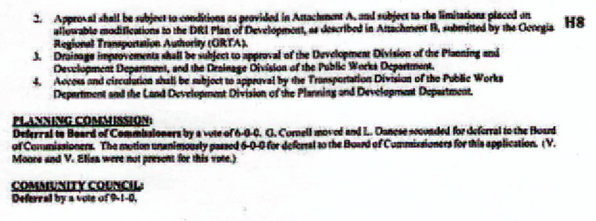
Subject Property: 18-053-03-001 thru 003; 18-053-03-006 & 007; 18-053-03-010; 18-053 03 010, 027 & 030

RECOMMENDATION(S):

PLANNING DEPARTMENT:

Approval with conditions. (Revised 9/15/08) Based on the submitted site plan and information, as well as field investigation, it appears that the proposed project meets the requirements under Section 27-493 of the DeKalb County Zoning Ordinance, as it relates to "Height of buildings and structures in the O-I (Office Institution) District". It also appears that the request is consistent with the policies and strategies of the Town Center Character Area of the DeKalb County Land Use Plan calling for new and re-development at or near activity centers as a means of reducing vehicle miles traveled (TCCASI9) and organizing traffic circulation patterns through traffic calming techniques and access management (TCCASI5). Based on the surrounding development pattern consisting of Emory healthcare facilities and other Emory-owned properties within the Emory University Clifton Road campus, the proposed height would not cause the building to cast objectionable shadows on adjoining properties in the area, and the building would not be out-of-scale with its surroundings. The Georgia Regional Transportation Authority (GRTA) has also recommended approval of the project with conditions and issued a Notice of Decision on September 4, 2008 (See attached). The Atlanta Regional Commission (ARC) has found the project to be in the best interest of the State (Planning and Development file available at meeting). Therefore, it is the recommendation of the Planning and Development Department that the application be "Approved", subject to the four (4) conditions shown below. The applicant submitted a list of eleven (11) additional conditions (see attached "Proposed Zoning Conditions, Woodruff Health Sciences Center Hospital and Clinic") at the September 11, 2008 Planning Commission meeting to enhance the project's compatibility with surrounding properties, and Staff supports those conditions with the exception of #1 and #2 since those conditions are already incorporated into Staff's recommended conditions.

1. General compliance with the submitted site plan entitled "Emory University Clifton Campus" and dated August 25, 2008 as prepared by Kimley-Horn and Associates, Inc and dated stamped August 25, 2008 by the Planning and Development Department.

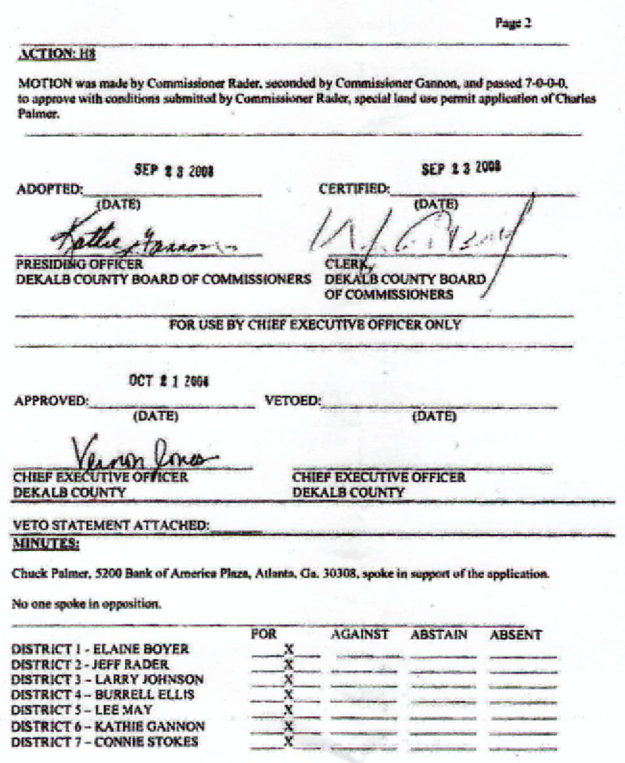


2. Approval shall be subject to conditions as provided in Attachment A, and subject to the limitations placed on allowable modifications to the DRI Plan of Development, as described in Attachment B, submitted by the Georgia Regional Transportation Authority (GRTA).
3. Drainage improvements shall be subject to approval of the Development Division of the Planning and Development Department, and the Drainage Division of the Public Works Department.
4. Access and circulation shall be subject to approval by the Transportation Division of the Public Works Department and the Land Development Division of the Planning and Development Department.

H8

PLANNING COMMISSION:
Deferral to Board of Commissioners by a vote of 6-0-0. G. Cornell moved and L. Danese seconded for deferral to the Board of Commissioners. The motion unanimously passed 6-0-0 for deferral to the Board of Commissioners for this application. (V. Moore and V. Elisa were not present for this vote.)

COMMUNITY COUNCIL:
Deferral by a vote of 9-1-0.



Page 2

ACTION: H8

MOTION was made by Commissioner Rader, seconded by Commissioner Gannon, and passed 7-0-0-0, to approve with conditions submitted by Commissioner Rader, special land use permit application of Charles Palmer.

ADOPTED: SEP 23 2008
(DATE)

Kathie Gannon
PRESIDING OFFICER
DEKALB COUNTY BOARD OF COMMISSIONERS

CERTIFIED: SEP 23 2008
(DATE)

CLERK,
DEKALB COUNTY BOARD OF COMMISSIONERS

FOR USE BY CHIEF EXECUTIVE OFFICER ONLY

APPROVED: OCT 21 2008
(DATE)

VETOED: ______
(DATE)

Vernon Jones
CHIEF EXECUTIVE OFFICER
DEKALB COUNTY

CHIEF EXECUTIVE OFFICER
DEKALB COUNTY

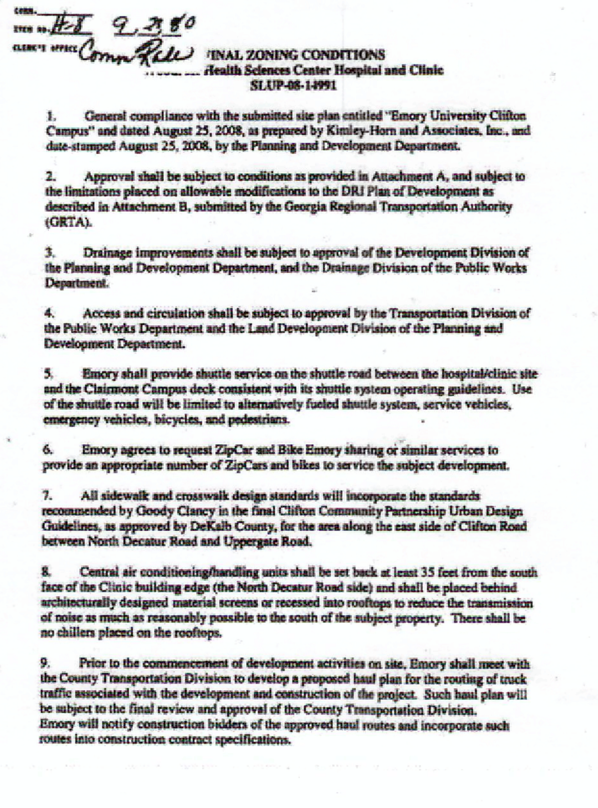
VETO STATEMENT ATTACHED: ______

MINUTES:

Chuck Palmer, 5200 Bank of America Plaza, Atlanta, Ga. 30308, spoke in support of the application.

No one spoke in opposition.

	FOR	AGAINST	ABSTAIN	ABSENT
DISTRICT 1 - ELAINE BOYER	X			
DISTRICT 2 - JEFF RADER	X			
DISTRICT 3 - LARRY JOHNSON	X			
DISTRICT 4 - BURRELL ELLIS	X			
DISTRICT 5 - LEE MAY	X			
DISTRICT 6 - KATHIE GANNON	X			
DISTRICT 7 - CONNIE STOKES	X			



COMM.
ITEM NO. H-8 9.23.08
CLERK'S OFFICE Comm Rader

INAL ZONING CONDITIONS
Health Sciences Center Hospital and Clinic
SLUP-08-14991

1. General compliance with the submitted site plan entitled "Emory University Clifton Campus" and dated August 25, 2008, as prepared by Kimley-Horn and Associates, Inc., and date-stamped August 25, 2008, by the Planning and Development Department.

2. Approval shall be subject to conditions as provided in Attachment A, and subject to the limitations placed on allowable modifications to the DRI Plan of Development as described in Attachment B, submitted by the Georgia Regional Transportation Authority (GRTA).

3. Drainage improvements shall be subject to approval of the Development Division of the Planning and Development Department, and the Drainage Division of the Public Works Department.

4. Access and circulation shall be subject to approval by the Transportation Division of the Public Works Department and the Land Development Division of the Planning and Development Department.

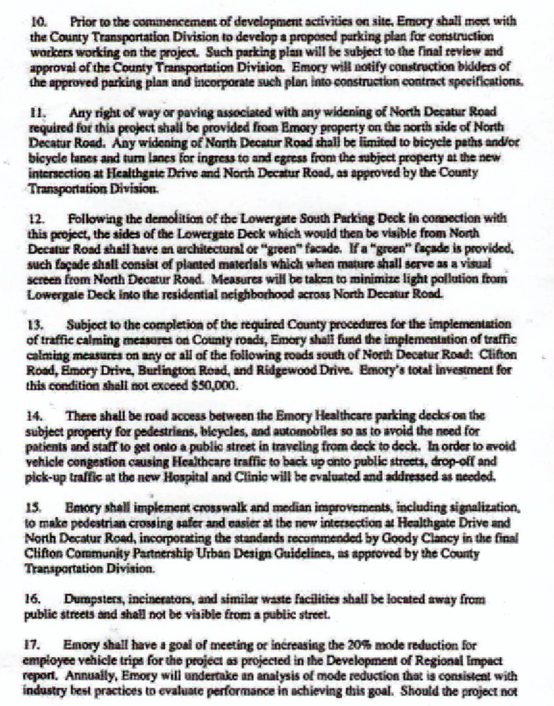
5. Emory shall provide shuttle service on the shuttle road between the hospital/clinic site and the Clairmont Campus deck consistent with its shuttle system operating guidelines. Use of the shuttle road will be limited to alternatively fueled shuttle system, service vehicles, emergency vehicles, bicycles, and pedestrians.

6. Emory agrees to request ZipCar and Bike Emory sharing or similar services to provide an appropriate number of ZipCars and bikes to service the subject development.

7. All sidewalk and crosswalk design standards will incorporate the standards recommended by Goody Clancy in the final Clifton Community Partnership Urban Design Guidelines, as approved by DeKalb County, for the area along the east side of Clifton Road between North Decatur Road and Uppergate Road.

8. Central air conditioning/handling units shall be set back at least 35 feet from the south face of the Clinic building edge (the North Decatur Road side) and shall be placed behind architecturally designed material screens or recessed into rooftops to reduce the transmission of noise as much as reasonably possible to the south of the subject property. There shall be no chillers placed on the rooftops.

9. Prior to the commencement of development activities on site, Emory shall meet with the County Transportation Division to develop a proposed haul plan for the routing of truck traffic associated with the development and construction of the project. Such haul plan will be subject to the final review and approval of the County Transportation Division. Emory will notify construction bidders of the approved haul routes and incorporate such routes into construction contract specifications.



10. Prior to the commencement of development activities on site, Emory shall meet with the County Transportation Division to develop a proposed parking plan for construction workers working on the project. Such parking plan will be subject to the final review and approval of the County Transportation Division. Emory will notify construction bidders of the approved parking plan and incorporate such plan into construction contract specifications.

11. Any right of way or paving associated with any widening of North Decatur Road required for this project shall be provided from Emory property on the north side of North Decatur Road. Any widening of North Decatur Road shall be limited to bicycle paths and/or bicycle lanes and turn lanes for ingress to and egress from the subject property at the new intersection at Healthgate Drive and North Decatur Road, as approved by the County Transportation Division.

12. Following the demolition of the Lowergate South Parking Deck in connection with this project, the sides of the Lowergate Deck which would then be visible from North Decatur Road shall have an architectural or "green" facade. If a "green" façade is provided, such façade shall consist of planted materials which when mature shall serve as a visual screen from North Decatur Road. Measures will be taken to minimize light pollution from Lowergate Deck into the residential neighborhood across North Decatur Road.

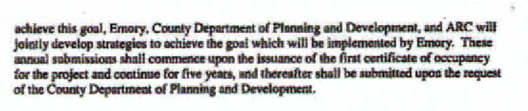
13. Subject to the completion of the required County procedures for the implementation of traffic calming measures on County roads, Emory shall fund the implementation of traffic calming measures on any or all of the following roads south of North Decatur Road: Clifton Road, Emory Drive, Burlington Road, and Ridgewood Drive. Emory's total investment for this condition shall not exceed $50,000.

14. There shall be road access between the Emory Healthcare parking decks on the subject property for pedestrians, bicycles, and automobiles so as to avoid the need for patients and staff to get onto a public street in traveling from deck to deck. In order to avoid vehicle congestion causing Healthcare traffic to back up onto public streets, drop-off and pick-up traffic at the new Hospital and Clinic will be evaluated and addressed as needed.

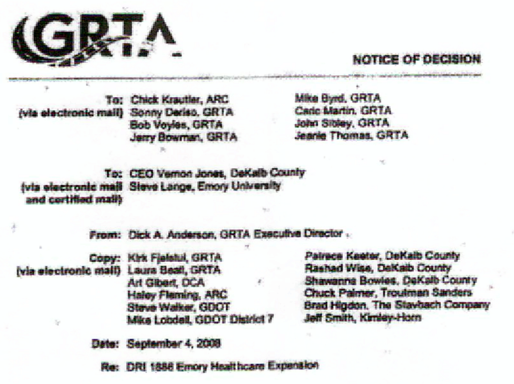
15. Emory shall implement crosswalk and median improvements, including signalization, to make pedestrian crossing safer and easier at the new intersection at Healthgate Drive and North Decatur Road, incorporating the standards recommended by Goody Clancy in the final Clifton Community Partnership Urban Design Guidelines, as approved by the County Transportation Division.

16. Dumpsters, incinerators, and similar waste facilities shall be located away from public streets and shall not be visible from a public street.

17. Emory shall have a goal of meeting or increasing the 20% mode reduction for employee vehicle trips for the project as projected in the Development of Regional Impact report. Annually, Emory will undertake an analysis of mode reduction that is consistent with industry best practices to evaluate performance in achieving this goal. Should the project not



achieve this goal, Emory, County Department of Planning and Development, and ARC will jointly develop strategies to achieve the goal which will be implemented by Emory. These annual submissions shall commence upon the issuance of the first certificate of occupancy for the project and continue for five years, and thereafter shall be submitted upon the request of the County Department of Planning and Development.



GRTA

NOTICE OF DECISION

To: Chick Krautler, ARC
(via electronic mail) Sonny Deriso, GRTA
Bob Voyles, GRTA
Jerry Bowman, GRTA
Mike Byrd, GRTA
Cedric Martin, GRTA
John Sibley, GRTA
Jeanie Thomas, GRTA

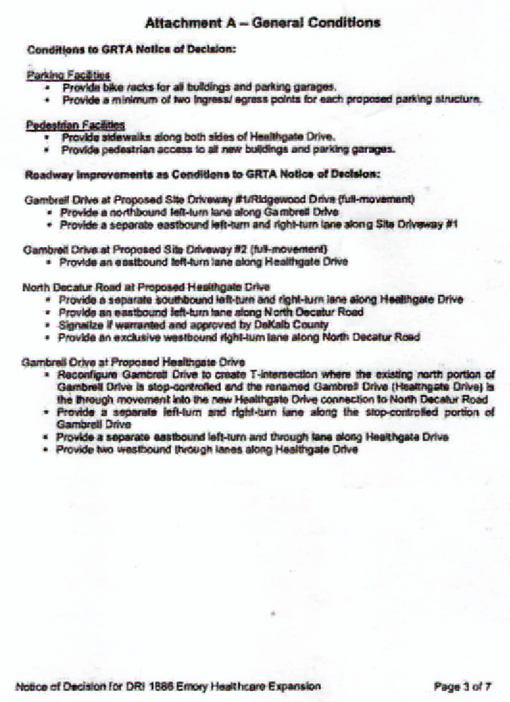
To: CEO Vernon Jones, DeKalb County
(via electronic mail and certified mail) Steve Lange, Emory University

From: Dick A. Anderson, GRTA Executive Director

Copy: Kirk Fjelstul, GRTA
(via electronic mail) Laura Beall, GRTA
Art Gilbert, DCA
Haley Fleming, ARC
Steve Walker, GDOT
Mike Lobdell, GDOT District 7
Patrece Keeter, DeKalb County
Rashad Wise, DeKalb County
Shawanna Bowles, DeKalb County
Chuck Palmer, Troutman Sanders
Brad Higdon, The Slavbach Company
Jeff Smith, Kimley-Horn

Date: September 4, 2008

Re: DRI 1886 Emory Healthcare Expansion



Attachment A – General Conditions

Conditions to GRTA Notice of Decision:

Parking Facilities
- Provide bike racks for all buildings and parking garages.
- Provide a minimum of two ingress/ egress points for each proposed parking structure.

Pedestrian Facilities
- Provide sidewalks along both sides of Healthgate Drive.
- Provide pedestrian access to all new buildings and parking garages.

Roadway Improvements as Conditions to GRTA Notice of Decision:

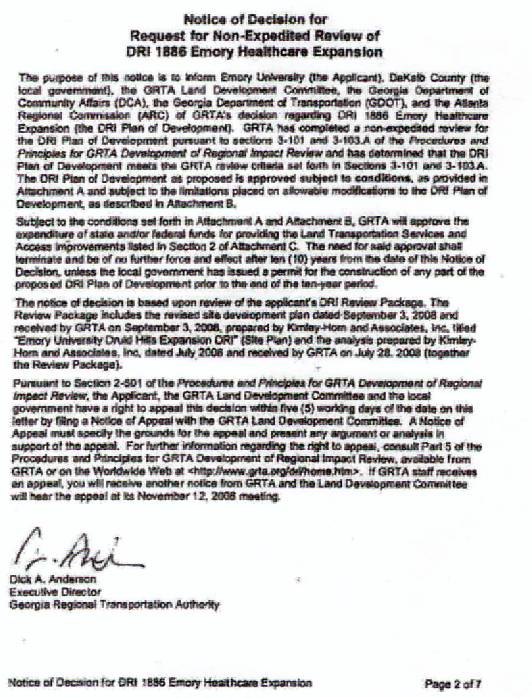
Gambrell Drive at Proposed Site Driveway #1/Ridgewood Drive (full-movement)
- Provide a northbound left-turn lane along Gambrell Drive
- Provide a separate eastbound left-turn and right-turn lane along Site Driveway #1

Gambrell Drive at Proposed Site Driveway #2 (full-movement)
- Provide an eastbound left-turn lane along Healthgate Drive

North Decatur Road at Proposed Healthgate Drive
- Provide a separate southbound left-turn and right-turn lane along Healthgate Drive
- Provide an eastbound left-turn lane along North Decatur Road
- Signalize if warranted and approved by DeKalb County
- Provide an exclusive westbound right-turn lane along North Decatur Road

Gambrell Drive at Proposed Healthgate Drive
- Reconfigure Gambrell Drive to create T-intersection where the existing north portion of Gambrell Drive is stop-controlled and the renamed Gambrell Drive (Healthgate Drive) is the through movement into the new Healthgate Drive connection to North Decatur Road
- Provide a separate left-turn and right-turn lane along the stop-controlled portion of Gambrell Drive
- Provide a separate eastbound left-turn and through lane along Healthgate Drive
- Provide two westbound through lanes along Healthgate Drive

Notice of Decision for DRI 1886 Emory Healthcare Expansion Page 3 of 7



Notice of Decision for
Request for Non-Expedited Review of
DRI 1886 Emory Healthcare Expansion

The purpose of this notice is to inform Emory University (the Applicant), DeKalb County (the local government), the GRTA Land Development Committee, the Georgia Department of Community Affairs (DCA), the Georgia Department of Transportation (GDOT), and the Atlanta Regional Commission (ARC) of GRTA's decision regarding DRI 1886 Emory Healthcare Expansion (the DRI Plan of Development). GRTA has completed a non-expedited review for the DRI Plan of Development pursuant to sections 3-101 and 3-103.A of the *Procedures and Principles for GRTA Development of Regional Impact Review* and has determined that the DRI Plan of Development meets the GRTA review criteria set forth in Sections 3-101 and 3-103.A. The DRI Plan of Development as proposed is approved subject to conditions, as provided in Attachment A and subject to the limitations placed on allowable modifications to the DRI Plan of Development, as described in Attachment B.

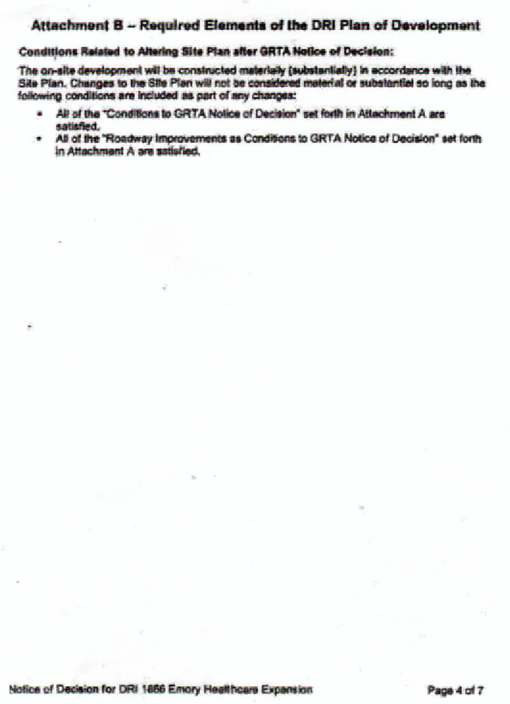
Subject to the conditions set forth in Attachment A and Attachment B, GRTA will approve the expenditure of state and/or federal funds for providing the Land Transportation Services and Access Improvements listed in Section 2 of Attachment C. The need for said approval shall terminate and be of no further force and effect after ten (10) years from the date of this Notice of Decision, unless the local government has issued a permit for the construction of any part of the proposed DRI Plan of Development prior to the end of the ten-year period.

The notice of decision is based upon review of the applicant's DRI Review Package. The Review Package includes the revised site development plan dated September 3, 2008 and received by GRTA on September 3, 2008, prepared by Kimley-Horn and Associates, Inc. titled "Emory University Druid Hills Expansion DRI" (Site Plan) and the analysis prepared by Kimley-Horn and Associates, Inc, dated July 2008 and received by GRTA on July 28, 2008 (together the Review Package).

Pursuant to Section 2-501 of the *Procedures and Principles for GRTA Development of Regional Impact Review*, the Applicant, the GRTA Land Development Committee and the local government have a right to appeal this decision within five (5) working days of the date on this letter by filing a Notice of Appeal with the GRTA Land Development Committee. A Notice of Appeal must specify the grounds for the appeal and present any argument or analysis in support of the appeal. For further information regarding the right to appeal, consult Part 5 of the Procedures and Principles for GRTA Development of Regional Impact Review, available from GRTA or on the Worldwide Web at <http://www.grta.org/dri/home.htm>. If GRTA staff receives an appeal, you will receive another notice from GRTA and the Land Development Committee will hear the appeal at its November 12, 2008 meeting.

Dick A. Anderson
Executive Director
Georgia Regional Transportation Authority

Notice of Decision for DRI 1886 Emory Healthcare Expansion Page 2 of 7



Attachment B – Required Elements of the DRI Plan of Development

Conditions Related to Altering Site Plan after GRTA Notice of Decision:

The on-site development will be constructed materially (substantially) in accordance with the Site Plan. Changes to the Site Plan will not be considered material or substantial so long as the following conditions are included as part of any changes:

- All of the "Conditions to GRTA Notice of Decision" set forth in Attachment A are satisfied.
- All of the "Roadway Improvements as Conditions to GRTA Notice of Decision" set forth in Attachment A are satisfied.

Notice of Decision for DRI 1886 Emory Healthcare Expansion Page 4 of 7

PLAT BOOK 227 Pg 97

DEKALB COUNTY DEVELOPMENT DEPARTMENT IS NOT RESPONSIBLE FOR ANY ERRORS OR OMISSIONS BY ENGINEERS OR OTHER DESIGN PROFESSIONALS ON DESIGN OR COUNTY CODE REQUIREMENTS OF THIS PROJECT.

SEI

SOUTHEASTERN ENGINEERING, INC.

2470 Sandy Plains Road Marietta, Georgia 30066
tel: 770-321-3936 fax: 770-321-3935
www.seengineering.com

MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA
(SAMSOG)

ALL MATTERS OF TITLE ARE EXCEPTED. c 2013

Deuteronomy 19:14 Do not move your neighbor's boundary stone set up by your predecessors...

SURVEYED: ML DRAFTED:SEI CHECKED: CAA

No.	REVISION	DATE

PLAT INFORMATION:

SCALE 1"=100' DATE: 10/03/13

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE OF 1 FOOT IN 83,557 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT AND WAS ADJUSTED USING THE LEAST SQUARES METHOD.
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THIS PLAT WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS OR ENTITY NAMED HEREON. THIS PLAT DOES NOT EXTEND TO ANY UNNAMED PERSON, PERSONS OR ENTITY WITHOUT EXPRESS RECERTIFICATION BY THE SURVEYOR NAMING SAID PERSON, PERSONS OR ENTITY.

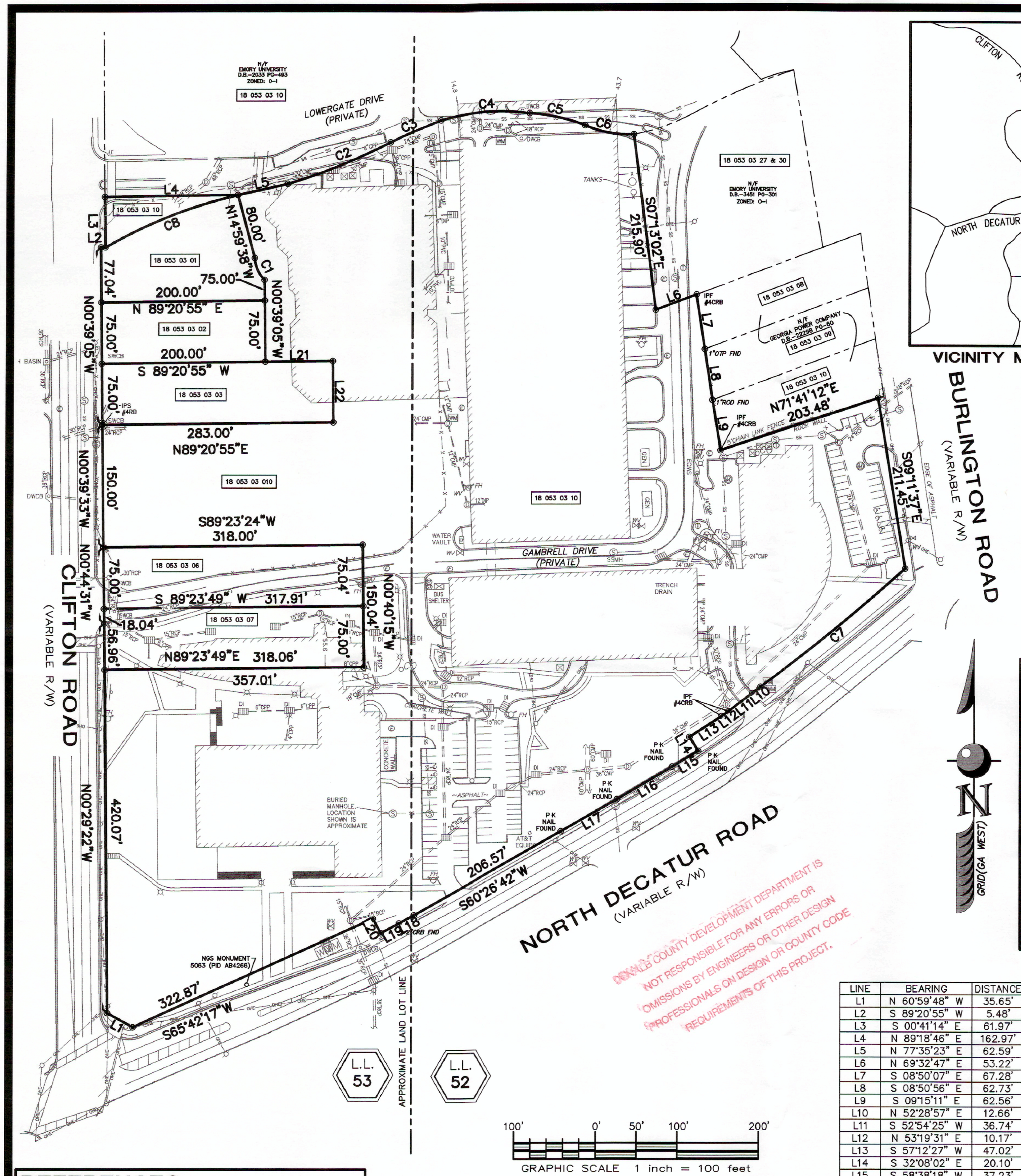
LOT DIVISION PLAT FOR:
URS CORPORATION
LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA
DeKALB COUNTY PLANNING
AND SUSTAINABILITY FILE
18883.

GEORGIA REGISTERED LAND SURVEYOR No. 2796 CHRIS AMOS ADAMS

JOB No.: 481-13-117

SHEET NO. 2 OF 4

PLAT BOOK 227 Pg 98



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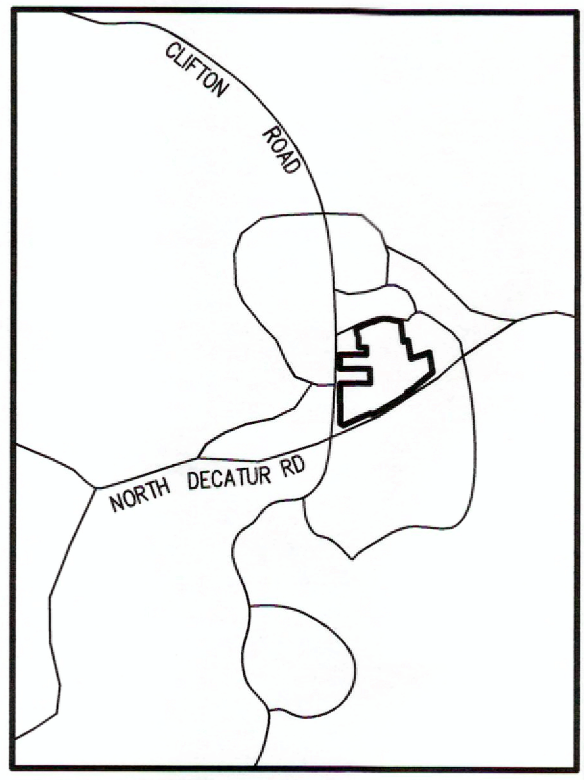

VICINITY MAP (1"=2000')

LEGEND:

IPS	IRON PIN SET
IPF	IRON PIN FOUND
OTP	OPEN TOP PIPE
CTP	CRIMP TOP PIPE
RB	REINFORCING BAR
CRB	CAPPED RE–BAR
R/W	RIGHT–OF–WAY
LL	LAND LOT
LLL	LAND LOT LINE
L	LINE
A	ARC
R	RADIUS
CH	CHORD
C	CURVE
CONC	CONCRETE
	GUY POLE
	GAS VALVE
GM	GAS METER
G	GAS MARKER
☼	LAMP POLE
	POWER POLE
	FIBER OPTIC MARKER
ICV	IRRIGATION CONTROL VALVE
◙	MONITORING WELL
PRV	PRESSURE RELEASE VALVE
⊗	PVC STUB
⊠	POWER STUB
EM	ELECTRIC METER
⚑	WETLAND FLAG
CMP	CORRUGATED METAL PIPE
RCP	REINFORCED CONCRETE PIPE
CD	CROSS DRAIN
——SS——	SANITARY SEWER
—X—X—	FENCE
CMF ☐	CONCRETE MONUMENT FOUND
—Z—Z—	OVERHEAD UTILITY LINE(S).
DE	DRAINAGE EASEMENT
	CATCH BASIN
Ⓙ	JUNCTION BOX
Ⓓ	DRAINAGE MANHOLE
	DROP INLET
	HEAD WALL
	FLARED END SECTION (FES)
Ⓣ	TELEPHONE MANHOLE
TP	TELEPHONE PEDESTAL
TB	TELEPHONE BOX
Ⓢ	SEWER MANHOLE
SSE	SANITARY SEWER EASEMENT
CO	SEWER CLEANOUT
	FIRE HYDRANT
WV	WATER VALVE
WM	WATER METER
	WATER SEEP
⊠	WATER SPIGOT
	SIGN
	TRAFFIC BOX
	PEDESTRIAN SIGNAL
●	BOLLARD (ROUND)
▫	BOLLARD (SQUARE)
CB	CABLE BOX
℄	CENTERLINE
◉	BORE HOLE
⊗	FENCE POST
POB	POINT OF BEGINNING
POC	POINT OF COMMENCEMENT
PI	POINT OF INTERSECTION

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3. UNLESS OTHERWISE STATED HEREON, ONLY EVIDENCE OF EASEMENTS OR STRUCTURES THERETO WHICH ARE READILY APPARENT FROM A CASUAL ABOVE GROUND VIEW OF PREMISES ARE SHOWN. NO LIABILITY IS ASSUMED BY THE UNDERSIGNED FOR LOSS RELATING TO THE EXISTENCE OF ANY EASEMENT NOT DISCOVERED FROM MY CASUAL ABOVE GROUND VIEW OF THE PREMISES.
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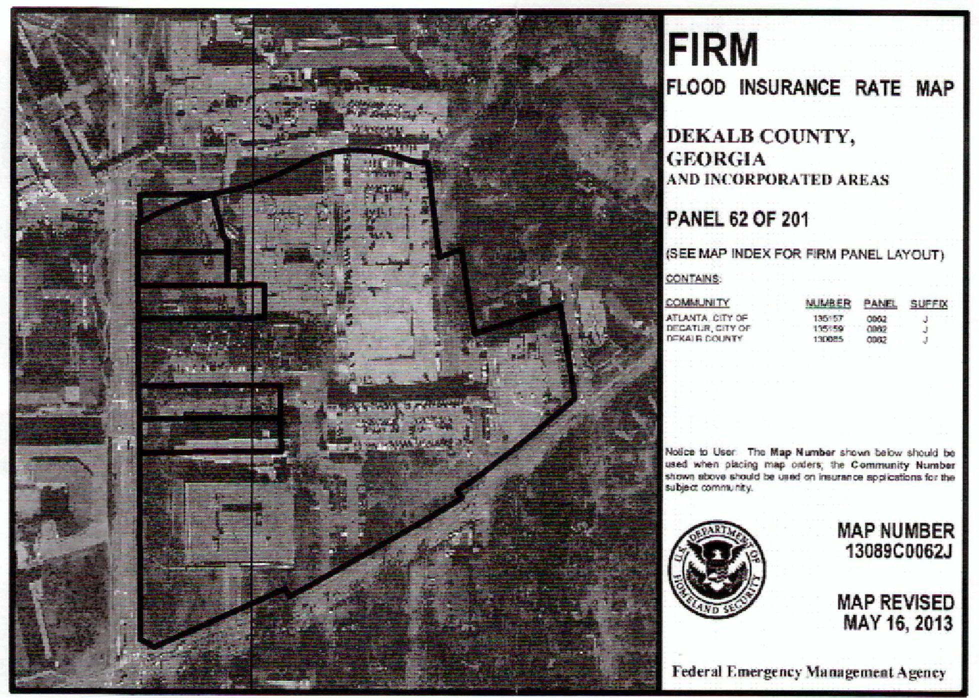
I HAVE THIS DATE EXAMINED THE "FIA OFFICIAL FLOOD HAZARD MAP" AND FOUND THAT BY GRAPHIC PLOTTING ONLY, THE REFERENCE PARCEL IS NOT IN AN AREA HAVING SPECIAL FLOOD HAZARDS.

MAP ID 13089 C 0062 J EFFECTIVE DATE: 05/16/13



FIRM

FLOOD INSURANCE RATE MAP

DEKALB COUNTY, GEORGIA
AND INCORPORATED AREAS

PANEL 62 OF 201

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ATLANTA, CITY OF	135157	0062	J
DECATUR, CITY OF	135159	0062	J
DEKALB COUNTY	130065	0062	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
13089C0062J

MAP REVISED
MAY 16, 2013

Federal Emergency Management Agency

LINE	BEARING	DISTANCE
L1	N 60°59'48" W	35.65'
L2	S 89°20'55" W	5.48'
L3	S 00°41'14" E	61.97'
L4	N 89°18'46" E	162.97'
L5	N 77°35'23" E	62.59'
L6	N 69°32'47" E	53.22'
L7	S 08°50'07" E	67.28'
L8	S 08°50'56" E	62.73'
L9	S 09°15'11" E	62.56'
L10	N 52°28'57" E	12.66'
L11	S 52°54'25" W	36.74'
L12	N 53°19'31" E	10.17'
L13	S 57°12'27" W	47.02'
L14	S 32°08'02" E	20.10'
L15	S 58°38'18" W	37.23'
L16	S 59°31'45" W	78.24'
L17	S 60°30'47" W	79.21'
L18	N 61°39'44" E	20.86'
L19	S 61°30'02" W	25.20'
L20	N 28°18'45" W	20.20'
L21	N 89°20'55" E	83.00'
L22	S 00°39'05" E	75.00'

CURVE	RADIUS	ARC LENGTH	CHORD BEARING	CHORD LENGTH
C1	38.86'	30.16'	N24°15'35"W	29.40'
C2	719.31'	135.62'	N68°10'03"E	135.42'
C3	559.16'	67.07'	N66°21'10"E	67.03'
C4	253.50'	110.17'	N85°38'32"E	109.30'
C5	224.56'	69.74'	S77°38'19"E	69.46'
C6	125.29'	61.72'	S79°27'09"E	61.09'
C7	2352.84'	229.78'	S50°38'06"W	229.69'
C8	585.31'	175.00'	N68°29'38"E	174.35'

REFERENCES:

1) SUBDIVISION OF WOODLAND PARK PREPARED BY GORDON NALLEY DATED OCTOBER, 1940. SAID PLAT IS UNRECORDED.

2) SURVEY AND PLAT OF PROPERTY LOCATED IN LAND LOTS 52 & 53, 18TH DISTRICT, DEKALB COUNTY, GEORGIA PREPARED BY SHIRLEY, NELSON, & ASSOCIATES DATED JUNE 17, 1964 AND RECORDED IN DEED BOOK 2033, PAGE 493, FULTON COUNTY RECORDS.

3) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 3, 2008. SAID PLAT IS UNRECORDED.

4) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 30, 2008. SAID PLAT IS UNRECORDED.

SITE DATA

OWNER:	EMORY UNIVERSITY 1380 OXFORD ROAD ATLANTA. GEORGIA 30322 PH: (404) 686–2422
SUBDIVIDER:	URS CORPORATION 400 NORTHPARK TOWN CENTER 1000 ABERNATHY ROAD NE, SUITE 900 ATLANTA, GEORGIA 30328 PH: (678) 808–8915
ENGINEER & SURVEYOR:	SOUTHEASTERN ENGINEERING, INC 2470 SANDY PLAINS ROAD MARIETTA, GEORGIA 30066 PH: (770) 321–3936
PERMIT NUMBER:	18883
TAX MAP I.D. NUMBERS:	18 053 03–01, 02, 03, 06, 07 & 010
BOUNDARY REFERENCE:	SEI, DATED AUGUST 2013
SITE AREA:	726,883 SQUARE FEET OR 16.687 ACRES
WATER AND SEWER SERVICE:	DeKALB COUNTY
RECEIVING WATERS:	PEAVINE CREEK

SEI

SOUTHEASTERN ENGINEERING, INC.
2470 Sandy Plains Road Marietta, Georgia 30066
tel: 770-321-3936 fax: 770-321-3935
www.seengineering.com

MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA
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ALL MATTERS OF TITLE ARE EXCEPTED. c 2013

Deuteronomy 19:14 Do not move your neighbor's boundary stone set up by your predecessors...

SURVEYED: ML DRAFTED:SEI CHECKED: CAA

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PARCEL EXHIBIT FOR:

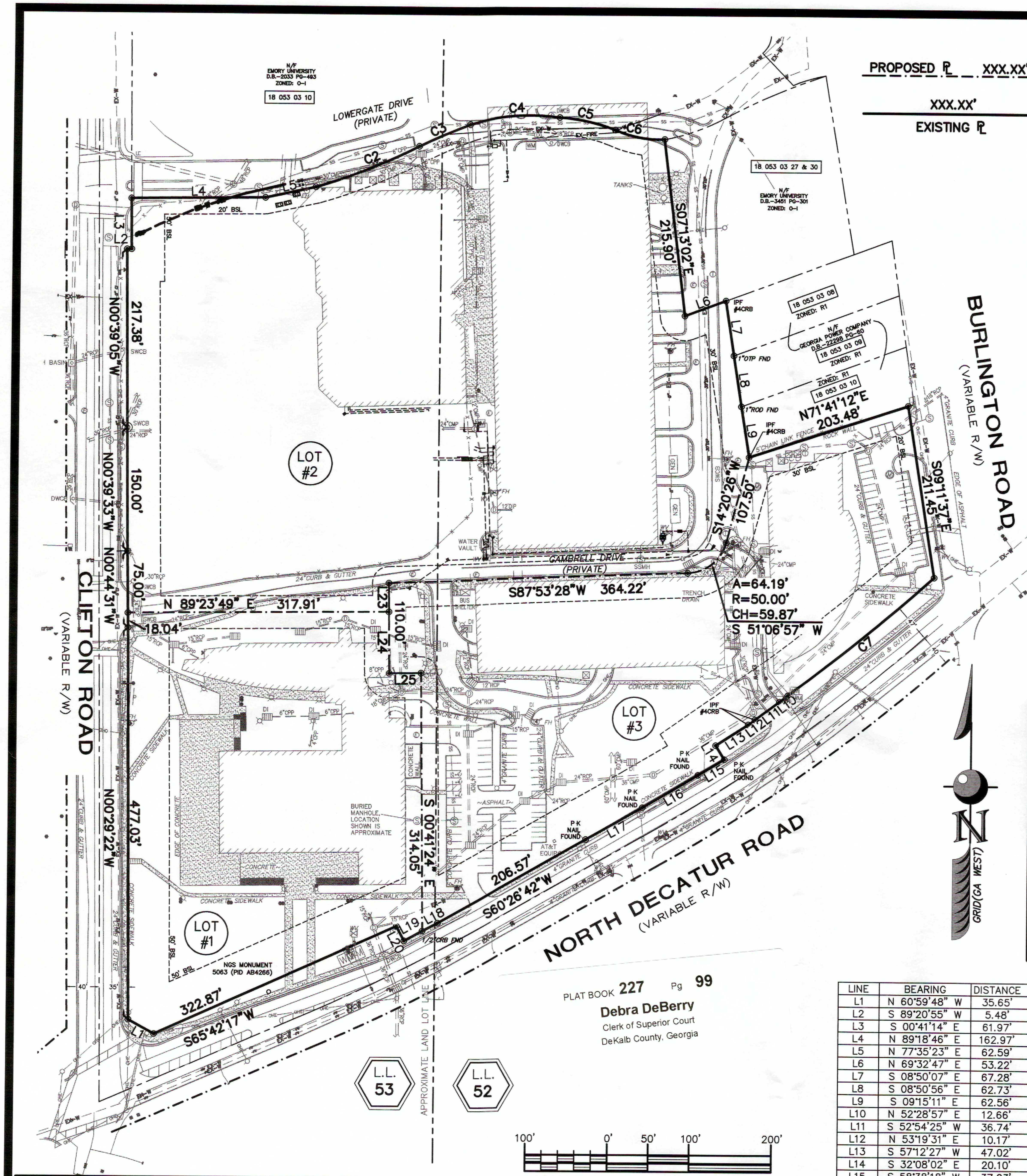
URS CORPORATION

LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA

No. 2796
CHRIS AMOS ADAMS

JOB No.: 481–13–117

SHEET NO. 3 OF 4



PLAT BOOK 227 Pg 99

Debra DeBerry
Clerk of Superior Court
DeKalb County, Georgia

LEGEND.

IPS	IRON PIN SET	DE	DRAINAGE EASEMENT
IPF	IRON PIN FOUND		CATCH BASIN
OTP	OPEN TOP PIPE	Ⓙ	JUNCTION BOX
CTP	CRIMP TOP PIPE	Ⓓ	DRAINAGE MANHOLE
RB	REINFORCING BAR	▥	DROP INLET
CRB	CAPPED RE-BAR		HEAD WALL
R/W	RIGHT-OF-WAY		FLARED END SECTION (FES)
LL	LAND LOT	Ⓣ	TELEPHONE MANHOLE
LLL	LAND LOT LINE	TP	TELEPHONE PEDESTAL
L	LINE	TB	TELEPHONE BOX
A	ARC	Ⓢ	SEWER MANHOLE
R	RADIUS	SSE	SANITARY SEWER EASEMENT
CH	CHORD		SEWER CLEANOUT
C	CURVE		FIRE HYDRANT
CONC	CONCRETE	⊠	WATER VALVE
	GUY POLE	WM	WATER METER
⊠	GAS VALVE	⊠	WATER SEEP
GM	GAS METER	⊠	WATER SPIGOT
	GAS MARKER		SIGN
☼	LAMP POLE	⊠	TRAFFIC BOX
	POWER POLE		PEDESTRIAN SIGNAL
	FIBER OPTIC MARKER	●	BOLLARD (ROUND)
ICV	IRRIGATION CONTROL VALVE	□	BOLLARD (SQUARE)
	MONITORING WELL	CB	CABLE BOX
PRV	PRESSURE RELEASE VALVE	℄	CENTERLINE
⊗	PVC STUB	●	BORE HOLE
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EM	ELECTRIC METER	POB	POINT OF BEGINNING
	WETLAND FLAG	POC	POINT OF COMMENCEMENT
		PI	POINT OF INTERSECTION
CMP	CORRUGATED METAL PIPE		
RCP	REINFORCED CONCRETE PIPE		
CD	CROSS DRAIN		
——SS——	SANITARY SEWER		
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CMF □	CONCRETE MONUMENT FOUND		
—Z—Z—	OVERHEAD UTILITY LINE(S).		

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MAP ID 13089 C 0062 J EFFECTIVE DATE: 05/16/13

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FLOOD INSURANCE RATE MAP

DEKALB COUNTY,
GEORGIA
AND INCORPORATED AREAS

PANEL 62 OF 201

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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L17	S 60°30'47" W	79.21'
L18	N 61°39'44" E	20.86'
L19	S 61°30'02" W	25.20'
L20	N 28°18'45" W	20.20'
L21	N 89°20'55" E	83.00'
L22	S 00°39'05" E	75.00'
L23	N 00°40'15" W	35.00'
L24	S 00°40'15" E	75.00'
L25	S 89°23'49" W	38.95'

CURVE	RADIUS	ARC LENGTH	CHORD BEARING	CHORD LENGTH
C1	38.86'	30.16'	N24°15'35"W	29.40'
C2	719.31'	135.62'	N68°10'03"E	135.42'
C3	559.16'	67.07'	N66°21'10"E	67.03'
C4	253.50'	110.17'	N85°38'32"E	109.30'
C5	224.56'	69.74'	S77°38'19"E	69.46'
C6	125.29'	61.72'	S79°27'09"E	61.09'
C7	2352.84'	229.78'	S50°38'06"W	229.69'
C8	585.31'	175.00'	N68°29'38"E	174.35'

REFERENCES.

1) SUBDIVISION OF WOODLAND PARK PREPARED BY GORDON NALLEY DATED OCTOBER, 1940. SAID PLAT IS UNRECORDED.

2) SURVEY AND PLAT OF PROPERTY LOCATED IN LAND LOTS 52 & 53, 18TH DISTRICT, DEKALB COUNTY, GEORGIA PREPARED BY SHIRLEY, NELSON, & ASSOCIATES DATED JUNE 17, 1964 AND RECORDED IN DEED BOOK 2033, PAGE 493, FULTON COUNTY RECORDS.

3) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 3, 2008. SAID PLAT IS UNRECORDED.

4) BOUNDARY SURVEY FOR EMORY UNIVERSITY PREPARED BY TRAVIS PRUITT & ASSOCIATES, INC. DATED JULY 30, 2008. SAID PLAT IS UNRECORDED.

DEKALB COUNTY DEVELOPMENT DEPARTMENT IS
NOT RESPONSIBLE FOR ANY ERRORS OR
OMISSIONS BY ENGINEERS OR OTHER DESIGN
PROFESSIONALS ON DESIGN OR COUNTY CODE
REQUIREMENTS OF THIS PROJECT.

SEI
SOUTHEASTERN ENGINEERING, INC.
2470 Sandy Plains Road Marietta, Georgia 30066
tel: 770-321-3936 fax: 770-321-3935
www.seengineering.com

MEMBER OF THE SURVEYING & MAPPING SOCIETY OF GEORGIA (SAMSOG)

ALL MATTERS OF TITLE ARE EXCEPTED. c 2013
Deuteronomy 19:14 Do not move your neighbor's boundary stone set up by your predecessors...

SURVEYED: ML DRAFTED:SEI CHECKED: CAA

No.	REVISION	DATE

PLAT INFORMATION:

SCALE 1"=100' DATE: 10/03/13

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE OF 1 FOOT IN 83,557 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT AND WAS ADJUSTED USING THE LEAST SQUARES METHOD. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND FOUND TO BE ACCURATE TO 1 FOOT IN 198,857 FEET. AN ELECTRONIC TOTAL STATION WAS USED TO GATHER THE INFORMATION USED IN THE PREPARATION OF THIS PLAT.
THIS PLAT WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS OR ENTITY NAMED HEREON. THIS PLAT DOES NOT EXTEND TO ANY UNNAMED PERSON, PERSONS OR ENTITY WITHOUT EXPRESS RECERTIFICATION BY THE SURVEYOR NAMING SAID PERSON, PERSONS OR ENTITY.

LOT DIVISION PLAT FOR:
URS CORPORATION
LAND LOTS 52 & 53
OF THE 18TH DISTRICT,
DeKALB COUNTY, GEORGIA

DeKALB COUNTY PLANNING
AND SUSTAINABILITY FILE
18883.

CHRIS AMOS ADAMS No. 2796

JOB No.: 481-13-117

SHEET NO. 4 OF 4

ALL THAT TRACT or parcel of land lying and being in Land Lot 52 and 53 of the 18th District, DeKalb County, Georgia and being more particularly described as follows:

BEGINNING at a point on the mitered intersection of the Northwesterly right-of-way of North Decatur Road and the Easterly right-of-way of Clifton Road; THENCE proceeding NORTH 60 DEGREES 59 MINUTES 48 SECONDS WEST a distance of 35.65 feet to a point; THENCE proceeding NORTH 00 DEGREES 29 MINUTES 22 SECONDS WEST a distance of 420.07 feet to a point; THENCE proceeding NORTH 89 DEGREES 23 MINUTES 49 SECONDS EAST a distance of 318.06 feet to a point; THENCE proceeding NORTH 00 DEGREES 40 MINUTES 15 SECONDS WEST a distance of 150.04 feet to a point; THENCE proceeding SOUTH 89 DEGREES 23 MINUTES 24 SECONDS WEST a distance of 318.00 feet to a point; THENCE proceeding NORTH 00 DEGREES 39 MINUTES 33 SECONDS WEST a distance of 150.00 feet to a point; THENCE proceeding NORTH 89 DEGREES 20 MINUTES 55 SECONDS EAST a distance of 283.00 feet to a point; THENCE proceeding NORTH 00 DEGREES 39 MINUTES 05 SECONDS WEST a distance of 75.00 feet to a point; THENCE proceeding SOUTH 89 DEGREES 20 MINUTES 55 SECONDS WEST a distance of 83.00 feet to a point; THENCE proceeding NORTH 00 DEGREES 39 MINUTES 05 SECONDS WEST a distance of 100.00 feet to a point; THENCE along a curve to the right an arc length of 30.16 feet having a radius of 38.86 feet and a chord bearing of NORTH 24 DEGREES 15 MINUTES 35 SECONDS WEST , and a chord distance of 29.40 feet; THENCE proceeding NORTH 14 DEGREES 59 MINUTES 38 SECONDS WEST a distance of 80.00 feet to a point; THENCE proceeding NORTH 77 DEGREES 35 MINUTES 23 SECONDS EAST a distance of 62.59 feet to a point; THENCE along a curve to the left an arc length of 135.62 feet having a radius of 719.31 feet and a chord bearing of NORTH 68 DEGREES 10 MINUTES 03 SECONDS EAST , and a chord distance of 135.42 feet; THENCE along a reverse curve to the right an arc length of 67.07 feet having a radius of 559.16 feet and a chord bearing of NORTH 66 DEGREES 21 MINUTES 10 SECONDS EAST and a chord distance of 67.03 feet; THENCE along a compound curve to the right an arc length of 110.17 feet having a radius of 253.50feet and a chord bearing of NORTH 85 DEGREES 38 MINUTES 32 SECONDS EAST , and a chord distance of 109.30feet; THENCE along a compound curve to the right an arc length of 69.74feet having a radius of 224.56 feet and a chord bearing of SOUTH 77 DEGREES 38 MINUTES 19 SECONDS EAST and a chord distance of 69.46 feet; THENCE along a reverse curve to the left an arc length of 61.72 feet having a radius of 125.29 feet and a chord bearing of SOUTH 79 DEGREES 27 MINUTES 09 SECONDS EAST , and a chord distance of 61.09 feet; THENCE proceeding SOUTH 07 DEGREES 13 MINUTES 02 SECONDS EAST a distance of 215.90 feet to a point; THENCE proceeding NORTH 69 DEGREES 32 MINUTES 47 SECONDS EAST a distance of 53.22 feet to a point; THENCE proceeding SOUTH 08 DEGREES 50 MINUTES 07 SECONDS EAST a distance of 67.28 feet to a point; THENCE proceeding SOUTH 08 DEGREES 50 MINUTES 56 SECONDS EAST a distance of 62.73 feet; THENCE proceeding SOUTH 09 DEGREES 15 MINUTES 11 SECONDS EAST a distance of 62.56 feet to a point; THENCE proceeding NORTH 71 DEGREES 41 MINUTES 12 SECONDS EAST a distance of 203.48 feet to a point; THENCE proceeding SOUTH 09 DEGREES 11 MINUTES 37 SECONDS EAST a distance of 211.45 feet to a point; THENCE along a curve to the right an arc length of 229.78 feet having a radius of 2352.84 feet and a chord bearing of SOUTH 50 DEGREES 38 MINUTES 06 SECONDS WEST and a chord distance of 229.69 feet; THENCE proceeding SOUTH 52 DEGREES 28 MINUTES 57 SECONDS WEST a distance of 12.66 feet to a point; THENCE proceeding SOUTH 52 DEGREES 54 MINUTES 25 SECONDS WEST a distance of 36.74 feet to a point; THENCE proceeding SOUTH 53 DEGREES 19 MINUTES 31 SECONDS WEST a distance of 10.17 feet to a point; THENCE proceeding SOUTH 57 DEGREES 12 MINUTES 27 SECONDS WEST a distance of 47.02 feet to a point; THENCE proceeding SOUTH 32 DEGREES 08 MINUTES 02 SECONDS EAST a distance of 20.10 feet to a point;

THENCE proceeding SOUTH 58 DEGREES 38 MINUTES 18 SECONDS WEST a distance of 37.23 feet to a point; THENCE proceeding SOUTH 59 DEGREES 31 MINUTES 45 SECONDS WEST a distance of 78.24 feet to a point; THENCE proceeding SOUTH 60 DEGREES 30 MINUTES 47 SECONDS WEST a distance of 79.21 feet to a point; THENCE proceeding SOUTH 60 DEGREES 26 MINUTES 42 SECONDS WEST a distance of 206.57 feet to a point; THENCE proceeding SOUTH 61 DEGREES 39 MINUTES 44 SECONDS WEST a distance of 20.86 feet to a point; THENCE proceeding SOUTH 61 DEGREES 30 MINUTES 02 SECONDS WEST a distance of 25.20 feet to a point; THENCE proceeding NORTH 28 DEGREES 18 MINUTES 45 SECONDS WEST a distance of 20.20 feet to a point; THENCE proceeding SOUTH 65 DEGREES 42 MINUTES 17 SECONDS WEST a distance of 322.87 feet to a point and POINT OF BEGINNING.

Said parcel contains 619,312 Square Feet or 14.217 Acres

APPENDIX C

2015 Conceptual Site Model/Updated Groundwater Model/ Vapor Intrusion Evaluation

Conceptual Site Model
Emory University
North Decatur Road/Burlington Road Site
HSI No. 10121

A conceptual site model (CSM) has been developed for the Emory University North Decatur Road/Burlington Road Site, HSI No. 10121site located at the intersection of North Decatur Road and Burlington Road in Atlanta, Georgia. See **Figures 1 and 2**.The purpose of the conceptual site model is to:

- Integrate technical data from various sources;
- Support the selection of sample locations;
- Identify data needs; and,
- Evaluate risks to human health and the environment.

Development of the CSM required consideration of the site setting, regulated substances, suspected source, etc. which are described more fully in the following subsections.

1.1 Surface Setting

The surface setting is commercial/university. The property is located in the Druid Hills area of Atlanta, at the intersection of Burlington Road and North Decatur Road. The site consists of a science building and associated parking lot, a multi-level parking garage, and several large landscaped areas. The property immediately south of the site consists of North Decatur Road and a residential neighborhood. The northern adjacent properties consist of a Georgia Power substation (under construction), a multi-level parking garage, and a new hospital facility that is currently under construction. The property immediately to the west consists of the law library and the property immediately east of the site consists of Burlington Road and a dormitory. See **Figure 1**.

1.2 Subsurface Setting

The site is located in the Piedmont physiographic province of the Appalachian Orogenic Belt, and is underlain by the Clarkston Formation. The Clarkston formation is primarily comprised of mica-schist and amphibolite. The soils at the site are characterized as belonging to the Urban Land Series. This classification indicates that the soils at the site have been significantly altered from their original condition due to the construction activities.

The site soils consist of a tan to reddish brown fine sandy silt grading to dense white to black micaceous silty sand. Bedrock was encountered at depth of 42 feet below land surface (bls) in monitoring well MW-2 and 60 feet bls in recovery well RW-2 (**Table 1**). Groundwater is generally encountered from 21 feet bls (monitoring well MW-1) to 37 feet bls (RW-2). The direction of groundwater flow is generally to the southwest **(Figure 3**).

1.3 Regulated Substances

Groundwater remediation and monitoring began at the site in 1995 and is currently ongoing. Based on the groundwater data, the current constituents of concern include PCE and it’s degradation products trichloroethene (TCE) and cis-1,2-dichloroethene (cis-1,2 DCE). These COCs were detected in groundwater at the site and are summarized on **Table 2**. The site soils have been certified to meet the Type I Risk Reduction Standards.

1.4 Known or Suspected Source Areas

In 1989 Emory University purchased property at the intersection of North Decatur and Burlington Roads in Atlanta, Georgia. A subsequent site assessment determined the property had likely been impacted by a dry cleaning operation that had previously operated at the property prior to Emory's purchase. An automotive repair garage was also located on the property. The assessment detected PCE in the property soils and groundwater. The dry cleaner building and automotive garage building were subsequently removed during the redevelopment of the property and construction of a six story math building. The former dry cleaners were located in front of the current location of the North Decatur Road math building in the vicinity of recovery well RW-2. The footprint of the former strip mall, including the dry cleaners, is shown on **Figure 2**.

1.5 Contaminant Migration Pathways

An evaluation of the contaminant migration pathways indicates the following potential pathways:

- horizontal and vertical migration through the soil to the groundwater; and
- horizontal and vertical migration within shallow groundwater, with transport driven by hydraulic properties of the local groundwater flow system, and the direction of groundwater flow as influenced by the active pump and treat remediation system.

1.6 Soil and Groundwater Impacts

The extent of groundwater impacts has been complied for this report. The groundwater flow direction is shown on **Figure 3**. The impacts to groundwater are summarized on **Table 2** and shown on **Figure 4** (October 2014 sample results) in plan view and in cross-sectional view on **Figure 6** (August 2014 sample results) and **Figure 7** (October 2014 sample results). The line of section for these maps is provided on **Figure 5** (Cross Section Location Map). The laboratory reports for the 2014 sampling events are included in **Appendix A**.

1.7 Receptor Evaluation

The Site is a highly developed commercial property that is nearly completely covered by buildings, pavement, and landscaped areas **(Figure 2)**. Except for a few landscaped areas, the Site is covered by a 5-story building, 7-story parking garage or pavement. Groundwater from beneath the site flows toward the southwest. There are several large on-site green spaces along North Decatur Road. No surface water bodies are located on the site. The nearest surface water body is an unnamed tributary of Lullwater Creek which is located approximately 1,500 feet due south of the site**.**

A schematic of the CSM is provided in **Figure 6**. As shown in the schematic, bedrock is overlain by an unconsolidated layer of residual soil. Groundwater occurs above bedrock at the property. It is anticipated that the Site will continue to be used as an educational institution in the future. A significant investment has recently been made on property improvements, including a 5-story science building and 7-story parking garage. Recently, Georgia Power installed a high power line on the site and future improvements include the widening of North Decatur Road. Therefore, the CSM assumes the same receptors will continue to be present in the future.

An evaluation of potential receptors was conducted. Potential future human receptors for the Site include current and future on-site workers, students, faculty, visitors, trespassers, utility workers, and future construction workers. Potential receptors may be exposed to on-site soil, but the Site soils meet the Type I Risk Reduction Standards.

A literature review of available information from the U.S. Fish and Wildlife Service (FWS) and Georgia Department of Natural Resources (DNR) was conducted to gather information pertaining to the potential presence of federally- or state-protected species or their habitats in Dekalb County. None of these species have been identified at the Site. Two endangered and two threatened animal species were reported by the Georgia DNR as potentially occurring in DeKalb County; however these species are all aquatic fishes and invertebrates, and aquatic habitats are not present on the Site. The FWS lists two endangered plant species in DeKalb County, the dwarf sumac and the black-spored quillwort, and one threatened plant species (little amphianthus). None of the species listed have been identified at the Site. Therefore, no endangered and threatened fauna or animal species would be exposed to the constituents of potential concern (COPC).

The nearest surface water body is Lullwater Creek which is located approximately 2,500 feet southwest in the downgradient flow direction. The possibility of future receptors ingesting or contacting surface water that is impacted with the COPCs is considered remote since the concentrations of the COPCs would be reduced to below detection limits by dispersion, advection, and attenuation processes before they reach the Lullwater Creek. The results of the BIOCHLOR groundwater model included in **Appendix C** and the most recent sampling results, indicate that the PCE plume should currently be reduced to below the Maximum Contaminant Level of 5 micrograms per liter (ug/L) at a distance of about 700 feet southwest of the intersection of Burlington Road and North Decatur Road.

The COCs are present in dissolved phase in groundwater and can migrate through the subsurface to reach potential receptors. Groundwater beneath the facility generally flows toward the southwest **(Figure 3)**. Future exposure to Site groundwater will be restricted by covenants barring the installation of wells for any purpose. Therefore, the possibility of future receptors ingesting groundwater from a water-supply well or an irrigation well installed on the Site is considered remote.

Groundwater from the Site or within a one-half mile radius of the site is not currently used as a potable water supply or for irrigation. Future exposure to the Site groundwater will be restricted by covenants barring the installation of wells for any purpose. An updated water well survey was performed by GA EPD in November 2013. GA EPD did not identify any groundwater users within a ½-mile radius of the site. Furthermore, an environmental covenant will be prepared and executed pursuant to the Georgia Uniform Environmental Covenants Act, OCGA § 44-16-1, et seq to limit groundwater use and/or use limitations to protect human health and the environment.

The current and future on-site workers, students, faculty, visitors, trespassers, utility workers, and future construction workers would not be exposed to on-site groundwater. Future exposure to groundwater by on-site workers and customers will be eliminated by the restrictive covenant that will be placed on the property, forbidding the use of groundwater for drinking, irrigation, or other purposes. Where the groundwater plume is covered by enclosed buildings or other structures, current and future on-site workers, students, faculty, visitors, trespassers, utility workers and future construction workers could potentially be exposed to contaminants from the groundwater via the vapor intrusion pathway, although as described in **Appendix B,** vapor intrusion modeling utilizing the Ettinger Vapor Intrusion Model shows there is no exposure.

Utility workers will not have direct contact (dermal or ingestion) with site groundwater as the depth to groundwater (21 to 37 feet) is greater than the depth of utility excavations (approximately 5 feet). However, although no construction plans currently exist, hypothetical future construction workers may have contact with groundwater if the construction activities include deep foundation work and dewatering. Utility workers in trenches may be exposed to COPCs in the vapor phase. It should be noted, however, that utility workers will be on site at any one time for only short durations (typically, a day or days) and will have only sub-chronic exposure to COPCs. It is not appropriate to use chronic toxicity values (reference doses and slope factors) to evaluate sub-chronic exposure for COPCs; instead, short-term exposure and risks to the utility worker will be managed by Occupational Safety and Health Administration (OSHA) requirements.

TABLES

Table 1

Well Construction Details and Water Level Measurements
2012 Corrective Action Effectiveness Report
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well	Top of Casing Elevation (feet)	Well Depth (feet bls)	Screened Interval (feet bls)	6/27/08 Depth To Water (feet)	6/27/08 Groundwater Elevation (feet, msl)	3/11/09 Depth To Water (feet)	3/11/09 Groundwater Elevation (feet, msl)	6/30/09 Depth To Water (feet)	6/30/09 Groundwater Elevation (feet, msl)	1/22/10 Depth To Water (feet)	1/22/10 Groundwater Elevation (feet, msl)	7/8/10 Depth To Water (feet)	7/8/10 Groundwater Elevation (feet, msl)	6/27/11 Depth To Water (feet)	6/27/11 Groundwater Elevation (feet, msl)	01/04/12 Depth To Water (feet)	01/04/12 Groundwater Elevation (feet, msl)	06/26/12 Depth To Water (feet)	06/26/12 Groundwater Elevation (feet, msl)	10/14/2014 Depth to Water (feet)	10/14/14 Groundwater Elevation (feet, msl)
RW-1	968.90	60.0	40-60	55.65	913.25	55.60	913.30	55.65	913.25	54.5	914.40	54.2	914.70	35.60	933.30	NG	-	NG	-	36.46	932.44
RW-2	970.34	60.0	40-60	57.5	912.84	58.4	911.94	57.5	912.84	56.2	914.14	38.9	931.44	40.50	929.84	NG	-	NG	-	37.59	932.75
RW-3	968.35	55.0	35-55	54.3	914.05	54.97	913.38	54.3	914.05	56.75	911.60	56.5	911.85	35.40	932.95	NG	-	NG	-	32.75	935.60
RW-4	968.63	55.0	35-55	42.8	925.83	42.3	926.33	42.8	925.83	40.17	928.46	40.35	928.28	36.43	932.20	38.18	930.45	39.47	929.16	34.86	933.77
RW-5	962.64	60.0	50-60	40.92	921.72	38.9	923.74	40.92	921.72	37.3	925.34	24.74	937.90	35.45	927.19	37.43	925.21	38.22	924.42	35.52	927.12
MW-1	954.59	45.0	35-45	29.69	924.90	27.1	927.49	29.69	924.90	25.6	928.99	23.29	931.30	23.10	931.49	27.54	927.05	27.85	926.74	21.73	932.86
MW-2	968.82	42.0	32-42	38.48	930.34	34.7	934.12	38.48	930.34	33.65	935.17	30.72	938.10	32.10	936.72	35.16	933.66	36.40	932.42	30.43	938.39
MW-4	954.35	48.0	38-48	37.39	916.96	35.6	918.75	37.39	916.96	33.5	920.85	30.8	923.55	32.15	922.20	34.70	919.65	35.68	918.67	35.62	918.73
TP-1	968.86	45.00	35-45	40.92	927.94	43.5	925.36	40.92	927.94	43.25	925.61	44.1	924.76	32.18	936.68	NM		NM		NM	
TP-2	963.36	40.0	30-40	Dry		Dry		Dry		Dry		Dry		NM		NM		NM		NM	
TP-3	958.70	40.0	30-40	Damaged		Damaged		Damaged		Damaged		Damaged		Damaged		NM		NM		NM	
TP-4	966.30	45.0	35-45	Dry		Dry		Dry		Dry		Dry		NM		NM		NM		NM	
TP-5	956.27	58.0	34-58	34.7	921.57	34.70	921.57	34.70	921.57	35.5	920.77	36.25	920.02	28.20	928.07	NM		NM		NM	

NM - Not measured

NG - Not gauged due to pump and wiring obstructing well

Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-1	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA

Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-2	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	19	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA

Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-3/RW-5*	02/05/01	65	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	78	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	89.2	BRL	BRL	BRL	BRL	BRL	NA
	02/14/02	90	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	66.6	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	43.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	75	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	53	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	56	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	47	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	40	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	57	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	66	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	50	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	14	BRL	BRL	120	BRL	BRL	NA
	03/01/08	39	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	44	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	40	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	66	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	71	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	73	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	160	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	190	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	200	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	230	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	150	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	180	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	190	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	160	BRL	BRL	BRL	BRL	BRL	NA

Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-4	02/05/01	3.4	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	4.0	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	3.8	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	4.8	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	3.0	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	4.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	4.0	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	3.7	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	5.0	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	8.7	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	11	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	14	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	15	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	14	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	20	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	29	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	29	BRL	BRL	BRL	BRL	BRL	NA

Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-1	Jun-98	8.4	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	BRL	NA	NA	NA	NA	NA	NA
	07/09/99	12.4	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	20	NA	NA	NA	NA	NA	NA
	07/07/00	56.4	NA	NA	NA	NA	NA	NA
	02/05/01	59.0	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	85.4	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	107	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	144	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	170	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	200	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	200	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	190	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	190	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	140	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	160	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	110	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	160	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	90	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	130	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	99	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	120	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	170	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	200	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	180	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	130	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	120	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	110	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	57	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	160	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA

Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-2	Jun-98	127	NA	NA	NA	NA	NA	NA
	Jun-98	150	NA	NA	NA	NA	NA	NA
	01/08/99	270	NA	NA	NA	NA	NA	NA
	07/09/99	55	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	197	NA	NA	NA	NA	NA	NA
	07/07/00	382	NA	NA	NA	NA	NA	NA
	02/05/01	549	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	119	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	710	2.2	NS	NS	NS	NS	NS
	01/29/03	138	2.1	BRL	1.5	BRL	BRL	NA
	06/19/03	630	1.0	BRL	2.0	BRL	BRL	NA
	01/15/04	890	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	650	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	490	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	860	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	970	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	1,000	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	440	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	780	5.7	BRL	8.1	BRL	BRL	NA
	03/01/08	300	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	460	120	BRL	190	BRL	BRL	BRL
	03/11/09	NS	NS	NS	NS	NS	NS	NS
	06/30/09	NS	NS	NS	NS	NS	NS	NS
	01/22/10	NS	NS	NS	NS	NS	NS	NS
	07/08/10	1,200	13	BRL	27	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	790	9.5	BRL	25	BRL	BRL	NA
	06/27/12	570	BRL	BRL	11	BRL	BRL	NA
	01/10/13	37	BRL	BRL	90	BRL	BRL	NA
	06/27/13	490	BRL	BRL	12	BRL	BRL	NA
	01/21/14	700	7.4	BRL	20	BRL	BRL	NA
	08/04/14	670	6.9	BRL	18	BRL	BRL	NA
	10/15/14	550	7.5	BRL	24	BRL	BRL	NA

Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-3	Jun-98	6.9	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	6.8	NA	NA	NA	NA	NA	NA
	07/09/99	8.8	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	8.0	NA	NA	NA	NA	NA	NA
	07/07/00	35.9	NA	NA	NA	NA	NA	NA
	02/05/01	39	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27.1	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	27.7	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	31.5	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	55.4	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	58	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	57	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	71	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	38	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	91	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	53	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	70	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	33	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	71	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	38	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	67	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	55	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	71	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	84	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	130	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	NS	NS	NS	NS	NS	NS	NS
	06/27/12	50	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	54	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	85	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	37	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	62	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA

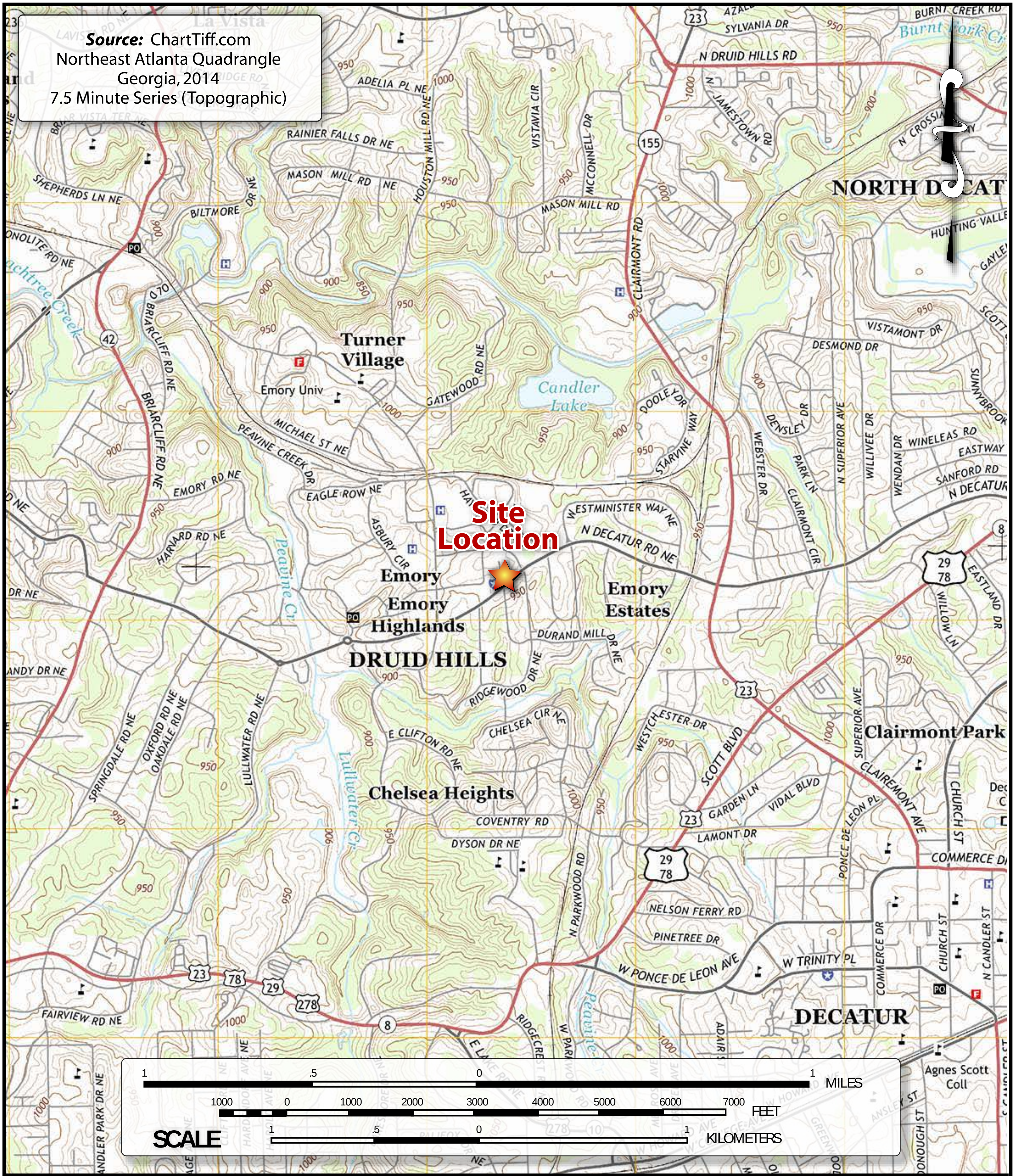
Table 2
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-4**	Jun-98	19	NA	NA	NA	NA	NA	NA
	Jun-98	25	NA	NA	NA	NA	NA	NA
	01/08/99	57	NA	NA	NA	NA	NA	NA
	07/09/99	225	NA	NA	NA	NA	NA	NA
	07/27/99	187	NA	NA	NA	NA	NA	NA
	01/06/00	128	NA	NA	NA	NA	NA	NA
	07/07/00	189	NA	NA	NA	NA	NA	NA
	02/05/01	174	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	253	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	NS	NS	NS	NS	NS	NS	NS
	01/29/03	NS	NS	NS	NS	NS	NS	NS
	06/19/03	NS	NS	NS	NS	NS	NS	NS
	01/15/04	NS	NS	NS	NS	NS	NS	NS
	06/18/04	NS	NS	NS	NS	NS	NS	NS
	01/28/05	NS	NS	NS	NS	NS	NS	NS
	07/01/05	NS	NS	NS	NS	NS	NS	NS
	02/01/06	NS	NS	NS	NS	NS	NS	NS
	06/20/06	980	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	540	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	640	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	370	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	380	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	640	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	220	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	360	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	420	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	270	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	160	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	93	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	68	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	160	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	180	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	250	BRL	BRL	BRL	BRL	BRL	NA

Notes:

µg/L – micrograms per liter or parts p
BRL – Not detected above laboratory method reporting limits
NA – Not analyzed
NS – Not sampled
Monitoring wells MW-1, -2, -3, and -4 were installed between December 2000 and January 2001
* – MW-3 was converted to recovery well RW-5 and became operational on August 6, 2001
** – RW-4 was converted to a monitoring well on June 14, 2006

FIGURES


Source: ChartTiff.com
Northeast Atlanta Quadrangle
Georgia, 2014
7.5 Minute Series (Topographic)

CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

DATE: **December 2014**

SCALE: **1:24,000**

FILE: H:\proj\EmoryUniversity\December2014\EmoryTopoMap.ai

DESIGNED BY:

DRAWN BY: **J. Gross**

CHECKED BY: **B. Jacobs**

TITLE:

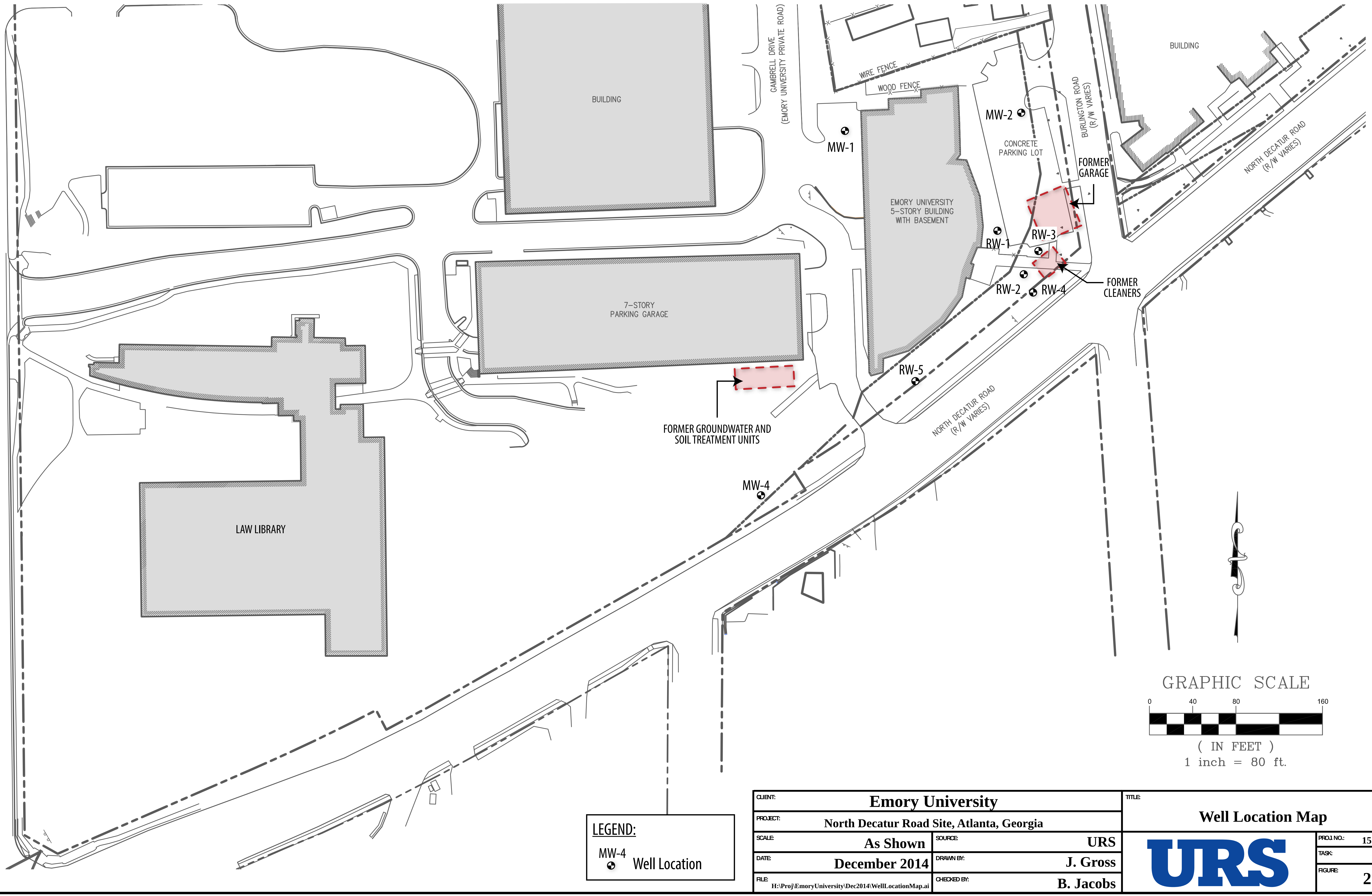
Site Location Map

URS

PROJ NO.: 15263255

TASK: 01150

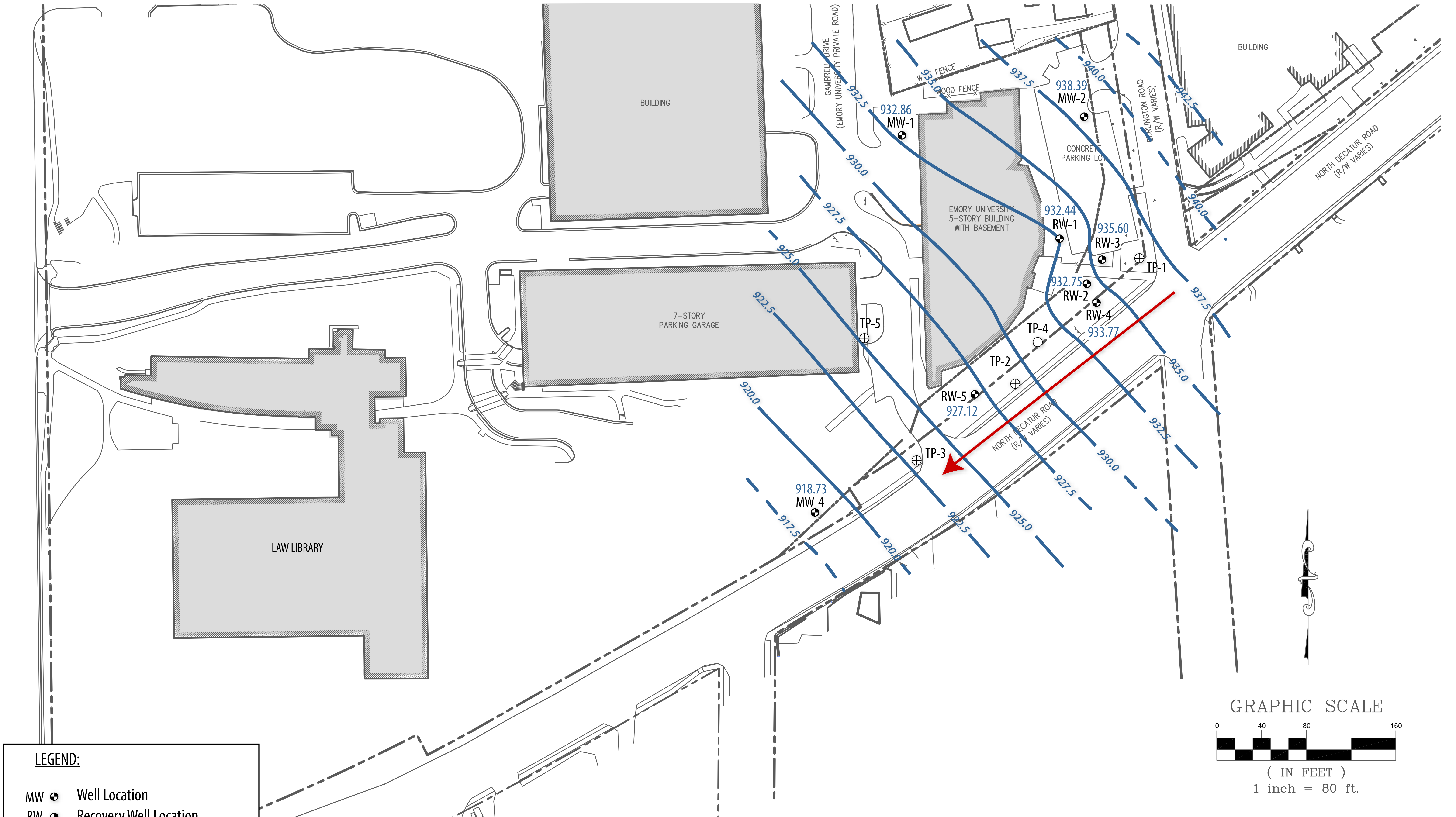
FIGURE: 1



LEGEND:

MW-4 ● Well Location

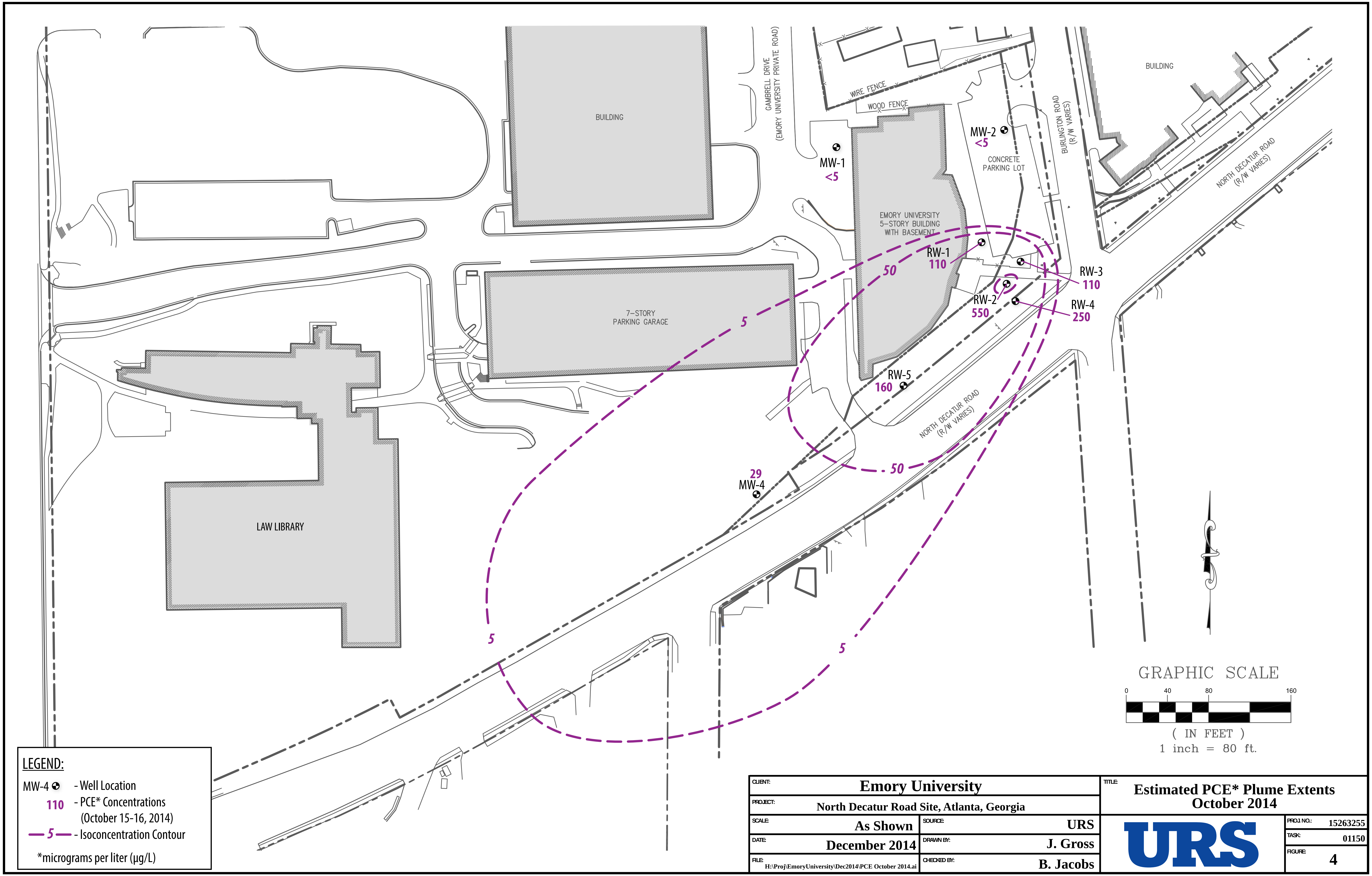
CLIENT:	Emory University
PROJECT:	North Decatur Road Site, Atlanta, Georgia
SCALE:	As Shown
SOURCE:	URS
DATE:	December 2014
DRAWN BY:	J. Gross
FILE:	H:\Proj\EmoryUniversity\Dec2014\WellLocationMap.ai
CHECKED BY:	B. Jacobs
TITLE:	Well Location Map
PROJ NO.:	15263255
TASK:	01150
FIGURE:	2



LEGEND:

MW ●	Well Location
RW ●	Recovery Well Location
TP ⊕	Temporary Piezometer
919.16	Water Elevation (feet)
→	Direction of Groundwater Flow

CLIENT: Emory University		TITLE: Potentiometric Map October 14, 2014	
PROJECT: North Decatur Road Site, Atlanta, Georgia			
SCALE: As Shown	SOURCE: URS	URS	PROJ NO.: 15263255
DATE: December 2014	DRAWN BY: J. Gross		TASK: 01150
FILE: H:\Proj\EmoryUniversity\Dec2014\WellLocationMap.ai	CHECKED BY: B. Jacobs		FIGURE: 3



LEGEND:

MW-4 ● - Well Location

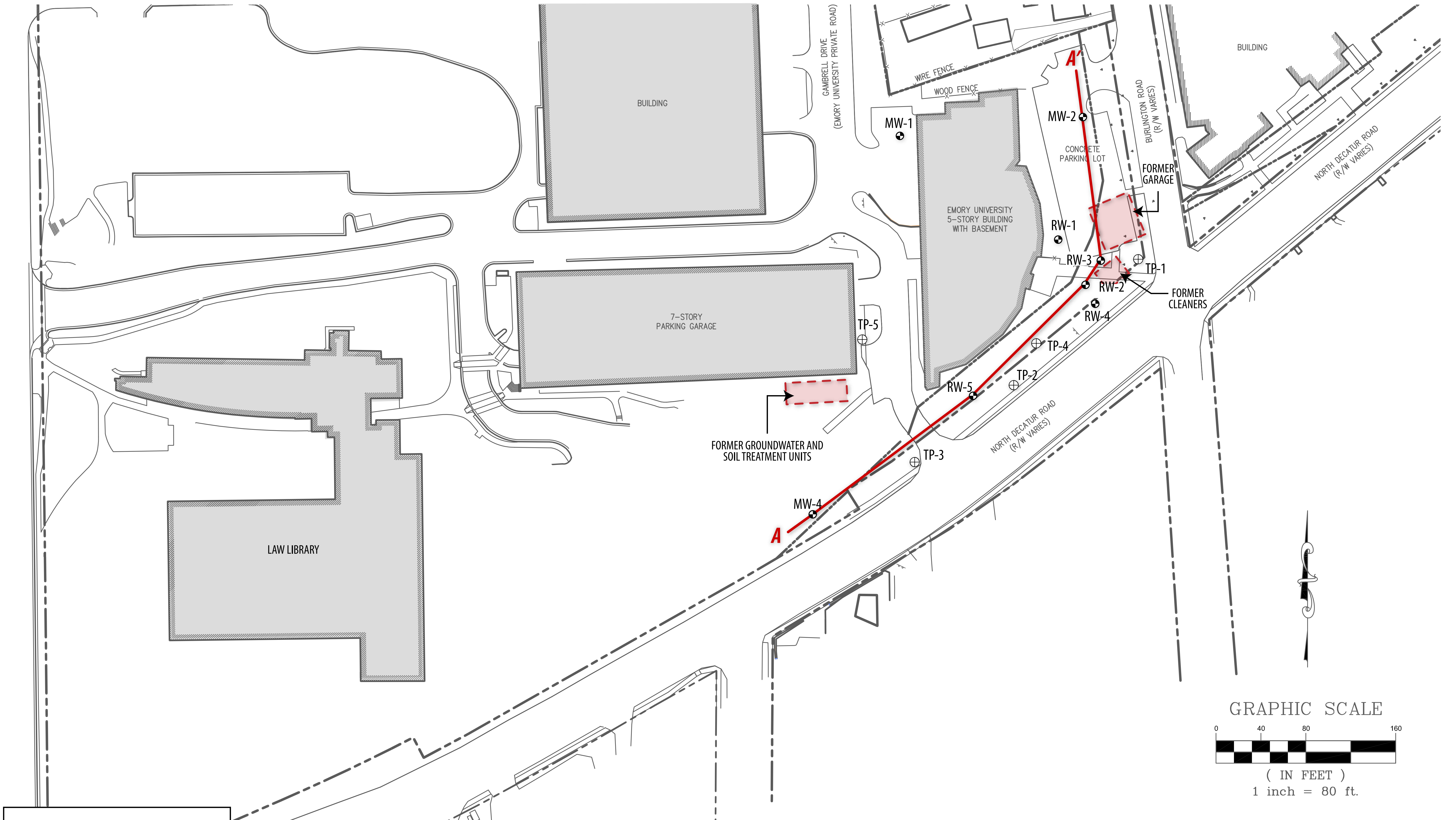
110 - PCE* Concentrations (October 15-16, 2014)

— 5 — - Isoconcentration Contour

*micrograms per liter (µg/L)

CLIENT:	Emory University
PROJECT:	North Decatur Road Site, Atlanta, Georgia
SCALE:	As Shown
SOURCE:	URS
DATE:	December 2014
DRAWN BY:	J. Gross
FILE:	H:\Proj\EmoryUniversity\Dec2014\PCE October 2014.ai
CHECKED BY:	B. Jacobs
TITLE:	Estimated PCE* Plume Extents October 2014
PROJ NO.:	15263255
TASK:	01150
FIGURE:	4

URS



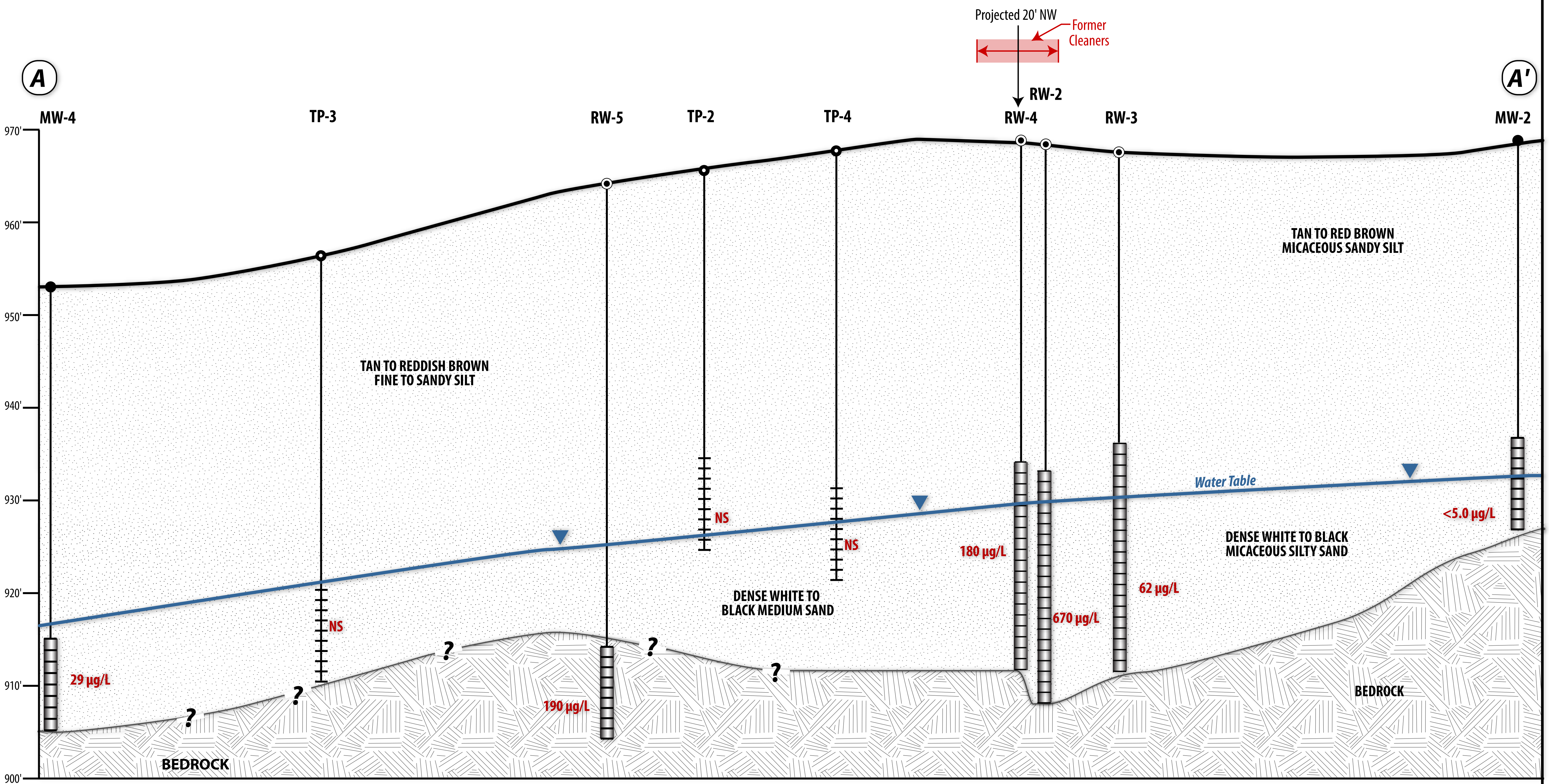
LEGEND:

MW ● Well Location
RW ● Recovery Well Location
TP ⊕ Temporary Piezometer

CLIENT: **Emory University**	TITLE: **Cross Section Location Map**
PROJECT: **North Decatur Road Site, Atlanta, Georgia**	
SCALE: **As Shown**	SOURCE: **URS**
DATE: **December 2014**	DRAWN BY: **J. Gross**
FILE: H:\Proj\EmoryUniversity\Dec2014\XSectionLocationMap.ai	CHECKED BY: **B. Jacobs**

URS

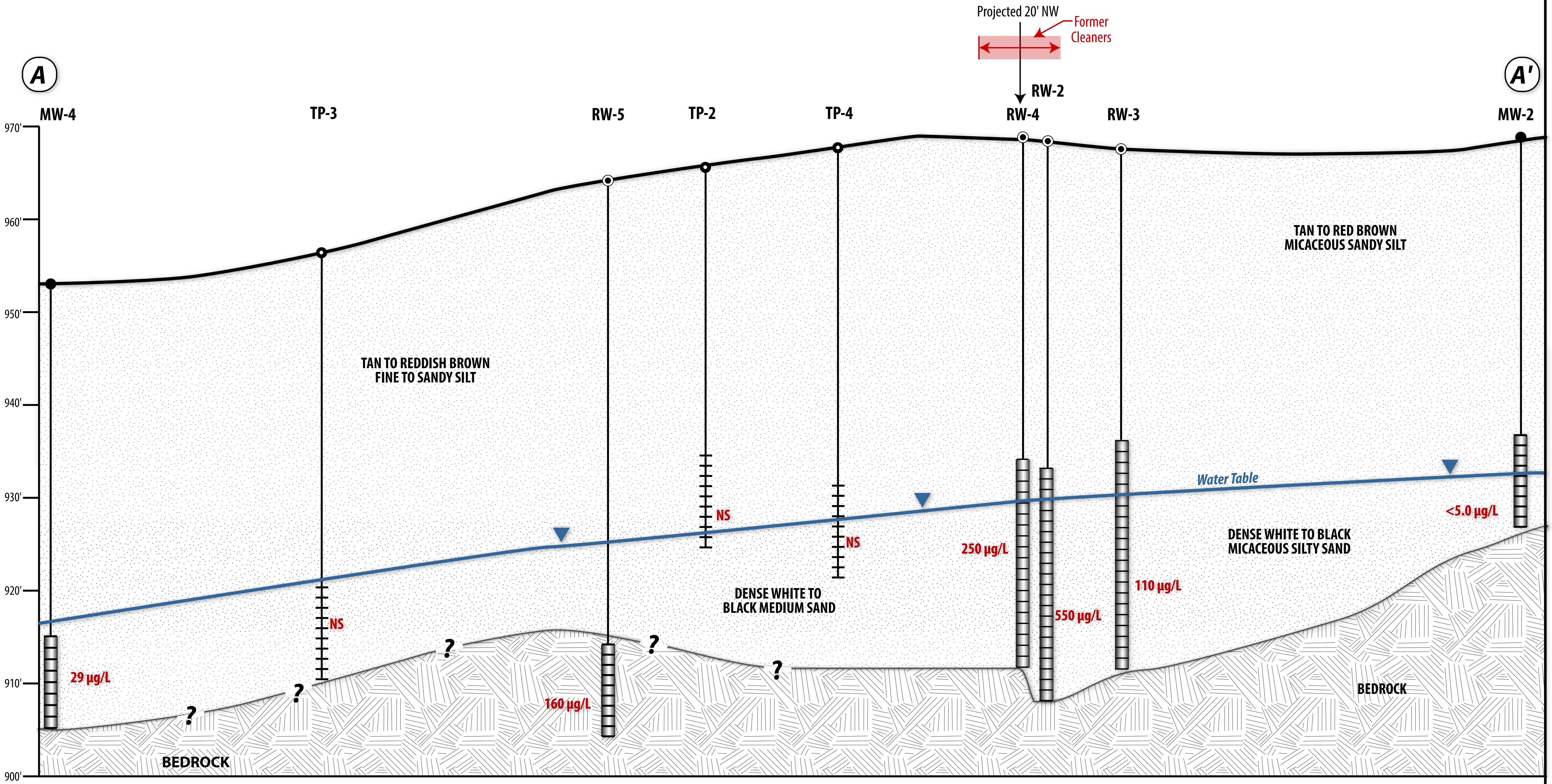
PROJ NO.: 15263255
TASK: 01150
FIGURE: 5

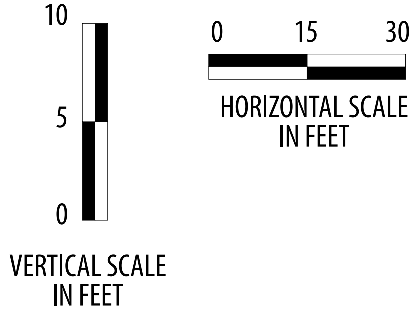


MW - Monitoring Well
TP - Temporary Piezometer
RW - Recovery Well (Except RW-4 which was converted to a Monitoring Well)
NS - Not Sampled

PCE Concentrations from October 2014 Semi-Annual Sampling
Water Table Elevations Measured on October 14, 2014
All units are in micrograms per liter (µg/L)

CLIENT: Emory University
PROJECT: North Decatur Road Site, Atlanta, Georgia
SCALE: Horizontal: 1" = 30' Vertical: 1" = 10'
DATE: December 2014
DRAWN BY: J. Gross
FILE: H:\Proj\EmoryUniversity\Dec2014\PCE CrossSect Sug14.ai
CHECKED BY: B. Jacobs
TITLE: PCE in Groundwater in Cross Section A-A', August 2014
URS
PROJ NO.: 15263255
TASK: 01150
FIGURE: 6





MW - Monitoring Well
TP - Temporary Piezometer
RW - Recovery Well (Except RW-4 which was converted to a Monitoring Well)
NS - Not Sampled

PCE Concentrations from October 2014 Semi-Annual Sampling
Water Table Elevations Measured on October 14, 2014
All units are in micrograms per liter (µg/L)

CLIENT: Emory University
PROJECT: North Decatur Road Site, Atlanta, Georgia
SCALE: Horizontal: 1" = 30' Vertical: 1" = 10'
DATE: December 2014
DRAWN BY: J. Gross
FILE: H:\Proj\EmoryUniversity\Dec2014\PCE CrossSect Oct14.ai
CHECKED BY: B. Jacobs

TITLE:
PCE in Groundwater in Cross Section A-A', October 2014

URS

PROJ NO.: 15263255
TASK: 01150
FIGURE: 7

APPENDIX A

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

October 24, 2014

Brent Jacobs
URS
400 Northpark Town Center
Atlanta GA 30328

TEL: (678) 808-8915
FAX: (678) 808-8400

RE: Emory-N. Decatur Rd

Dear Brent Jacobs: Order No: 1410G04

Analytical Environmental Services, Inc. received 10 samples on 10/16/2014 2:17:00 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 07/01/14-06/30/15.

-AIHA-LAP, LLC Laboratory ID: 100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) Direct Examination, effective until 09/01/15.

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.

Tara Esbeck

Tara Esbeck
Project Manager

AES ANALYTICAL ENVIRONMENTAL SERVICES, INC
3080 Presidential Drive, Atlanta GA 30340-3704
TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

CHAIN OF CUSTODY

Work Order: 1410G04

Date: 10/14/14 Page 1 of

COMPANY: URS Corp

ADDRESS: 1000 Abernathy Rd NE
Suite 900
Atlanta GA 30328

PHONE: 678-808-8975

FAX: 678-808-8400

SAMPLED BY: B. Hilliard / URS

SIGNATURE:

#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	Grab	Composite	Matrix (See codes)	*8260	REMARKS	No # of Containers
1	MW-2	10/14/14	1633	X		GW	X		2
2	MW-1	10/15/14	0900	X		GW	X		2
3	MW-4	10/15/14	1053	X		GW	X		2
4	RW-1	10/15/14	1353	X		GW	X		2
5	RW-3	10/15/14	1707	X		GW	X		2
6	RW-4	10/15/14	1954	X		GW	X		2
7	RW-5	10/16/14	1052	X		GW	X		2
8	RW-2	10/16/14	1307	X		GW	X		2
9	DUP-1	10/16/14	—	X		GW	X		2
10	Trip Blank	—	—			W	X		2
11									
12									
13									
14									

ANALYSIS REQUESTED

PRESERVATION (See codes)

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

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1:	10/16/14 1417	1: Lataya Reeves	10/16/14 2:17
2:		2:	
3:		3:	

PROJECT INFORMATION

PROJECT NAME: Emory - N. Decatur Rd

PROJECT #: 15263255.01150

SITE ADDRESS: 1784 N. Decatur Rd
Decatur GA

SEND REPORT TO: Brent. Jacobs@urs.com

INVOICE TO:
(IF DIFFERENT FROM ABOVE)

QUOTE #: PO#:

RECEIPT

Total # of Containers: 20

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:
*Only PCE, TCE, 1,1-DCE, cis-1,2-DCE, Trans-1,2-DCE and Vinyl chloride.

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: 24-Oct-14

Client:	URS	**Client Sample ID:**	MW-2
Project Name:	Emory-N. Decatur Rd	**Collection Date:**	10/14/2014 4:33:00 PM
Lab ID:	1410G04-001	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:02	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:02	NP
Tetrachloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:02	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:02	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:02	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 12:02	NP
Surr: 4-Bromofluorobenzene	92.4	66.2-120		%REC	198050	1	10/23/2014 12:02	NP
Surr: Dibromofluoromethane	100	79.5-121		%REC	198050	1	10/23/2014 12:02	NP
Surr: Toluene-d8	97.1	77-117		%REC	198050	1	10/23/2014 12:02	NP

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

Client:	URS	**Client Sample ID:**	MW-1
Project Name:	Emory-N. Decatur Rd	**Collection Date:**	10/15/2014 9:00:00 AM
Lab ID:	1410G04-002	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:29	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:29	NP
Tetrachloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:29	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:29	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:29	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 12:29	NP
Surr: 4-Bromofluorobenzene	91.9	66.2-120		%REC	198050	1	10/23/2014 12:29	NP
Surr: Dibromofluoromethane	99.8	79.5-121		%REC	198050	1	10/23/2014 12:29	NP
Surr: Toluene-d8	96.5	77-117		%REC	198050	1	10/23/2014 12:29	NP

Analytical Environmental Services, Inc

Date: 24-Oct-14

Client:	URS	**Client Sample ID:**	MW-4
Project Name:	Emory-N. Decatur Rd	**Collection Date:**	10/15/2014 10:53:00 AM
Lab ID:	1410G04-003	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:55	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:55	NP
Tetrachloroethene	29	5.0		ug/L	198050	1	10/23/2014 12:55	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:55	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:55	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 12:55	NP
Surr: 4-Bromofluorobenzene	94.3	66.2-120		%REC	198050	1	10/23/2014 12:55	NP
Surr: Dibromofluoromethane	101	79.5-121		%REC	198050	1	10/23/2014 12:55	NP
Surr: Toluene-d8	95.6	77-117		%REC	198050	1	10/23/2014 12:55	NP

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

Client:	URS	**Client Sample ID:**	RW-1
Project Name:	Emory-N. Decatur Rd	**Collection Date:**	10/15/2014 1:53:00 PM
Lab ID:	1410G04-004	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:22	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:22	NP
Tetrachloroethene	110	5.0		ug/L	198050	1	10/23/2014 13:22	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:22	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:22	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 13:22	NP
Surr: 4-Bromofluorobenzene	93.1	66.2-120		%REC	198050	1	10/23/2014 13:22	NP
Surr: Dibromofluoromethane	99.3	79.5-121		%REC	198050	1	10/23/2014 13:22	NP
Surr: Toluene-d8	97.2	77-117		%REC	198050	1	10/23/2014 13:22	NP

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: 24-Oct-14

Client:	URS	**Client Sample ID:**	RW-3
Project Name:	Emory-N. Decatur Rd	**Collection Date:**	10/15/2014 5:07:00 PM
Lab ID:	1410G04-005	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:48	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:48	NP
Tetrachloroethene	110	5.0		ug/L	198050	1	10/23/2014 13:48	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:48	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:48	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 13:48	NP
Surr: 4-Bromofluorobenzene	89	66.2-120		%REC	198050	1	10/23/2014 13:48	NP
Surr: Dibromofluoromethane	97.1	79.5-121		%REC	198050	1	10/23/2014 13:48	NP
Surr: Toluene-d8	95.8	77-117		%REC	198050	1	10/23/2014 13:48	NP

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: 24-Oct-14

Client: URS
Project Name: Emory-N. Decatur Rd
Lab ID: 1410G04-006

Client Sample ID: RW-4
Collection Date: 10/15/2014 7:54:00 PM
Matrix: Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:36	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:36	NP
Tetrachloroethene	250	50		ug/L	198050	10	10/23/2014 14:14	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:36	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 12:36	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 12:36	NP
Surr: 4-Bromofluorobenzene	93	66.2-120		%REC	198050	1	10/23/2014 12:36	NP
Surr: 4-Bromofluorobenzene	93.8	66.2-120		%REC	198050	10	10/23/2014 14:14	NP
Surr: Dibromofluoromethane	103	79.5-121		%REC	198050	1	10/23/2014 12:36	NP
Surr: Dibromofluoromethane	104	79.5-121		%REC	198050	10	10/23/2014 14:14	NP
Surr: Toluene-d8	101	77-117		%REC	198050	1	10/23/2014 12:36	NP
Surr: Toluene-d8	102	77-117		%REC	198050	10	10/23/2014 14:14	NP

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

Client:	URS	**Client Sample ID:**	RW-5
Project Name:	Emory-N. Decatur Rd	**Collection Date:**	10/16/2014 10:52:00 AM
Lab ID:	1410G04-007	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:00	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:00	NP
Tetrachloroethene	160	5.0		ug/L	198050	1	10/23/2014 13:00	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:00	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:00	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 13:00	NP
Surr: 4-Bromofluorobenzene	93.2	66.2-120		%REC	198050	1	10/23/2014 13:00	NP
Surr: Dibromofluoromethane	103	79.5-121		%REC	198050	1	10/23/2014 13:00	NP
Surr: Toluene-d8	101	77-117		%REC	198050	1	10/23/2014 13:00	NP

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

Client:	URS	**Client Sample ID:**	RW-2
Project Name:	Emory-N. Decatur Rd	**Collection Date:**	10/16/2014 1:07:00 PM
Lab ID:	1410G04-008	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:25	NP
cis-1,2-Dichloroethene	24	5.0		ug/L	198050	1	10/23/2014 13:25	NP
Tetrachloroethene	550	50		ug/L	198050	10	10/23/2014 14:39	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:25	NP
Trichloroethene	7.5	5.0		ug/L	198050	1	10/23/2014 13:25	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 13:25	NP
Surr: 4-Bromofluorobenzene	93.6	66.2-120		%REC	198050	1	10/23/2014 13:25	NP
Surr: 4-Bromofluorobenzene	92.7	66.2-120		%REC	198050	10	10/23/2014 14:39	NP
Surr: Dibromofluoromethane	103	79.5-121		%REC	198050	10	10/23/2014 14:39	NP
Surr: Dibromofluoromethane	104	79.5-121		%REC	198050	1	10/23/2014 13:25	NP
Surr: Toluene-d8	102	77-117		%REC	198050	1	10/23/2014 13:25	NP
Surr: Toluene-d8	104	77-117		%REC	198050	10	10/23/2014 14:39	NP

Client: URS
Project Name: Emory-N. Decatur Rd
Lab ID: 1410G04-009

Client Sample ID: DUP-1
Collection Date: 10/16/2014
Matrix: Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:50	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:50	NP
Tetrachloroethene	160	5.0		ug/L	198050	1	10/23/2014 13:50	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:50	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 13:50	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 13:50	NP
Surr: 4-Bromofluorobenzene	92	66.2-120		%REC	198050	1	10/23/2014 13:50	NP
Surr: Dibromofluoromethane	103	79.5-121		%REC	198050	1	10/23/2014 13:50	NP
Surr: Toluene-d8	102	77-117		%REC	198050	1	10/23/2014 13:50	NP

Qualifiers:

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

Analytical Environmental Services, Inc **Date:** 24-Oct-14

Client: URS
Project Name: Emory-N. Decatur Rd
Lab ID: 1410G04-010

Client Sample ID: TRIP BLANK
Collection Date: 10/16/2014
Matrix: Aqueous

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 11:36	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 11:36	NP
Tetrachloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 11:36	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 11:36	NP
Trichloroethene	BRL	5.0		ug/L	198050	1	10/23/2014 11:36	NP
Vinyl chloride	BRL	2.0		ug/L	198050	1	10/23/2014 11:36	NP
Surr: 4-Bromofluorobenzene	92.1	66.2-120		%REC	198050	1	10/23/2014 11:36	NP
Surr: Dibromofluoromethane	98.5	79.5-121		%REC	198050	1	10/23/2014 11:36	NP
Surr: Toluene-d8	92.3	77-117		%REC	198050	1	10/23/2014 11:36	NP

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 URS   Work Order Number 1410604

Checklist completed by   10/16/14
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? (0°≤6°C)* [✓ Yes] No __

Cooler #1 2.1 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.

\\Aes_server\I\Sample Receipt\My Documents\COCs and pH Adjustment Sheet\Sample_Cooler_Recipt_Checklist_Rev1.rtf

Client:	URS
Project Name:	Emory-N. Decatur Rd
Workorder:	1410G04

ANALYTICAL QC SUMMARY REPORT

BatchID: **198050**

Sample ID: **MB-198050** Client ID: Units: **ug/L** Prep Date: **10/21/2014** Run No: **278317**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **198050** Analysis Date: **10/21/2014** Seq No: **5882161**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	BRL	5.0									
cis-1,2-Dichloroethene	BRL	5.0									
Tetrachloroethene	BRL	5.0									
trans-1,2-Dichloroethene	BRL	5.0									
Trichloroethene	BRL	5.0									
Vinyl chloride	BRL	2.0									
Surr: 4-Bromofluorobenzene	48.18	0	50.00		96.4	66.2	120				
Surr: Dibromofluoromethane	59.60	0	50.00		119	79.5	121				
Surr: Toluene-d8	48.49	0	50.00		97.0	77	117				

Sample ID: **LCS-198050** Client ID: Units: **ug/L** Prep Date: **10/21/2014** Run No: **278317**
SampleType: **LCS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **198050** Analysis Date: **10/21/2014** Seq No: **5882160**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	57.92	5.0	50.00		116	63.1	140				
Trichloroethene	54.10	5.0	50.00		108	71.2	135				
Surr: 4-Bromofluorobenzene	47.98	0	50.00		96.0	66.2	120				
Surr: Dibromofluoromethane	58.09	0	50.00		116	79.5	121				
Surr: Toluene-d8	47.42	0	50.00		94.8	77	117				

Sample ID: **1410E71-043AMS** Client ID: Units: **ug/L** Prep Date: **10/21/2014** Run No: **278393**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **198050** Analysis Date: **10/22/2014** Seq No: **5883799**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	57.93	5.0	50.00		116	60.2	159				
Trichloroethene	55.33	5.0	50.00		111	70.1	144				
Surr: 4-Bromofluorobenzene	47.08	0	50.00		94.2	66.2	120				
Surr: Dibromofluoromethane	46.67	0	50.00		93.3	79.5	121				

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: URS
Project Name: Emory-N. Decatur Rd
Workorder: 1410G04

ANALYTICAL QC SUMMARY REPORT

BatchID: **198050**

Sample ID: **1410E71-043AMS** Client ID: Units: **ug/L** Prep Date: **10/21/2014** Run No: **278393**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **198050** Analysis Date: **10/22/2014** Seq No: **5883799**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Surr: Toluene-d8	47.92	0	50.00		95.8	77	117				

Sample ID: **1410E71-043AMSD** Client ID: Units: **ug/L** Prep Date: **10/21/2014** Run No: **278393**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **198050** Analysis Date: **10/22/2014** Seq No: **5883800**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	56.90	5.0	50.00		114	60.2	159	57.93	1.79	19.2	
Trichloroethene	54.58	5.0	50.00		109	70.1	144	55.33	1.36	20	
Surr: 4-Bromofluorobenzene	47.14	0	50.00		94.3	66.2	120	47.08	0	0	
Surr: Dibromofluoromethane	47.72	0	50.00		95.4	79.5	121	46.67	0	0	
Surr: Toluene-d8	47.50	0	50.00		95.0	77	117	47.92	0	0	

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

Page 15 of 15

APPENDIX B

EMORY UNIVERSITY
NORTH DECATUR ROAD/BURLINGTON ROAD
HSI No. 10121
ATLANTA, GEORGIA

Introduction

An evaluation for potential vapor intrusion from groundwater and soil pathways was conducted for the site. The evaluation utilized a weight of evidence approach consistent with ITRC's *Vapor Intrusion Pathway: A Practical Guideline* (ITRC, 2007) and follows the principles in *EPA's Superfund Vapor Intrusion FAQs* (EPA, 2012) available on-line at http:// http://www.epa.gov/oswer/vaporintrusion/, and *EPA's draft Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air* (EPA, 2013). Lines of evidence used in the data evaluation will initially include building-specific factors (such as size and air exchange rate) and analytical data (groundwater) collected during the investigation. The findings from this evaluation are presented in this Section.

Approach

A tiered evaluation was performed to assess whether the vapor intrusion exposure pathway is complete. The evaluation consists of the following three steps, summarized below and detailed in the following sub-sections.

- Tier 1 Screen– Identification of constituents of potential concern (COPCs) for vapor intrusion.
- Tier 2 Screen– Comparison of groundwater data to risk-based screening concentrations.
- Tier 3 Screen (Site-specific Assessment) – Comparison of groundwater concentrations to screening concentrations derived using the Johnson & Ettinger (J&E) Model.

Tier 1 Screening Summary

Groundwater samples have been collected at and adjacent to the site as part of various investigations. Four shallow monitoring wells and four recovery wells, which are in the vicinity of the groundwater and soil former treatment units (Figure 1), were selected as part of this evaluation. Results from these wells indicate various volatile organic compounds (VOCs) listed in EPA's *Vapor Intrusion Screening Level (VISL) Calculator* (May 2014 edition - EPA, 2014) available on-line at http://www.epa.gov/oswer/vaporintrusion/ are present in the site's shallow groundwater (**Table 1**). Historical groundwater monitoring data have been collected from these locations since 1998. However for this evaluation, only the more recent data collected from monitoring events conducted in 2013 and 2014 were evaluated to reflect current conditions.

EPA's *Superfund Vapor Intrusion FAQs* (EPA, 2012) does not recommend the use of soil concentrations for assessing whether or not the vapor intrusion pathway is complete because of the large uncertainties associated with using them. However, soil concentrations provide useful information in identifying potential source areas. The source of VOCs in the subsurface soils has been identified and remediated and certified to meet the Georgia Environmental Protection Division (GAEPD) Georgia Hazardous Site Response Act (HSRA) Type 1 Risk reduction Standards (RRS).

Tier 2 Screening Summary

The site is currently used for non-residential land use. However, volatile constituents detected in shallow groundwater were compared to both commercial/industrial and residential screening levels generated using EPA's Vapor Intrusion Screening Level (VISL) calculator (EPA, 2014) to identify COPCs for indoor air. The VISLs were based on EPA's SLs for industrial air and residential air, respectively, with an applied generic attenuation factor (EPA, 2014).

Table 2 presents the screening levels and the comparison to the on-site groundwater data. The following observations were noted.

- Tetrachloroethylene (PCE) was detected above commercial/industrial VISLs and residential VISLs in each of the recovery well locations (RW-1 through RW-4) and two monitoring well locations (MW-3 and MW-4).
- The maximum detected PCE concentration was observed in recovery well location RW-2.
- Trichloroethene (TCE) was detected above residential VISLs but less than commercial/industrial VISLs. The exceedance was limited to one location (RW-2).
- No other constituents were detected above VISLs.

Tier 3: Site-Specific Assessment

The EPA spreadsheets that incorporate the J&E Model were used to further evaluate the vapor intrusion pathway from PCE and TCE identified in shallow groundwater. The J&E Model is a one-dimensional analytical solution to convective and diffusive vapor transport into indoor spaces and provides an estimated attenuation coefficient that relates the vapor concentration in the indoor space to the vapor concentration at the source of contamination. The model is constructed as both a steady-state solution to vapor transport (infinite or non-diminishing source) and as a quasi-steady-state solution (finite or diminishing source). Inputs to the model include chemical properties of the contaminant, saturated and unsaturated zone soil properties, and structural properties of the building. Model results (both screening and advanced) are provided as either a risk-based groundwater concentration, or as an estimate of the incremental risks associated with a user-defined initial groundwater concentration (EPA, 2003). The J&E model is considered a conservative screening level tool. For instance, the model assumes that all vapors originating from below the building will enter the building unless the floors and walls are perfect vapor barriers. In addition, the model does not account for dispersion or transformation processes (e.g., biodegradation, hydrolysis).

The following site-specific inputs were incorporated into the groundwater model:

- Depth below grade to bottom of enclosed space floor – 200 cm (default value for basement)
- Depth below grade to water table – 1154 cm (site-specific average, 38 feet)
- Soil Conservation Service (SCS) soil type directly above water table – Sandy Loam (site-specific).
- Average groundwater temperature (degrees (°) Celsius) – 18 ° (regional-specific)
- Default vadose zone soil type parameters for sandy loam.

- Default building-related information and air exchange rate
- The model was run to calculate a screening concentration based on residential or non-residential endpoints. Exposure scenarios were evaluated: using USEPA default exposure assumptions (i.e., worker – 250 days/year for 25 years).
- Most recent inhalation toxicity factors as listed in EPA's Regional Screening Level Table (May 2014) were used.
- The current version of the EPA spreadsheets that incorporate the J&E model does not have an input for the number of hours per day; however, 24 hr/day is implicit in the model. Therefore, to derive a screening level consistent with a non-residential endpoint the model output was multiplied by 3 to adjust the exposure rate for a commercial/industrial worker from the assumed value of 24 hr/day to an 8 hr/day exposure. Commercial/industrial screening levels presented in **Table 2** include the adjustment factor.

Table 2 summarizes the results of the J&E Model. J&E Model outputs are provided in **Appendix A**. As presented in the table, maximum detected concentrations of TCE were less than the site-specific screening levels for residential or commercial/industrial land use.

Maximum detected concentrations of PCE were less than site-specific screening levels for commercial/industrial land use. Concentrations of PCE were detected above site-specific screening levels for residential land use in one location RW-2. However, exceedances were not observed in cross-gradient location RW-4 and downgradient location MW-3. The PCE concentration (44 ug/L) detected in off-site sample collected during a December 2013 Phase II Environmental Site Assessment at 1743, 1767, 1775, and 1785 North Decatur Road (University Inn) was also less than the site-specific screening level.

Summary

The results of this site-specific evaluation indicate that vapor intrusion from groundwater to indoor air is not expected to be a concern at this time. Constituents detected in groundwater were less than risk-based screening levels derived using site-specific assumptions.

References

Interstate Technical and Regulatory Guidance (ITRC), 2007. *Vapor Intrusion Pathway: A Practical Guideline*. January.

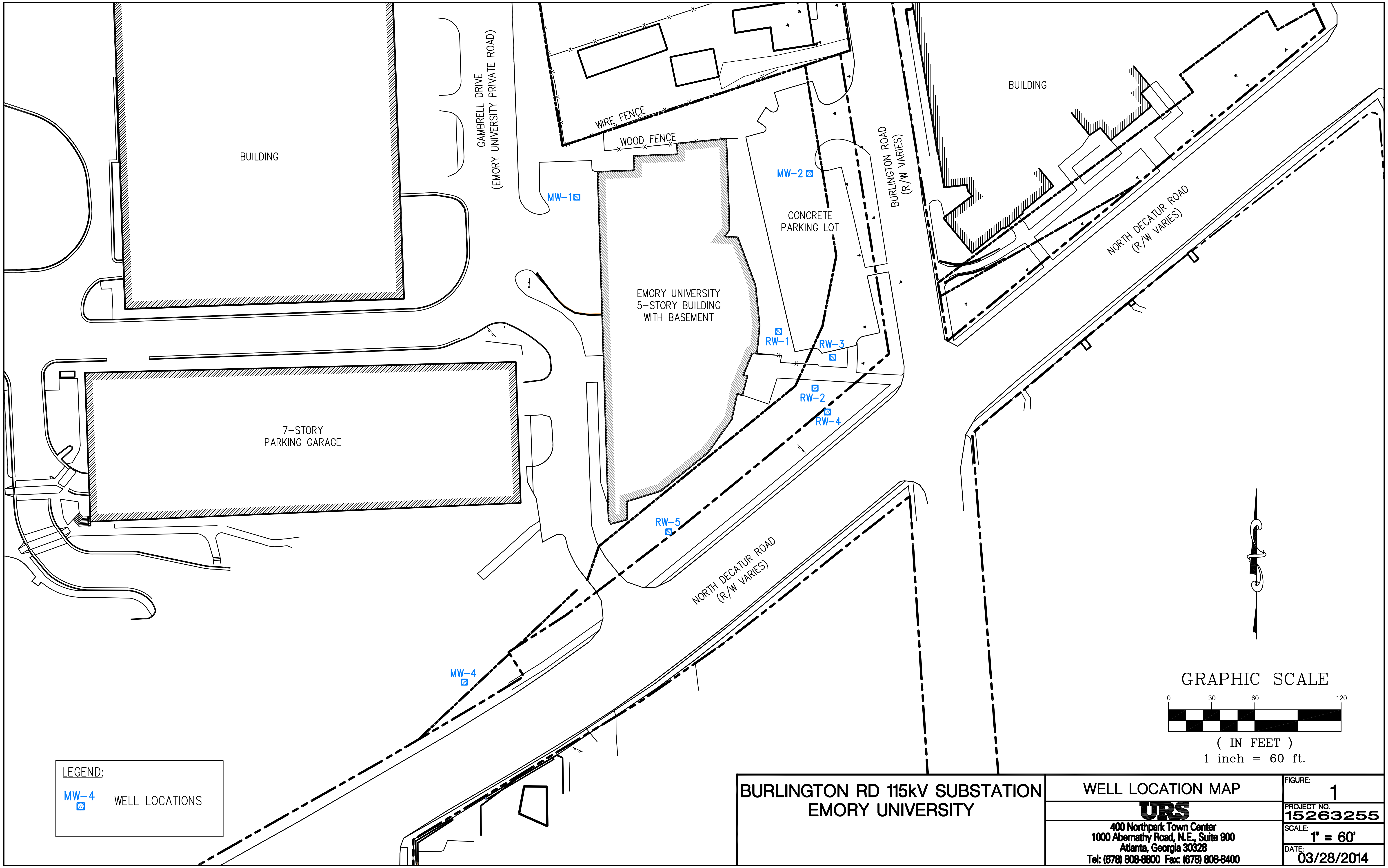
EPA, 2003. *User Guide for Evaluating Subsurface Vapor Intrusion into Buildings, June 2003. Prepared by: Environmental Quality Management, Inc*.

EPA, 2012. *EPA's Superfund Vapor Intrusion FAQs*. February. Available on-line at http://www.epa.gov/oswer/vaporintrusion/.

EPA, 2013. OSWER Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air. External Review Draft. April 2013.

EPA, 2014. *Vapor Intrusion Screening Level Calculator*. May 2014 edition. Available on-line at http://www.epa.gov/oswer/vaporintrusion/.

FIGURE



BURLINGTON RD 115kV SUBSTATION
EMORY UNIVERSITY

WELL LOCATION MAP

URS
400 Northpark Town Center
1000 Abernathy Road, N.E., Suite 900
Atlanta, Georgia 30328
Tel: (678) 808-8800 Fax: (678) 808-8400

FIGURE: 1

PROJECT NO. 15263255

SCALE: 1" = 60'

DATE: 03/28/2014

TABLES

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-1	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-2	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	19	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-3/RW-5*	02/05/01	65	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	78	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	89.2	BRL	BRL	BRL	BRL	BRL	NA
	02/14/02	90	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	66.6	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	43.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	75	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	53	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	56	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	47	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	40	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	57	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	66	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	50	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	14	BRL	BRL	120	BRL	BRL	NA
	03/01/08	39	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	44	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	40	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	66	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	71	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	73	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	160	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	190	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	200	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	230	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	150	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	180	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	190	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	160	BRL	BRL	BRL	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-4	02/05/01	3.4	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	4.0	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	3.8	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	4.8	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	3.0	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	4.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	4.0	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	3.7	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	5.0	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	8.7	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	11	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	14	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	15	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	14	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	20	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	29	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	29	BRL	BRL	BRL	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-1	Jun-98	8.4	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	BRL	NA	NA	NA	NA	NA	NA
	07/09/99	12.4	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	20	NA	NA	NA	NA	NA	NA
	07/07/00	56.4	NA	NA	NA	NA	NA	NA
	02/05/01	59.0	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	85.4	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	107	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	144	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	170	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	200	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	200	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	190	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	190	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	140	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	160	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	110	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	160	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	90	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	130	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	99	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	120	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	170	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	200	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	180	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	130	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	120	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	110	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	57	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	160	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-2	Jun-98	127	NA	NA	NA	NA	NA	NA
	Jun-98	150	NA	NA	NA	NA	NA	NA
	01/08/99	270	NA	NA	NA	NA	NA	NA
	07/09/99	55	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	197	NA	NA	NA	NA	NA	NA
	07/07/00	382	NA	NA	NA	NA	NA	NA
	02/05/01	549	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	119	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	710	2.2	NS	NS	NS	NS	NS
	01/29/03	138	2.1	BRL	1.5	BRL	BRL	NA
	06/19/03	630	1.0	BRL	2.0	BRL	BRL	NA
	01/15/04	890	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	650	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	490	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	860	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	970	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	1,000	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	440	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	780	5.7	BRL	8.1	BRL	BRL	NA
	03/01/08	300	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	460	120	BRL	190	BRL	BRL	BRL
	03/11/09	NS	NS	NS	NS	NS	NS	NS
	06/30/09	NS	NS	NS	NS	NS	NS	NS
	01/22/10	NS	NS	NS	NS	NS	NS	NS
	07/08/10	1,200	13	BRL	27	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	790	9.5	BRL	25	BRL	BRL	NA
	06/27/12	570	BRL	BRL	11	BRL	BRL	NA
	01/10/13	37	BRL	BRL	90	BRL	BRL	NA
	06/27/13	490	BRL	BRL	12	BRL	BRL	NA
	01/21/14	700	7.4	BRL	20	BRL	BRL	NA
	08/04/14	670	6.9	BRL	18	BRL	BRL	NA
	10/15/14	550	7.5	BRL	24	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-3	Jun-98	6.9	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	6.8	NA	NA	NA	NA	NA	NA
	07/09/99	8.8	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	8.0	NA	NA	NA	NA	NA	NA
	07/07/00	35.9	NA	NA	NA	NA	NA	NA
	02/05/01	39	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27.1	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	27.7	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	31.5	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	55.4	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	58	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	57	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	71	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	38	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	91	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	53	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	70	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	33	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	71	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	38	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	67	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	55	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	71	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	84	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	130	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	NS	NS	NS	NS	NS	NS	NS
	06/27/12	50	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	54	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	85	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	37	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	62	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA

Table 1

Summary of Groundwater Analytical Results
Emory University North Decatur/Burlington Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Date	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-4**	Jun-98	19	NA	NA	NA	NA	NA	NA
	Jun-98	25	NA	NA	NA	NA	NA	NA
	01/08/99	57	NA	NA	NA	NA	NA	NA
	07/09/99	225	NA	NA	NA	NA	NA	NA
	07/27/99	187	NA	NA	NA	NA	NA	NA
	01/06/00	128	NA	NA	NA	NA	NA	NA
	07/07/00	189	NA	NA	NA	NA	NA	NA
	02/05/01	174	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	253	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	NS	NS	NS	NS	NS	NS	NS
	01/29/03	NS	NS	NS	NS	NS	NS	NS
	06/19/03	NS	NS	NS	NS	NS	NS	NS
	01/15/04	NS	NS	NS	NS	NS	NS	NS
	06/18/04	NS	NS	NS	NS	NS	NS	NS
	01/28/05	NS	NS	NS	NS	NS	NS	NS
	07/01/05	NS	NS	NS	NS	NS	NS	NS
	02/01/06	NS	NS	NS	NS	NS	NS	NS
	06/20/06	980	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	540	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	640	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	370	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	380	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	640	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	220	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	360	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	420	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	270	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	160	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	93	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	68	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	160	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	180	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	250	BRL	BRL	BRL	BRL	BRL	NA

Notes:

µg/L – micrograms per liter or parts p
BRL – Not detected above laboratory method reporting limits
NA – Not analyzed
NS – Not sampled
Monitoring wells MW-1, -2, -3, and -4 were installed between December 2000 and January 2001
* – MW-3 was converted to recovery well RW-5 and became operational on August 6, 2001
** – RW-4 was converted to a monitoring well on June 14, 2006

Table 2
Comparison of Constituents Detected in Groundwater to Vapor Intrusion Screening Levels

Analyte[1]	Units	Minimum Detect	Maximum Detect	Location of Max Detect	EPA VISL GW-to-Indoor Air - Com/Ind[2]	J&E Modeled GW SL Com/Ind[3]	EPA VISL GW-to-Indoor Air - Res[2]	J&E Modeled GW SL - Res[3]
1,1-Dichloroethene	ug/L	<5.0	<5.0	-	820	-	200	-
cis-1,2-Dichloroethene	ug/L	12	90	RW-2	NV	-	NV	-
trans-1,2-Dichloroethene	ug/L	<5.0	<5.0	-	NV	-	NV	-
Tetrachloroethene	ug/L	14	700	RW-2	65	1275	15	292
Trichloroethene	ug/L	<5.0	7.5	RW-2	7.5	131	1.2	22
Vinyl Chloride	ug/L	<2.0	<2.0	-	2.5	-	0.15	-

Notes:

1 - Analytes reported during most recent 2013 and 2014 sampling events

2 - EPA Vapor Intrusion Screening Level (VISL) for Groundwater (May 2014 version)

3 - Johnson and Ettinger Site-Specific Groundwater Screening Level (SL)

Model Assumptions:

GW Screen version 3.1

Slab-on-grade

Site-specific soil type: sandy silt (sandy loam used in the model per instructions)

Site-specific depth to water: 38 feet (most shallow depth in RW locations)

Region-specific groundwater temperature: 18 deg C (65 deg F)

Toxicity factors updated consistent with those consistent with EPA's VISL Calculator

Model output multiplied by a factor of 3 to account for an 8-hour exposure for a worker

For TCE , the resident model results are applied by a factor of 0.72 to account for mutagenic mechanisms.

APPENDIX A

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

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

YES ☒ X

OR

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

YES ☐

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

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (^oC)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
200	1154.44	SL	18.3	

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vandose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone SCS soil type Lookup Soil Parameters	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	**ENTER** Vadose zone soil total porosity, n^V (unitless)	**ENTER** Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SL			SL	1.62	0.387	0.103

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC

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

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone 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)
954.44	0.284	0.184	6.02E-09	0.901	5.42E-09	25.00	0.387	0.067	0.320	4,000

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)	Vadose zone effective diffusion coefficient, D^{eff}_V (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)
2.54E+04	1.80E+06	2.22E-04	200	9,469	1.27E-02	5.31E-01	1.78E-04	7.27E-03	6.24E-05	1.81E-03

Diffusion path length, L_d (cm)	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)
954.44	200	5.31E+02	0.10	3.69E+00	7.27E-03	4.00E+02	3.27E+05	6.97E-05	3.70E-02	2.6E-07	4.0E-02

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)
4.25E+02	1.58E+03	4.25E+02	2.00E+05	4.25E+02

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

END

]

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

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

YES ☒ X

OR

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

YES ☐

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

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (^oC)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
200	1154.44	SL	18.3	

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vandose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone SCS soil type Lookup Soil Parameters	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	**ENTER** Vadose zone soil total porosity, n^V (unitless)	**ENTER** Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SL	OR		SL	1.62	0.387	0.103

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	26	26	350

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC

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

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone 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)
954.44	0.284	0.184	6.02E-09	0.901	5.42E-09	25.00	0.387	0.067	0.320	4,000

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)	Vadose zone effective diffusion coefficient, D^{eff}_V (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)
2.54E+04	1.80E+06	2.22E-04	200	9,469	1.27E-02	5.31E-01	1.78E-04	7.27E-03	6.24E-05	1.81E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/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., $C_{building}$ (μg/m^3)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
954.44	200	5.31E+02	0.10	3.69E+00	7.27E-03	4.00E+02	3.27E+05	6.97E-05	3.70E-02	2.6E-07	4.0E-02

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)
2.92E+02	1.13E+03	2.92E+02	2.00E+05	2.92E+02

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

END

]

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

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

YES ☒ X

OR

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

YES ☐

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (μg/L)	Chemical
79016		Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (^{o}C)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
200	1154.44	SL	18.3	

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vandose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone SCS soil type Lookup Soil Parameters	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	**ENTER** Vadose zone soil total porosity, n^V (unitless)	**ENTER** Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SL			SL	1.62	0.387	0.103

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	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)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone 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)
954.44	0.284	0.184	6.02E-09	0.901	5.42E-09	25.00	0.387	0.067	0.320	4,000

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)	Vadose zone effective diffusion coefficient, D^{eff}_V (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)
2.54E+04	1.80E+06	2.22E-04	200	8,454	7.40E-03	3.09E-01	1.78E-04	7.98E-03	7.03E-05	2.02E-03

Diffusion path length, L_d (cm)	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)
954.44	200	3.09E+02	0.10	3.69E+00	7.98E-03	4.00E+02	1.06E+05	7.38E-05	2.28E-02	4.1E-06	2.0E-03

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)
4.37E+01	1.28E+02	4.37E+01	1.47E+06	4.37E+01

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

END

]

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

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

YES X

OR

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

YES ☐

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (μg/L)	Chemical
79016		Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (^oC)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
200	1154.44	SL	18.3	

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vandose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone SCS soil type Lookup Soil Parameters	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	**ENTER** Vadose zone soil total porosity, n^V (unitless)	**ENTER** Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
SL	OR		SL	1.62	0.387	0.103

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	26	26	350

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	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)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone 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)
954.44	0.284	0.184	6.02E-09	0.901	5.42E-09	25.00	0.387	0.067	0.320	4,000

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} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (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)
2.54E+04	1.80E+06	2.22E-04	200	8,454	7.40E-03	3.09E-01	1.78E-04	7.98E-03	7.03E-05	2.02E-03

Diffusion path length, L_d (cm)	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)
954.44	200	3.09E+02	0.10	3.69E+00	7.98E-03	4.00E+02	1.06E+05	7.38E-05	2.28E-02	4.1E-06	2.0E-03

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)
3.00E+01	9.13E+01	3.00E+01	1.47E+06	3.00E+01

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

END

]

APPENDIX C

Groundwater Model
Emory University
North Decatur Road/Burlington Road Site
HSI No. 10121

This report summarizes the results of the groundwater model (BIOCHLOR) runs that were recently performed using the October 2014 and historic groundwater monitoring results obtained from wells associated with the North Decatur Road/Burlington Road Remediation System ("Site") located at Emory University. The modeling runs were performed as a scientific and cost-effective means to estimate future dissolved-phase chlorinated solvent concentrations in site groundwater.

MODEL DESCRIPTION

BIOCHLOR v. 2.2 (March 2002) is a fate and transport model that is publicly available at the USEPA Center for Subsurface Modeling Support (CSMoS). Originally developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division, BIOCHLOR simulates remediation by natural attenuation of dissolved solvents at chlorinated solvent release sites using three different model types:

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

Based on the Domenico analytical solution, the Microsoft Excel spreadsheet software can simulate 1-D advection, 3-D dispersion, linear adsorption, and biotransformation of chlorinated solvents by reductive dechlorination.

As a screening model BIOCHLOR provides insight on how far a dissolved chlorinated solvent plume will extend, and what groundwater concentrations are likely to be encountered, if no engineered controls or source area reduction measures are implemented at a contaminant site. This model was deemed appropriate for use at this site, since it is a screening tool for chlorinated solvents (the groundwater contaminants at the site), no free product is present, and the groundwater flow field at the site is not complicated. Now that the extraction system at the site has been removed, there are no pumping wells to impact the direction of flow within the shallow groundwater flow field and the dissolved contaminants (chlorinated solvents) are limited in extent to the groundwater within the unconsolidated overburden and a few feet of underlying fractured bedrock.

MODEL INPUTS

Source

One key (source) input parameter required by BIOCHLOR is knowledge of the time of the release (spill, leak, etc.); as well as, size (or volume and duration) of the release. Unfortunately, at the Emory site, there is no clear indication of the actual time of the release, the amount, or for that matter, when and where the actual release occurred. The initial Corrective Action Plan for the Site prepared by Willmer Engineering in 1993 (CAP_1993) potentially related the measured groundwater impacts by perchloroethylene (aka tetrachloroethylene, or PCE) to a former dry cleaning establishment that had ceased operations 8-10 years earlier. The CAP_1993 also noted the presence of a former automotive repair facility located adjacent to the dry cleaning establishment as another potential source of the PCE contamination, since both facilities would have been expected to have used PCE in their daily routine operations (i.e., cleaning parts and/or cleaning clothes).

The locations of the former garage and cleaners are provided on **Figure 1** (attached). For modeling purposes, the source area for the original PCE release was estimated to be 20 feet wide at the surface (the approximate width of the former cleaners), was assumed to be located in the immediate vicinity of the former recovery well RW-3 (for subsequent distance measurements), and it was assumed that the release (model start date) occurred on/or about 1983. (*As noted in previous letters to the Agency, during the subsequent calibration of the model the start date for the time of the release was later changed to 1988*). Based upon the various cross-sections that have been developed for the site (see Figures 5 and 6, PCE in Groundwater-August and October 2014, in the accompanying Conceptual Site Model section) and the typical measured depth to the static water table at the site, the (maximum) saturated thickness (unconsolidated overburden plus fractured rock upper-surface) of this PCE source area for model input was estimated to be 40 feet.

Hydrogeologic Data

In order to calculate advection, dispersion, adsorption, and biotransformation parameters required for the model, BIOCHLOR also requires that the hydrogeologic parameters (hydraulic conductivity, gradient, and effective porosity) for the spill site be entered as model input. The hydraulic conductivity used in the model was a value (4.0E-04 centimeters per second) provided in the CAP_1993, which was originally determined (calculated average) based upon the results of a number of falling head and recharge permeability tests conducted at the Site in 1993. This value is also quite typical for Piedmont soils. The effective porosity of the sediments in the subsurface was input as 15 percent; a value that was also provided earlier in the original 1993 Corrective Action Plan. The BIOCHLOR User’s Manual (January 2000) indicates that soils similar to the Piedmont soils at the Site (sandy silts and silty sands) typically exhibit effective porosities ranging from 1 to 30 percent, although experience with Piedmont soils indicates effective porosities more in the range of 15 to 25 percent. As a conservative measure 15% was selected, since groundwater plumes move a greater distance downgradient in soils with a lower effective porosity. The hydraulic gradient used in the model (0.04376 foot per foot, or 4.4 percent) was calculated from the water level measurements and contours developed from the most recent groundwater sampling event conducted in October 2014 (**Figure 2**, attached). The gradient selected followed a path parallel to the direction of groundwater flow in the central portion of the site beginning at an upgradient position along the estimated position of the 940-feet elevation water level contour, passing almost directly over former recovery well RW-1, and terminating downgradient at the estimated position of the 920-feet elevation contour; a change in elevation of 20 feet over a measured distance of approximately 457 feet. This calculated gradient under non-pumping conditions compares favorably with the estimated (overall) gradient provided in the 1993 CAP (4 percent) before any of the remedial activities took place at the site. Now that remedial groundwater extraction at the site has ceased, the similarity in gradients suggests that there has been little change in the many factors (rainfall, infiltration characteristics, topographic position, soil porosity, etc.) that could affect the position of the water table during the past 20-year period. As a result, today's calculated groundwater seepage velocity should mimic the groundwater seepage velocity in the past. With an estimated hydraulic conductivity of 4.0E-04 cm/sec, an effective porosity of 0.15, and gradient of 0.04376, the calculated seepage velocity for the site is 120.7 feet per year, or about 0.33 feet per day.

Dispersivity

The dispersion characteristics of the plume were calculated by the model based upon an initial estimate of the current (2014) plume length (1000 feet) using the results from the most-recent (October) sampling event. Based upon the October 2014 sampling results, it was assumed that the groundwater PCE concentrations would be at the current drinking water standard (maximum contaminant level, or MCL) of 5 micrograms per liter (ug/L) at a distance no greater than 1000 feet downgradient of the original source area (vicinity of RW-3). The longitudinal dispersivity for the plume was then calculated (23.798 feet) using the plume-length estimate formula developed by Xu and Eckstein (1995) within BIOCHLOR (Option 3). The transverse and vertical dispersivities were set to the default values programmed in BIOCHLOR (0.1 and 1.0E-99, respectively).

Retardation Factor

Dissolved PCE in site groundwater can be reduced by adsorption to the subsurface soils. The ratio of the groundwater seepage velocity to the rate of PCE (or any contaminant) movement in groundwater is the retardation factor (R). The retardation factor for PCE and its breakdown products in site groundwater was calculated by BIOCHLOR using an estimate of the aquifer's soil bulk density (rho) and fraction of the soil matrix comprised of natural organic carbon (f_{oc}) in soil derived from uncontaminated areas. Because no laboratory analysis was available, the rho value selected, 1.7 kilograms per liter, is the suggested default value in BIOCHLOR. The f_{oc} value selected for calculation of the retardation factor (0.001, or 0.1%) is the default value in BIOCHLOR. Initially, a f_{oc} of 0.3% (GA EPD default value) was selected for input but BIOCHLOR would not accept the value. BIOCHLOR Version 2.2 incorporates an automatic approximation calibration feature that indicated, based upon the previous input parameters (effective porosity, hydraulic conductivity, etc.) and sampling results, the f_{oc} estimate had to be less than 0.195 percent for model calibration. The 0.1% f_{oc} value used in the model is considered conservative. As the fraction of organic carbon increases, the calculated retardation value also increases (drastically); resulting in much shortened groundwater plumes. With a rho of 1.7 kg/L and an estimated f_{oc} of 0.001, BIOCHLOR calculated a common retardation factor of 2.47 for the dissolved chlorinated solvent constituents in site groundwater.

Biotransformation Data

First order decay kinetics are assumed to be present at that site based on the change in PCE contaminant concentrations over time and, more recently, with the monitored presence of PCE daughter products (TCE and 1,2-DCE). The first-order decay rate (λ, or lambda) represents the degradation of the contaminant as it moves through the aquifer with time (transport decay). Lambda is equal to 0.693 divided by the half-life of the contaminant in groundwater. Usually, this parameter influences the downgradient change in contaminant concentrations more than any other input parameter in BIOCHLOR. Initially, the λ values were selected from the mean of the typical ranges of values presented in BIOCHLOR manual for PCE and its daughter products. For the first order transformation of PCE to TCE the typical λ values range from 0.07 to 1.20 year $^{-1}$, with a mean of 0.635 year $^{-1}$. The mean λ input value for the PCE transformation was subsequently changed (slightly) to 1.15 year $^{-1}$ during the calibration process; near the high end of λ values but still within the range of typical values. All of the other mean λ values selected for the transformation of the PCE daughter products (e.g., TCE to cis1,2-DCE, etc.) were kept constant (no change) during the subsequent modeling process and can be seen on the model input attached.

Contaminant Concentrations

With respect to the chlorinated solvent of concern (PCE) and its breakdown products by biotransformation [Trichloroethylene (TCE), Dichloroethylene (DCE), and Vinyl Chloride (VC)], there is no historic information in the file regarding the groundwater conditions at the time of the initial spill (prior to calibration, assumed to have occurred in 1983). For modeling purposes it was assumed that the groundwater PCE concentration at the time of the release would have been equivalent to the maximum solubility of PCE in groundwater. According to information provided in the BIOCHLOR manual, the aqueous phase solubility of PCE in groundwater at 20 degrees Centigrade is 150 milligrams per liter (mg/L). This value was input as the source groundwater concentration used in all subsequent calculations by the model for the movement of the dissolved PCE plume. The source concentrations for the PCE daughter products were estimated based upon the historic monitoring well sampling results during the model calibration procedures.

The 1993 CAP included laboratory results for groundwater samples obtained at monitoring well locations GWC-1 and GWC-2, both located approximately 85 feet downgradient of the assumed source location (RW-3), with reported groundwater PCE concentrations of 2,480 micrograms per liter (ug/L) and 16,530 ug/L, respectively. Significantly, GWC-1 was screened at the top of rock; whereas, GWC-2 was screened at the water table. As described in previous correspondence with the GA EPD, the 16,530 ug/L (16.53 mg/L) value was used in the model during the initial attempts at calibration, assuming that the release had occurred on, or about, 1983. Based upon the previous model runs, the estimated release date was subsequently changed to 1988.

Although there is a rather lengthy record of historic sampling results prior to 2014 (see Table 2, Conceptual Site Model) most of these results cannot be used in in the model, since BIOCHLOR was not intended to predict the effect of remedial applications. An active remedy (including soil vapor extraction and groundwater extraction and treatment) occurred almost continuously at the site during the period 1995-2011. By 2012, the groundwater extraction had declined to the point that the impact of the extraction system on the groundwater flow field was hardly evident in the shape of the groundwater contours. By 2013, extraction at the site had ceased. Currently, groundwater conditions at the site are presumed to be at equilibrium, given the rather lengthy period of declining groundwater extraction at the site and the complete dismantling of the extraction system during the past year.

During the most recent sampling event conducted at the site in October 2014, the laboratory results at select monitoring wells were as follows:

RW-2 (TCE-550 ug/L, TCE-7.5 ug/L, cis 1,2 DCE-24 ug/L, VC-BRL); located 25 feet downgradient of source.
RW-5/MW-3 (TCE-160 ug/L, TCE-BRL, DCE-BRL, VC-BRL); located 165 feet downgradient of source.
MW-4 (TCE-29 ug/L, TCE-BRL, DCE-BRL, VC-BRL); located 340 feet downgradient of source.

[*As previously noted, the source area (for modeling purposes) is presumed to be in the immediate vicinity of former recovery well RW-3]*.

MODEL SIMULATIONS

Calibration

Although multiple BIOCHLOR simulations were previously run until the model output matched the measured groundwater concentrations in the site wells (as described in earlier correspondence to the GA EPD), little effort (or change) was required to simulate the results of the most-recent sampling event conducted in October 2014 using the input parameters described in the previous correspondence. The recent groundwater concentration values were used to refine the model input parameters so that the calibrated model could be used to predict future contaminant concentrations at the site, assuming that natural attenuation would be the only remedy that would continue at the site. Very slight changes in earlier estimates of the site hydrogeologic parameters were sufficient to simulate both recent and historic results with adequate accuracy. A compilation of the various input parameters that were used to calibrate BIOCHLOR are provided on **Table 1** (attached).

The predicted model output for 2014, with the input parameters previously described, 26 years after the assumed date of the release (1988), is provided in the appendix to this report as Plates 1A and 1B (attached). Plate 1A provides a summation of the input values used in the 2014 model run and Plates 1B, 1C, 1D, and 1E provide the final numeric and visual model output of the PCE, TCE, cis-1,2-DCE, and VC concentrations, respectively. As indicated on Plate 1B, the decreasing trend of the 2014 Site field PCE concentrations (October 2014 sampling results) with distance conforms very well to the modeled output PCE concentrations generated with the predicted first-order biotransformation. The October 2014 sampling results at RW-2 (25-feet downgradient), RW-5 (about 165-feet downgradient), and MW-4 (340 feet downgradient) conform favorably to the model output indicating biotransformation of the original PCE release. The presence of PCE, TCE, and cis-1,2-DCE in the October 2014 sampling results obtained from recovery well RW-2 clearly indicates that biotransformation of PCE in the Site groundwater is occurring. Historically, the PCE daughter products (TCE, cis-1,2-DCE, VC, etc.) were not present in the samples obtained from the various site monitoring wells. Their absence in the historic sampling results is thought to be due to the masking effect of the near-constant remedial actions (soil vapor extraction and groundwater extraction and removal) that were being actively conducted at the site during the period from 1995 to 2011. A figure presenting the estimated configuration of the current PCE plume in site groundwater, based upon the October 2014 sampling results and BIOCHLOR output, is provided as **Figure 3**.

To recheck the validity of the model input parameters, the model was run for only 5 years to see if BIOCHLOR would simulate the PCE concentrations reported present in the site monitoring wells in the 1993 CAP. The predicted model output for 1995, using the identical input parameters that were used previously in the 2014 model, five (5) years after the (assumed) release in 1988, is provided in the appendix as Plates 2A/2B (attached). As indicated on Plate 2B, the modeled PCE concentrations generated using first-order biotransformation conform very well to the reported presence of PCE (16,530 ug/L) in 1993 at monitoring well GWC-2, located about 85 feet downgradient of the source area. No daughter products were reported present in the 1993 data.

Based upon the excellent simulation of both the 1993 and 2014 PCE sampling results, the input values appeared validated and the model was deemed calibrated. The calibrated model was then run in 5-year increments into the future (2019, 2024,…) to predict the chlorinated solvent concentrations that could be expected downgradient of the source area; as well as, the anticipated length of the downgradient chlorinated solvent plume.

Predicted Concentrations

Because of the sparse current record of PCE daughter products in the sample results, the model predictions in this report focus on the future PCE concentrations to be expected at the site, although the model predictions for the daughter products can be easily generated using the same input parameters utilized for the PCE concentration predictions. The current mandated Primary Drinking Water Standard, or maximum contaminant level (MCL), for the presence of PCE in drinking water is 5 ug/L (0.005 mg/L). In the model predictions to follow, the point at which the plume center line PCE concentrations decreased to the MCL was used to distinguish the furthest extent, or end, of the downgradient plume(s).

The model output illustrating the predicted PCE concentrations in 2019, 31 years after the assumed time of the release, is provided in the appendix as Plates 3A/3B (attached). Plate 3A provides a summation of the (previously calibrated) input values used in the 2019 model run and Plate 3B provides the final numeric and visual model output. The only change to the input parameters (Plate 3A) was in the section for the calculation of the dispersion coefficients. Based on an initial trial model run, the estimated maximum length of the plume was decreased to 800 feet, which resulted in the calculation of slightly smaller dispersion coefficients than those calculated for the 2014 model. No other changes in the initial input parameters were made. As presented on Plate 3B, the model predicts that the maximum PCE concentration in site groundwater in the source area will be 304 ug/L; PCE concentrations will have declined to 50 ug/L about 125-feet downgradient of the source area, and will have diminished to the current MCL approximately 480-feet downgradient. A figure presenting the predicted extents of the PCE groundwater plume at the site in 2019 is provided as **Figure 4**.

The model output illustrating the predicted PCE concentrations in 2024, 36 years after the assumed time of the release, is provided in the appendix as Plates 4A/4B (attached). Plate 4A provides a summation of the (previously calibrated) input values used in the 2024 model run and Plate 4B provides the final numeric and visual model output. Again, based on an initial trial model run, in this model the estimated maximum length of the plume was decreased to 600 feet, which resulted in the calculation of slightly smaller dispersion coefficients than those calculated for the 2014 model. No other changes in the initial input parameters were made. As presented on Plate 4B, the model predicts that the maximum PCE concentration in site groundwater in the source area will be 112 ug/L; concentrations will have declined to 50 ug/L approximately 45-feet downgradient, and will have diminished to the current MCL 320-feet downgradient. A figure presenting the predicted extents of the PCE groundwater plume at the site in 2024 is provided as **Figure 5**.

The model output illustrating the predicted PCE concentrations in 2029, 41 years after the assumed time of the release, is provided in the appendix as Plates 5A/5B (attached). Plate 5A provides a summation of the (previously calibrated) input values used in the 2029 model run and Plate 5B provides the final numeric and visual model output. Based on an initial trial model run, the estimated maximum length of the plume was decreased to 500 feet, which again resulted in the calculation of slightly smaller dispersion coefficients. No other changes in the initial input parameters were made. As presented on Plate 5B, the model predicts that the maximum PCE concentration in site groundwater in the source area will be about 41 ug/L, and PCE concentrations will have declined to the MCL approximately 180-feet downgradient of the source area. A figure presenting the predicted extents of the PCE groundwater plume at the site in 2029 is provided as **Figure 6**.

The model output illustrating the predicted PCE concentrations in 2034, 46 years after the assumed time of the release, is provided in the appendix as Plates 6A/6B (attached). Plate 6A provides a summation of the (previously calibrated) input values used in the 2034 model run and Plate 6B provides the final numeric and visual model output. Based on an initial trial model run, the estimated maximum length of the plume was decreased to 300 feet; again resulting in the calculation of slightly smaller dispersion coefficients. No other changes in the initial input parameters were made. As presented on Plate 6B, the model predicts that the maximum PCE concentration in site groundwater in the former source area will be about 15 ug/L, and PCE concentrations will have declined to the MCL within 80-feet of the former source area. A figure presenting the predicted extents of the PCE groundwater plume at the site in 2034 is provided as **Figure 7** (attached).

The model output illustrating the predicted PCE concentrations in 2039, 51 years after the assumed time of the release, is provided in the appendix as Plates 7A/7B (attached). Plate 7A provides a summation of the (previously calibrated) input values used in the 2039 model run and Plate 7B provides the final numeric and visual model output. In this model run the estimated maximum length of the plume was decreased to 200 feet, which again resulted in the calculation of slightly smaller dispersion coefficients. No other changes in the initial input parameters were made. As presented on Plate 7B, the model predicts that PCE in site groundwater due to the 1988 release should no longer be an issue, with predicted maximum PCE concentrations in groundwater of about 5 to 6 ug/L at the point of the original release in the former source area.

SENSITIVITY ANALYSIS

Methodology

A sensitivity analysis was performed to evaluate the influence or relative importance of key input variables, particularly those variables where literature values were used for input. The parameters evaluated in the sensitivity analysis herein include the biotransformation decay coefficients, the retardation factor, hydraulic conductivity, and the effective porosity. The analysis was run for model year 2019 at two distances: 165 feet (the distance downgradient from the source to RW-5) and 320 feet (the distance to the furthest downgradient well MW-4). For each parameter being considered, the predicted concentrations at both of these points of reference were determined for: 1) baseline conditions (the calibrated value presented earlier), 2) a value two times greater than baseline, and 3) a value one-half of the baseline condition. The predicted values resulting from this sensitivity analysis are provided on **Table 2**.

Analysis of the information presented on the table suggests that (for the Emory BIOCHLOR model) changes in the hydraulic conductivity and porosity (which affects the seepage velocity) had almost an equal impact on the final predicted downgradient PCE plume concentrations. However, the most sensitive parameter was shown to be the 1st order decay coefficient (λ).

With respect to the advection terms of the Emory BIOCHLOR model, the sensitivity analysis indicates that if the hydraulic conductivities of the subsurface materials are less permeable than the baseline estimate, the current PCE plume will reach an acceptable concentration (MCLs) at the points of reference sooner than anticipated. Whereas, if the hydraulic conductivities of the subsurface materials are more permeable than the baseline estimate, the current PCE plume will reach an acceptable concentration at the points of reference later than currently anticipated. Conversely, if the effective porosity of the subsurface materials is significantly less than the baseline estimate, the current PCE plume will take longer to reach an acceptable concentration at the points of reference; whereas, if the effective porosity of the subsurface materials is significantly greater than the baseline estimate, the current PCE plume will reach an acceptable concentration sooner than currently anticipated at the points of reference.

With respect to the calculated retardation factor in the Emory BIOCHLOR model, decreasing the retardation factor did not have an appreciable difference in the predicted PCE concentrations. However, increasing the retardation factor did increase the predicted concentrations downgradient of the source area.

As expected, changes in the 1st order decay coefficient (λ) had an appreciable effect on the modeled predictions. Doubling lambda significantly reduced the predicted PCE plume concentrations downgradient at the points of interest; whereas, reducing lambda (by one-half) significantly increased the predicted PCE plume concentrations downgradient at the points of interest. Since lambda is equal to 0.693 divided by the half-life of the contaminant, the latter point is significant. Greater lambda values are the result of shorter half-lives and smaller lambda values are the result of longer half-lives. As the calibrated model utilized a lambda near the upper range of the typical values indicated by EPA (2000) (a short half-life), any change in future model conditions would be much more likely to require a lessening of the lambda value (i.e., if this were the model parameter requiring change, it can't go much higher); thereby, more likely to result in an increase in the predicted downgradient PCE plume concentrations.

Attachments:	Tables 1, 2
	Figures 1-7
	Appendix- BIOCHLOR output (Plates 1A-7B)

TABLES

TABLE 1

Input Parameters for the Emory BIOCHLOR Model

Mechanism	Parameter	Value	Units	Basis
Advection	Hydraulic Conductivity	4.00E-04	cm/sec	Average conductivity presented in the 1993 CAP
	Hydraulic Gradient	0.04376	ft/ft	Measured gradient under non-pumping conditions, October 2014
	Effective Porosity	0.15	unitless	Typical value for Piedmont Soil, presented in 1993 CAP
Dispersion	Alpha X	23.798	feet	XU and Eckstein (1995) calculation based on estimated 1000 ft. plume length
	Alpha Y/Alpha X	0.1	unitless	EPA model default value
	Alpha Z/Alpha X	1.00E-99	unitless	EPA model default value
Adsorption	Soil Bulk Density	1.7	kg/L	EPA model default value
	Fraction Organic Carbon	1.00E-03	unitless	Conservative estimate within the range of typical values (EPA, 2000)
	Organic Carbon Partitioning Coefficients			
	PCE	426	L/kg	EPA model default value
	TCE	130	L/kg	EPA model default value
	DCE	125	L/kg	EPA model default value
	VC	30	L/kg	EPA model default value
	Ethenes	302	L/kg	EPA model default value
	Retardation Factor	2.47		Calculated value based on input values above
Biotransformation	1st Order Decay Coefficients (λ)			
	PCE->TCE	1.150	1/yr	Within range of typical values (EPA, 2000) after model calibration
	TCE->DCE	0.475	1/yr	Mean of typical values in guidance (EPA, 2000)
	DCE->VC	1.740	1/yr	Mean of typical values in guidance (EPA, 2000)
	VC->Ethene	1.420	1/yr	Mean of typical values in guidance (EPA, 2000)
General	Simulation Time	varies	year	Assumes the release began in 1988
	Model Area Width	250	feet	Assumption based on monitoring well sampling results
	Model Area Length	1000	feet	Assumption based on monitoring well sampling results
	Zone Length	1000	feet	Assumes one zone
Source Data	Type	continuous		Assumes continuous source concentrations throughout time
	Source Thickness in Saturated Zone	40	feet	Based on analysis of site cross-section
	Source Width	20	feet	Approximate width of former cleaning establishment
	Source Concentrations			
	PCE	150.0	mg/L	Aqueous phase solubility of PCE (EPA, 2000)
	TCE	0.5	mg/L	Based on model calibration
	DCE	4.0	mg/L	Based on model calibration
	VC	0.1	mg/L	Based on model calibration
	Ethenes	0	mg/L	Based on model calibration

EPA, 2000: BIOCHLOR Natural Attenuation Decision Support System. User's Manual Version 1.0 USEPA. January 2000

EPA, 2001: BIOCHLOR Natural Attenuation Decision Support System. User's Manual Addendum Version 2.0 USEPA. March 2001

TABLE 2

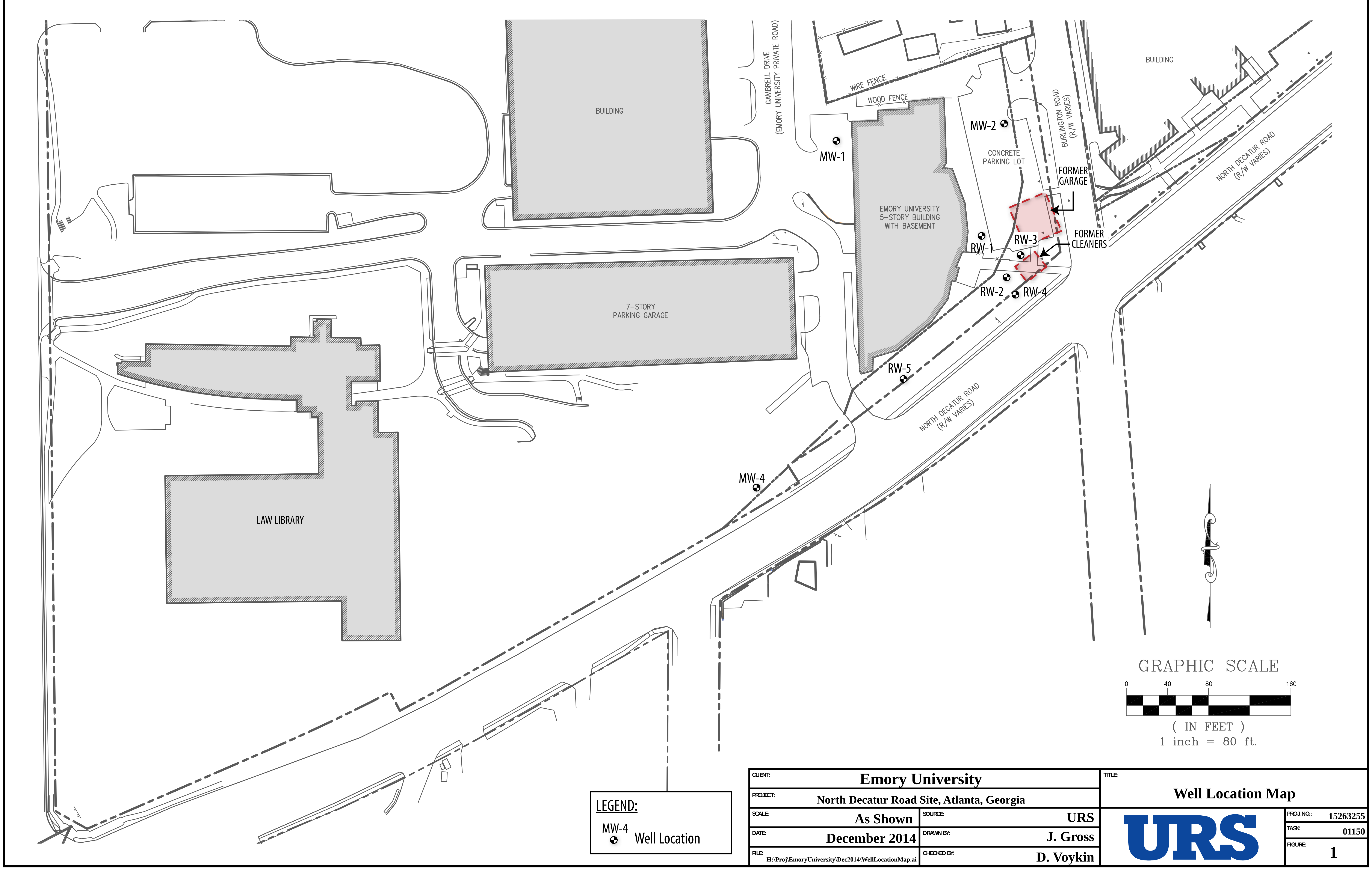
Sensitivity Analysis for the Emory BIOCHLOR Model (Year 2019)

Hydraulic Conductivity (cm/second)						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Constituent	2.00E-04	K=4.0E-04 (Baseline)	8.00E-04	2.00E-04	K=4.0E-04 (Baseline)	8.00E-04
PCE	0.020	0.039	0.057	0.003	0.012	0.026
TCE	0.098	0.069	0.043	0.091	0.072	0.051
DCE	0.022	0.012	0.006	0.024	0.016	0.009
VC	0.018	0.007	0.002	0.024	0.013	0.005
Porosity						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Constituent	n_e=0.075	n_e=0.15 (Baseline)	n_e=0.30	n_e=0.075	n_e=0.15 (Baseline)	n_e=0.30
PCE	0.069	0.039	0.015	0.037	0.012	0.002
TCE	0.055	0.069	0.064	0.081	0.072	0.040
DCE	0.007	0.012	0.014	0.014	0.016	0.010
VC	0.003	0.007	0.011	0.008	0.013	0.011
Retardation Factor						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Constituent	R=1.235	R=2.47 (Baseline)	R=4.940	R=1.235	R=2.47 (Baseline)	R=4.94
PCE	0.030	0.039	0.070	0.007	0.012	0.039
TCE	0.047	0.069	0.163	0.036	0.072	0.344
DCE	0.008	0.012	0.031	0.008	0.016	0.083
VC	0.004	0.007	0.020	0.006	0.013	0.073
1st Order Decay Coefficient - λ (1/year)						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Constituent	0.575	1.150 (Baseline)	2.3*	0.575	1.150 (Baseline)	2.3*
PCE	0.078	0.039	0.012	0.049	0.012	0.001
	0.288	0.475 (Baseline)	0.950	0.288	0.475 (Baseline)	0.950
TCE	0.083	0.069	0.046	0.107	0.072	0.032
	0.870	1.740 (Baseline)	3.480	0.870	1.740 (Baseline)	3.480
DCE	0.019	0.012	0.007	0.032	0.016	0.008
	0.710	1.420 (Baseline)	2.840	0.710	1.420 (Baseline)	2.840
VC	0.01	0.007	0.004	0.024	0.013	0.007

basis for sensitivity analysis: 0.5 times and 2.0 times the baseline value

* value for λ outside of typical range for PCE (0.07 to 1.20 yr^{-1})

FIGURES



CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

SCALE: **As Shown**

SOURCE: **URS**

DATE: **December 2014**

DRAWN BY: **J. Gross**

FILE: **H:\Proj\EmoryUniversity\Dec2014\WellLocationMap.ai**

CHECKED BY: **D. Voykin**

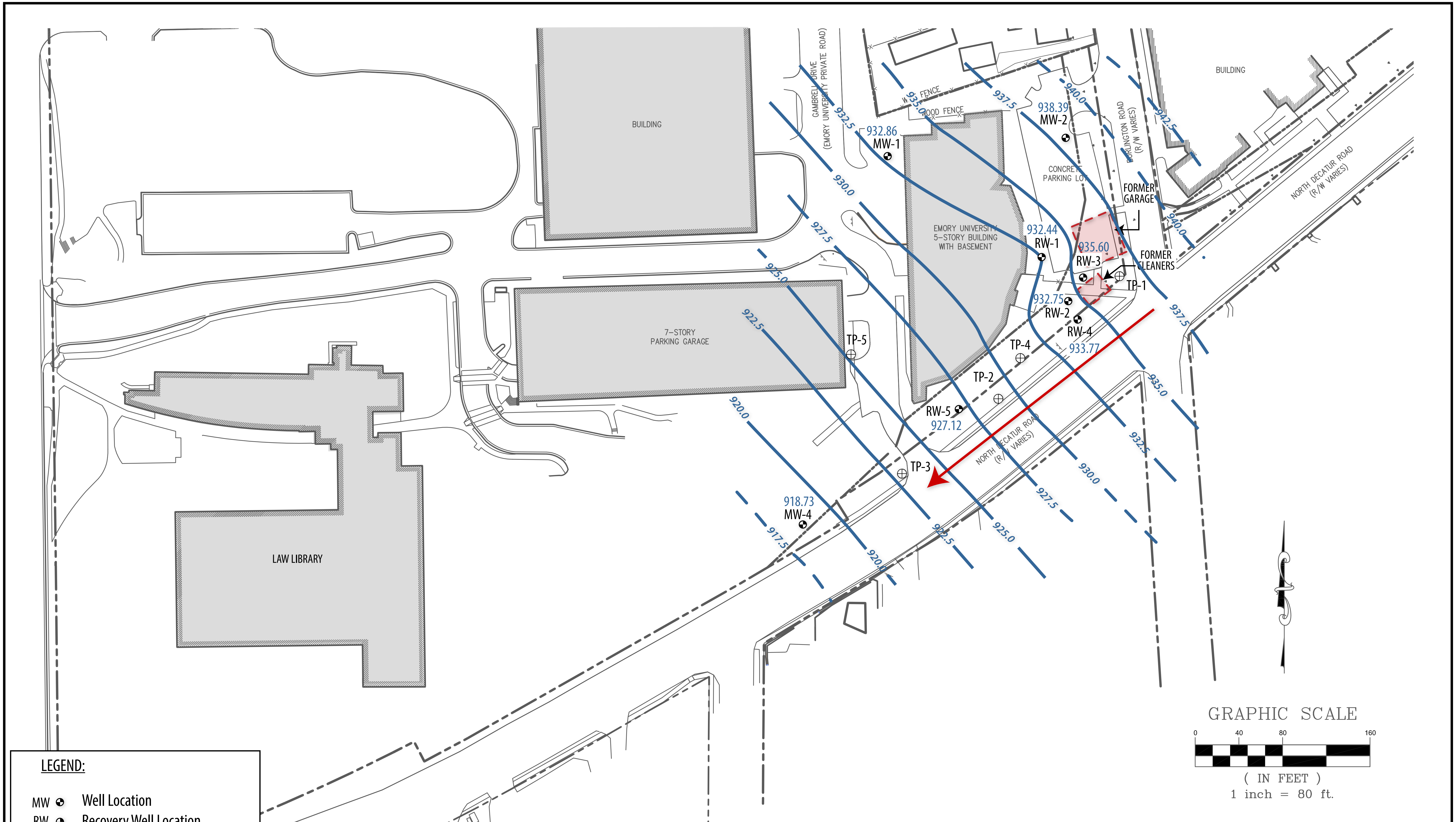
TITLE: **Well Location Map**

URS

PROJ NO.: 15263255

TASK: 01150

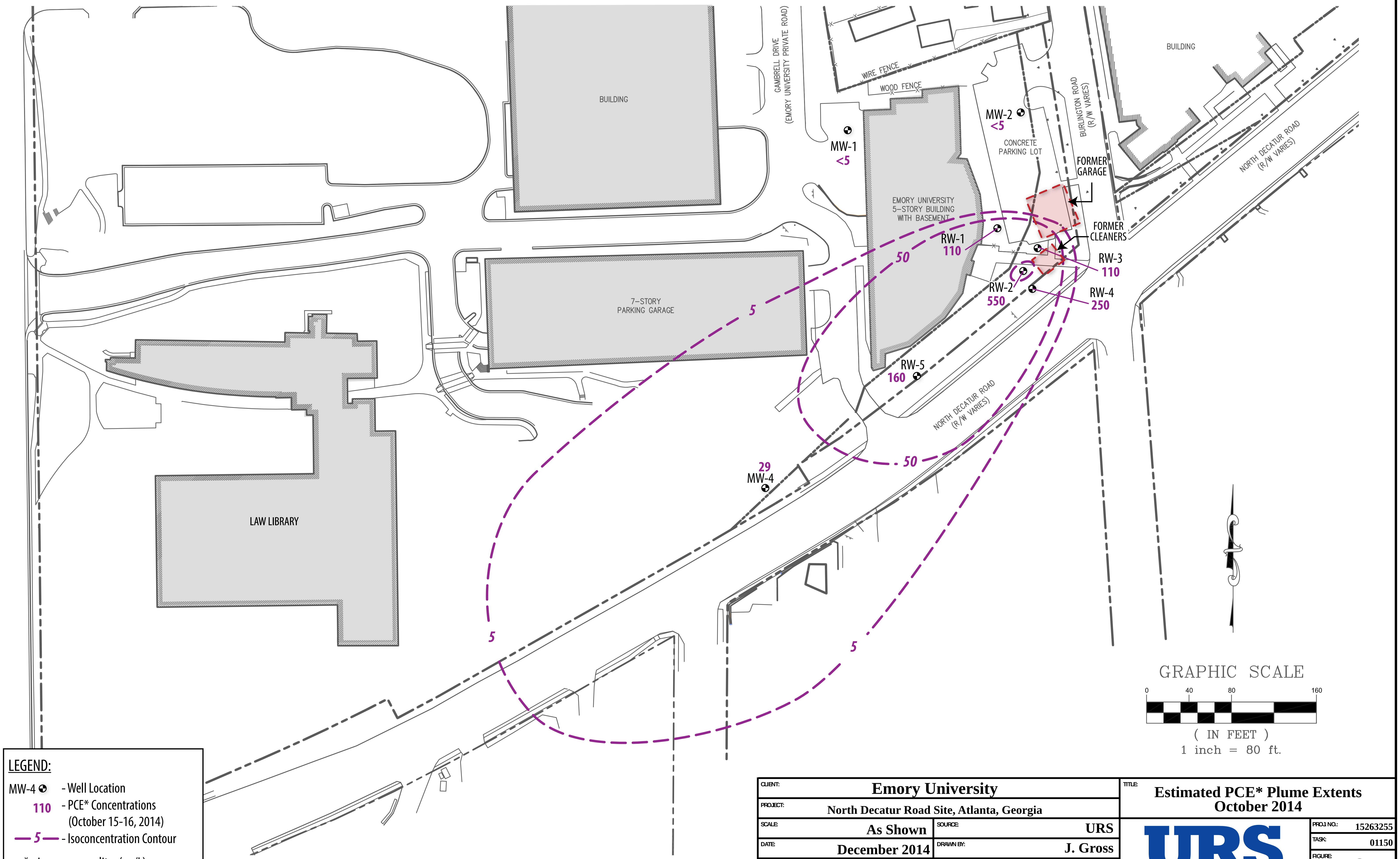
FIGURE: **1**



LEGEND:

MW	●	Well Location
RW	●	Recovery Well Location
TP	⊕	Temporary Piezometer
	919.16	Water Elevation (feet)
	→	Direction of Groundwater Flow

CLIENT: Emory University		TITLE: Potentiometric Map October 14, 2014	
PROJECT: North Decatur Road Site, Atlanta, Georgia			
SCALE: As Shown	SOURCE: URS	URS	PROJ NO.: 15263255
DATE: December 2014	DRAWN BY: J. Gross		TASK: 01150
FILE: H:\Proj\EmoryUniversity\Dec2014\WellLocationMap.ai	CHECKED BY: D. Voykin		FIGURE: 2



LEGEND:

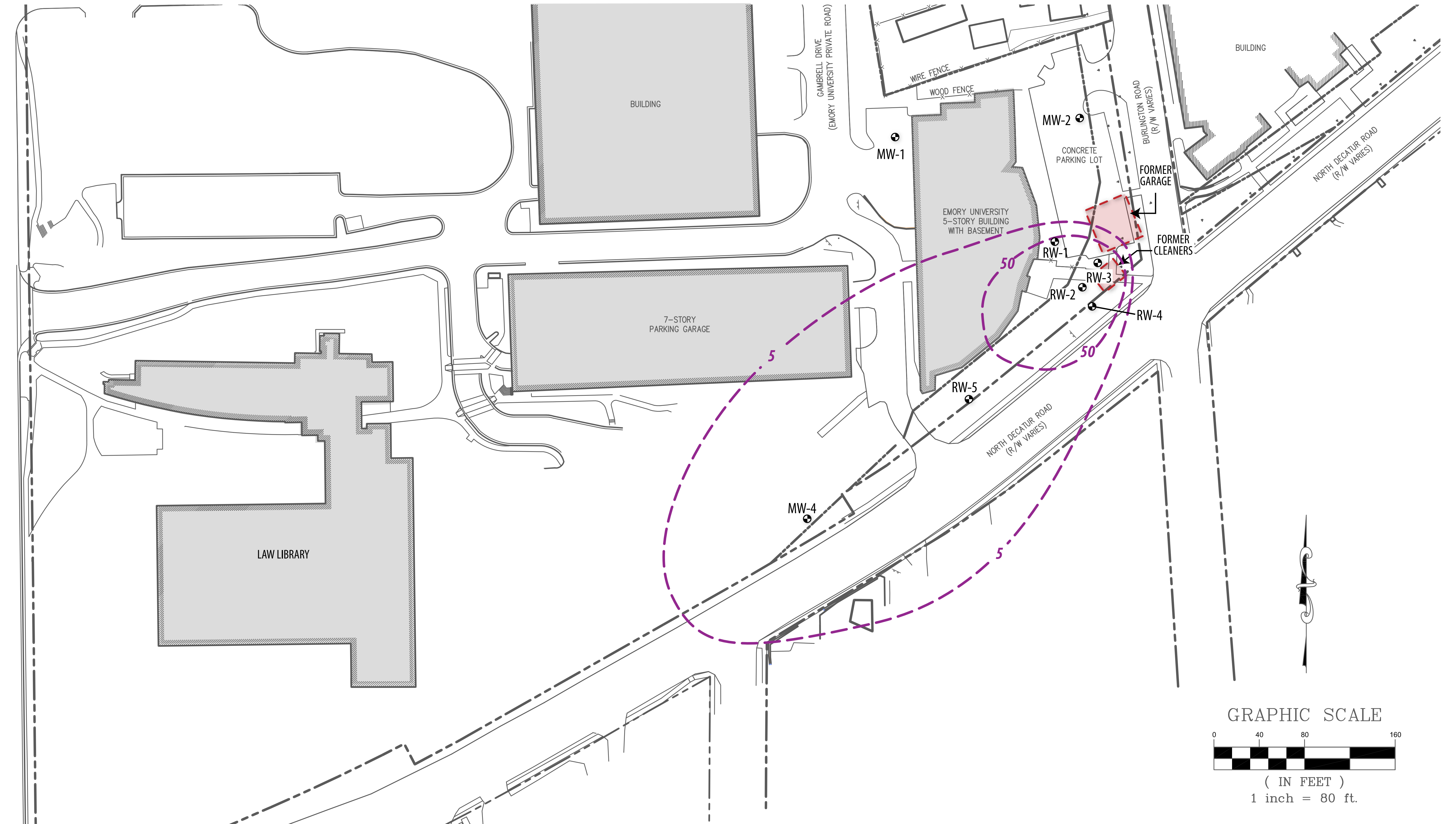
MW-4 ● - Well Location

110 - PCE* Concentrations (October 15-16, 2014)

— 5 — - Isoconcentration Contour

*micrograms per liter (µg/L)

CLIENT: **Emory University**		TITLE: **Estimated PCE* Plume Extents October 2014**	
PROJECT: **North Decatur Road Site, Atlanta, Georgia**			
SCALE: **As Shown**	SOURCE: **URS**	URS	PROJ NO.: 15263255
DATE: **December 2014**	DRAWN BY: **J. Gross**		TASK: 01150
FILE: H:\Proj\EmoryUniversity\Dec2014\PCE October 2014.ai	CHECKED BY: **D. Voykin**		FIGURE: 3



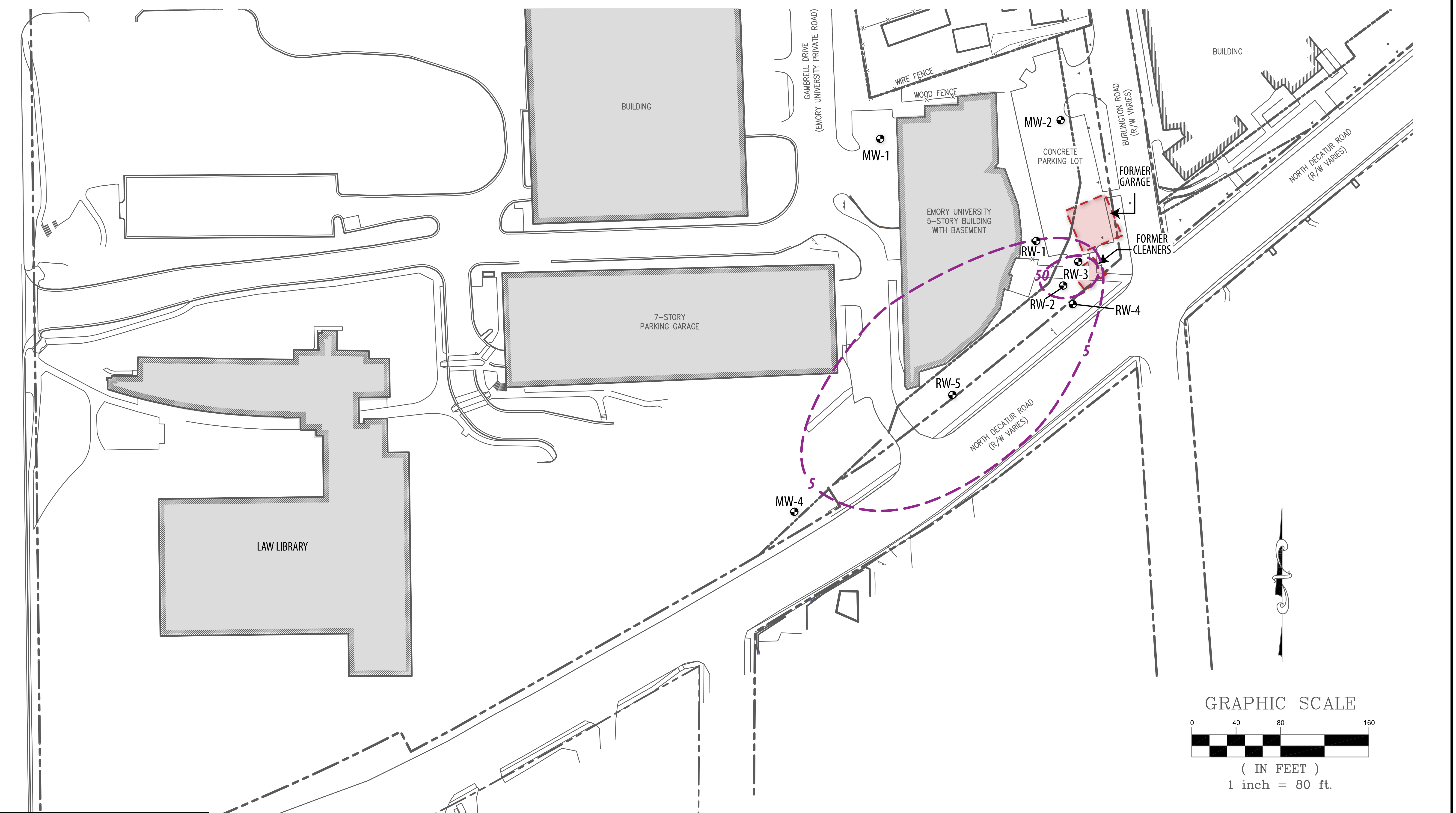
LEGEND:

MW-4 ⊕ - Well Location

— 5 — - PCE* Isoconcentration Contour

*micrograms per liter (µg/L)

CLIENT: Emory University		TITLE: Predicted PCE* Plume Extents 2019	
PROJECT: North Decatur Road Site, Atlanta, Georgia			
SCALE: As Shown	SOURCE: URS		PROJ NO.: 15263255
DATE: December 2014	DRAWN BY: J. Gross	URS	TASK: 01150
FILE: H:\Proj\EmoryUniversity\Dec2014\PCE 2019.ai	CHECKED BY: D. Voykin		FIGURE: 4



LEGEND:

MW-4 ⊕ - Well Location

— 5 — - PCE* Isoconcentration Contour

*micrograms per liter (µg/L)

CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

SCALE: **As Shown**

SOURCE: **URS**

DATE: **December 2014**

DRAWN BY: **J. Gross**

FILE: H:\Proj\EmoryUniversity\Dec2014\PCE 2024.ai

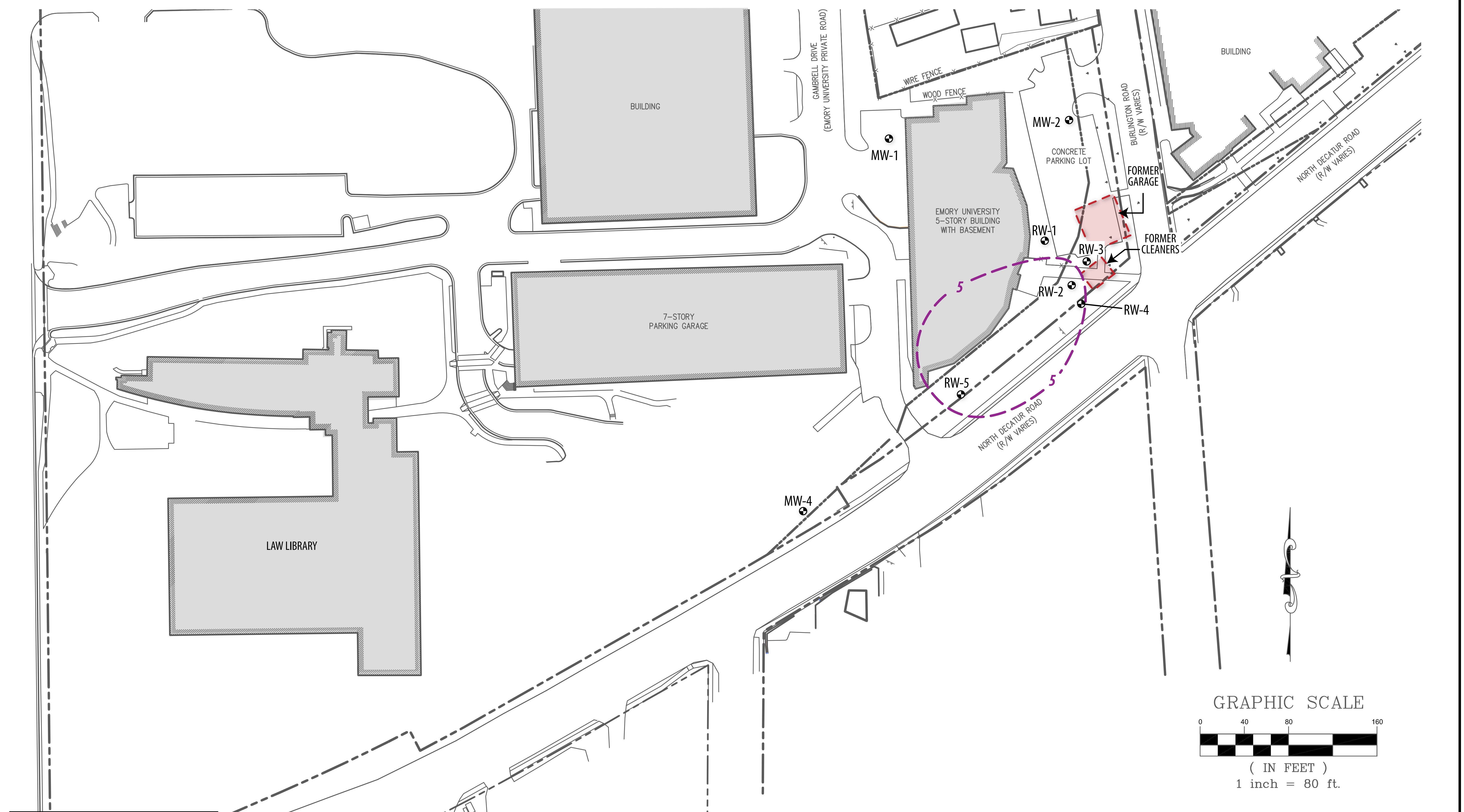
CHECKED BY: **D. Voykin**

TITLE: **Predicted PCE* Plume Extents 2024**

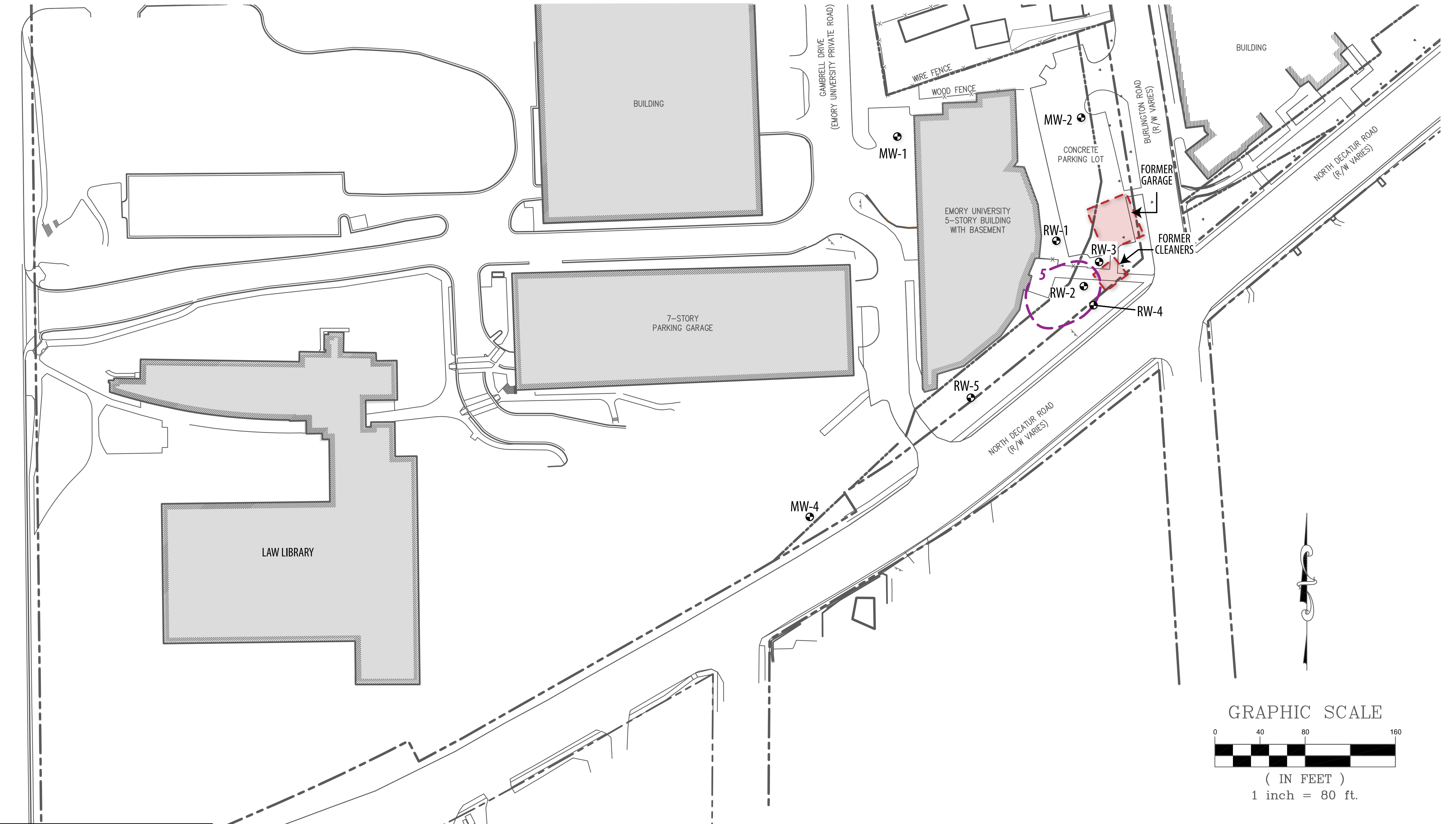
PROJ NO.: 15263255

TASK: 01150

FIGURE: 5



CLIENT:	Emory University
PROJECT:	North Decatur Road Site, Atlanta, Georgia
SCALE:	As Shown
SOURCE:	URS
DATE:	December 2014
DRAWN BY:	J. Gross
FILE:	H:\Proj\EmoryUniversity\Dec2014\PCE 2029.ai
CHECKED BY:	D. Voykin
TITLE:	Predicted PCE* Plume Extents 2029
PROJ NO.:	15263255
TASK:	01150
FIGURE:	6



LEGEND:

MW-4 ● - Well Location

—5— - PCE* Isoconcentration Contour

*micrograms per liter (µg/L)

CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

SCALE: **As Shown**
SOURCE: **URS**

DATE: **December 2014**
DRAWN BY: **J. Gross**

FILE: H:\Proj\EmoryUniversity\Dec2014\PCE 2034.ai
CHECKED BY: **D. Voykin**

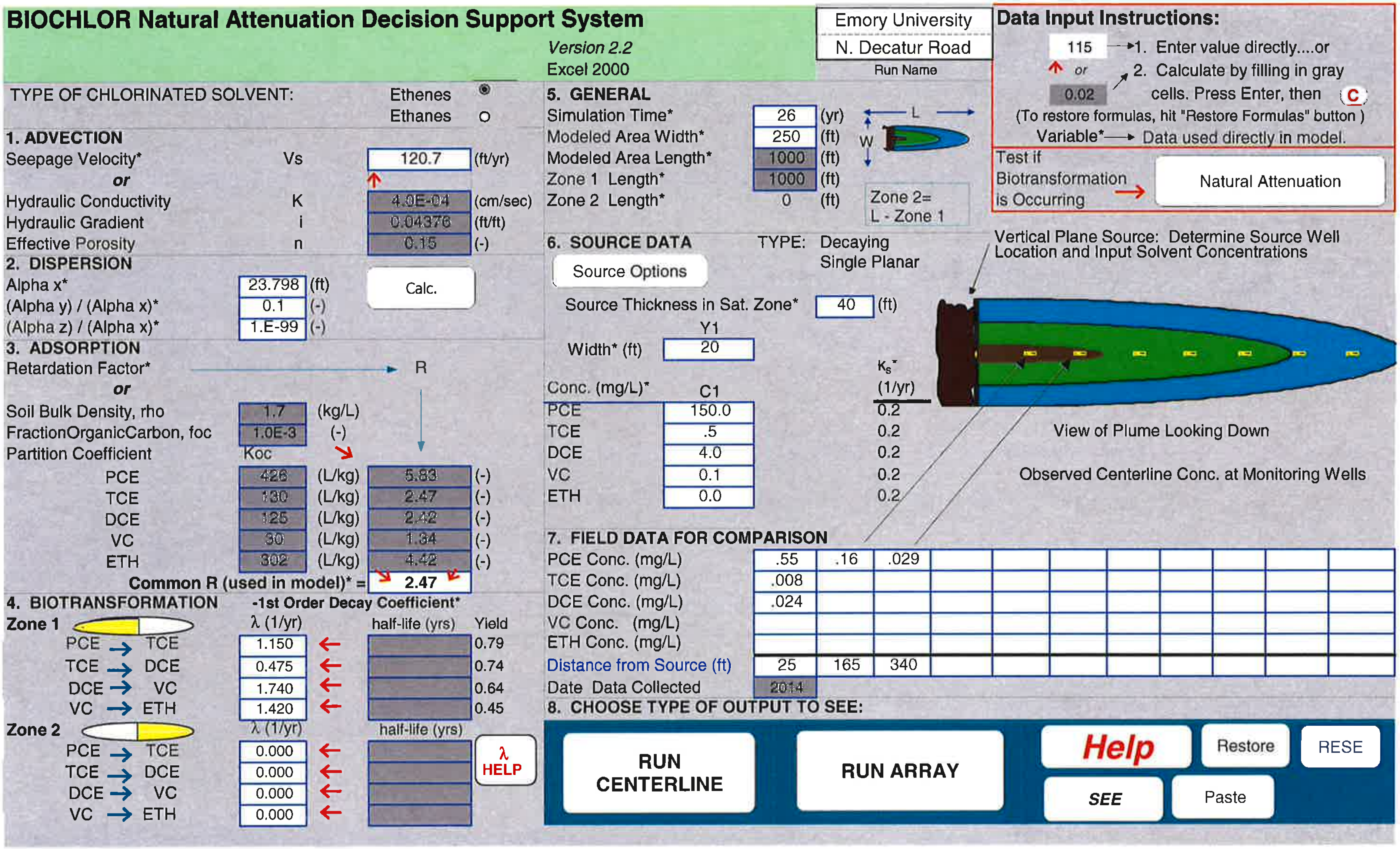
TITLE: **Predicted PCE* Plume Extents 2034**

URS

PROJ NO.: 15263255
TASK: 01150
FIGURE: 7

APPENDIX

BIOCHLOR Model Output



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	120.7	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.04376	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	23.798	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	1.7	(kg/L)
FractionOrganicCarbon, foc	1.0E-3	(-)

Partition Coefficient

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	26	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	1000	(ft)
Zone 1 Length*	1000	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

Source Thickness in Sat. Zone* 40 (ft)

Width* (ft) Y1 20

Conc. (mg/L)*	C1	K_s* (1/yr)
PCE	150.0	0.2
TCE	.5	0.2
DCE	4.0	0.2
VC	0.1	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

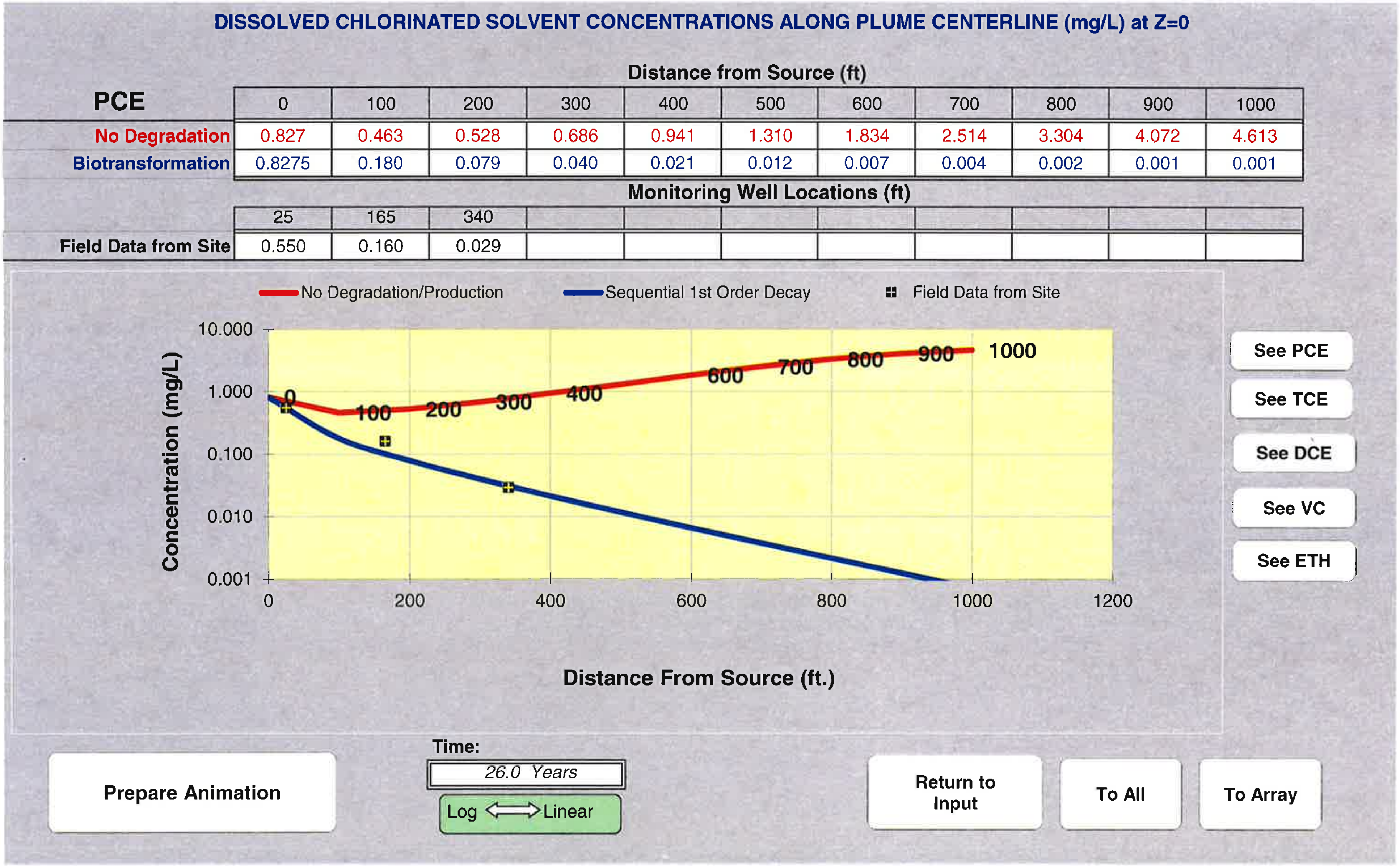
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	.55	.16	.029							
TCE Conc. (mg/L)	.008									
DCE Conc. (mg/L)	.024									
VC Conc. (mg/L)										
ETH Conc. (mg/L)										
Distance from Source (ft)	25	165	340							
Date Data Collected	2014									

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 1A



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

Distance from Source (ft)

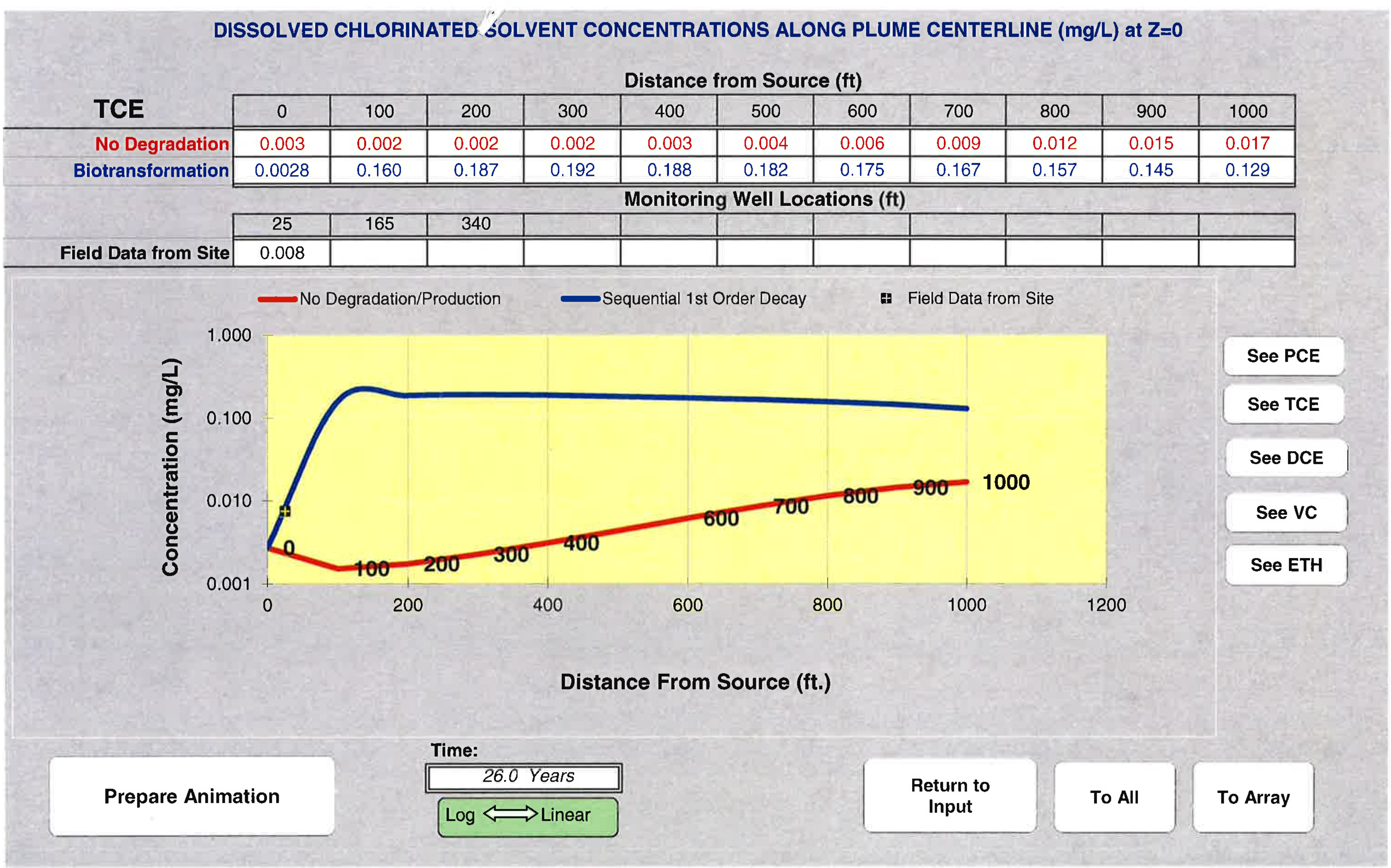
PCE	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.827	0.463	0.528	0.686	0.941	1.310	1.834	2.514	3.304	4.072	4.613
Biotransformation	0.8275	0.180	0.079	0.040	0.021	0.012	0.007	0.004	0.002	0.001	0.001

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site	0.550	0.160	0.029								

Time: 26.0 Years

Plate 1B



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

Distance from Source (ft)

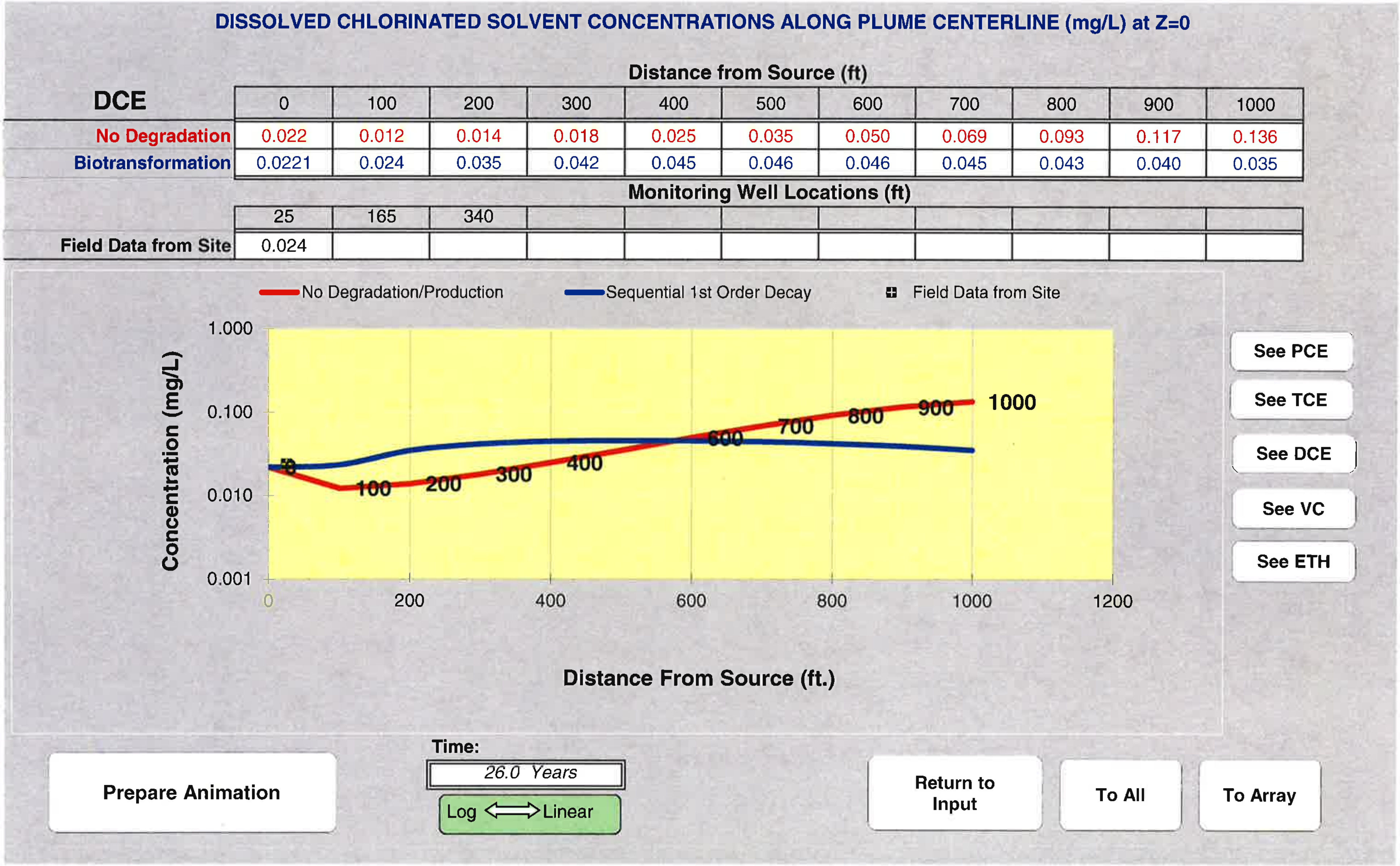
TCE	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.003	0.002	0.002	0.002	0.003	0.004	0.006	0.009	0.012	0.015	0.017
Biotransformation	0.0028	0.160	0.187	0.192	0.188	0.182	0.175	0.167	0.157	0.145	0.129

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site	0.008										

Time: 26.0 Years

Plate 1C



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

Distance from Source (ft)

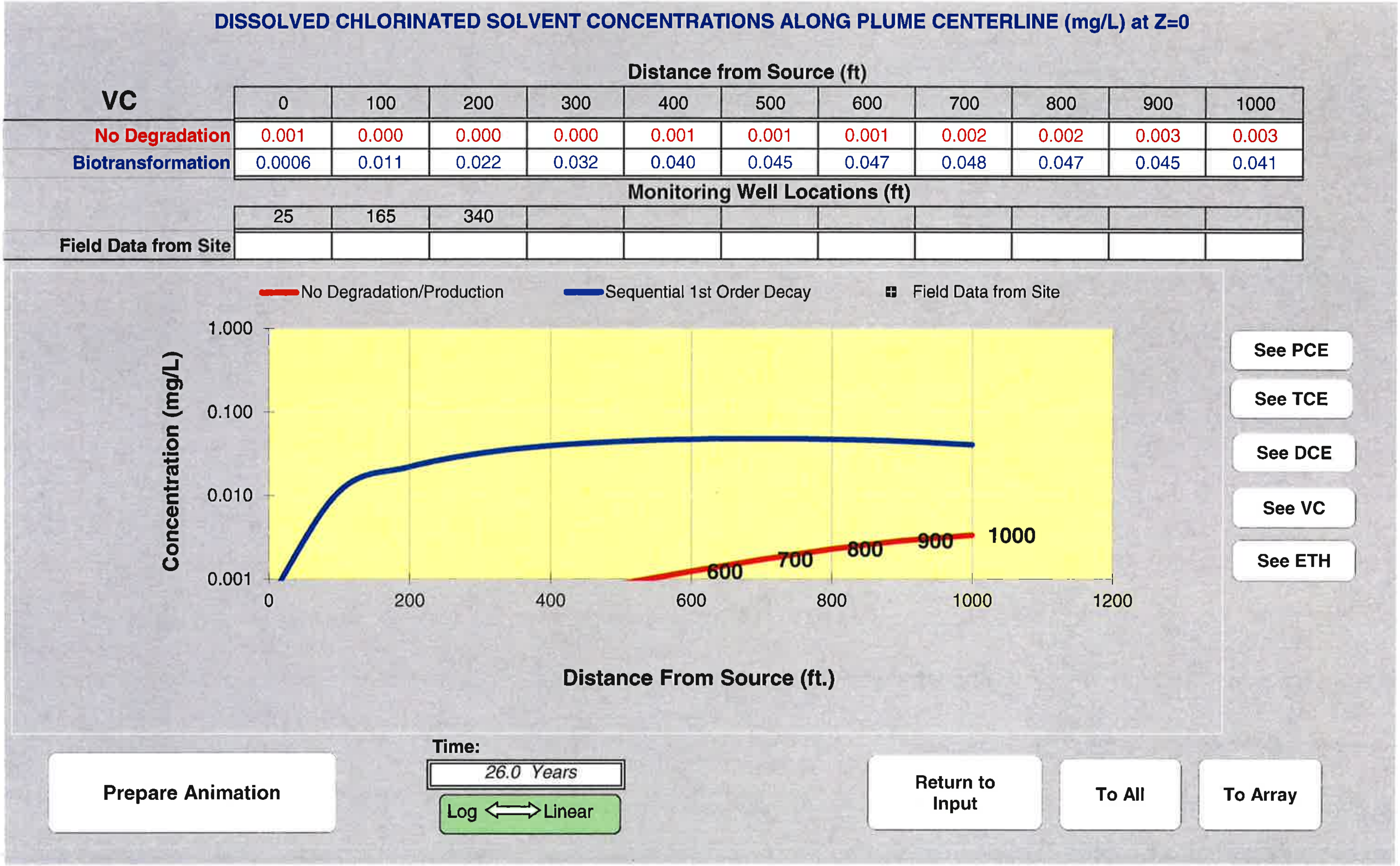
DCE	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.022	0.012	0.014	0.018	0.025	0.035	0.050	0.069	0.093	0.117	0.136
Biotransformation	0.0221	0.024	0.035	0.042	0.045	0.046	0.046	0.045	0.043	0.040	0.035

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site	0.024										

Time: *26.0 Years*

Plate 1D



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

Distance from Source (ft)

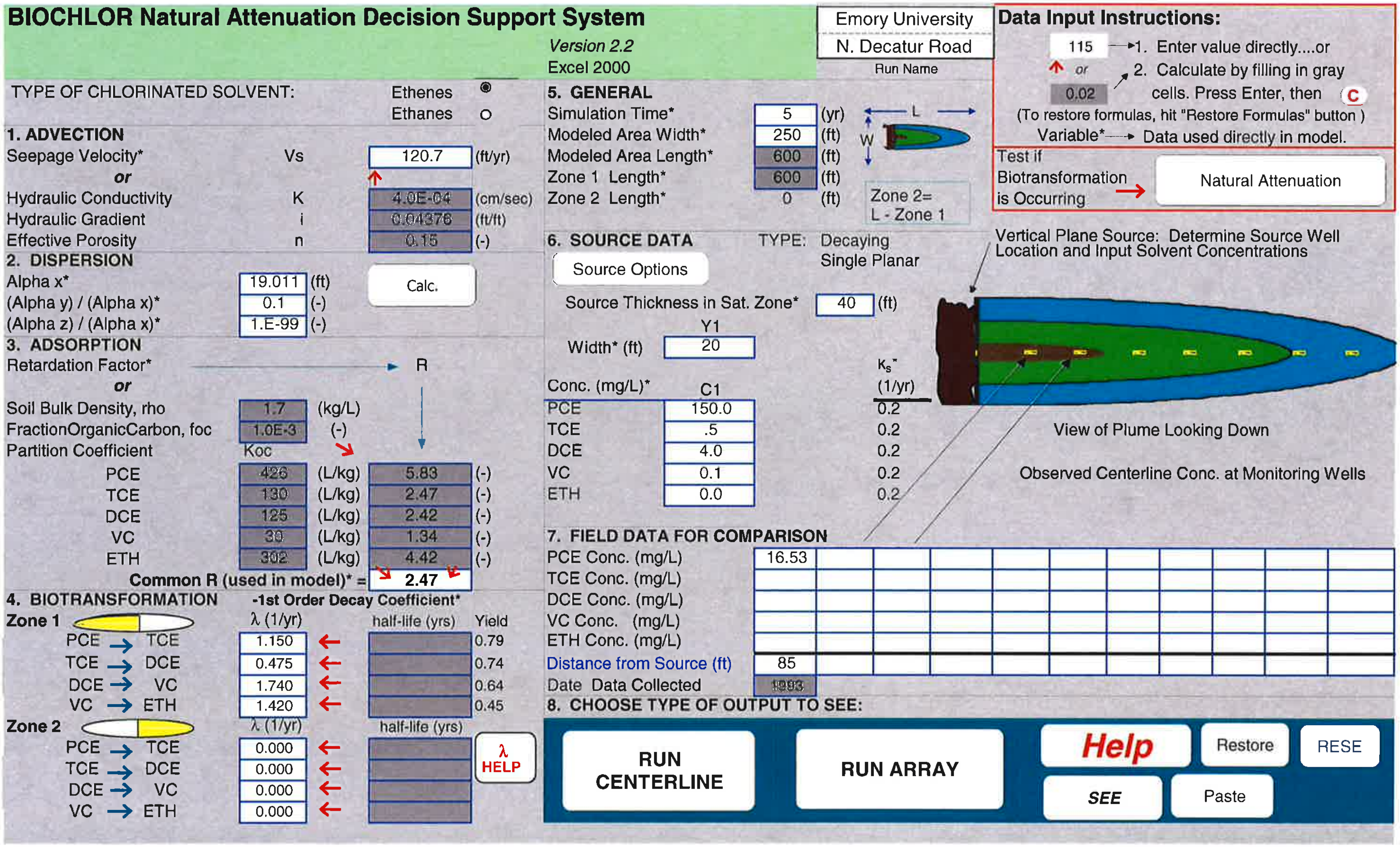
VC	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.003	0.003
Biotransformation	0.0006	0.011	0.022	0.032	0.040	0.045	0.047	0.048	0.047	0.045	0.041

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Time: 26.0 Years

Plate 1E



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	120.7	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.04376	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	19.011	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or
Soil Bulk Density, rho 1.7 (kg/L)
FractionOrganicCarbon, foc 1.0E-3 (-)
Partition Coefficient Koc

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	5	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	600	(ft)
Zone 1 Length*	600	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

Source Thickness in Sat. Zone* 40 (ft)

Width* (ft) Y1 20

Conc. (mg/L)*	C1	K_s* (1/yr)
PCE	150.0	0.2
TCE	.5	0.2
DCE	4.0	0.2
VC	0.1	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

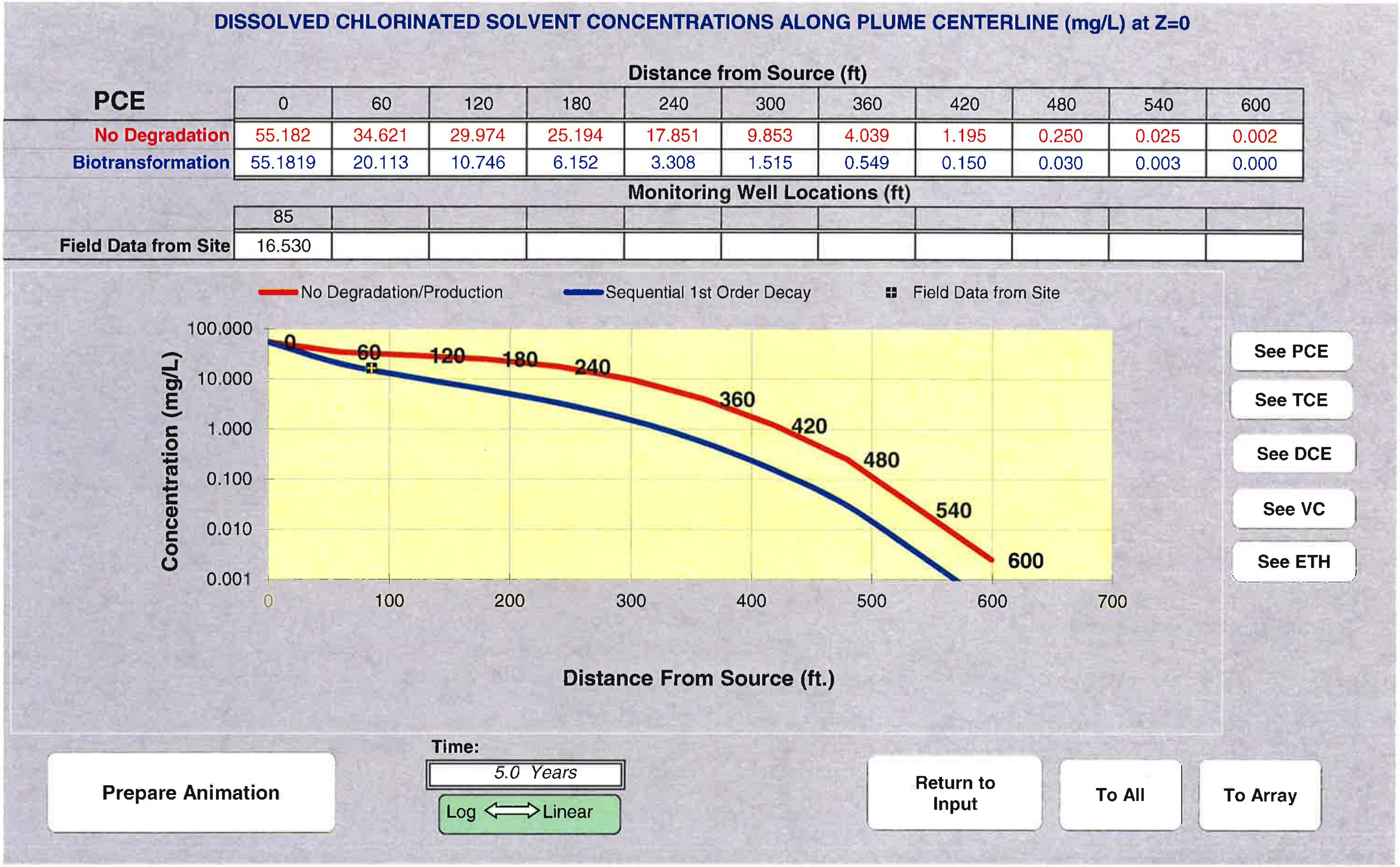
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	16.53									
TCE Conc. (mg/L)										
DCE Conc. (mg/L)										
VC Conc. (mg/L)										
ETH Conc. (mg/L)										
Distance from Source (ft)	85									
Date Data Collected	1993									

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 2A



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

Distance from Source (ft)

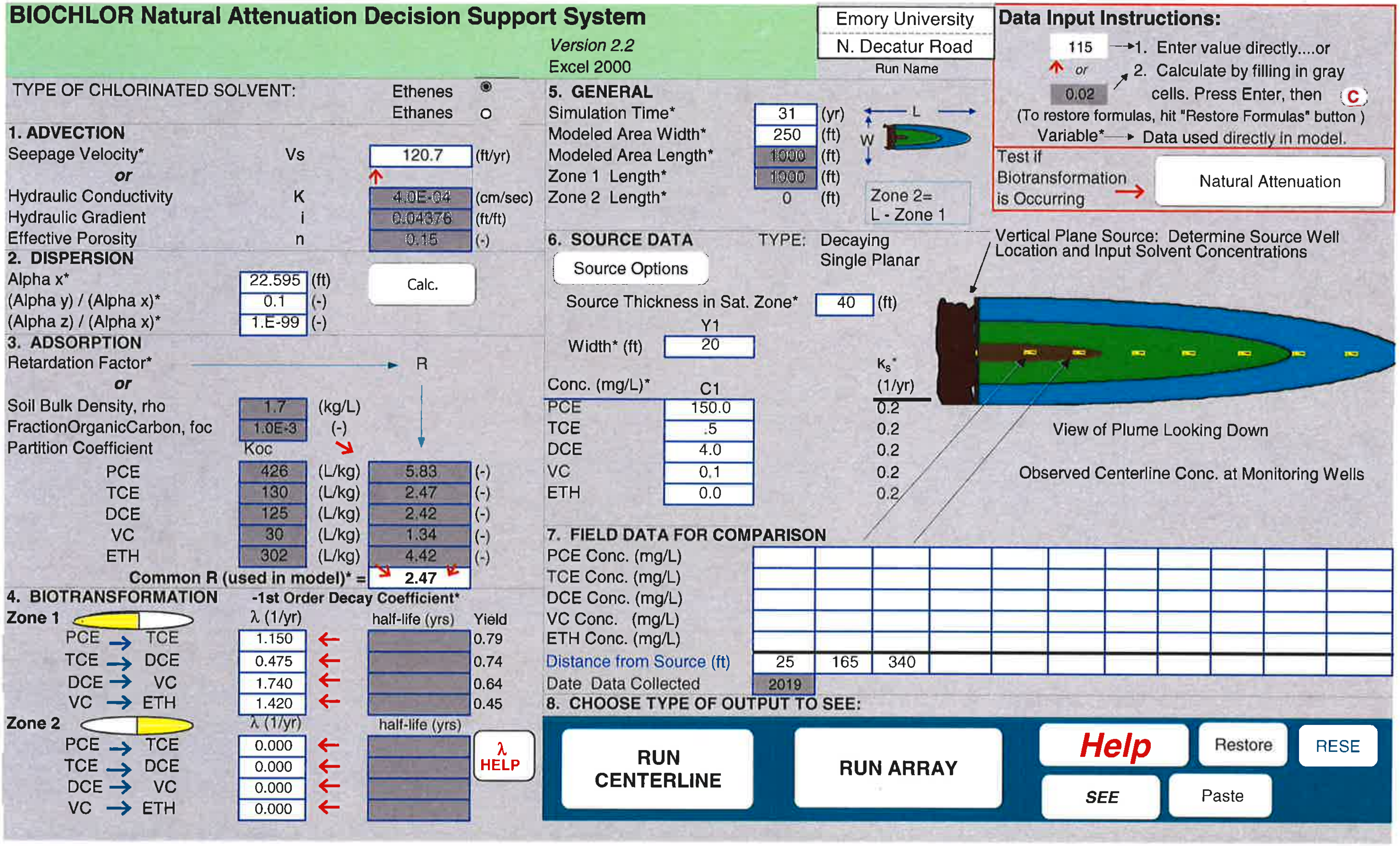
PCE	0	60	120	180	240	300	360	420	480	540	600
No Degradation	55.182	34.621	29.974	25.194	17.851	9.853	4.039	1.195	0.250	0.025	0.002
Biotransformation	55.1819	20.113	10.746	6.152	3.308	1.515	0.549	0.150	0.030	0.003	0.000

Monitoring Well Locations (ft)

	85										
Field Data from Site	16.530										

Time: 5.0 Years

Plate 2B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	120.7	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.04376	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	22.595	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.7	(kg/L)
FractionOrganicCarbon, foc	1.0E-3	(-)

Partition Coefficient

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	31	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	1000	(ft)
Zone 1 Length*	1000	(ft)
Zone 2 Length*	0	(ft)

L W
Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

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

Source Thickness in Sat. Zone* 40 (ft)

Width* (ft) Y1 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	150.0	0.2
TCE	.5	0.2
DCE	4.0	0.2
VC	0.1	0.2
ETH	0.0	0.2

View of Plume Looking Down

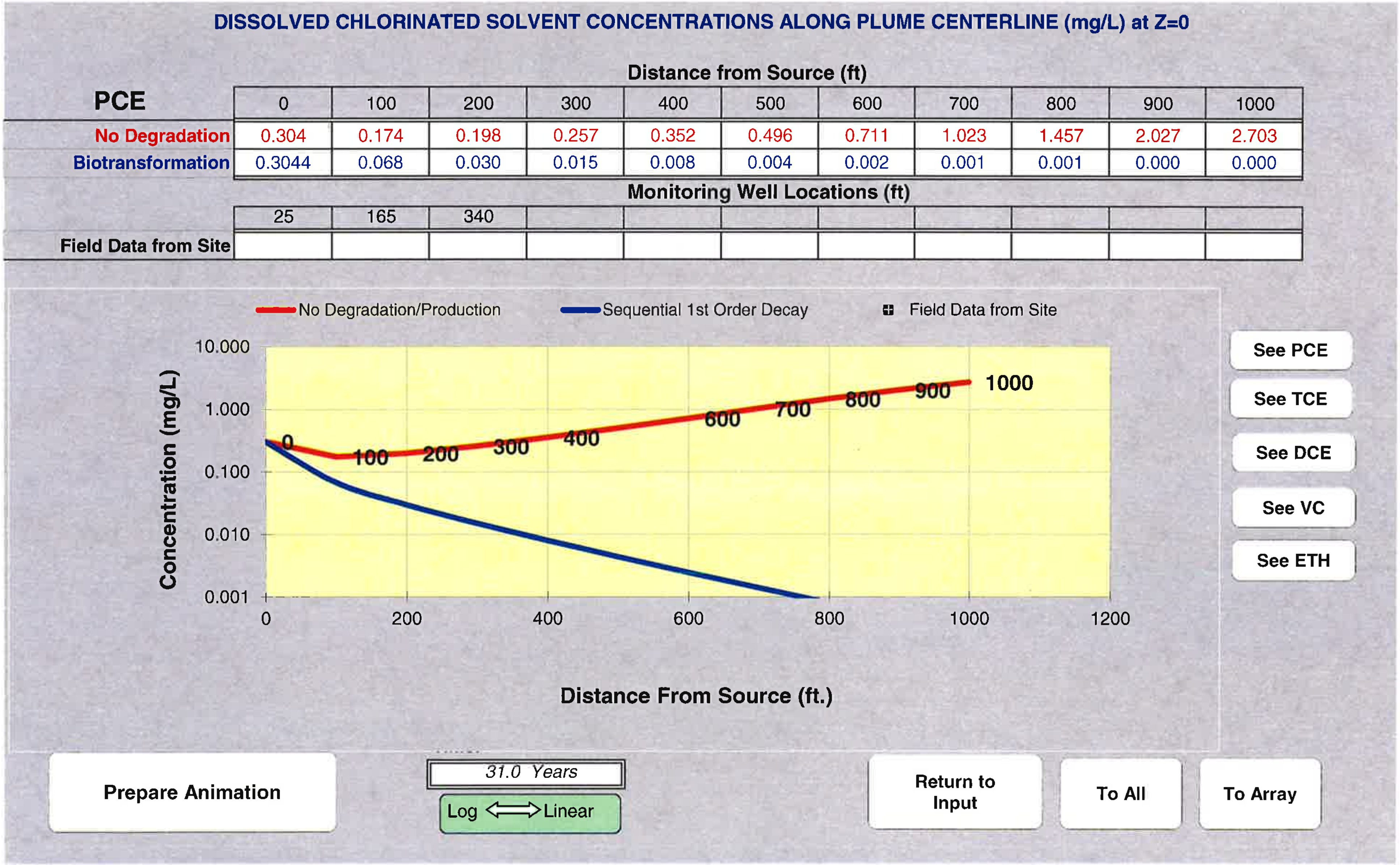
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	25	165	340								
Date Data Collected	2019										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 3A



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

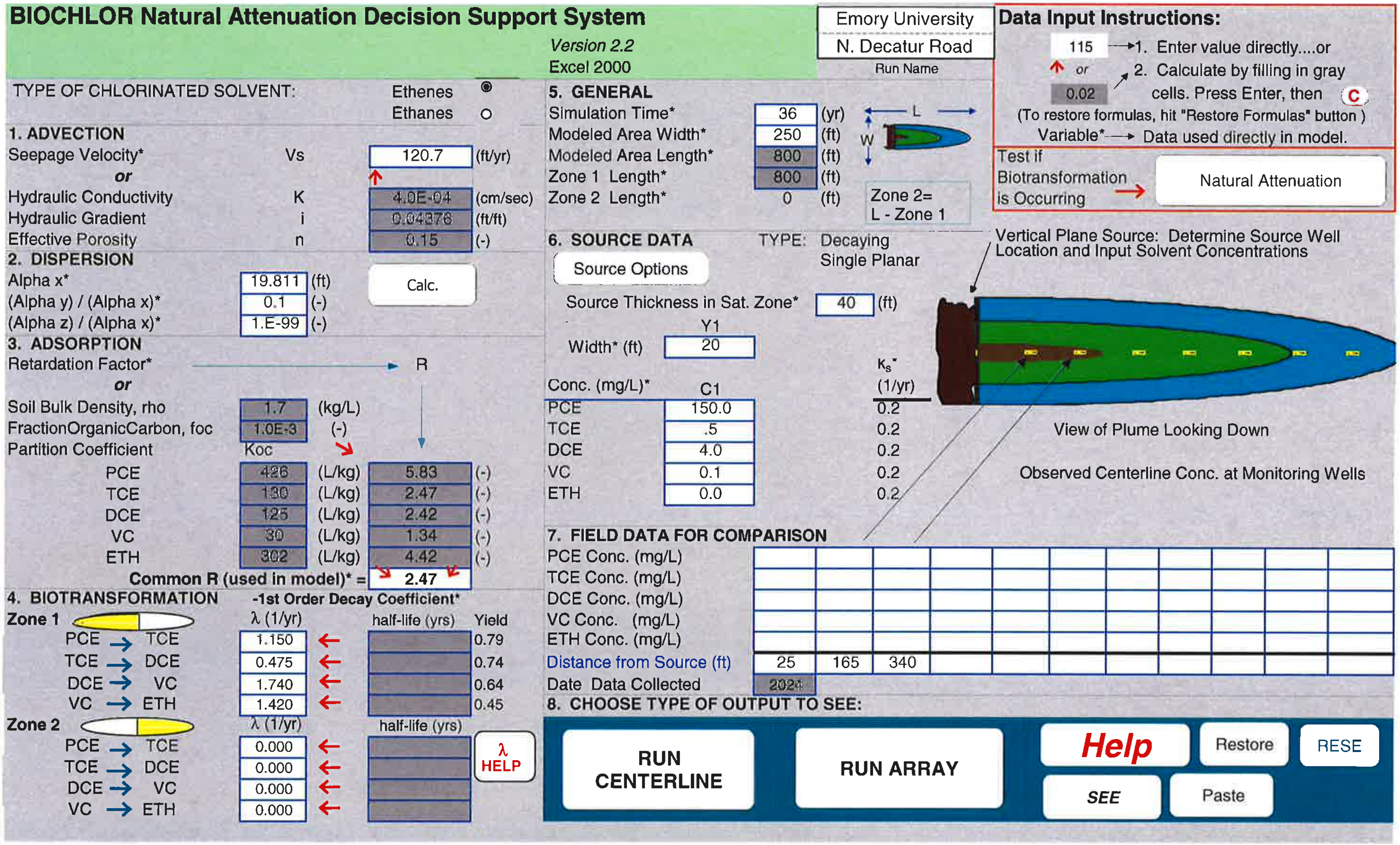
Distance from Source (ft)

PCE	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.304	0.174	0.198	0.257	0.352	0.496	0.711	1.023	1.457	2.027	2.703
Biotransformation	0.3044	0.068	0.030	0.015	0.008	0.004	0.002	0.001	0.001	0.000	0.000

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Plate 3B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	120.7	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.04376	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	19.811	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	1.7	(kg/L)		
FractionOrganicCarbon, foc	1.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	36	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	800	(ft)
Zone 1 Length*	800	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

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

Source Thickness in Sat. Zone* 40 (ft)

	Y1	
Width* (ft)	20	
Conc. (mg/L)*	C1	K_s* (1/yr)
PCE	150.0	0.2
TCE	.5	0.2
DCE	4.0	0.2
VC	0.1	0.2
ETH	0.0	0.2

View of Plume Looking Down

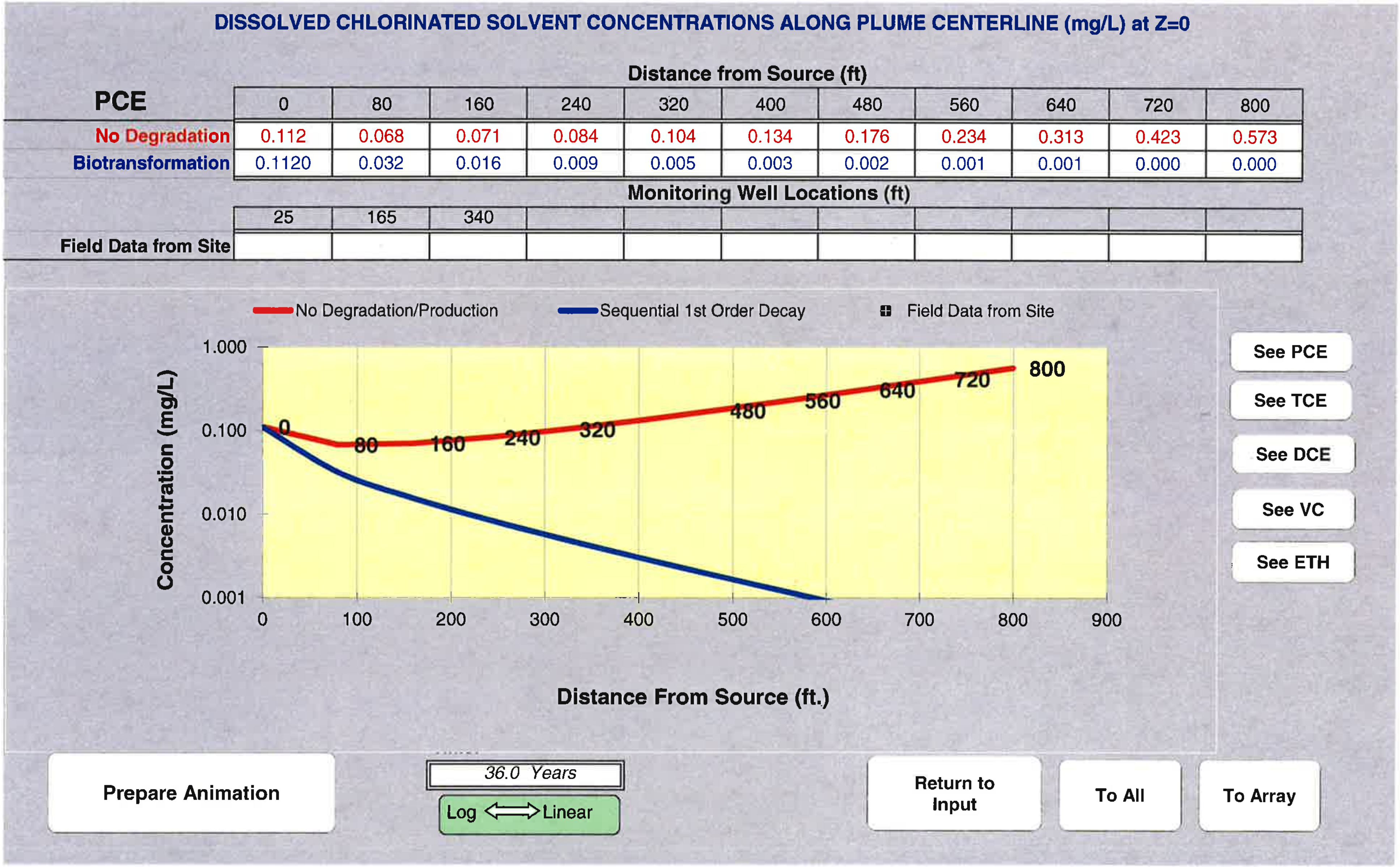
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	25	165	340								
Date Data Collected	2024										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 4A



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

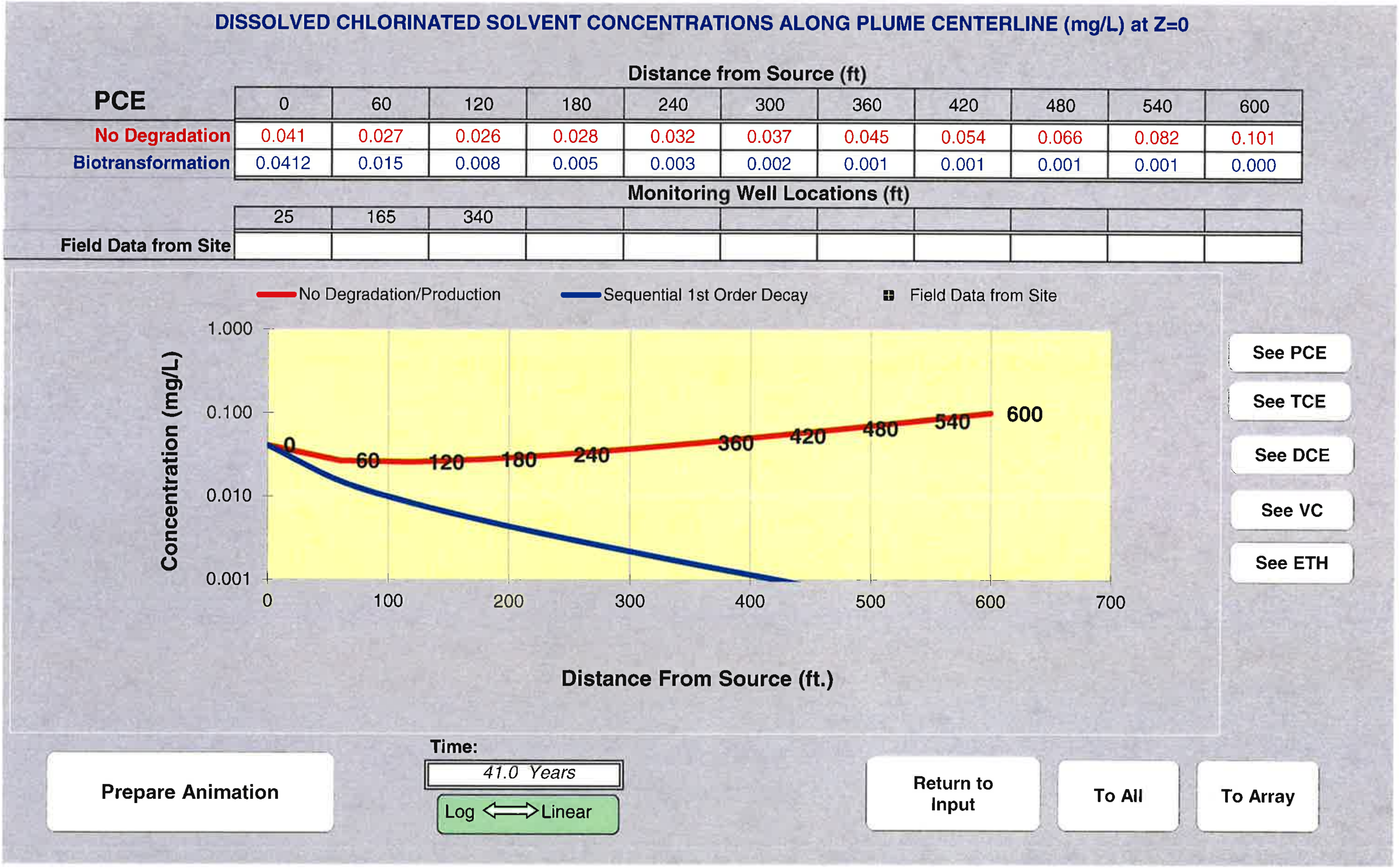
Distance from Source (ft)

PCE	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.112	0.068	0.071	0.084	0.104	0.134	0.176	0.234	0.313	0.423	0.573
Biotransformation	0.1120	0.032	0.016	0.009	0.005	0.003	0.002	0.001	0.001	0.000	0.000

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Plate 4B



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

Distance from Source (ft)

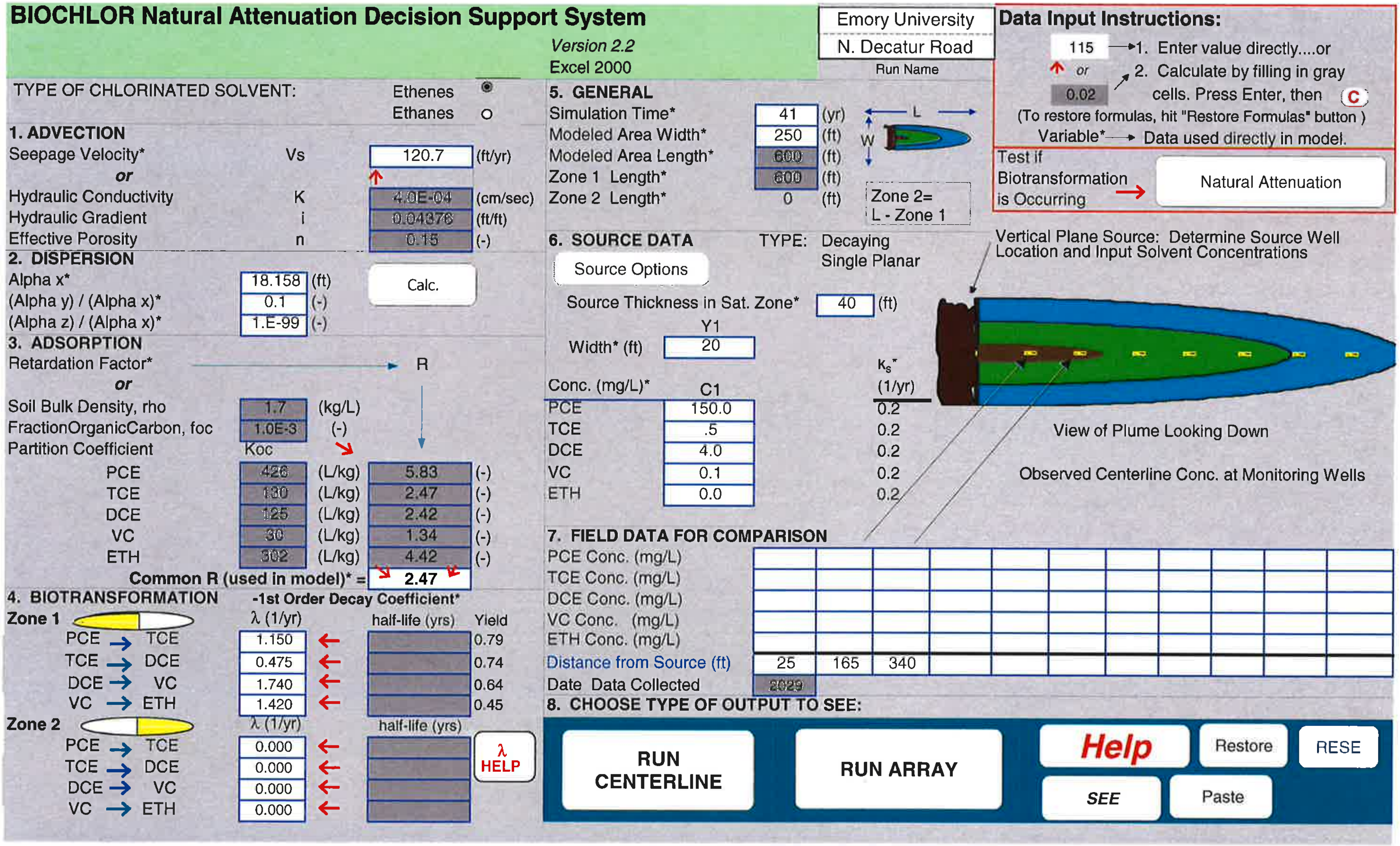
PCE	0	60	120	180	240	300	360	420	480	540	600
No Degradation	0.041	0.027	0.026	0.028	0.032	0.037	0.045	0.054	0.066	0.082	0.101
Biotransformation	0.0412	0.015	0.008	0.005	0.003	0.002	0.001	0.001	0.001	0.001	0.000

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Time: 41.0 Years

Plate 5B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT:
Ethenes ●
Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	120.7	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.04376	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	18.158	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.7	(kg/L)
FractionOrganicCarbon, foc	1.0E-3	(-)

Partition Coefficient	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION **-1st Order Decay Coefficient***

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	41	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	600	(ft)
Zone 1 Length*	600	(ft)
Zone 2 Length*	0	(ft)

L
W
Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

Source Thickness in Sat. Zone* 40 (ft)

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

	Y1
Width* (ft)	20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	150.0	0.2
TCE	.5	0.2
DCE	4.0	0.2
VC	0.1	0.2
ETH	0.0	0.2

View of Plume Looking Down

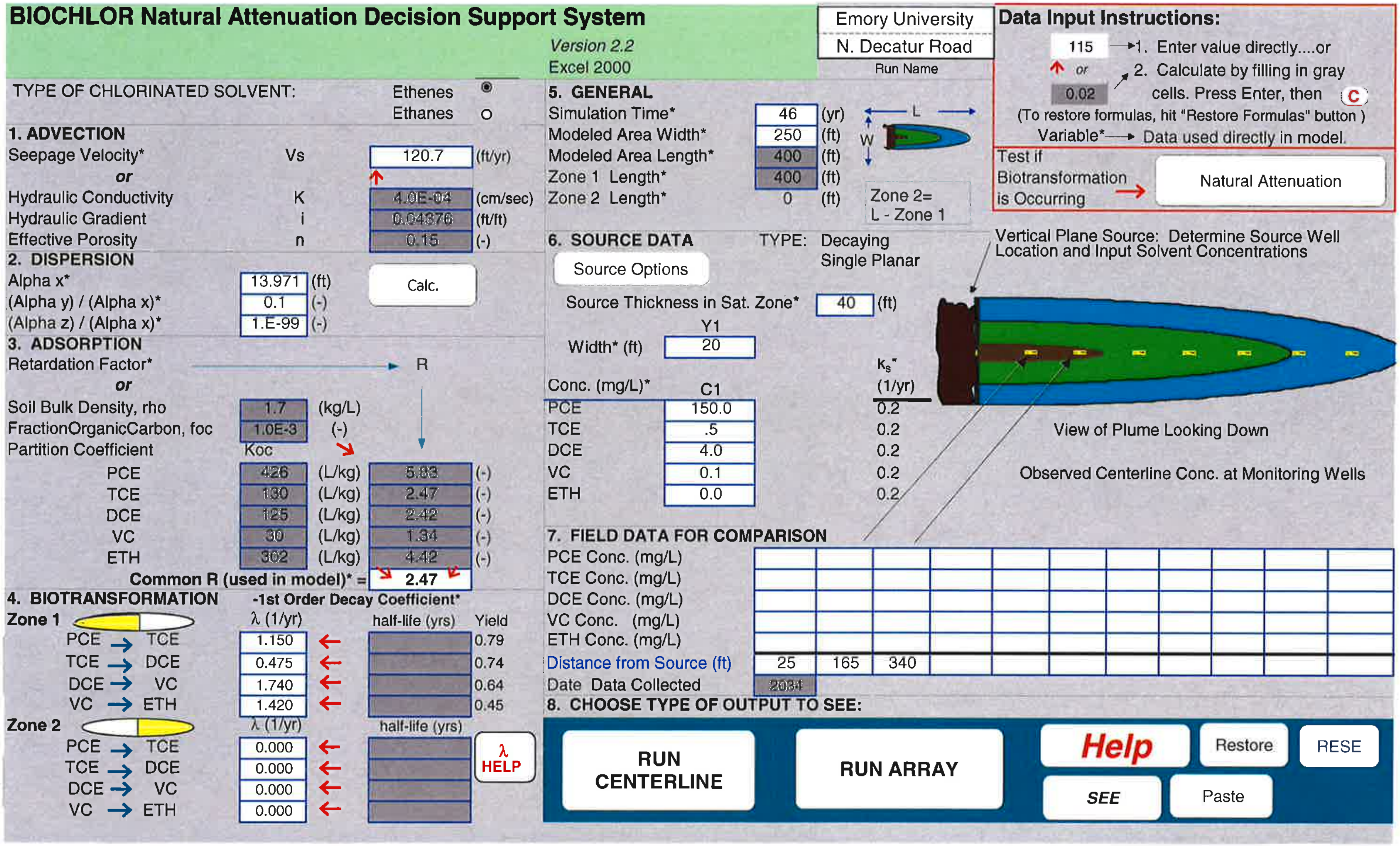
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	25	165	340								
Date Data Collected	2029										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 5A



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	120.7	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.04376	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	13.971	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.7	(kg/L)
FractionOrganicCarbon, foc	1.0E-3	(-)

Partition Coefficient

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	46	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	400	(ft)
Zone 1 Length*	400	(ft)
Zone 2 Length*	0	(ft)

L W
Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

Source Thickness in Sat. Zone* 40 (ft)

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

	Y1
Width* (ft)	20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	150.0	0.2
TCE	.5	0.2
DCE	4.0	0.2
VC	0.1	0.2
ETH	0.0	0.2

View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)										
TCE Conc. (mg/L)										
DCE Conc. (mg/L)										
VC Conc. (mg/L)										
ETH Conc. (mg/L)										
Distance from Source (ft)	25	165	340							
Date Data Collected	2034									

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

RUN ARRAY

Help

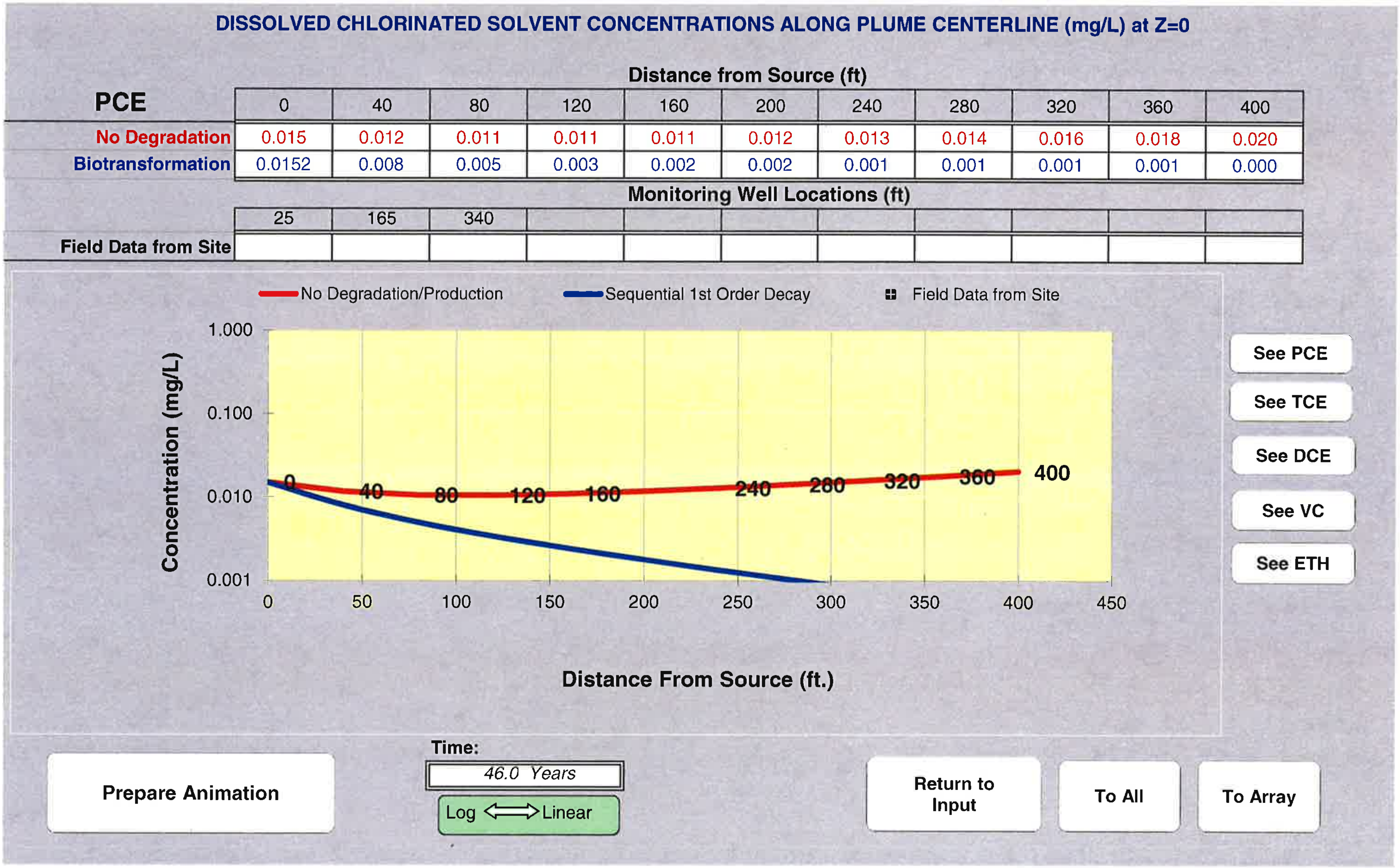
SEE

Restore

Paste

RESE

Plate 6A



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

Distance from Source (ft)

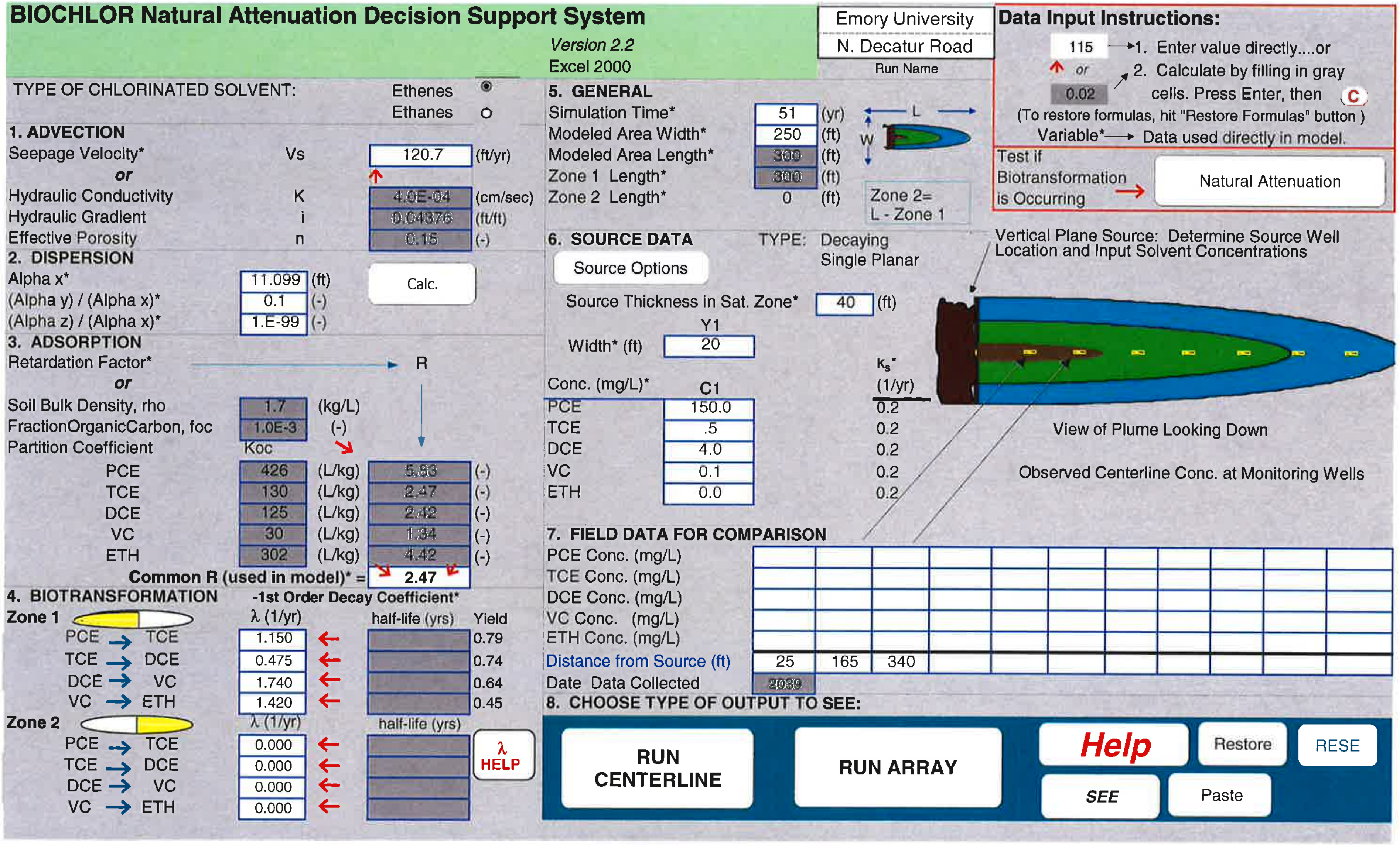
PCE	0	40	80	120	160	200	240	280	320	360	400
No Degradation	0.015	0.012	0.011	0.011	0.011	0.012	0.013	0.014	0.016	0.018	0.020
Biotransformation	0.0152	0.008	0.005	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.000

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Time: 46.0 Years

Plate 6B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION
Seepage Velocity* Vs 120.7 (ft/yr)
or
Hydraulic Conductivity K 4.0E-04 (cm/sec)
Hydraulic Gradient i 0.04376 (ft/ft)
Effective Porosity n 0.15 (-)

2. DISPERSION
Alpha x* 11.099 (ft)
(Alpha y) / (Alpha x)* 0.1 (-)
(Alpha z) / (Alpha x)* 1.E-99 (-)
Calc.

3. ADSORPTION
Retardation Factor* → R
or
Soil Bulk Density, rho 1.7 (kg/L)
FractionOrganicCarbon, foc 1.0E-3 (-)
Partition Coefficient Koc

	Koc		R	
PCE	426	(L/kg)	5.33	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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* 51 (yr)
Modeled Area Width* 250 (ft)
Modeled Area Length* 300 (ft)
Zone 1 Length* 300 (ft)
Zone 2 Length* 0 (ft)
Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar
Source Options
Source Thickness in Sat. Zone* 40 (ft)
Width* (ft) Y1 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	150.0	0.2
TCE	.5	0.2
DCE	4.0	0.2
VC	0.1	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

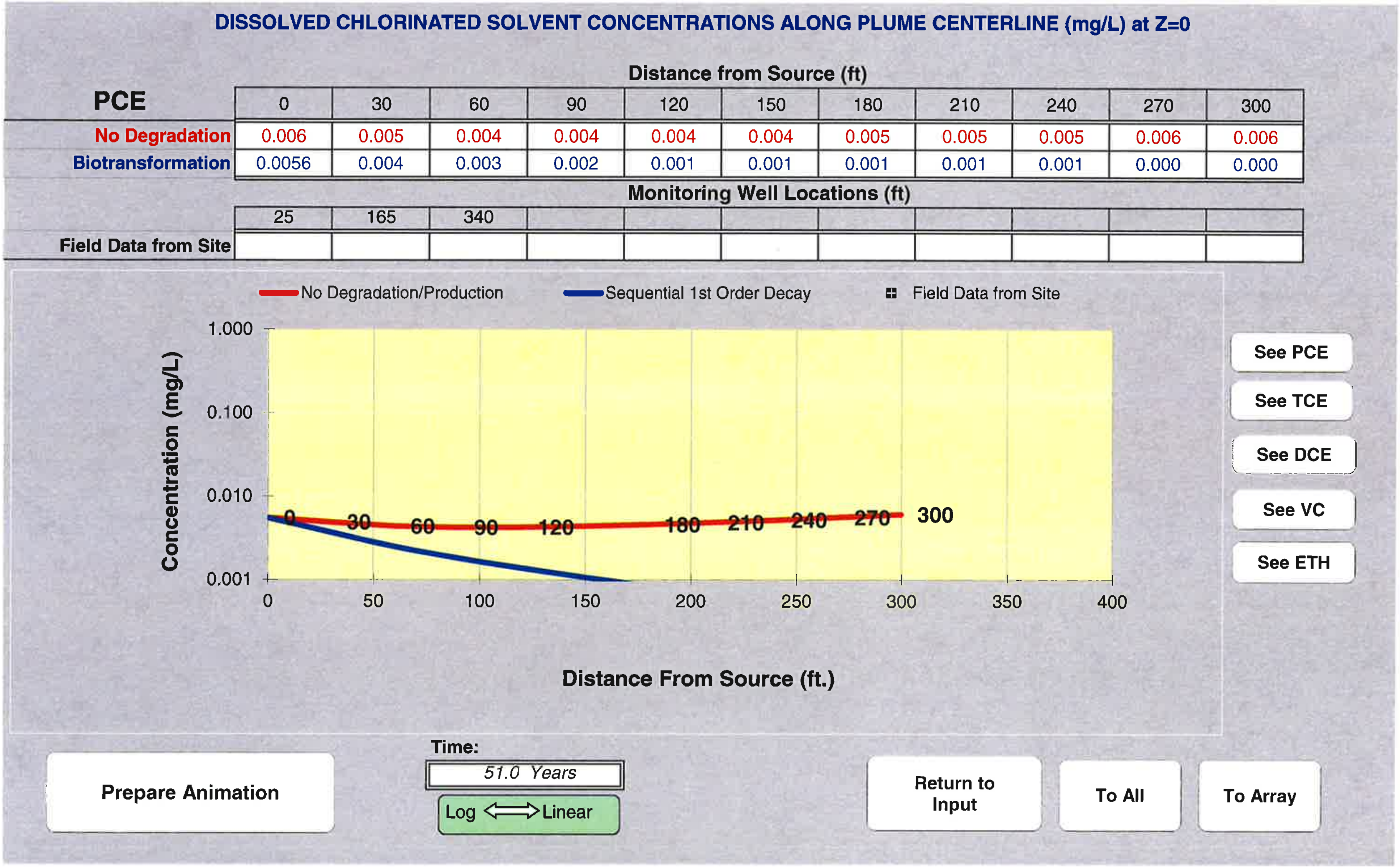
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	25	165	340								
Date Data Collected	2039										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 7A



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

Distance from Source (ft)

PCE	0	30	60	90	120	150	180	210	240	270	300
No Degradation	0.006	0.005	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.006	0.006
Biotransformation	0.0056	0.004	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.000	0.000

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Time: 51.0 Years

Plate 7B

APPENDIX D

Public Notice Letters and Proof of Delivery

EMORY

Office of Government and Community Affairs

January 15, 2016

Isabel Thompson
13 White Street Extension
Watkinsville, GA 30677

Dear Isabel Thompson:

Enclosed is an Environmental Covenant for property located at 1784 North Decatur Road. This property was impacted by environmental contamination and is in the process of a remedial action. Georgia Environmental Protection Division (GA EPD) requires that adjacent property owners be provided a copy of this covenant before signature by the Director of Georgia Natural Resources. Your property located at 1779 North Decatur Road, Decatur, GA is considered adjacent property. This covenant is for your information and no action is required.

Emory University (Emory) acquired this property in 1989 and redeveloped this location. Soil and groundwater contamination from perchloroethylene (dry cleaning fluid) was discovered at this site during redevelopment. GA EPD was notified and this site was entered into the Hazardous Site Response Act (HSRA) program and placed on the Hazardous Site Index (HSI). Soil and groundwater impacts at 1784 North Decatur Road have been undergoing remediation by Emory in accordance with HSRA. Soil remediation started in 1995 and was completed in 1996. Active groundwater remediation started in 1995. In 2014, upon the recommendation of GA EPA the site was entered into the GA EPD Voluntary Remediation Program (VRP) and the active remediation was terminated. Part of the VPR process is the implementation of Institutional Controls in the form of this Environmental Covenant for the purpose of protecting human health and the environment. This covenant restricts property at 1784 North Decatur Road to non-residential development and sets groundwater use limitations. This covenant does not affect adjacent properties.

Sincerely,

Betty Willis
Office of Government and Community Affairs
Emory University
1599 Clifton Road, NE, 5th Floor
Atlanta, GA 30322
betty.willis@emory.edu

February 10,2016

Dear Customer:

The following is the proof-of-delivery for tracking number **775600123957**.

Delivery Information:

Status:	Delivered	**Delivered to:**	Residence
Signed for by:	Signature not required	**Delivery location:**	WATKINSVILLE, GA
Service type:	FedEx 2Day	**Delivery date:**	Feb 9, 2016 12:56
Special Handling:	Deliver Weekday Residential Delivery		

NO SIGNATURE REQUIRED
Proof-of-delivery details appear below; however, no signature is available for this FedEx Express shipment because a signature was not required.

Shipping Information:

Tracking number:	775600123957	**Ship date:**	Feb 8, 2016
		Weight:	0.5 lbs/0.2 kg

Recipient: WATKINSVILLE, GA US	**Shipper:** Atlanta, GA US
Reference	0000021514

Thank you for choosing FedEx.

EMORY

Office of Government and Community Affairs

January 15, 2016

Richard Larson and Jason Cohen
2941 W. Cypress Creek Road #102
Fort Lauderdale, FL 33309-1762

Dear Richard Larson and Jason Cohen:

Enclosed is an Environmental Covenant for property located at 1784 North Decatur Road, Decatur, GA. This property was impacted by environmental contamination and is in the process of a remedial action. Georgia Environmental Protection Division (GA EPD) requires that adjacent property owners be provided a copy of this covenant before signature by the Director of Georgia Natural Resources. Your property at 1793 North Decatur Road, Decatur Georgia is considered adjacent property. This covenant is for your information and no action is required.

Emory University (Emory) acquired this property in 1989 and redeveloped this location. Soil and groundwater contamination from perchloroethylene (dry cleaning fluid) was discovered at this site during redevelopment. GA EPD was notified and this site was entered into the Hazardous Site Response Act (HSRA) program and placed on the Hazardous Site Index (HSI). Soil and groundwater impacts at 1784 North Decatur Road have been undergoing remediation by Emory in accordance with HSRA. Soil remediation started in 1995 and was completed in 1996. Active groundwater remediation started in 1995. In 2014, upon the recommendation of GA EPA the site was entered into the GA EPD Voluntary Remediation Program (VRP) and the active remediation was terminated. Part of the VPR process is the implementation of Institutional Controls in the form of this Environmental Covenant for the purpose of protecting human health and the environment. This covenant restricts property at 1784 North Decatur Road to non-residential development and sets groundwater use limitations. This covenant does not affect adjacent properties.

Sincerely,

Betty Willis
Office of Government and Community Affairs
Emory University
1599 Clifton Road, NE, 5th Floor
Atlanta, GA 30322
betty.willis@emory.edu

Office of Governmental and Community Affairs
1599 Clifton Rd NE, 5th Floor
Atlanta, GA 30322
www.gca.emory.edu

Ph: 404-727-5311
F: 404-727-5313

February 11,2016

Dear Customer:

The following is the proof-of-delivery for tracking number 775600072209.

Delivery Information:

Status:	Delivered	**Delivered to:**	Receptionist/Front Desk
Signed for by:	N.PATEL	**Delivery location:**	FORT LAUDERDALE, FL
Service type:	FedEx 2Day	**Delivery date:**	Feb 11, 2016 13:10
Special Handling:	Deliver Weekday		

NO SIGNATURE REQUIRED
Proof-of-delivery details appear below; however, no signature is available for this FedEx Express shipment because a signature was not required.

Shipping Information:

Tracking number:	775600072209	**Ship date:**	Feb 8, 2016
		Weight:	0.5 lbs/0.2 kg

Recipient:
FORT LAUDERDALE, FL US

Shipper:
Atlanta, GA US

Reference 0000021514

Thank you for choosing FedEx.

EMORY

Office of Government and Community Affairs

January 15, 2016

Thibadeau Holdings, LLC
1448 McClendon Drive #B
Decatur, GA 30033-1805

Dear Thibadeau Holdings:

Enclosed is an Environmental Covenant for property located at 1784 North Decatur Road. This property was impacted by environmental contamination and is in the process of a remedial action. Georgia Environmental Protection Division (GA EPD) requires that adjacent property owners be provided a copy of this covenant before signature by the Director of Georgia Natural Resources. Your property located at 1767/1775/1785 North Decatur Road, Decatur, GA is considered adjacent property. This covenant is for your information and no action is required.

Emory University (Emory) acquired this property in 1989 and redeveloped this location. Soil and groundwater contamination from perchloroethylene (dry cleaning fluid) was discovered at this site during redevelopment. GA EPD was notified and this site was entered into the Hazardous Site Response Act (HSRA) program and placed on the Hazardous Site Index (HSI). Soil and groundwater impacts at 1784 North Decatur Road have been undergoing remediation by Emory in accordance with HSRA. Soil remediation started in 1995 and was completed in 1996. Active groundwater remediation started in 1995. In 2014, upon the recommendation of GA EPA the site was entered into the GA EPD Voluntary Remediation Program (VRP) and the active remediation was terminated. Part of the VPR process is the implementation of Institutional Controls in the form of this Environmental Covenant for the purpose of protecting human health and the environment. This covenant restricts property at 1784 North Decatur Road to non-residential development and sets groundwater use limitations. This covenant does not affect adjacent properties.

Sincerely,

Betty Willis
Office of Government and Community Affairs
Emory University
1599 Clifton Road, NE, 5th Floor
Atlanta, GA 30322
betty.willis@emory.edu

Office of Governmental and Community Affairs
1599 Clifton Rd NE, 5th Floor
Atlanta, GA 30322
www.gca.emory.edu

Ph: 404-727-5311
F: 404-727-5313

FedEx

February 10,2016

Dear Customer:

The following is the proof-of-delivery for tracking number **775599924086**.

Delivery Information:

Status:	Delivered	**Delivery location:**	Decatur, GA
Signed for by:	Signature release on file	**Delivery date:**	Feb 10, 2016 11:00
Service type:	FedEx 2Day		
Special Handling:	Deliver Weekday		

NO SIGNATURE REQUIRED
Proof-of-delivery details appear below; however, no signature is available for this FedEx Express shipment because a signature was not required.

Shipping Information:

Tracking number:	775599924086	**Ship date:**	Feb 8, 2016
		Weight:	0.5 lbs/0.2 kg

Recipient: Decatur, GA US	**Shipper:** Atlanta, GA US
Reference	0000021514

Thank you for choosing FedEx.

EMORY

Office of Government and Community Affairs

February 29, 2016

DeKalb County Tax Assessors Office
120 W Trinity Pl #209,
Decatur, GA 30030

Dear Sir/Madame:

Enclosed is an Environmental Covenant for property located at 1784 North Decatur Road in DeKalb County, Georgia. This property was impacted by environmental contamination and is in the process of a remedial action. Georgia Environmental Protection Division (GA EPD) requires that the County and County government in which the property is located be provided a copy of this covenant before signature by the Director of Georgia Natural Resources.

Emory University (Emory) acquired this property in 1989 and redeveloped this location. Soil and groundwater contamination from perchloroethylene (dry cleaning fluid) was discovered at this site during redevelopment. GA EPD was notified and this site was entered into the Hazardous Site Response Act (HSRA) program and placed on the Hazardous Site Index (HSI). Soil and groundwater impacts at 1784 North Decatur Road have been undergoing remediation by Emory in accordance with HSRA. Soil remediation started in 1995 and was completed in 1996. Active groundwater remediation started in 1995. In 2014, upon the recommendation of GA EPA the site was entered into the GA EPD Voluntary Remediation Program (VRP) and the active remediation was terminated. Part of the VPR process is the implementation of Institutional Controls in the form of this Environmental Covenant for the purpose of protecting human health and the environment. This covenant restricts property at 1784 North Decatur Road to non-residential development and sets groundwater use limitations. This covenant does not affect adjacent properties.

Sincerely,

Betty Willis
Senior Associate Vice President
For Government and Community Affairs
Betty.willis@emory.edu

Jacobs, Brent

From: Thomaston, Scott W <scott.thomaston@emory.edu>
Sent: Thursday, March 10, 2016 8:38 AM
To: Jacobs, Brent
Subject: FW: FedEx Shipment 775813639072 Delivered

-----Original Message-----
From: trackingupdates@fedex.com [mailto:trackingupdates@fedex.com]
Sent: Wednesday, March 09, 2016 10:16 PM
To: Benton, Tiffany A. <tiffany.benton@emory.edu>
Subject: FedEx Shipment 775813639072 Delivered

This tracking update has been requested by:

Company Name: Emory
Name: Scott Thomaston
E-mail: tiffany.benton@emory.edu

Our records indicate that the following shipment has been delivered:

Reference: 0000021514
Ship (P/U) date: Mar 7, 2016
Delivery date: Mar 9, 2016 11:16 am
Sign for by: A.SMITH
Delivery location: Decatur, GA
Delivered to: Receptionist/Front Desk
Delivery date: Wed, 3/9/2016 11:16 am
Service type: FedEx 2Day
Packaging type: FedEx Envelope
Number of pieces: 1
Weight: 0.50 lb.
Special handling/Services: Deliver Weekday

Tracking number: 775813639072

Shipper Information	Recipient Information
Scott Thomaston	DeKalb County Tax Assessors Office
Emory	120 W Trinity Place
1762 Clifton Road NE	209
suite 1200	Decatur
Atlanta	GA
GA	US
US	30030
30322	

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APPENDIX E

Voluntary Remediation Program 2016 Annual Progress Report

Voluntary Remediation Program
2016 Annual Progress Report
Emory University
North Decatur Road Site
HSI Site No 10121
Atlanta, Georgia

Prepared by:
AECOM
400 Northpark Town Center
Suite 900
Atlanta, Georgia 30328
October 2016

CERTIFICATION

2016 ANNUAL VRP PROGRESS REPORT
FOR
EMORY UNIVERSITY NORTH DECATUR ROAD SITE
HSI SITE NO. 10121

PREPARED FOR
EMORY UNIVERSITY

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

Dale P. Voykin, P.G.
Georgia Reg. No. 1220

____

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FIGURES

APPENDICES

1.0 INTRODUCTION

This Annual Voluntary Remediation Program (VRP) Progress Report presents the results for the period of December 2015 through September 2016 of the site activities for the Emory University North Decatur Road Site, Georgia Hazardous Site Inventory (HSI) Site Number 10121.

1.1 Site History

In 1989 Emory University purchased property at the intersection of North Decatur and Burlington Roads in Atlanta, Georgia. A subsequent site assessment determined the property had been impacted by a dry cleaning operation that had previously operated at the property prior to Emory's purchase. The assessment detected tetrachloroethene (PCE or "Perc") in the property soils and groundwater. In September 1993, Emory University submitted a Corrective Action Plan (CAP) to Georgia Department of Natural Resources Environmental Protection Division (GAEPD) outlining the installation of a soil vapor recovery system (SVE) and groundwater recovery system to remediate the site soils and groundwater, and to meet the applicable risk reduction standards as described in GAEPD Rule 391-3-19.07. In 1994, the property was subsequently listed on the Georgia Hazardous Site Inventory (HSI).

In 1995, the remedial systems were installed in accordance with the original CAP, concurrent with the construction of the computer science building (referred to as the North Decatur Building on the Figures) at the site. The remedial systems consisted of four groundwater recovery wells (RW-1, RW-2, RW-3, and RW-4) and fourteen soil vapor recovery wells. Several of the SVE wells were installed beneath the computer science building. The SVE system became fully operational in May 1995.

The groundwater recovery system became fully operational in July 1995. In July 1996, Emory University requested approval from GAEPD to discontinue the operation of the SVE system for soil remediation because the soils at the site met the Type I Risk Reduction Standards (RRS) (as described in GAEPD Rule 391-3-19.07). On August 15, 1996, the SVE system operation was shutdown after approval by GAEPD. In August 2000 Emory collected additional soil samples at the site to confirm the soils met the Type I RRS and the soil contamination had been delineated. Soil samples were collected at three (3) locations. At each location, two soil samples were collected: one at a depth of two (2) feet below ground surface (bgs) and the other at four (4) feet bgs, for a total of six soil samples. The six soil samples were analyzed by EPA Method 8260B for tetrachloroethene and its daughter products (trichloroethene, dichloroethenes, and vinyl chloride). The analytical results for the six soil samples were below the Georgia Hazardous Site response Act (HSRA) soil notification threshold. The concentrations of tetrachloroethene in the six soil samples were also an order of magnitude below the HSRA Type 1 RRS. The results of these samples confirmed GAEPD's earlier decision to approve the temporary shutdown of the SVE system. The soil vapor extraction carbon cells were removed from the treatment area during October 2001 to complete the shutdown of the SVE system. The carbon cells were sent to MKC Enterprises Inc. in Doraville, Georgia for disposal.

In October 2000, Emory University submitted a revised CAP for the remediation of the groundwater at the site. In December 2000 and January 2001, four additional monitoring wells were installed at the site in accordance with the revised October 2000 CAP. The locations of the monitoring wells, MW-1, MW-2, MW-3 (subsequently relabeled as recovery well RW-5), and MW-4, are shown on Figure 1. The installation and construction of the wells were summarized in a report titled *Well Installation Report, May 15, 2001* that was previously submitted to the GAEPD. Monitoring well MW-3 was converted to a recovery well and relabeled RW-5, since PCE was detected at a low concentration in this well. Recovery well RW-5 was connected to the groundwater treatment system and placed into operation on August 6, 2001.

GAEPD agreed, in a Consent Order dated June 7, 2001, that Emory University could continue corrective action for groundwater at the site prior to submittal of a Compliance Status Report. In December 2001, the first Annual Corrective Action Effectiveness Report (CAER) (dated December 7, 2001) was submitted to GAEPD in accordance with the revised October 2000 CAP. The 2001 CAER report recommended sampling all monitoring wells and recovery wells on the same date on a semi-annual basis, reducing the influent sampling from bi-monthly to quarterly, and abandoning temporary piezometers TP-2 and TP-4 because these piezometers were dry and were not needed for potentiometric contouring purposes. GAEPD reviewed the 2001 CAER and approved these recommendations on October 7, 2002.

In December 2002, the second Annual CAER report was submitted to GAEPD for review. The CAER recommended converting recovery well RW-4 to a monitoring well because the recovery well had little to no effect on the cone of depression and the recovery well pump had failed. On October 30, 2003, GAEPD approved the recommendation subject to a public notice period regarding the conversion of RW-4 to a monitoring well. Emory refrained from implementing the well conversion pending GAEPD's final review of the 2002 CAER. The Public Notice was published and to our knowledge no comments were received. A Revised 2002 CAER was submitted to GAEPD on December 8, 2003 after incorporating GAEPD's October 30, 2003 comments.

The 2003 CAER was submitted to GAEPD on December 15, 2003, the 2004 CAER was submitted to GAEPD on December 15, 2004, and the 2005 CAER was submitted on December 20, 2005.

On May 11, 2006 GAEPD provided comments to the 2005 CAER, as well as the February 2006 Semi-Annual Sampling Report, and approved the conversion of recovery well RW-4 to a monitoring well. The conversion of RW-4 was completed on June 14, 2006. GAEPD also requested additional items related to the annual and semi-annual reporting requirements, including well construction details, a cross section depicting well locations, and VOC data. Emory responded to GAEPD comments on June 29, 2006 with the information requested.

On October 28, 2008 GAEPD provided comments to the February and June 2008 Semi-Annual Sampling Reports. In the comment letter, GAEPD requested future sampling events utilize low-flow sampling methods and that the semi-annual reports be combined into one annual CAER to be submitted by December 31 of each year. GAEPD indicated that the annual report should include historical PCE concentrations for the monitoring wells and recovery wells, an evaluation of the effectiveness of the corrective action, and an estimate on the length of time to bring the site into compliance with the risk reduction standards.

The 2009 CAER was submitted to GAEPD on January 5, 2010 and the 2010 CAER was submitted on February 4, 2011. On March 1, 2011 GAEPD provided comments to both the 2009 and 2010 CAERs. These comments were addressed in the 2011 CAER which was submitted on January 27, 2012. In February 2012, Emory University meet with GAEPD to discuss transitioning the site into the Voluntary Cleanup Program (VCP). A 2012 CAER was submitted on March 14, 2013 to GAEPD for review.

On December 13, 2013, Emory University submitted an application to the VCP. In January 2014, Emory University submitted a Preliminary Remediation Plan and Conceptual Site Model. The Preliminary Remediation Plan proposed to discontinue the pump and treat remediation and utilize groundwater use controls/limitations and natural attenuation processes to protect human health and the environment. In May 2014, Emory submitted a draft uniform environmental covenant to GAEPD for review. In August and October 2014, URS performed sampling of the site monitoring wells at the request of GAEPD to update the groundwater model that had been included to support the Conceptual Site Model. On October 19 and 20, 2014, URS dismantled the groundwater extraction system after approval from GAEPD. The groundwater treatment compound was dismantled, including all equipment (air stripper, air treatment unit, primary sump tank, pumps, and electrical controls, fencing, and concrete containment pad) by A&D Environmental. The groundwater discharge point to the DeKalb County Sewer was properly capped below ground. DeKalb County was subsequently notified the NPDES permit for the system was no longer needed. In addition, the former SVE well vaults were removed after the SVE wells were abandoned by Environmental Exploration, Inc. (EEI). The groundwater pumps, controllers, and wiring were removed from within the recovery wells as part of the dismantling process. The former locations of the vaults were backfilled with soil and the surface graded to match the existing conditions (grass or pine bark).

In January 2015, URS submitted an updated groundwater model, a vapor intrusion evaluation, an updated Conceptual Site Model, and draft Uniform Environmental Covenant. On April 8, 2015, AECOM (formerly URS) performed a groundwater sampling event. On November 9, 2015, the GAEPD notified Emory that the Uniform Environmental Covenant (the “Covenant”), groundwater model, vapor intrusion evaluation, and Conceptual Site Model were approved. With that approval, GAEPD requested the Covenant be signed and recorded at the DeKalb County courthouse and that a recorded copy of the Covenant also be provided to GAEPD. On June 17, 2016, AECOM filed the final Covenant with the DeKalb County courthouse to be recorded on the property deed,.

2.0 Groundwater Monitoring

This section presents the results of the groundwater monitoring event conducted on March 30 and 31, 2016. The groundwater sampling event data for 2015 was previously submitted with the Voluntary Remediation 2015Annual Progress report.

2.1 Water Level Measurements

Prior to performance of the sampling event conducted on March 30, 2016, water level measurements were collected from the existing monitoring wells and former recovery wells. A summary of the water level measurements, total depth of the wells, the screened elevations, and groundwater elevation data, is presented on Table 1. Figure 2 presents a potentiometric map constructed from the gauging data obtained on April 8, 2015 and Figure 3 presents a potentiometric map constructed from the gauging data obtained on March 30, 2016.

2.2 Monitoring Well and Former Recovery Well Sampling

The monitoring wells (MW-1, MW-2, MW-4, and RW-4) and former recovery wells (RW-1, RW-2, RW-3, and RW-5) were sampled on March 30 and 31, 2016. AECOM personnel utilized low-flow sampling methods to collect the groundwater samples. Sampling parameters for the wells were allowed to stabilize prior to collecting groundwater samples. The groundwater sampling parameters are presented in Table 2. A copy of the groundwater sampling logs for the March 2016 sampling event is provided in Appendix A.

2.3 Groundwater Analytical Results

The groundwater samples collected during the March 2016 sampling event were submitted to Analytical Environmental Services, Inc. (AES) for analysis of tetrachloroethene and its daughter products (1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride by EPA Method 8260B. Copies of the 2016 monitoring well and former recovery well analytical data are provided in Appendix B and summarized on Table 3. A summary of the 2104/2015/2016 PCE concentrations are presented on Figure 5.

PCE and its daughter products (1,1-dichloroethene, cis-1,2-dichloroethene, trans –1,2-dichloroethene, trichloroethene, and vinyl chloride) were not detected above the laboratory detection limit in monitoring wells MW-1 and MW-2 during the 2016 sampling event. PCE was detected at varying concentrations in monitoring wells MW-4 and RW-4, and former recovery wells RW-1, RW-2, RW-3, and RW-5 during the groundwater sampling event. However, no daughter products were detected in monitoring wells MW-4, and RW-4 and former recovery well RW-5 during the groundwater sampling event. The daughter product trichloroethene was detected in former recovery wells RW-2, at a concentration of 12 ug/l, and former recovery well RW-3 at a concentration of 8.9 ug/L,. The PCE concentration in the furthest downgradient well, MW-4, showed a slight decrease in concentration from 33 ug/L during the April 2015 sampling event to a concentration of 29 ug/L during the March 2016 sampling event.

Overall, the March 2016 groundwater results conform with the 2015 groundwater sampling and with the Conceptual (groundwater) Site Model. The 2016 results appear to confirm the earlier BIOCHLOR model predictions for the longer-term fate of PCE in site groundwater.

Conclusions and Recommendations

Based upon the analytical results of the recovery and monitoring well sampling, air sampling, and water level measurements, we recommend that:

- Annual monitoring be performed as requested by GAEPD, along with submission of a yearly VRP Progress Report.

TABLES

Table 1

Water Level Measurements
2016 VRP
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well	Top of Casing Elevation (feet)	Well Depth (feet bls)	Screened Interval (feet bls)	6/27/11 Depth To Water (feet)	6/27/11 Groundwater Elevation (feet, msl)	01/04/12 Depth To Water (feet)	01/04/12 Groundwater Elevation (feet, msl)	06/26/12 Depth To Water (feet)	06/26/12 Groundwater Elevation (feet, msl)	03/30/16 Depth To Water (feet)	03/30/16 Groundwater Elevation (feet, msl)
RW-1	968.90	60.0	40-60	35.60	933.30	NG	-	NG	-	31.30	937.60
RW-2	970.34	60.0	40-60	40.50	929.84	NG	-	NG	-	33.74	936.60
RW-3	968.35	55.0	35-55	35.40	932.95	NG	-	NG	-	27.82	940.53
RW-4	968.63	55.0	35-55	36.43	932.20	38.18	930.45	39.47	929.16	30.92	937.71
RW-5	962.64	60.0	50-60	35.45	927.19	37.43	925.21	38.22	924.42	31.54	931.10
MW-1	954.59	45.0	35-45	23.10	931.49	27.54	927.05	27.85	926.74	15.35	939.24
MW-2	968.82	42.0	32-42	32.10	936.72	35.16	933.66	36.40	932.42	28.35	940.47
MW-4	954.35	48.0	38-48	32.15	922.20	34.70	919.65	35.68	918.67	31.77	922.58
TP-1	968.86	45.00	35-45	32.18	936.68	NM		NM		NM	
TP-2	963.36	40.0	30-40	NM		NM		NM		NM	
TP-3	958.70	40.0	30-40	Damaged		NM		NM		NM	
TP-4	966.30	45.0	35-45	NM		NM		NM		NM	
TP-5	956.27	58.0	34-58	28.20	928.07	NM		NM		NM	

NM - Not measured

NG - Not gauged due to pump and wiring obstructing well

March 2013

Table 2

Groundwater Sampling Parameters
2016 Annual VRP Progress Report
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Monitoring Well	Date	Purge Method	Purge Flow Rate (L/min)	Casing Volume (L)	Total Volume Purged (L)	Stabilized Chemical Parameters					
						pH (standard units)	Conductivity (mS/cm)	Turbidity (NTUs)	Diss. Oxygen (mg/L)	Temperature (°C)	Oxygen Reduction Potential (mV)
MW-1	3/30/2016	BP	0.15	17.8	11.75	5.76	0.190	0.00	5.91	21.37	84.50
MW-2	3/30/2016	BP	0.20	12.3	12.5	5.29	0.100	0.89	4.44	20.48	106.00
MW-4	3/31/2016	BP	0.15	9.8	8.0	5.70	0.333	0.05	6.77	18.54	92.00
RW-1	3/31/2016	BP	0.20	71.1	12.6	5.86	0.140	25.2	4.36	18.68	70.00
RW-2	3/31/2016	BP	0.15	62.0	8.1	5.52	0.300	3.19	5.96	18.84	89.40
RW-3	3/31/2016	BP	0.23	61.3	16.7	6.69	0.310	6.0	0.38	19.43	0.70
RW-4	3/31/2016	BP	0.20	42.0	11.6	5.63	0.120	0.54	5.54	18.78	76.60
RW-5	3/31/2016	BP	0.15	17.4	8.1	5.72	0.200	1.01	5.37	18.84	38.70

Notes:

NTUs - Nephelometric Turbidity Unit
mg/L - milligrams per liter
BP - bladder pump
°C - Degrees Celsius
mS/cm - millisiemens per centimeter

Table 3
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-1	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	04/08/15	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/30/16	BRL	BRL	BRL	BRL	BRL	BRL	NA
MW-2	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	19	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	04/08/15	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/30/16	BRL	BRL	BRL	BRL	BRL	BRL	NA

Table 3
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-3/RW-5*	02/05/01	65	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	78	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	89.2	BRL	BRL	BRL	BRL	BRL	NA
	02/14/02	90	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	66.6	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	43.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	75	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	53	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	56	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	47	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	40	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	57	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	66	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	50	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	14	BRL	BRL	120	BRL	BRL	NA
	03/01/08	39	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	44	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	40	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	66	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	71	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	73	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	160	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	190	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	200	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	230	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	150	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	180	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	190	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	160	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	200	BRL	BRL	BRL	BRL	BRL	NA
	03/31/16	180	BRL	BRL	BRL	BRL	BRL	NA
MW-4	02/05/01	3.4	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	4.0	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	3.8	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	4.8	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	3.0	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	4.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	4.0	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	3.7	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	5.0	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	8.7	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12		BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	14	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	15	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	14	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	20	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	29	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	29	BRL	BRL	BRL	BRL	BRL	NA
	4/8/2015 (DUP-1)	33 38	BRL	BRL	BRL	BRL	BRL	NA
	03/31/16	29	BRL	BRL	BRL	BRL	BRL	NA

Table 3
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-1	Jun-98	8.4	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	BRL	NA	NA	NA	NA	NA	NA
	07/09/99	12.4	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	20	NA	NA	NA	NA	NA	NA
	07/07/00	56.4	NA	NA	NA	NA	NA	NA
	02/05/01	59.0	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	85.4	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	107	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	144	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	170	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	200	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	200	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	190	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	190	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	140	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	160	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	110	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	160	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	90	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	130	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	99	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	120	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	170	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	200	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	180	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	130	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	120	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	110	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	57	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	160	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	130	BRL	BRL	BRL	BRL	BRL	NA
	3/31/2016 (DUP-1)	140 130	BRL BRL	BRL BRL	5.5 6	BRL BRL	BRL BRL	NA NA
RW-2	Jun-98	127	NA	NA	NA	NA	NA	NA
	Jun-98	150	NA	NA	NA	NA	NA	NA
	01/08/99	270	NA	NA	NA	NA	NA	NA
	07/09/99	55	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	197	NA	NA	NA	NA	NA	NA
	07/07/00	382	NA	NA	NA	NA	NA	NA
	02/05/01	549	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	119	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	710	2.2	NS	NS	NS	NS	NS
	01/29/03	138	2.1	BRL	1.5	BRL	BRL	NA
	06/19/03	630	1.0	BRL	2.0	BRL	BRL	NA
	01/15/04	890	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	650	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	490	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	860	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	970	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	1,000	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	440	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	780	5.7	BRL	8.1	BRL	BRL	NA
	03/01/08	300	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	460	120	BRL	190	BRL	BRL	BRL
	03/11/09	NS	NS	NS	NS	NS	NS	NS
	06/30/09	NS	NS	NS	NS	NS	NS	NS

Table 3
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Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-2 (continued)	01/22/10	NS	NS	NS	NS	NS	NS	NS
	07/08/10	1,200	13	BRL	27	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	790	9.5	BRL	25	BRL	BRL	NA
	06/27/12	570	BRL	BRL	11	BRL	BRL	NA
	01/10/13	37	BRL	BRL	90	BRL	BRL	NA
	06/27/13	490	BRL	BRL	12	BRL	BRL	NA
	01/21/14	700	7.4	BRL	20	BRL	BRL	NA
	08/04/14	670	6.9	BRL	18	BRL	BRL	NA
	10/15/14	550	7.5	BRL	24	BRL	BRL	NA
	04/09/15	830	10	BRL	34	BRL	BRL	NA
	03/31/16	920	12	BRL	42	BRL	BRL	NA
RW-3	Jun-98	6.9	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	6.8	NA	NA	NA	NA	NA	NA
	07/09/99	8.8	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	8.0	NA	NA	NA	NA	NA	NA
	07/07/00	35.9	NA	NA	NA	NA	NA	NA
	02/05/01	39	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27.1	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	27.7	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	31.5	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	55.4	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	58	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	57	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	71	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	38	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	91	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	53	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	70	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	33	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	71	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	38	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	67	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	55	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	71	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	84	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	130	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	NS	NS	NS	NS	NS	NS	NS
	06/27/12	50	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	54	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	85	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	37	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	62	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	42	37	BRL	130	BRL	BRL	NA
	03/31/16	36	8.9	BRL	20	BRL	BRL	NA

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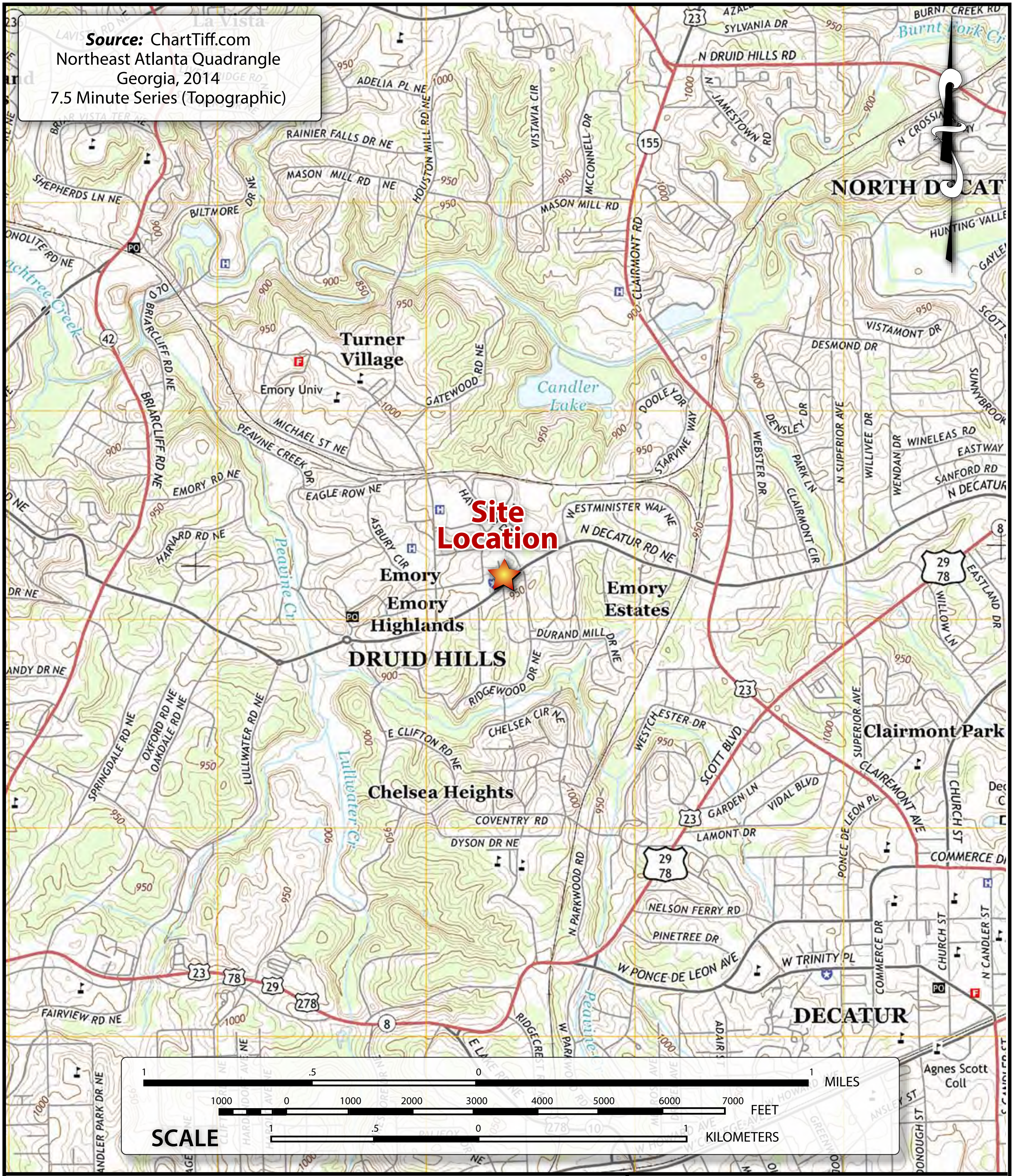
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-4**	Jun-98	19	NA	NA	NA	NA	NA	NA
	Jun-98	25	NA	NA	NA	NA	NA	NA
	01/08/99	57	NA	NA	NA	NA	NA	NA
	07/09/99	225	NA	NA	NA	NA	NA	NA
	07/27/99	187	NA	NA	NA	NA	NA	NA
	01/06/00	128	NA	NA	NA	NA	NA	NA
	07/07/00	189	NA	NA	NA	NA	NA	NA
	02/05/01	174	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	253	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	NS	NS	NS	NS	NS	NS	NS
	01/29/03	NS	NS	NS	NS	NS	NS	NS
	06/19/03	NS	NS	NS	NS	NS	NS	NS
	01/15/04	NS	NS	NS	NS	NS	NS	NS
	06/18/04	NS	NS	NS	NS	NS	NS	NS
	01/28/05	NS	NS	NS	NS	NS	NS	NS
	07/01/05	NS	NS	NS	NS	NS	NS	NS
	02/01/06	NS	NS	NS	NS	NS	NS	NS
	06/20/06	980	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	540	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	640	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	370	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	380	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	640	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	220	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	360	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	420	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	270	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	160	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	93	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	68	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	160	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	180	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	250	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	330	BRL	BRL	BRL	BRL	BRL	NA
	03/31/16	200	BRL	BRL	BRL	BRL	BRL	NA

Notes:
µg/L – micrograms per liter or part
BRL – Not detected above laboratory method reporting limits
NA – Not analyzed
NS – Not sampled
Monitoring wells MW-1, -2, -3, and -4 were installed between December 2000 and January 2001
* – MW-3 was converted to recovery well RW-5 and became operational on August 6, 2001
** – RW-4 was converted to a monitoring well on June 14, 2006

FIGURES


Source: ChartTiff.com
Northeast Atlanta Quadrangle
Georgia, 2014
7.5 Minute Series (Topographic)

CLIENT: Emory University

TITLE: Site Location Map

PROJECT: North Decatur Road Site, Atlanta, Georgia

DATE: October 2016

DESIGNED BY:

SCALE: 1:24,000

DRAWN BY: J. Gross

FILE: H:\proj\EmoryUniversity\VRP2016\EmoryTopoMap.ai

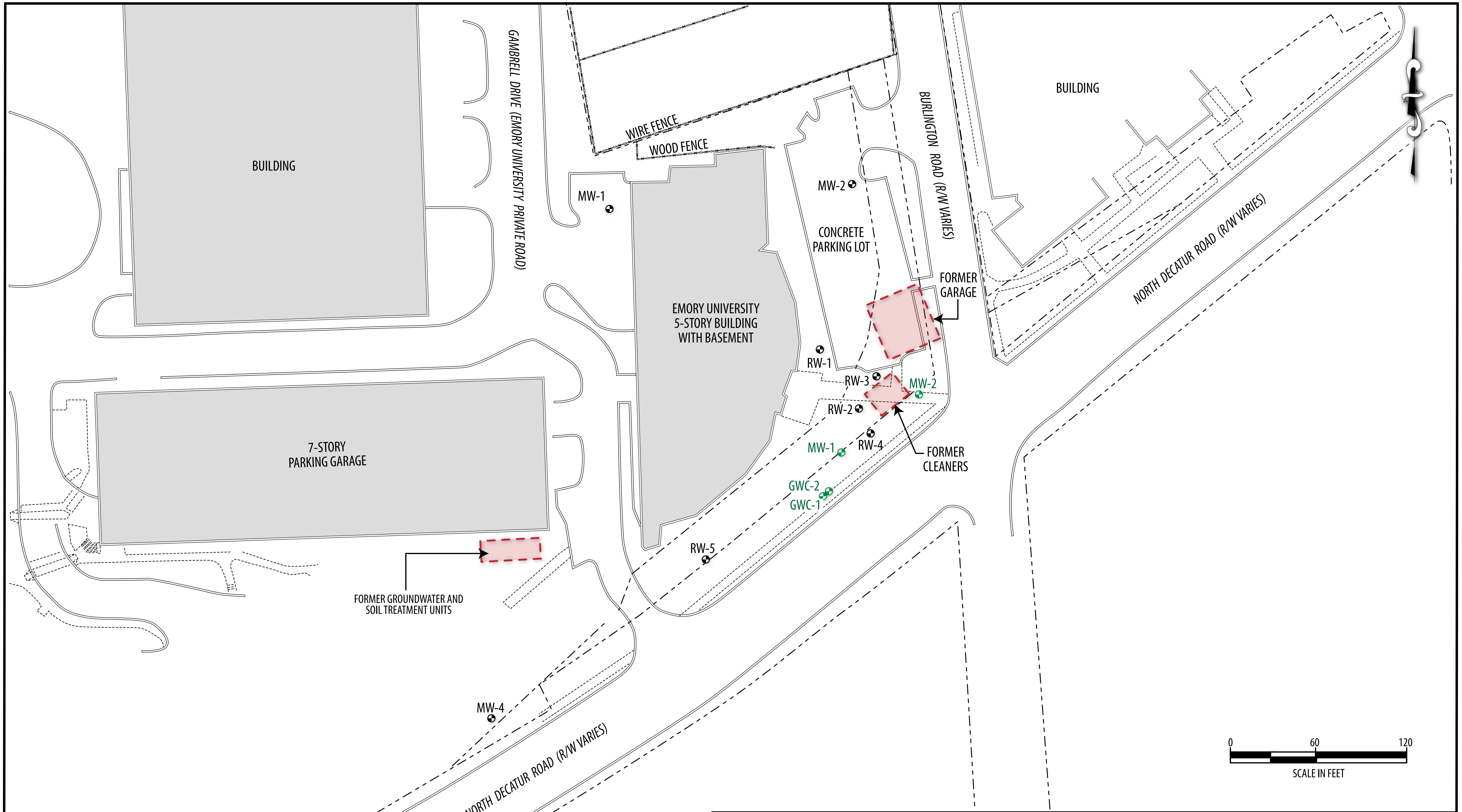
CHECKED BY: B. Jacobs

AECOM

PROJ NO.: 60401439

TASK: 01

FIGURE: 1



LEGEND

- ● - Well Location
- ● - Former (Abandoned) Monitoring Well

CLIENT: Emory University

PROJECT: North Decatur Road Site, Atlanta, Georgia

DATE: October 2016

SOURCE: URS

SCALE: As Shown

DRAWN BY: J. Gross

FILE: H:\Proj\EmoryUniversity\VRP2016\WellLocationMap.ai

CHKD BY: B. Jacobs

TITLE:

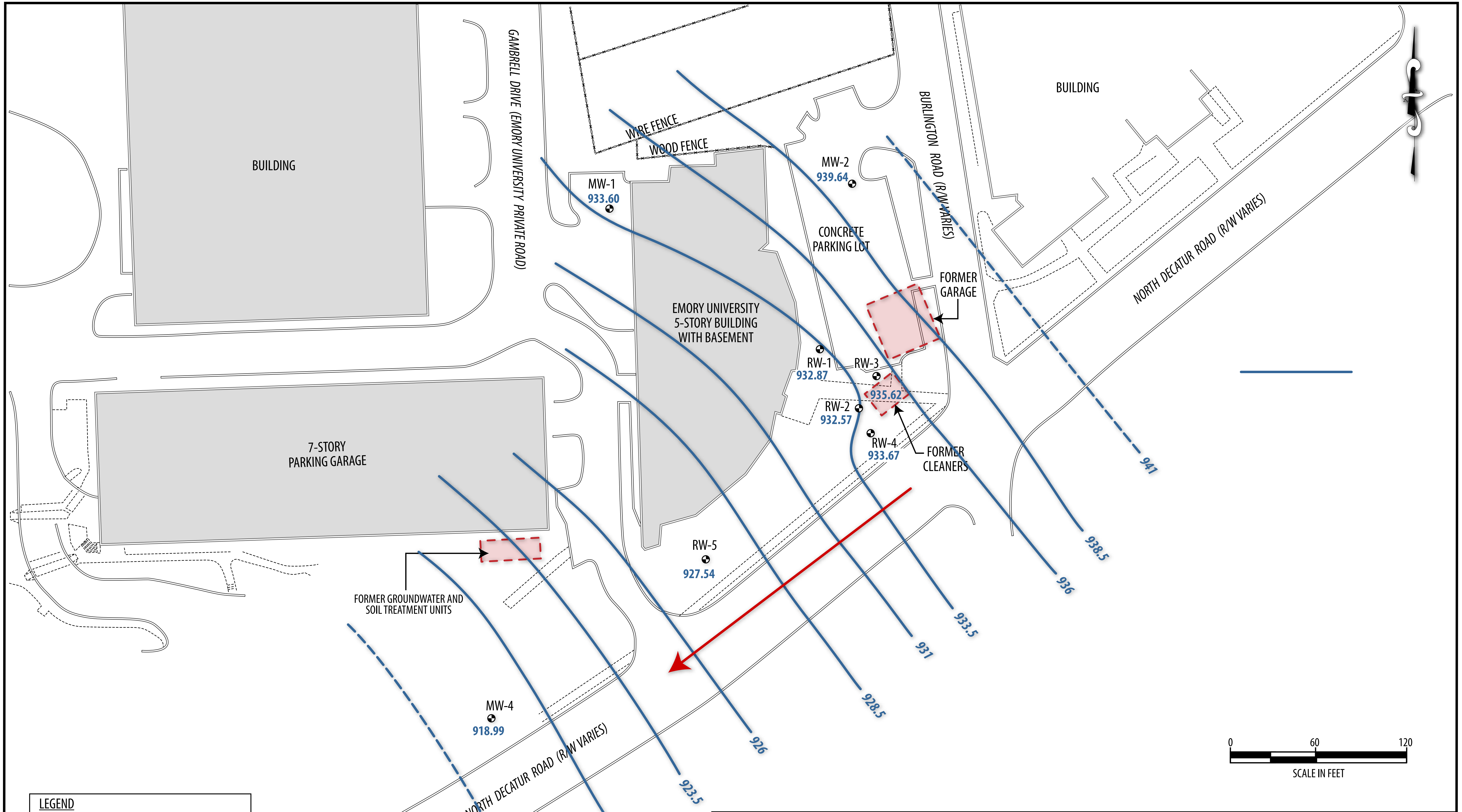
Well Location Map

AECOM

PROJ. NO.: 60401439

TASK NO.: 01

FIGURE: 2



CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

DATE: **October 2016**

SOURCE: **URS**

SCALE: **As Shown**

DRAWN BY: **J. Gross**

FILE: **H:\Proj\EmoryUniversity\VRP2016\Pot Map April 2015.ai**

CHKD BY: **B. Jacobs**

TITLE:

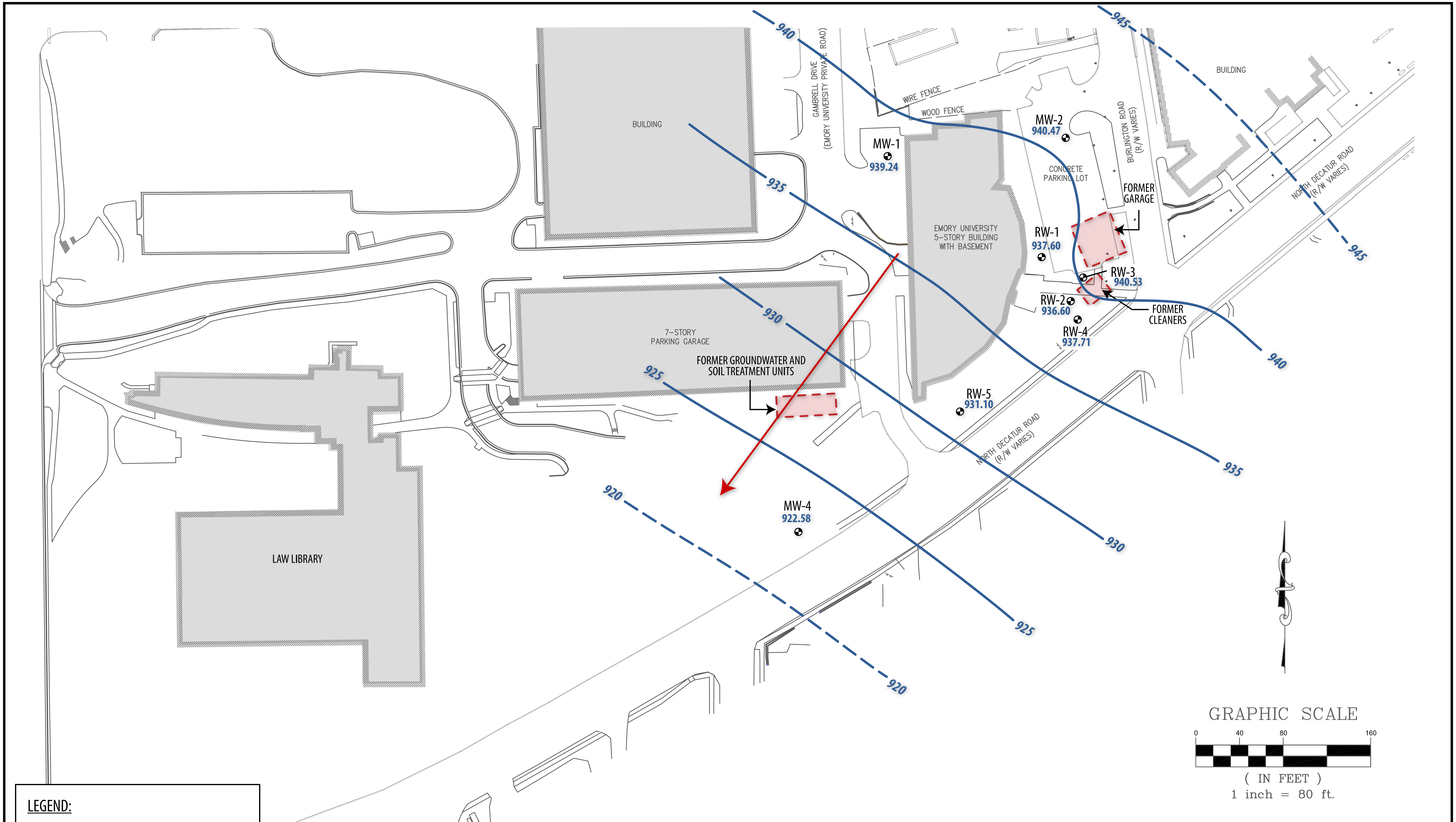
Potentiometric Map
April 8, 2015

AECOM

PROJ. NO.: 60401439

TASK NO.: 01

FIGURE: 3



LEGEND:

MW ● Well Location

RW ● Recovery Well Location

922.58 Water Elevation (feet)

← Direction of Groundwater Flow

CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

SCALE: **As Shown**

SOURCE: **AECOM**

DATE: **October 2016**

DRAWN BY: **J. Gross**

FILE: H:\Proj\EmoryUniversity\VRP2016\Potmap March 2016.ai

CHECKED BY: **D. Voykin**

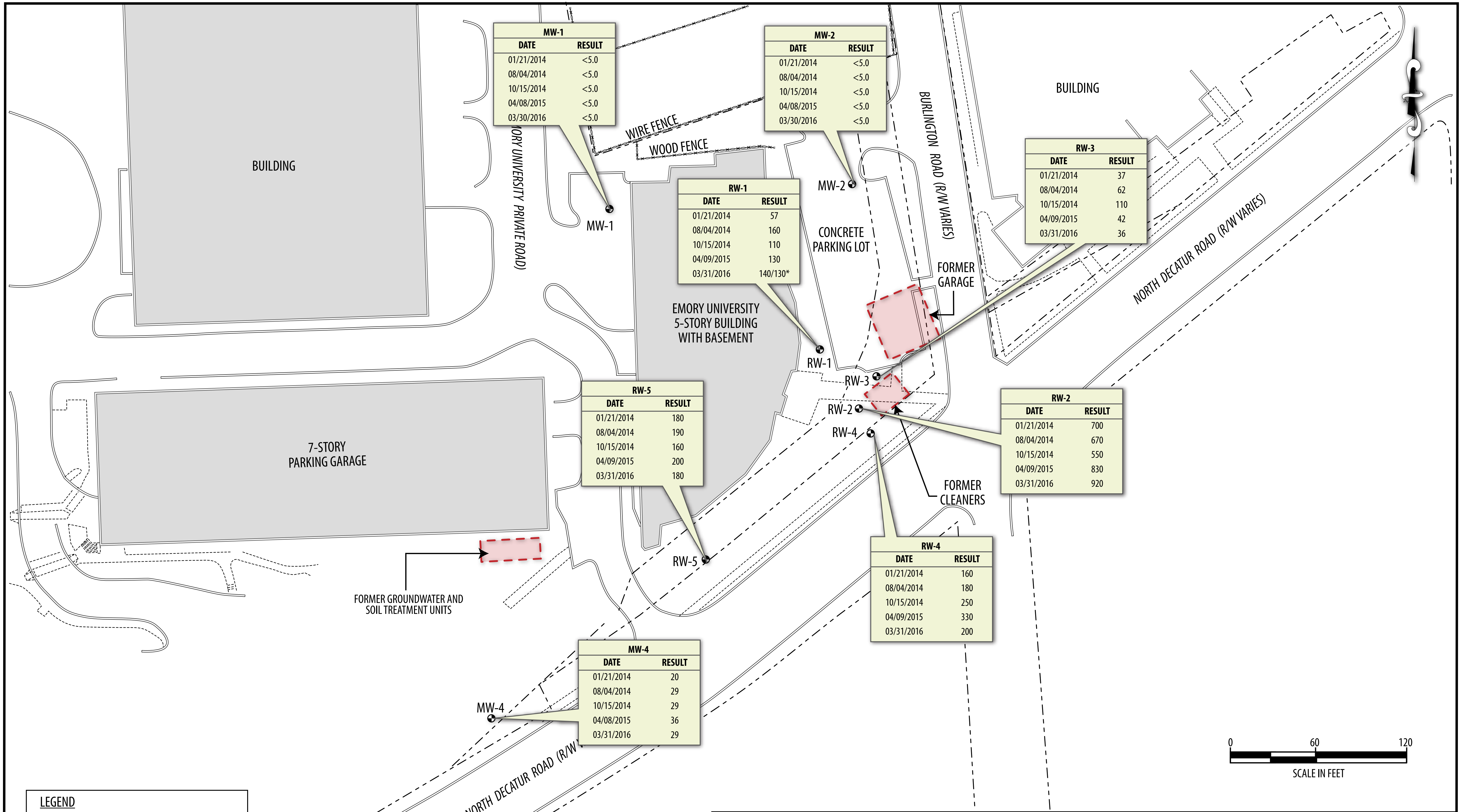
TITLE:
Potemtiometric Map
March 30, 2016

AECOM

PROJ. NO.: 60401439

TASK: 01

FIGURE: 4



MW-1

DATE	RESULT
01/21/2014	<5.0
08/04/2014	<5.0
10/15/2014	<5.0
04/08/2015	<5.0
03/30/2016	<5.0

MW-2

DATE	RESULT
01/21/2014	<5.0
08/04/2014	<5.0
10/15/2014	<5.0
04/08/2015	<5.0
03/30/2016	<5.0

RW-1

DATE	RESULT
01/21/2014	57
08/04/2014	160
10/15/2014	110
04/09/2015	130
03/31/2016	140/130*

RW-3

DATE	RESULT
01/21/2014	37
08/04/2014	62
10/15/2014	110
04/09/2015	42
03/31/2016	36

RW-5

DATE	RESULT
01/21/2014	180
08/04/2014	190
10/15/2014	160
04/09/2015	200
03/31/2016	180

RW-2

DATE	RESULT
01/21/2014	700
08/04/2014	670
10/15/2014	550
04/09/2015	830
03/31/2016	920

RW-4

DATE	RESULT
01/21/2014	160
08/04/2014	180
10/15/2014	250
04/09/2015	330
03/31/2016	200

MW-4

DATE	RESULT
01/21/2014	20
08/04/2014	29
10/15/2014	29
04/08/2015	36
03/31/2016	29

LEGEND

- ● - Well Location
- **PCE** - Tetrachloroethene
- **<5.0** - Below Laboratory Detection Limits
- ***** - Duplicate Sample Result

All Results in micrograms per Liter (µg/L)

CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

DATE: **October 2016**

SOURCE: **URS**

SCALE: **As Shown**

DRAWN BY: **J. Gross**

FILE: H:\Proj\EmoryUniversity\VRP2016\PCE Conc 2014-2016.ai

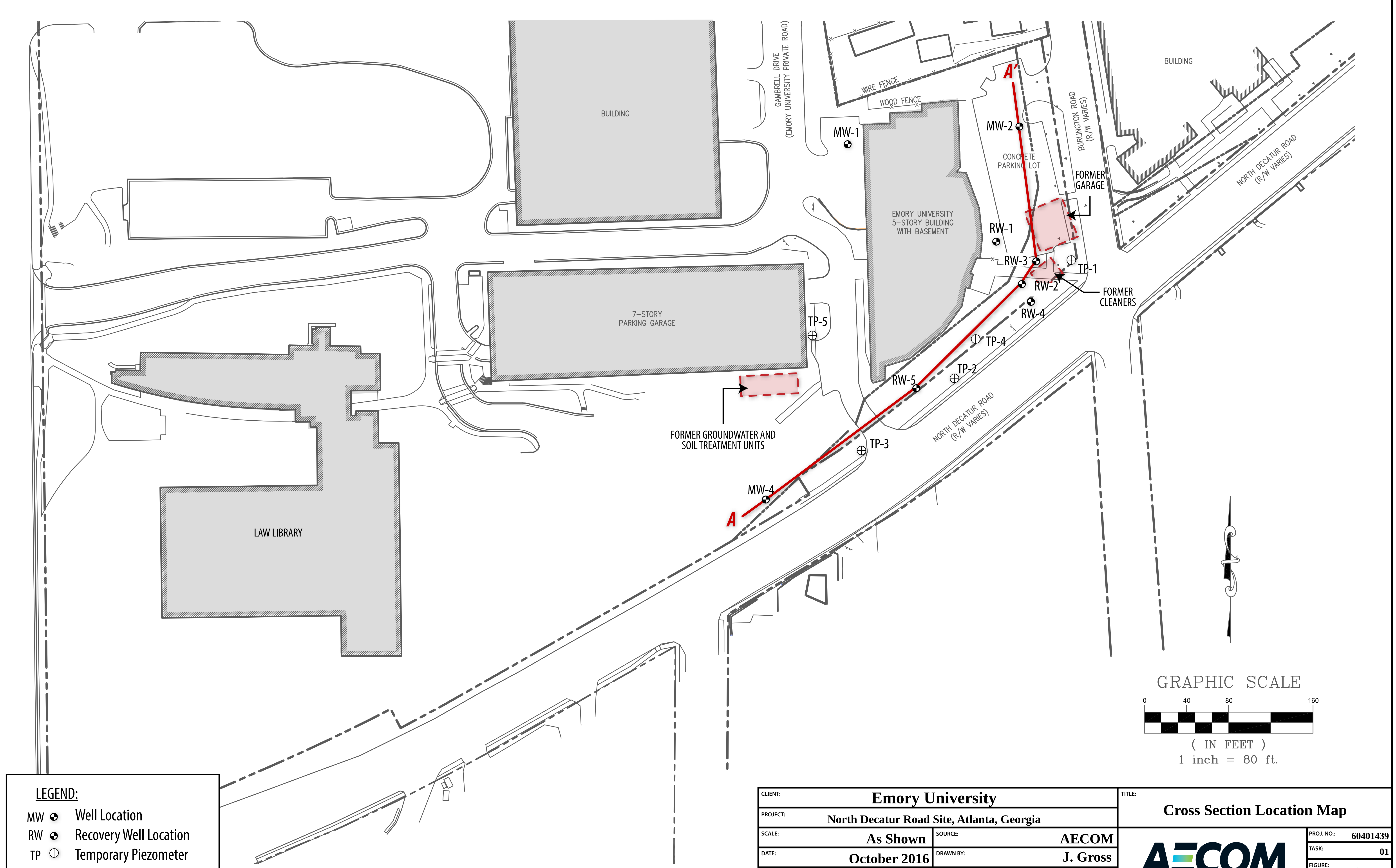
CHKD BY: **B. Jacobs**

TITLE: **PCE Concentration 2014/2015/2016**

PROJ. NO.: 60401439

TASK NO.: 01

FIGURE: 5



LEGEND:

MW	●	Well Location
RW	●	Recovery Well Location
TP	⊕	Temporary Piezometer

CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

SCALE: **As Shown**

SOURCE: **AECOM**

DATE: **October 2016**

DRAWN BY: **J. Gross**

FILE: H:\Proj\EmoryUniversity\VRP2016\XSectionLocationMap.ai

CHECKED BY: **B. Jacobs**

TITLE: **Cross Section Location Map**

AECOM

PROJ. NO.: 60401439

TASK: 01

FIGURE: 6

APPENDIX A

2016 Groundwater Sampling Logs

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME:	Emory University North Decatur Road Building	SITE LOCATION:	1784 North Decatur Road Atlanta, Georgia 30322
WELL NO: MW-1	SAMPLE ID: MW-1		DATE: 3/30/14

PURGING DATA

WELL DIAMETER (inches): 2

WELL SCREEN INTERVAL DEPTH: 22 feet to 42 feet

STATIC DEPTH TO WATER (feet): 15.35

PURGE PUMP TYPE OR BAILER: QED Sample Pro (1.7") Bladder Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY

1 WELL VOLUME = (42.80 feet – 15.35 feet) X 0.65 liters/foot ~ 17.8 liters 3x ~ 53.4L 5x ~ 89 L

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME

1 EQUIPMENT VOLUME = (45 feet X 0.005 liters/foot) + 0.25 liters ~ 0.5 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 32

FINAL PUMP OR TUBING DEPTH IN WELL (feet):

PURGING INITIATED AT: 1522

PURGING ENDED AT: 1639

TOTAL VOLUME PURGED (liters): 11.75

WATER QUALITY INSTRUMENT(S): Smar Troll

SERIAL NO(S):

CALIBRATION DETAILS:	Calibration Standards Used: AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU) Zobel (228 mV ORP Solution) ☐ Previously Calibrated					
Precalibration Readings:	°C	SU	mV	mS/cm	NTU	mg/L
Calibrated Readings:	°C	SU	mV	mS/cm	NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
4.1	1524	0.5	0.5	0.15	15.73	27.0	6.3	148	0.146	0.28	6.61
4.1	1529	0.75	1.25	0.15	15.91	21.6	6.02	98.1	0.16	0.33	6.03
4.1	1534	0.75	2.0	0.15	15.95	21.21	5.85	99.9	0.20	0.39	6.02
4.1	1539	0.75	2.75	0.15	15.97	21.02	5.81	88.3	0.20	0.26	5.95
4.1	1544	0.75	3.50	0.15	15.96	21.02	5.78	86.4	0.21	0.33	5.90
4.1	1549	0.75	4.25	0.15	15.97	21.00	5.77	103.1	0.21	0.27	5.88
4.1	1554	0.75	5.00	0.15	15.97	21.02	5.77	86.3	0.21	1.34	5.94
4.1	1559	0.75	5.75	0.15	15.97	20.84	5.77	84.1	0.21	0	5.95
4.1	1604	0.75	6.50	0.15	15.97	20.85	5.76	83.4	0.21	0	5.97
4.1	1609	0.75	7.25	0.15	15.97	21.06	5.76	82.8	0.19	0.64	5.95
4.1	1614	0.75	8.00	0.15	15.98	21.06	5.77	82.4	0.20	0	5.98
4.1	1619	0.75	8.75	0.15	15.98	21.06	5.76	83.5	0.21	0.28	5.96
4.1	1624	0.75	9.50	0.15	15.99	21.17	5.77	84.0	0.20	0.17	5.94
4.1	1629	0.75	10.25	0.15	15.99	21.15	5.76	85.6	0.19	0.16	5.95
~3.93 ~~4.1~~	1634	0.75	11.00	0.15	15.99	21.24	5.76	84.5	0.18	0	5.91
3.93	1639	0.75	11.75	0.15	15.99	21.37	5.76	84.5	0.19		5.91

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; **¼"** = 0.01 ; **⅜"** = 0.022 ; **½"** = 0.04 ; **⅝"** = 0.06 ; **¾"** = 0.09 ; **⅞"** = 0.12 ; **1"** = 0.16

NOTES:

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED)**

Required:
Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:
Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^{o}C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: R. Hilliard /AECOM
SAMPLER(S) SIGNATURES:
DATE SAMPLED: 3/30/16
SAMPLING INITIATED AT: 1640
PUMP OR TUBING DEPTH IN WELL (feet): 32
SAMPLE PUMP FLOW RATE (L per minute): 0.1
TUBING MATERIAL CODE: PE
SAMPLING ENDED AT: 1645
FIELD DECONTAMINATION: [✓ Y] N
FIELD-FILTERED: Y [✓ N] FILTER SIZE: _____ µm
Filtration Equipment Type: ______
DUPLICATE: Y [✓ N]

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
MW-1	2	40 mL	CG	HCl	8260 (select list)	Bladder Pump

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME: Emory N-Decatur	SITE LOCATION:	
WELL NO: ~~MW-2~~ MW-2	SAMPLE ID: MW-2	DATE: 3/30/16

PURGING DATA

WELL DIAMETER (inches): 2"

WELL SCREEN INTERVAL DEPTH: 22 feet to 42 feet

STATIC DEPTH TO WATER (feet): 23.85

PURGE PUMP TYPE OR BAILER: BP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY

1 WELL VOLUME = (42.80 feet – 23.89 feet) X 0.65 liters/foot ~ 12.3175 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME

1 EQUIPMENT VOLUME = (45 feet X .005 liters/foot) + .25 liters ~ 0.5 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 33

FINAL PUMP OR TUBING DEPTH IN WELL (feet): 33

PURGING INITIATED AT: 1235

PURGING ENDED AT: 1338

TOTAL VOLUME PURGED (liters): 12.5

WATER QUALITY INSTRUMENT(S): SmarTroll

SERIAL NO(S):

CALIBRATION DETAILS:	Calibration Standards Used:	AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU)	Zobel (228 mV ORP Solution)	☐ Previously Calibrated	
Precalibration Readings:	°C	SU	mV	mS/cm	NTU	mg/L
Calibrated Readings:	°C	SU	mV	mS/cm	NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
101/30	1237	0.5	0.5	0.2	24.28	22.2	5.02		.106.7	4.0	—
101/30	1247	2.0	2.5	0.2		20.3	5.31		0.104		4.54
101/30	1252	1.0	3.5	0.2	24.15	20.62	5.31	104.0	.10	4.19	4.37
101/30	1257	1.0	4.5	0.2	24.14	20.65	5.31	101.3	0.10	4.28	4.34
101/30	1302	1.0	5.5	0.2	24.14	20.93	5.30	111.0	0.10	4.03	6.54
101/30	1307	1.0	6.5	0.2	24.14	20.84	5.30	110.4	0.10	2.77	6.94
101/30	1312	1.0	7.5	0.2	24.15	20.52	5.31	110.8	0.10	1.40	6.20
101/30	1317	1.0	8.5	0.2	24.15	20.43	5.29	109.7	0.11	1.03	5.79
101/30	1322	1.0	4.5	0.2	24.15	20.65	5.29	109.9	0.01	1.13	6.34
101/30	1327	1.0	10.5	0.2	24.15	20.94	5.29	109.9	0.10	0.50	6.17
101/30	1332	1.0	11.5	0.2	24.15	20.60	5.29	109.9	0.10	0.87	4.81
101/30	1337	1.0	12.5	0.2	24.15	20.48	5.29	106.0	0.10	0.89	4.44

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; **¼ "** = 0.01 ; **⅜"** = 0.022 ; **½ "** = 0.04 ; **⅝"** = 0.06 ; **¾ "** = 0.09 ; **⅞"** = 0.12 ; **1"** = 0.16

NOTES: DO - air bubbles noticed in flow cell

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED)**

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^{o}C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED)**

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: R. Hilliard /AECOM
SAMPLER(S) SIGNATURES:
DATE SAMPLED: 3/30/16
SAMPLING INITIATED AT: 13:44
PUMP OR TUBING DEPTH IN WELL (feet): 33
SAMPLE PUMP FLOW RATE (L per minute): 0.1
TUBING MATERIAL CODE: PE
SAMPLING ENDED AT: 13:46
FIELD DECONTAMINATION: Y N
FIELD-FILTERED: Y N FILTER SIZE: _____ µm
Filtration Equipment Type: _______________
DUPLICATE: Y N

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
MW-2	2	40mL	CG	HCl	8260	BP

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME:	Emory University North Decatur Road Building	SITE LOCATION:	1784 North Decatur Road Atlanta, Georgia 30322

WELL NO: MW-4
SAMPLE ID: MW-4
DATE: 3/31/14

PURGING DATA

WELL DIAMETER (inches): 2
WELL SCREEN INTERVAL DEPTH: feet to feet
STATIC DEPTH TO WATER (feet): 31.77'
PURGE PUMP TYPE OR BAILER: QED Sample Pro (1.7") Bladder Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH ~ STATIC DEPTH TO WATER) X WELL CAPACITY
1 WELL VOLUME = (46.88 feet – 31.77 feet) X 0.65 liters/foot ~ 9.8 liters
3x ~ 29.4L
5x ~ 49L

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME
1 EQUIPMENT VOLUME = (50 feet X 0.005 liters/foot) + 0.25 liters ~ 0.5 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 36
FINAL PUMP OR TUBING DEPTH IN WELL (feet):
PURGING INITIATED AT: 904
PURGING ENDED AT: 956
TOTAL VOLUME PURGED (liters): 8.00

WATER QUALITY INSTRUMENT(S): Smar Troll
SERIAL NO(S):

CALIBRATION DETAILS:	Calibration Standards Used: AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU) Zobel (228 mV ORP Solution) ☐ Previously Calibrated					
Precalibration Readings:	20.31 °C	4.03 SU	201.1 mV	4.60 mS/cm	9.95 NTU	8.51 mg/L
Calibrated Readings:	°C	SU	mV	4.50 mS/cm	10.00 NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^{o}C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
103/25	906	0.5	0.5	0.15	31.92	18.98	5.93	152.6	0.269	0.30	7.92
103/25	911	0.75	1.25	0.15	31.93	18.18	5.72	103.3	0.296	1.08	7.28
103/25	916	0.75	2.00	0.15	31.94	18.13	5.70	97.5	0.327	2.13	7.26
103/25	921	0.75	2.75	0.15	31.95	18.13	5.70	95.1	0.333	1.08	7.01
103/25	926	0.75	3.50	0.15	31.94	18.13	5.70	94.2	0.334	0.46	6.93
103/25	931	0.75	4.25	0.15	31.94	18.12	5.69	93.4	0.335	0.27	6.91
103/25	936	0.75	5.00	0.15	31.94	18.12	5.69	93.0	0.334	0.25	6.95
103/25	941	0.75	5.75	0.15	31.94	18.20	5.69	92.6	0.334	0.11	6.87
103/25	946	0.75	6.50	0.15	31.93	18.34	5.69	92.6	0.334	0.08	6.87
103/25	951	0.75	7.25	0.15	31.93	18.57	5.69	92.3	0.333	0.21	6.83
103/25	956	0.75	8.00	0.15	31.93	18.54	5.70	92.0	0.333	0.05	6.77

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; **¼"** = 0.01 ; **⅜"** = 0.022 ; **½"** = 0.04 ; **⅝"** = 0.06 ; **¾"** = 0.09 ; **⅞"** = 0.12 ; **1"** = 0.16

NOTES:

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^oC)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Charles watson/AECOM

SAMPLER(S) SIGNATURES:

DATE SAMPLED: 3/31/16

SAMPLING INITIATED AT: 1000

PUMP OR TUBING DEPTH IN WELL (feet): 36

SAMPLE PUMP FLOW RATE (L per minute): 0.1

TUBING MATERIAL CODE: PE

SAMPLING ENDED AT: 1002

FIELD DECONTAMINATION: [✓ Y] N

FIELD-FILTERED: Y [✓ N] FILTER SIZE: _____ µm

Filtration Equipment Type: ____________

DUPLICATE: Y [✓ N]

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
MW-4	2	40 mL	CG	HCl	8260 (select list)	Bladder Pump

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **BP** = Bladder Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME:	Emory University North Decatur Road Building	SITE LOCATION:	1784 North Decatur Road Atlanta, Georgia 30322
WELL NO: RW-1	SAMPLE ID: RW-1	DATE: 3/31/16	

PURGING DATA

WELL DIAMETER (inches): 4	WELL SCREEN INTERVAL DEPTH: feet to feet	STATIC DEPTH TO WATER (feet): 31.30	PURGE PUMP TYPE OR BAILER: QED Sample Pro (1.7") Bladder Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY

1 WELL VOLUME = (59.72 feet – 31.30 feet) X 2.50 liters/foot ~ 71.1 liters

3x ~ 213.3

5x ~ 355.5

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME

1 EQUIPMENT VOLUME = (85 feet X 0.005 liters/foot) + 0.25 liters ~ 0.6 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 42	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT: 1300	PURGING ENDED AT: 1358	TOTAL VOLUME PURGED (liters): 12.8
WATER QUALITY INSTRUMENT(S):	SmarTroll	SERIAL NO(S):		

CALIBRATION DETAILS:	Calibration Standards Used: AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU) Zobel (228 mV ORP Solution) ☐ Previously Calibrated					
Precalibration Readings:	°C	SU	mV	mS/cm	NTU	mg/L
Calibrated Readings:	°C	SU	mV	mS/cm	NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
103/30	1302	0.6	0.6	0.3	31.35	19.3	5.90	106.8	0.140	86.9	4.62
103/30	1307	1	1.6	0.2	31.49	19.1	5.86	88.8	0.140	~~88.~~	4.58
103/30	1327	5	6.6	0.25	31.68	18.84	5.87	72.1	0.140	38.4	4.48
103/30	1332	1	7.6	0.2	31.68	18.84	5.86	71.5	0.14	32.9	4.45
103/30	1337	1	8.6	0.2	31.69	18.81	5.86	71.0	0.14	36.7	4.45
103/30	1342	1	9.6	0.2	31.69	18.78	5.86	70.7	0.14	29.5	4.43
103/30	1347	1	10.6	0.2	31.70	18.79	5.86	70.6	0.14	25.8	4.40
103/30	1352	1	11.6	0.2	31.70	18.73	5.86	70.4	0.14	25.4	4.38
103/30	1357	1	12.6	0.2	31.70	18.68	5.86	70.0	0.14	25.2	4.36
~~103/30~~	~~1402~~	~~1~~	~~13.6~~	~~0.2~~	CH						

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; **¼ "** = 0.01 ; **⅜"** = 0.022 ; **½ "** = 0.04 ; **⅝"** = 0.06 ; **¾ "** = 0.09 ; **⅞"** = 0.12 ; **1"** = 0.16

NOTES:

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^oC)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: C. Watson /AECOM

SAMPLER(S) SIGNATURES:

DATE SAMPLED: 3/31/16

SAMPLING INITIATED AT: 1401

PUMP OR TUBING DEPTH IN WELL (feet): 42

SAMPLE PUMP FLOW RATE (L per minute): 0.1

TUBING MATERIAL CODE: PG

SAMPLING ENDED AT: 1403

FIELD DECONTAMINATION: [✓ Y] N

FIELD-FILTERED: Y [✓ N] FILTER SIZE: _____ µm
Filtration Equipment Type:

DUPLICATE: [✓ Y] N

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
RW-1	2	40 mL	CG	HCl	8260 (select list)	Bladder Pump
DUP-1	2	40-L	CG	HCl	8260-select	BP

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME:	Emory University North Decatur Road Building	SITE LOCATION:	1784 North Decatur Road Atlanta, Georgia 30322

WELL NO: RW-2
SAMPLE ID: RW-2
DATE: 3/31/16

PURGING DATA

WELL DIAMETER (inches): 4
WELL SCREEN INTERVAL DEPTH: 20 feet to 60 ? feet
STATIC DEPTH TO WATER (feet): 33.74
PURGE PUMP TYPE OR BAILER: QED Sample Pro (1.7") Bladder Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY

1 WELL VOLUME = (58.48 feet – 33.74 feet) X 2.50 liters/foot ~ 62 liters 3v ~186 L 5v ~ 310 L

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME

1 EQUIPMENT VOLUME = (65 feet X 0.005 liters/foot) + 0.25 liters ~ 0.4 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 48
FINAL PUMP OR TUBING DEPTH IN WELL (feet):
PURGING INITIATED AT: 1734
PURGING ENDED AT: 1827
TOTAL VOLUME PURGED (liters): 8.10

WATER QUALITY INSTRUMENT(S): Smar Troll
SERIAL NO(S):

CALIBRATION DETAILS: Calibration Standards Used: AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU) Zobel (228 mV ORP Solution) ☐ Previously Calibrated

Precalibration Readings:	°C	SU	mV	mS/cm	NTU	mg/L
Calibrated Readings:	°C	SU	mV	mS/cm	NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
103/30	1737	0.6	0.6	.15	33.75	20.62	5.61	128.2	0.3	13.7	7.08
103/30	1742	0.75	~~1.75~~ 1.35	.15	33.84	19.15	5.51	97.90	0.40	3.84	6.44
103/30	1747	0.75	~~1.90~~ 2.10	.15	33.98	18.94	5.51	93.10	0.40	4.02	6.34
103/30	1752	0.75	2.85	.15	34.06	18.97	5.51	91.80	0.40	3.59	6.25
103/30	1757	0.75	3.60	.15	34.12	18.97	5.51	90.80	0.40	2.73	6.13
103/30	1802	0.75	4.35	0.15	34.14	18.86	5.51	90.20	0.30	2.74	6.11
103/30	1807	0.75	5.10	0.15	34.18	18.81	5.51	89.80	0.30	3.05	6.05
103/30	1812	0.75	5.85	0.15	34.22	18.92	5.51	89.96	0.30	2.61	6.00
103/30	1817	0.75	6.60	0.15	34.24	18.97	5.51	89.60	0.30	3.11	5.97
103/30	1822	0.75	7.35	0.15	34.24	18.91	5.51	89.00	0.30	1.98	5.95
103/30	1827	0.75	8.10	0.15	34.24	18.84	5.52	89.40	0.30	3.19	5.98

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** (liters) = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; **¼ "** = 0.01 ; **⅜"** = 0.022 ; **½ "** = 0.04 ; **⅝"** = 0.06 ; **¾ "** = 0.09 ; **⅞"** = 0.12 ; **1"** = 0.16

NOTES:

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:
Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:
Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:
Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:
Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Charles Watson /AECOM
SAMPLER(S) SIGNATURES:
DATE SAMPLED: 3/31/16
SAMPLING INITIATED AT: 1828
PUMP OR TUBING DEPTH IN WELL (feet): 48
SAMPLE PUMP FLOW RATE (L per minute): 0.10
TUBING MATERIAL CODE: PE
SAMPLING ENDED AT: 1820
FIELD DECONTAMINATION: [✓ Y] N
FIELD-FILTERED: Y [✓ N] FILTER SIZE: _____ µm
Filtration Equipment Type: ______
DUPLICATE: Y [✓ N]

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
RW-2	2	40 mL	CG	HCl	8260 (select list)	Bladder Pump

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME:	Emory University North Decatur Road Building	SITE LOCATION:	1784 North Decatur Road Atlanta, Georgia 30322

WELL NO: RW-3 SAMPLE ID: RW-3 DATE: 3/31/16

PURGING DATA

WELL DIAMETER (inches): 4

WELL SCREEN INTERVAL DEPTH: 22 feet to 52 feet

STATIC DEPTH TO WATER (feet): 27.82

PURGE PUMP TYPE OR BAILER: QED Sample Pro (1.7") Bladder Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY

1 WELL VOLUME = (52.35 feet – 22.82 feet) X 2.50 liters/foot ~ 41.3 liters 3x ~ 124 L 5x ~ 206.5 L

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME

1 EQUIPMENT VOLUME = (60 feet X 0.005 liters/foot) + 0.25 liters ~ 0.6 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 36

FINAL PUMP OR TUBING DEPTH IN WELL (feet):

PURGING INITIATED AT: 1050

PURGING ENDED AT: 1206

TOTAL VOLUME PURGED (liters): 16.70

WATER QUALITY INSTRUMENT(S): SmarTroll

SERIAL NO(S):

CALIBRATION DETAILS	Calibration Standards Used:	AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU)	Zobel (228 mV ORP Solution)	☐ Previously Calibrated		
Precalibration Readings:	°C	SU	mV	mS/cm	NTU	mg/L
Calibrated Readings:	°C	SU	mV	mS/cm	NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
103/29	1053	~~0.60~~	0.60	0.10	27.85	20.62	6.70	32.0	0.32	60.0	1.08
103/30	1058	1.15	1.75	0.23	28.19	19.14	6.68	10.2	0.31	19.2	1.03
103/30	1103	1.15	2.90	0.23	28.35	19.06	6.69	6.80	0.31	12.5	0.75
103/30	1108	1.15	4.05	0.23	28.46	19.02	6.68	5.30	0.30	14.6	1.43
103/30	1113	1.15	5.20	0.23	28.53	19.00	6.68	4.70	0.30	13.3	1.28
103/30	1118	1.15	6.35	0.23	28.62	19.06	6.69	4.90	0.30	13.0	1.08
103/30	1123	1.15	7.50	0.23	28.65	19.10	6.69	4.30	0.30	10.9	1.02
103/30	1128	1.15	8.65	0.23	28.70	19.14	6.69	3.90	0.30	8.62	0.90
103/30	1133	1.15	9.80	0.23	28.72	19.32	6.69	5.30	0.30	8.67	0.80
103/30	1138	1.15	10.95	0.23	28.75	19.46	6.69	4.60	0.30	8.20	0.68
103/30	1143	1.15	12.10	0.23	28.76	19.76	6.69	4.80	0.31	9.00	0.61
103/30	1148	1.15	13.25	0.23	28.77	19.54	6.69	3.50	0.31	8.67	0.53
103/30	1153	1.15	14.40	0.23	28.79	19.46	6.69	1.30	0.31	7.76	0.47
103/30	1158	1.15	15.55	0.23	28.79	19.42	6.69	0.40	0.32	5.62	0.40
103/30	1203	1.15	16.70	0.23	28.79	19.43	6.69	0.70	0.31	6.00	0.36

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; **¼"** = 0.01 ; **⅜"** = 0.022 ; **½"** = 0.04 ; **⅝"** = 0.06 ; **¾"** = 0.09 ; **⅞"** = 0.12 ; **1"** = 0.16

NOTES:

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:
Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:
Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^oC)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:
Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:
Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Charles watson/AECOM

SAMPLER(S) SIGNATURES:

DATE SAMPLED: 3/31/16

SAMPLING INITIATED AT: 1206

PUMP OR TUBING DEPTH IN WELL (feet): 36

SAMPLE PUMP FLOW RATE (L per minute): 0.10

TUBING MATERIAL CODE: PE

SAMPLING ENDED AT: 1208

FIELD DECONTAMINATION: [✓ Y] N

FIELD-FILTERED: Y [✓ N] FILTER SIZE: _____ µm
Filtration Equipment Type: ____________

DUPLICATE: Y [✓ N]

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
RW-3	2	40 mL	CG	HCl	8260 (select list)	Bladder Pump

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME:	Emory University North Decatur Road Building		SITE LOCATION:	1784 North Decatur Road Atlanta, Georgia 30322	
WELL NO:	RW-4	SAMPLE ID:	RW-4	DATE:	3/31/14

PURGING DATA

WELL DIAMETER (inches): 4

WELL SCREEN INTERVAL DEPTH: 15 feet to 45 ? feet

STATIC DEPTH TO WATER (feet): 30.92

PURGE PUMP TYPE OR BAILER: QED Sample Pro (1.7") Bladder Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY

1 WELL VOLUME = (47.72 feet – 30.92' feet) X 2.50 liters/foot ~ 42 liters 3x ~ 126L 5x ~ 210L

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME

1 EQUIPMENT VOLUME = (55 feet X 0.005 liters/foot) + 0.25 liters ~ 0.6 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 39

FINAL PUMP OR TUBING DEPTH IN WELL (feet):

PURGING INITIATED AT: 1432

PURGING ENDED AT: 1529

TOTAL VOLUME PURGED (liters): 11.6

WATER QUALITY INSTRUMENT(S): Smar Troll

SERIAL NO(S):

CALIBRATION DETAILS:	Calibration Standards Used: AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU) Zobel (228 mV ORP Solution) ☐ Previously Calibrated					
Precalibration Readings:	°C	SU	mV	mS/cm	NTU	mg/L
Calibrated Readings:	°C	SU	mV	mS/cm	NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
103/30	1434	0.6	0.6	0.2	31.00	18.75	5.63	108.6	0.12	10.88	6.34
103/30	1439	1	1.6	0.2	31.13	18.66	5.63	83.6	0.12	2.25	5.81
103/30	1444	1	2.6	0.2	31.20	18.70	5.63	74.3	0.12	1.94	5.75
103/30	1449	1	3.6	0.2	31.25	18.67	5.63	76.8	0.12	0.97	5.68
103/30	1454	1	4.6	0.2	31.21	18.50	5.62	75.7	0.12	1.32	5.72
103/30	1459	1	5.6	0.2	31.28	18.73	5.62	75.8	0.12	0.87	5.66
103/30	1504	1	6.6	0.2	31.32	18.74	5.63	75.8	0.12	0.91	5.60
103/30	1509	1	7.6	0.2	31.32	18.71	5.63	75.7	0.12	1.40	5.61
103/30	1514	1	8.6	0.2	31.33	18.72	5.63	75.7	0.12	0.49	5.59
103/30	1519	1	9.6	0.2	31.34	18.52	5.63	85.5	0.12	0.51	5.54
103/30	1524	1	10.6	0.2	31.31	18.86	5.63	77.8	0.11	0.58	5.54
103/30	1529	1	11.6	0.2	31.34	18.79	5.63	76.6	0.12	0.54	5.54

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; **¼"** = 0.01 ; **⅜"** = 0.022 ; **½"** = 0.04 ; **⅝"** = 0.06 ; **¾"** = 0.09 ; **⅞"** = 0.12 ; **1"** = 0.16

NOTES: 1452- Battery Died & had to change power source on MP50

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^oC)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Charles Watson/AECOM
SAMPLER(S) SIGNATURES:
DATE SAMPLED: 3/31/16
SAMPLING INITIATED AT: 1533
PUMP OR TUBING DEPTH IN WELL (feet): 39
SAMPLE PUMP FLOW RATE (L per minute): 0.1
TUBING MATERIAL CODE: PE
SAMPLING ENDED AT: 1535
FIELD DECONTAMINATION: [✓ Y] N
FIELD-FILTERED: Y [✓ N] FILTER SIZE: _____ µm
Filtration Equipment Type: ____________
DUPLICATE: Y [✓ N]

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
RW-4	2	40 mL	CG	HCl	8260 (select list)	Bladder Pump

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

LOW IMPACT GROUNDWATER SAMPLING LOG

SITE NAME:	Emory University North Decatur Road Building	SITE LOCATION:	1784 North Decatur Road Atlanta, Georgia 30322

WELL NO: RW-5

SAMPLE ID: RW-5

DATE: 3/31/16

PURGING DATA

WELL DIAMETER (inches): 2	WELL SCREEN INTERVAL DEPTH: 30 feet to 60 feet	STATIC DEPTH TO WATER (feet): 31.54	PURGE PUMP TYPE OR BAILER: QED Sample Pro (1.7") Bladder Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY 3x ~ 52 L

1 WELL VOLUME = (58.35 feet – 31.54 feet) X 0.65 liters/foot ~ 17.4 liters 5x ~ 87 L

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOLUME = (TOTAL LENGTH OF TUBING X TUBING CAPACITY) + FLOW THROUGH CELL VOLUME

1 EQUIPMENT VOLUME = (60 feet X 0.005 liters/foot) + 0.25 liters ~ 0.6 liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 48'	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 48'	PURGING INITIATED AT: 1609	PURGING ENDED AT: 1701	TOTAL VOLUME PURGED (liters): 8.10

WATER QUALITY INSTRUMENT(S):

SERIAL NO(S):

CALIBRATION DETAILS:	Calibration Standards Used:	AutoCAL. (4.00 SU, 4.49 mS/cm, 0.0 NTU) Zobel (228 mV ORP Solution) ☐ Previously Calibrated				
Precalibration Readings:	°C	SU	mV	mS/cm	NTU	mg/L
Calibrated Readings:	°C	SU	mV	mS/cm	NTU	mg/L

FIELD DATA TABLE

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (°C)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)
103/30	1611	0.4	0.4	.15 ~~31.53~~	31.53	18.71	5.75	78.2	0.20	14.0	6.61
103/30	1616	0.75	1.35	0.15	31.54	18.53	5.73	61.70	0.20	7.63	6.33
103/30	1621	0.75	2.10	0.15	31.56	18.48	5.72	59.60	0.20	4.74	6.16
103/30	1626	0.75	2.85	0.15	31.54	18.62	5.72	60.60	0.20	3.57	5.96
103/30	1631	0.75	3.60	0.15	31.54	18.82	5.71	57.0	0.20	4.13	5.88
103/30	1636	0.75	4.35	0.15	31.54	19.55	5.72	51.4	0.20	2.68	5.72
103/30	1641	0.75	5.10	0.15	31.54	19.61	5.72	40.70	0.20	2.45	5.56
103/30	1646	0.75	5.85	0.15	31.54	19.59	5.72	41.70	0.20	1.65	5.49
103/30	1651	0.75	6.60	0.15	31.54	19.32	5.71	40.80	0.20	2.15	5.42
103/30	1656	0.75	7.35	0.15	31.54	19.15	5.72	43.70	0.20	1.51	5.36
103/30	1701	0.75	8.10	0.15	31.54	18.84	5.72	38.70	0.20	1.01	5.37

☐ CONTINUED ON REVERSE SIDE

WELL CAPACITY (L Per Ft): **0.75"** = 0.10; **1"** = 0.20; **1.25"** = 0.30; **2"** = 0.65; **3"** = 1.45; **4"** = 2.50; **5"** = 3.90; **6"** = 5.60; **8"** = 9.75; **10"** = 15.40; **12"** = 21.80
TUBING CAPACITY (L Per Ft): **1/16"** = 0.001 ; **0.17"** = 0.005 ; ¼ " = 0.01 ; ⅜" = 0.022 ; ½ " = 0.04 ; ⅝" = 0.06 ; ¾ " = 0.09 ; ⅞" = 0.12 ; **1"** = 0.16

NOTES:

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

FIELD DATA TABLE (continued)

PUMP SETTING / PSI	TIME	VOLUME PURGED (liters)	TOTAL VOLUME PURGED (liters)	PURGE RATE (L/min)	DEPTH TO WATER (feet)	TEMP. (^oC)	pH (standard units)	OXYGEN REDUCTION POTENTIAL (mV)	COND. (mS/cm)	TURBIDITY (NTUs)	DISSOLVED OXYGEN (mg/L)

CHEMICAL PARAMETER STABILIZATION CRITERIA (THREE CONSECUTIVE READINGS **AFTER DEPTH TO WATER HAS STABILIZED**)

Required:

Turbidity: <10 NTU, or stable (±5%)
pH: ± 0.1 SU
Specific Conductance: ± 5%

Optional:

Dissolved Oxygen: 0.2 mg/L or 10% of saturation (whichever is greater)
Oxygen Reduction Potential: ±20 milliVolts

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: charles watson /AECOM
SAMPLER(S) SIGNATURES:
DATE SAMPLED: 3/31/16
SAMPLING INITIATED AT: 1701
PUMP OR TUBING DEPTH IN WELL (feet): 48
SAMPLE PUMP FLOW RATE (L per minute): 0.10
TUBING MATERIAL CODE: PE
SAMPLING ENDED AT: 1703
FIELD DECONTAMINATION: [✓ Y] N
FIELD-FILTERED: Y [✓ N] FILTER SIZE: _____ µm
Filtration Equipment Type: ____________
DUPLICATE: Y [✓ N]

SAMPLE ID	SAMPLE CONTAINER SPECIFICATION			SAMPLE PRESERVATION	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
	# CONTAINERS	VOLUME	MATERIAL CODE	PRESERVATIVE USED		
RW-5	2	40 mL	CG	HCl	8260 (select list)	Bladder Pump

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicon; **T** = Teflon; **O** = Other (Specify)

SAMPLING / PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

AES ANALYTICAL ENVIRONMENTAL SERVICES, INC
3080 Presidential Drive, Atlanta GA 30340-3704
TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

CHAIN OF CUSTODY

Work Order:
Date: 3/30/16 Page 1 of 1

COMPANY: AECOM
ADDRESS: 1000 Abernathy Rd NE
Suite 900
Atlanta GA 30338
PHONE: 678-808-8800
FAX: 678-808-8400
SAMPLED BY: R. Hilliard /AECOM
SIGNATURE:

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)	ANALYSIS REQUESTED: * 8260	REMARKS	No # of Containers
PRESERVATION (See codes)									
1	MW-2	3/30/16	13:41	X		GW	X		2
2	MW-1	3/30/16	11:40	X		GW	X		2
3	MW-4	3/31/16	1000	X		GW	X		2
4	RW-3	3/31/16	1201	X		GW	X		2
5	RW-1	3/31/16	1401	X		GW	X		2
6	RW-4	3/31/16	1533	X		GW	X		2
7	RW-5	3/31/16	1701	X		GW	X		2
8	RW-2	3/31/16		X		GW	X		2
9	DUP-1	3/31/16	—	X		GW	X		2
10									
11									
12									
13									
14									

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1:	4/1/16 0730	1:	4/1/2016 7:30AM
2:		2:	
3:		3:	

PROJECT INFORMATION

PROJECT NAME: Emory N. Decatur Bldg
PROJECT #:
SITE ADDRESS: 1784 N. Decatur Rd Atlanta Ga.
SEND REPORT TO: Brent.Jacobs@aecom.com
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:
* Only PCE, TCE, 1,1-DCE cis-1,2-DCE, Trans-1,2-DCE and Vinyl Chloride

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

APPENDIX B

2016 Groundwater Analytical Data

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

April 08, 2016

Brent Jacobs
URS
400 Northpark Town Center
Atlanta GA 30328

TEL: (678) 808-8915
FAX: (678) 808-8400

RE: Emory N. Decatur

Dear Brent Jacobs: Order No: 1604001

Analytical Environmental Services, Inc. received 10 samples on 4/1/2016 7:30:00 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's accreditations are as follows:
-NELAC/Florida State Laboratory ID E87582 for analysis of Non-Potable Water, Solid & Chemical Materials, and Drinking Water Microbiology, effective 07/01/15-06/30/16.
-NELAC/Louisiana Agency Interest No. 100818 for or analysis of Non-Potable Water and Solid & Chemical Materials, effective 07/01/15-06/30/16.
-NELAC/Texas Certificate No. T104704509-16-6 for or analysis of Non-Potable Water and Solid & Chemical Materials, effective 03/01/16-02/28/17.
-AIHA-LAP, LLC Laboratory ID: 100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) Direct Examination, effective until 09/01/17.

Ioana Pacurar

Ioana Pacurar
Project Manager

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC
3080 Presidential Drive, Atlanta GA 30340-3704
TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

CHAIN OF CUSTODY

1604001

Work Order: ~~1604000~~ MP 4/1/16

Date: 3/30/16 Page 1 of 1

COMPANY: AECOM

ADDRESS:
1000 Abernathy Rd NE
Suite 900
Atlanta GA 30328

PHONE: 678-808-8800

FAX: 678-808-8400

SAMPLED BY: R. Hilliard / AECOM

SIGNATURE: R. Hilliard

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)	ANALYSIS REQUESTED: * 8260	REMARKS	No # of Containers
1	MW-2	3/30/16	13:44	X		GW	X		
2	MW-1	3/30/16	16:40	X		GW	X		2
3	MW-4	3/31/16	1000	X		GW	X		2
4	RW-3	3/31/16	1206	X		GW	X		2
5	RW-1	3/31/16	1401	X		GW	X		2
6	RW-4	3/31/16	1533	X		GW	X		2
7	RW-5	3/31/16	1701	X		GW	X		2
8	RW-2	3/31/16		X		GW	X		2
9	DUP-1	3/31/16	—	X		GW	X		2
10									2
11									
12									
13									
14									

PRESERVATION (See codes)

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1: R. Hilliard	4/1/16 0730	1: Muriam Pauwar	4/1/2016 7:30AM
2:		2:	
3:		3:	

SPECIAL INSTRUCTIONS/COMMENTS:
* Only PCE, TCE, 1,1-DCE cis-1,2-DCE, Trans-1,2-DCE and Vinyl Chloride

SHIPMENT METHOD
OUT / / VIA:
IN / / VIA:
[✓ CLIENT] FedEx UPS MAIL COURIER
GREYHOUND OTHER

PROJECT INFORMATION
PROJECT NAME: Emory N. Decatur Bldg
PROJECT #:
SITE ADDRESS: 1784 N. Decatur Rd Atlanta Ga.
SEND REPORT TO: Brent.Jacobs@aecom.com
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

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

Analytical Environmental Services, Inc **Date:** 8-Apr-16

Client: URS
Project: Emory N. Decatur
Lab ID: 1604001

Case Narrative

Sample Receiving Nonconformance:

A Trip Blank was provided but not listed on the Chain of Custody. Trip blank analyzed at no cost to the client.

Analytical Environmental Services, Inc **Date:** 8-Apr-16

Client:	URS	**Client Sample ID:**	MW-2
Project Name:	Emory N. Decatur	**Collection Date:**	3/30/2016 1:44:00 PM
Lab ID:	1604001-001	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 10:45	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 10:45	NP
Tetrachloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 10:45	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 10:45	NP
Trichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 10:45	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 10:45	NP
Surr: 4-Bromofluorobenzene	75.2	70.7-125		%REC	222291	1	04/07/2016 10:45	NP
Surr: Dibromofluoromethane	113	82.2-120		%REC	222291	1	04/07/2016 10:45	NP
Surr: Toluene-d8	99.8	81.8-120		%REC	222291	1	04/07/2016 10:45	NP

Analytical Environmental Services, Inc

Date: 8-Apr-16

Client: URS
Project Name: Emory N. Decatur
Lab ID: 1604001-002

Client Sample ID: MW-1
Collection Date: 3/30/2016 4:40:00 PM
Matrix: Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:12	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:12	NP
Tetrachloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:12	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:12	NP
Trichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:12	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 11:12	NP
Surr: 4-Bromofluorobenzene	76.8	70.7-125		%REC	222291	1	04/07/2016 11:12	NP
Surr: Dibromofluoromethane	116	82.2-120		%REC	222291	1	04/07/2016 11:12	NP
Surr: Toluene-d8	94.1	81.8-120		%REC	222291	1	04/07/2016 11:12	NP

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

Client:	URS	**Client Sample ID:**	MW-4
Project Name:	Emory N. Decatur	**Collection Date:**	3/31/2016 10:00:00 AM
Lab ID:	1604001-003	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:39	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:39	NP
Tetrachloroethene	29	5.0		ug/L	222291	1	04/07/2016 11:39	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:39	NP
Trichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 11:39	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 11:39	NP
Surr: 4-Bromofluorobenzene	73.5	70.7-125		%REC	222291	1	04/07/2016 11:39	NP
Surr: Dibromofluoromethane	112	82.2-120		%REC	222291	1	04/07/2016 11:39	NP
Surr: Toluene-d8	90.7	81.8-120		%REC	222291	1	04/07/2016 11:39	NP

Client:	URS	**Client Sample ID:**	RW-3
Project Name:	Emory N. Decatur	**Collection Date:**	3/31/2016 12:06:00 PM
Lab ID:	1604001-004	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 14:21	NP
cis-1,2-Dichloroethene	20	5.0		ug/L	222291	1	04/07/2016 14:21	NP
Tetrachloroethene	36	5.0		ug/L	222291	1	04/07/2016 14:21	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 14:21	NP
Trichloroethene	8.9	5.0		ug/L	222291	1	04/07/2016 14:21	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 14:21	NP
Surr: 4-Bromofluorobenzene	77.1	70.7-125		%REC	222291	1	04/07/2016 14:21	NP
Surr: Dibromofluoromethane	106	82.2-120		%REC	222291	1	04/07/2016 14:21	NP
Surr: Toluene-d8	88.2	81.8-120		%REC	222291	1	04/07/2016 14:21	NP

Client:	URS	**Client Sample ID:**	RW-1
Project Name:	Emory N. Decatur	**Collection Date:**	3/31/2016 2:01:00 PM
Lab ID:	1604001-005	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				(SW5030B)				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 14:48	NP
cis-1,2-Dichloroethene	5.5	5.0		ug/L	222291	1	04/07/2016 14:48	NP
Tetrachloroethene	140	5.0		ug/L	222291	1	04/07/2016 14:48	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 14:48	NP
Trichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 14:48	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 14:48	NP
Surr: 4-Bromofluorobenzene	74.7	70.7-125		%REC	222291	1	04/07/2016 14:48	NP
Surr: Dibromofluoromethane	110	82.2-120		%REC	222291	1	04/07/2016 14:48	NP
Surr: Toluene-d8	89.1	81.8-120		%REC	222291	1	04/07/2016 14:48	NP

Client:	URS	**Client Sample ID:**	RW-4
Project Name:	Emory N. Decatur	**Collection Date:**	3/31/2016 3:33:00 PM
Lab ID:	1604001-006	**Matrix:**	Groundwater

TCL VOLATILE ORGANICS SW8260B (SW5030B)

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 03:39	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 03:39	NP
Tetrachloroethene	200	50		ug/L	222291	10	04/07/2016 15:41	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 03:39	NP
Trichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 03:39	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 03:39	NP
Surr: 4-Bromofluorobenzene	76.5	70.7-125		%REC	222291	1	04/07/2016 03:39	NP
Surr: 4-Bromofluorobenzene	76.7	70.7-125		%REC	222291	10	04/07/2016 15:41	NP
Surr: Dibromofluoromethane	109	82.2-120		%REC	222291	10	04/07/2016 15:41	NP
Surr: Dibromofluoromethane	114	82.2-120		%REC	222291	1	04/07/2016 03:39	NP
Surr: Toluene-d8	91.5	81.8-120		%REC	222291	10	04/07/2016 15:41	NP
Surr: Toluene-d8	92.2	81.8-120		%REC	222291	1	04/07/2016 03:39	NP

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

Client:	URS	**Client Sample ID:**	RW-5
Project Name:	Emory N. Decatur	**Collection Date:**	3/31/2016 5:01:00 PM
Lab ID:	1604001-007	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 04:06	NP
cis-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 04:06	NP
Tetrachloroethene	180	5.0		ug/L	222291	1	04/07/2016 04:06	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 04:06	NP
Trichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 04:06	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 04:06	NP
Surr: 4-Bromofluorobenzene	71	70.7-125		%REC	222291	1	04/07/2016 04:06	NP
Surr: Dibromofluoromethane	116	82.2-120		%REC	222291	1	04/07/2016 04:06	NP
Surr: Toluene-d8	91.7	81.8-120		%REC	222291	1	04/07/2016 04:06	NP

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

Client:	URS	**Client Sample ID:**	RW-2
Project Name:	Emory N. Decatur	**Collection Date:**	3/31/2016
Lab ID:	1604001-008	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 04:32	NP
cis-1,2-Dichloroethene	42	5.0		ug/L	222291	1	04/07/2016 04:32	NP
Tetrachloroethene	920	50		ug/L	222291	10	04/07/2016 16:08	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 04:32	NP
Trichloroethene	12	5.0		ug/L	222291	1	04/07/2016 04:32	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 04:32	NP
Surr: 4-Bromofluorobenzene	75.5	70.7-125		%REC	222291	10	04/07/2016 16:08	NP
Surr: 4-Bromofluorobenzene	76.2	70.7-125		%REC	222291	1	04/07/2016 04:32	NP
Surr: Dibromofluoromethane	112	82.2-120		%REC	222291	1	04/07/2016 04:32	NP
Surr: Dibromofluoromethane	115	82.2-120		%REC	222291	10	04/07/2016 16:08	NP
Surr: Toluene-d8	90.2	81.8-120		%REC	222291	1	04/07/2016 04:32	NP
Surr: Toluene-d8	96	81.8-120		%REC	222291	10	04/07/2016 16:08	NP

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: 8-Apr-16

Client:	URS	**Client Sample ID:**	DUP-1
Project Name:	Emory N. Decatur	**Collection Date:**	3/31/2016
Lab ID:	1604001-009	**Matrix:**	Groundwater

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 15:14	NP
cis-1,2-Dichloroethene	6.0	5.0		ug/L	222291	1	04/07/2016 15:14	NP
Tetrachloroethene	130	5.0		ug/L	222291	1	04/07/2016 15:14	NP
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 15:14	NP
Trichloroethene	BRL	5.0		ug/L	222291	1	04/07/2016 15:14	NP
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/07/2016 15:14	NP
Surr: 4-Bromofluorobenzene	74.9	70.7-125		%REC	222291	1	04/07/2016 15:14	NP
Surr: Dibromofluoromethane	115	82.2-120		%REC	222291	1	04/07/2016 15:14	NP
Surr: Toluene-d8	90.7	81.8-120		%REC	222291	1	04/07/2016 15:14	NP

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:** 8-Apr-16

Client:	URS	**Client Sample ID:**	TRIP BLANK
Project Name:	Emory N. Decatur	**Collection Date:**	4/1/2016
Lab ID:	1604001-010	**Matrix:**	Aqueous

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
TCL VOLATILE ORGANICS SW8260B				**(SW5030B)**				
1,1-Dichloroethene	BRL	5.0		ug/L	222291	1	04/06/2016 23:25	CH
cis-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/06/2016 23:25	CH
Tetrachloroethene	BRL	5.0		ug/L	222291	1	04/06/2016 23:25	CH
trans-1,2-Dichloroethene	BRL	5.0		ug/L	222291	1	04/06/2016 23:25	CH
Trichloroethene	BRL	5.0		ug/L	222291	1	04/06/2016 23:25	CH
Vinyl chloride	BRL	2.0		ug/L	222291	1	04/06/2016 23:25	CH
Surr: 4-Bromofluorobenzene	73.2	70.7-125		%REC	222291	1	04/06/2016 23:25	CH
Surr: Dibromofluoromethane	99.9	82.2-120		%REC	222291	1	04/06/2016 23:25	CH
Surr: Toluene-d8	87.5	81.8-120		%REC	222291	1	04/06/2016 23:25	CH

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 AECOM / URS

Work Order Number 1604001

Checklist completed by 4/1/2016
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? (0°≤6°C)* [✓ Yes] No ___

Cooler #1 0.9°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.

\\Aes_server\l\Sample Receipt\My Documents\COCs and pH Adjustment Sheet\Sample_Cooler_Recipt_Checklist_Rev1.rtf

Client: URS
Project Name: Emory N. Decatur
Workorder: 1604001

ANALYTICAL QC SUMMARY REPORT

BatchID: **222291**

Sample ID: **MB-222291** Client ID: Units: **ug/L** Prep Date: **04/06/2016** Run No: **314128**
SampleType: **MBLK** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **222291** Analysis Date: **04/06/2016** Seq No: **6758094**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	BRL	5.0									
cis-1,2-Dichloroethene	BRL	5.0									
Tetrachloroethene	BRL	5.0									
trans-1,2-Dichloroethene	BRL	5.0									
Trichloroethene	BRL	5.0									
Vinyl chloride	BRL	2.0									
Surr: 4-Bromofluorobenzene	37.14	0	50.00		74.3	70.7	125				
Surr: Dibromofluoromethane	50.47	0	50.00		101	82.2	120				
Surr: Toluene-d8	43.73	0	50.00		87.5	81.8	120				

Sample ID: **LCS-222291** Client ID: Units: **ug/L** Prep Date: **04/06/2016** Run No: **314128**
SampleType: **LCS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **222291** Analysis Date: **04/06/2016** Seq No: **6758093**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	56.84	5.0	50.00		114	65.3	137				
Trichloroethene	51.83	5.0	50.00		104	73.1	128				
Surr: 4-Bromofluorobenzene	37.39	0	50.00		74.8	70.7	125				
Surr: Dibromofluoromethane	49.77	0	50.00		99.5	82.2	120				
Surr: Toluene-d8	44.27	0	50.00		88.5	81.8	120				

Sample ID: **1604358-003AMS** Client ID: Units: **ug/L** Prep Date: **04/06/2016** Run No: **314212**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **222291** Analysis Date: **04/07/2016** Seq No: **6760299**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	60.03	5.0	50.00		120	60	150				
Trichloroethene	52.99	5.0	50.00		106	70	136				
Surr: 4-Bromofluorobenzene	38.12	0	50.00		76.2	70.7	125				
Surr: Dibromofluoromethane	54.56	0	50.00		109	82.2	120				

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: URS
Project Name: Emory N. Decatur
Workorder: 1604001

ANALYTICAL QC SUMMARY REPORT

BatchID: **222291**

Sample ID: **1604358-003AMS** Client ID: Units: **ug/L** Prep Date: **04/06/2016** Run No: **314212**
SampleType: **MS** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **222291** Analysis Date: **04/07/2016** Seq No: **6760299**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Surr: Toluene-d8	47.91	0	50.00		95.8	81.8	120				

Sample ID: **1604358-003AMSD** Client ID: Units: **ug/L** Prep Date: **04/06/2016** Run No: **314212**
SampleType: **MSD** TestCode: **TCL VOLATILE ORGANICS SW8260B** BatchID: **222291** Analysis Date: **04/07/2016** Seq No: **6760300**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
1,1-Dichloroethene	59.80	5.0	50.00		120	60	150	62.52	4.45	17.7	
Trichloroethene	48.98	5.0	50.00		98.0	70	136	52.97	7.83	20	
Surr: 4-Bromofluorobenzene	38.67	0	50.00		77.3	70.7	125	38.34	0	0	
Surr: Dibromofluoromethane	58.22	0	50.00		116	82.2	120	57.43	0	0	
Surr: Toluene-d8	49.69	0	50.00		99.4	81.8	120	46.39	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 F

2016 Groundwater Modeling Report

Groundwater Model (2016 Update)
Emory University
North Decatur Road/Burlington Road Site
HSI No. 10121

This report summarizes the results of the groundwater model (BIOCHLOR) runs that were recently performed using the most recent (March 2016) and historic groundwater monitoring results obtained from wells associated with the North Decatur Road/Burlington Road Remediation System ("Site") located at Emory University. The modeling runs were performed as a scientific and cost-effective means to estimate future dissolved-phase chlorinated solvent concentrations in site groundwater.

MODEL DESCRIPTION

BIOCHLOR v. 2.2 (March 2002) is a fate and transport model that is publicly available at the USEPA Center for Subsurface Modeling Support (CSMoS). Originally developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division, BIOCHLOR simulates remediation by natural attenuation of dissolved solvents at chlorinated solvent release sites using three different model types:

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

Based on the Domenico analytical solution, the Microsoft Excel spreadsheet software can simulate 1-D advection, 3-D dispersion, linear adsorption, and biotransformation of chlorinated solvents by reductive dechlorination.

As a screening model BIOCHLOR provides insight on how far a dissolved chlorinated solvent plume will extend, and what groundwater concentrations are likely to be encountered, if no engineered controls or source area reduction measures are implemented at a contaminant site. This model was deemed appropriate for use at this site, since it is a screening tool for chlorinated solvents (the groundwater contaminants at the site), no free product is present, and the groundwater flow field at the site is not complicated. Now that the extraction system at the site has been removed, there are no pumping wells to impact the direction of flow within the shallow groundwater flow field and the dissolved contaminants (chlorinated solvents) are limited in extent to the groundwater within the unconsolidated overburden and a few feet of underlying fractured bedrock.

MODEL INPUTS

Source

One key (source) input parameter required by BIOCHLOR is knowledge of the time of the release (spill, leak, etc.); as well as, size (or volume and duration) of the release. Unfortunately, at the Emory site, there is no clear indication of the actual time of the release, the amount, or for that matter, when and where the actual release occurred. The initial Corrective Action Plan for the Site prepared by Willmer Engineering in 1993 (CAP_1993) potentially related the measured groundwater impacts by perchloroethylene (aka tetrachloroethylene, or PCE) to a former dry cleaning establishment that had ceased operations 8-10 years earlier. The CAP_1993 also noted the presence of a former automotive repair facility located adjacent to the dry cleaning establishment as another potential source of the PCE contamination, since both facilities would have been expected to have used PCE in their daily routine operations (i.e., cleaning parts and/or cleaning clothes).

The locations of the former garage and cleaners are provided on **Figure 1** (attached). For modeling purposes, the source area for the original PCE release was estimated to be 20 feet wide at the surface (the approximate width of the former cleaners), was assumed to be located in the immediate vicinity of the former recovery well RW-3 (for subsequent distance measurements), and initially it was presumed that the release (model start date) occurred on/or about 1983. Previous calibration runs of the model, using groundwater data obtained in 2014, indicated that the start date for the time of the release was on, or about, 1988. Calibration runs using the most-recent (2016) sampling results suggest a 1991 release date. Therefore, based upon both the previous and recent model results, the release is now thought to have generally occurred sometime late in the 1980's or early in the 1990's; about the time of the property purchase (1989) by Emory University. Based upon a cross-section that has been developed for the site (see Figure 7, PCE in Groundwater in Cross Section A-A', 2014/2015/2016) in the accompanying Voluntary Remediation Program (2016) Annual Progress Report and the typical measured depth to the static water table at the site, the (maximum) saturated thickness (unconsolidated overburden plus fractured rock upper-surface) of the PCE source area for model input is estimated to be 40 feet.

Hydrogeologic Data

In order to calculate advection, dispersion, adsorption, and biotransformation parameters required for the model, BIOCHLOR also requires that the hydrogeologic parameters (hydraulic conductivity, gradient, and effective porosity) for the spill site be entered as model input. The hydraulic conductivity used in the model was a value (4.0E-04 centimeters per second) provided in the CAP_1993, which was originally determined (calculated average) based upon the results of a number of falling head and recharge permeability tests conducted at the Site in 1993. This value is also quite typical for Piedmont soils. The effective porosity of the sediments in the subsurface was input as 15 percent; a value that was also provided earlier in the original 1993 Corrective Action Plan. The BIOCHLOR User's Manual (January 2000) indicates that soils similar to the Piedmont soils at the Site (sandy silts and silty sands) typically exhibit effective porosities ranging from 1 to 30 percent, although experience with Piedmont soils indicates effective porosities more in the range of 15 to 25 percent. The hydraulic gradient used in the model (0.041 foot per foot, or 4.1 percent) was calculated from the water level measurements and contours developed from the most recent groundwater sampling event conducted in March 2016 (**Figure 2**, attached). The gradient selected follows a path parallel to the direction of groundwater flow in the central portion of the site beginning at the upgradient monitoring well MW-2 (groundwater elevation 940.47 feet) and terminates at downgradient monitoring well MW-4 (groundwater elevation 922.58 feet); a change in elevation of 17.89 feet over a measured distance of approximately 435 feet. This calculated gradient under non-pumping conditions compares favorably with the estimated (overall) gradient provided in the 1993 CAP (4 percent) before any of the remedial activities took place at the site; indicating relatively little change in the original recharge/discharge relationships. Now that remedial groundwater extraction at the site has ceased, the similarity in gradients suggests that there has been little change in the many factors (rainfall, infiltration characteristics, topographic position, soil porosity, etc.) that could affect the position of the water table during the past 25-year period. As a result, today's calculated groundwater seepage velocity should mimic the groundwater seepage velocity in the past. With an estimated hydraulic conductivity of 4.0E-04 cm/sec, an effective porosity of 0.15, and gradient of 0.041, the calculated seepage velocity for the site is 113.1 feet per year, or about 0.31 feet per day; comparable to previous modeling estimates.

Dispersivity

The dispersion characteristics of the plume were calculated by the model based upon an initial estimate of the current (2016) plume length (1000 feet) using the results from the most-recent (March) sampling event. Based upon the March 2016 sampling results, it was assumed that the groundwater PCE concentrations would be at the current drinking water standard (maximum contaminant level, or MCL) of 5 micrograms per liter (ug/L) at a distance no greater than 1000 feet downgradient of the original source area (assumed to be in the immediate vicinity of RW-3). The longitudinal dispersivity for the plume was then calculated (24.905 feet) using the plume-length estimate formula developed by Xu and Eckstein (1995) within BIOCHLOR (Option 3). The transverse and vertical dispersivities were set to the default values that are programmed in BIOCHLOR (0.1 and 1.0E-99, respectively).

Retardation Factor

Dissolved PCE in site groundwater can be reduced by adsorption to the subsurface soils. The ratio of the groundwater seepage velocity to the rate of PCE (or any contaminant) movement in groundwater is the retardation factor (R). The retardation factor for PCE and its breakdown products in site groundwater was calculated by BIOCHLOR using an estimate of the aquifer's soil bulk density (rho) and fraction of the soil matrix comprised of natural organic carbon (f_{oc}) in soil derived from uncontaminated areas. Because no laboratory analysis was available, the rho value selected, 1.7 kilograms per liter, is the suggested default value in BIOCHLOR. The f_{oc} value selected for calculation of the retardation factor (0.001, or 0.1%) is also the default value in BIOCHLOR. The 0.1% f_{oc} value used in the model is considered conservative. As the fraction of organic carbon increases, the calculated retardation value also increases (drastically); resulting in much shortened ("fat") groundwater plumes. With a rho of 1.7 kg/L and an estimated f_{oc} of 0.001, BIOCHLOR calculated a common retardation factor of 2.47 for the dissolved chlorinated solvent constituents in site groundwater.

Biotransformation Data

First order decay kinetics are assumed to be present at that site based on the change in PCE contaminant concentrations over time and, more recently, with the monitored presence of PCE daughter products (TCE and 1,2-DCE). The first-order decay rate (λ, or lambda) represents the degradation of the contaminant as it moves through the aquifer with time (transport decay). Lambda is equal to 0.693 divided by the half-life of the contaminant in groundwater. Usually, this parameter influences the downgradient change in contaminant concentrations more than any other input parameter in BIOCHLOR. Initially, the λ values were selected from the mean of the typical ranges of values presented in BIOCHLOR manual for PCE and its daughter products. For the first order transformation of PCE to TCE the typical λ values range from 0.07 to 1.20 year $^{-1}$, with a mean of 0.635 year $^{-1}$. Similar to previous modeling runs for this site that have been submitted to the GAEPD in the past, the mean λ input value for the PCE transformation was changed (slightly) to 1.15 year $^{-1}$ during the calibration process; near the high end of λ values but still within the range of typical values. All of the other mean λ values selected for the transformation of the PCE daughter products (e.g., TCE to cis1,2-DCE, etc.) were kept constant (no change) during the subsequent modeling process and can be seen on the model input attached.

Contaminant Concentrations

With respect to the chlorinated solvent of concern (PCE) and its breakdown products by biotransformation [Trichloroethylene (TCE), Dichloroethylene (DCE), and Vinyl Chloride (VC)], there is no historic information in our files regarding the groundwater conditions at the time of the initial spill (prior to calibration, assumed to have occurred in 1983 and now thought to be sometime Late 1980's or Early 1990's). For modeling purposes it was assumed that the groundwater PCE concentration at the time of the release would have been equivalent to the maximum solubility of PCE in groundwater. According to information provided in the BIOCHLOR manual, the aqueous phase solubility of PCE in groundwater at 20 degrees Centigrade is 150 milligrams per liter (mg/L). This value was input as the source groundwater concentration used in all subsequent calculations by the model for the movement of the dissolved PCE plume. The source concentrations for the PCE daughter products were estimated based upon the historic monitoring well sampling results during the model calibration procedures.

The 1993 CAP included laboratory results for groundwater samples obtained at monitoring well locations GWC-1 and GWC-2, both located approximately 85 feet downgradient of the assumed source location (RW-3), with reported groundwater PCE concentrations of 2,480 micrograms per liter (ug/L) and 16,530 ug/L, respectively. Significantly, GWC-1 was screened at the top of rock; whereas, GWC-2 was screened at the water table. As described in previous correspondence with the GA EPD, the 16,530 ug/L (16.53 mg/L) value was used in the model during the initial attempts at calibration, assuming that the release had occurred on, or about, 1983. Based upon model runs utilizing the 2014 sampling results, the estimated release date was changed to 1988. More recently, based upon the 2016 sampling results, the estimated release date was changed to 1991.

Although there is a rather lengthy record of historic sampling results prior to 2016 (see Table 2, Conceptual Site Model) most of these results cannot be used in in the model, since BIOCHLOR was not intended to predict the effect of remedial applications. An active remedy (including soil vapor extraction and groundwater extraction and treatment) occurred almost continuously at the site during the period 1995-2011. By 2012, the groundwater extraction had declined to the point that the impact of the extraction system on the groundwater flow field was hardly evident in the shape of the groundwater contours. By 2013, extraction at the site had ceased. Given the rather lengthy period of declining groundwater extraction at the site and the complete dismantling of the extraction system in 2014, groundwater conditions at the site are currently presumed to be at equilibrium.

During the most recent sampling event conducted at the site during the period March 30-31, 2016, the laboratory results at select monitoring wells were as follows:
RW-2 (PCE-920 ug/L, TCE-12 ug/L, cis-1,2-DCE-42 ug/L, VC-BRL); located 25 feet downgradient of source.
RW-5 (PCE-180 ug/L, TCE-BRL, cis-1,2-DCE-BRL, VC-BRL); located 165 feet downgradient of source.
MW-4 (PCE-29 ug/L, TCE-BRL, cis-1,2-CE-BRL, VC-BRL); located 340 feet downgradient of source.
[*As previously noted, the source area (for modeling purposes) is presumed to be in the immediate vicinity of former recovery well RW-3].*

MODEL SIMULATIONS

Calibration

Although multiple BIOCHLOR simulations were previously run until the model output matched the measured groundwater concentrations in the site wells (as described in earlier correspondence to the GA EPD), little effort (or change) was required to simulate the results of the most-recent sampling event conducted in March 2016 using the same input parameters described in previous correspondence. The recent groundwater concentration values were used to refine the model input parameters so that the calibrated model could be used to predict future contaminant concentrations at the site, assuming that natural attenuation would be the only remedy that would continue at the site. Very slight changes in earlier estimates of the site hydrogeologic parameters were sufficient to simulate both recent and historic results with adequate accuracy. The only real change from previous calibration runs of the model was to change the estimated start date for the model from 1988 to, on or about, 1991. A compilation of the various input parameters that were used to calibrate BIOCHLOR are provided on **Table 1** (attached).

The predicted model output for 2016, with the input parameters previously described, 25 years after the assumed date of the release (1991), is provided in the appendix to this report as Plates 1A and 1B (attached). Plate 1A provides a summation of the input values used in the 2016 model run and Plates 1B, 1C, 1D, and 1E provide the final numeric and visual model output of the PCE, TCE, cis-1,2-DCE, and VC concentrations, respectively. As indicated on Plate 1B, the decreasing trend of the 2016 Site field PCE concentrations (March 2016 sampling results) with distance conforms very well to the modeled output PCE concentrations generated with the predicted first-order biotransformation. The March 2016 sampling results at RW-2 (25-feet downgradient), RW-5 (about 165-feet downgradient), and MW-4 (340 feet downgradient) also conform favorably to the model output, indicating biotransformation of the original PCE release. The presence of PCE, TCE, and cis-1,2-DCE in the March 2016 sampling results obtained from recovery well RW-2 clearly indicates that biotransformation of PCE in the Site groundwater is occurring. Historically, the PCE daughter products (TCE, cis-1,2-DCE, VC, etc.) were not present in the samples obtained from the various site monitoring wells. Their absence in the historic sampling results is thought to be due to the masking effect of the near-constant remedial actions (soil vapor extraction and groundwater extraction and removal) that were being actively conducted at the site during the period from 1995 to 2011. A figure presenting the estimated configuration of the current PCE plume in site groundwater, based upon the March 2016 sampling results and BIOCHLOR output, is provided as **Figure 3**.

To recheck the validity of the current model input parameters, the model was run for only 2 years to see if BIOCHLOR would simulate the PCE concentrations reported present in the site monitoring wells in the 1993 CAP. The predicted model output for 1993, using the identical input parameters that were used previously in the 2016 model, two (2) years after the (assumed) release in 1991, is provided in the appendix as Plates 2A/2B (attached). As indicated on Plate 2B, the modeled PCE concentrations generated using first-order biotransformation conforms well to the reported presence of PCE (16,530 ug/L) in 1993 at monitoring well GWC-2, located about 85 feet downgradient of the source area. No daughter products were reported present in the 1993 data.

Based upon the excellent simulation of both the 1993 and 2016 PCE sampling results, the input values appeared validated and the model was deemed calibrated. The calibrated model was then run in select increments into the future (2020, 2030, and 2040) to predict the chlorinated solvent concentrations that could be expected downgradient of the source area; as well as, the anticipated future length of the downgradient chlorinated solvent plume.

Predicted Concentrations

Because of the sparse current record of PCE daughter products in the groundwater sample results, the model predictions in this report focus on the future PCE concentrations to be expected in groundwater at the site and do not include predicted daughter product concentrations. The model predictions for the daughter products can be easily generated using the same input parameters utilized for the PCE concentration predictions. The current mandated Primary Drinking Water Standard, or maximum contaminant level (MCL), for the presence of PCE in drinking water is 5 ug/L (0.005 mg/L). In the model predictions to follow, the point at which the plume center line PCE concentrations decreased to the MCL was used to distinguish the furthest extent, or end, of the downgradient plume(s).

The model output illustrating the predicted PCE concentrations in 2020, 29 years after the assumed time of the release, is provided in the appendix as Plates 3A/3B (attached). Plate 3A provides a summation of the (previously calibrated) input values used in the 2020 model run and Plate 3B provides the final numeric and visual model output. The only change to the input parameters (Plate 3A) was in the section for the calculation of the dispersion coefficients. Based on an initial trial model run, the estimated maximum length of the plume was decreased to 800 feet, which resulted in the calculation of slightly smaller dispersion coefficients than those calculated for the 2016 model. No other changes in the initial input parameters were made. As presented on Plate 3B, the model predicts that the maximum PCE concentration in site groundwater in the source area will be 454 ug/L. PCE concentrations will have declined to 50 ug/L in groundwater about 175-feet further downgradient of the source area, and will have diminished to the current MCL (5 ug/L) approximately 520-feet downgradient. A figure presenting the predicted extents of the PCE groundwater plume at the site in 2020 is provided as **Figure 4**.

The model output illustrating the predicted PCE concentrations in 2030, 39 years after the assumed time of the release, is provided in the appendix as Plates 4A/4B (attached). Plate 4A provides a summation of the (previously calibrated) input values used in the 2030 model run and Plate 4B provides the final numeric and visual model output. Again, based on an initial trial model run, in this model the estimated maximum length of the plume was decreased to 500 feet, which again resulted in the calculation of slightly smaller dispersion coefficients than those calculated for the 2016 model. No other changes in the initial input parameters were made. As presented on Plate 4B, the model predicts that the maximum PCE concentration in site groundwater in the source area will be 61.5 ug/L. PCE concentrations in groundwater will have declined to a concentration of 50 ug/L within 15-feet of the source area, and will have diminished to 5 ug/L (current MCL) about 225-feet downgradient. A figure presenting the predicted extents of the PCE groundwater plume at the site in 2030 is provided as **Figure 5**.

The model output illustrating the predicted PCE concentrations in 2040, 49 years after the assumed time of the release, is provided in the appendix as Plates 5A/5B (attached). Plate 5A provides a summation of the (previously calibrated) input values used in the 2040 model run and Plate 5B provides the final numeric and visual model output. Based on an initial trial model run, the estimated maximum length of the plume was decreased to 200 feet, which again resulted in the calculation of slightly smaller dispersion coefficients. No other changes in the initial input parameters were made. As presented on Plate 5B, the model predicts that the maximum PCE concentration in site groundwater in the source area will be about 8 ug/L, and that PCE concentrations will have declined to below the MCL within 40-feet (downgradient) of the source area. A figure presenting the predicted extents of the PCE groundwater plume at the site in 2040 is provided as **Figure 6**.

The model output illustrating the predicted PCE concentrations in 2043, 52 years after the assumed time of the release, is provided in the appendix as Plates 6A/6B (attached). Plate 6A provides a summation of the (previously calibrated) input values used in the 2043 model run and Plate 6B provides the final numeric and visual model output. In this model run the estimated maximum length of the plume was decreased to 150 feet, which again resulted in the calculation of slightly smaller dispersion coefficients. No other changes in the initial input parameters were made. As presented on Plate 6B, the model predicts that PCE in site groundwater due to the 1991 release should no longer be an issue, with the predicted maximum PCE concentration in groundwater (4.6 ug/L) slightly less than the current mandated Primary Drinking Water Standard at all locations, even at the point of the original release in the former source area.

SENSITIVITY ANALYSIS

Methodology

A sensitivity analysis was previously performed using the Emory 2014 sampling data to evaluate the influence or relative importance of key input variables, particularly those variables where literature values were used for input in the model. The details of that evaluation were submitted to the GAEPD in a previous submission (Conceptual Site Model, Updated Groundwater Model, and Vapor Intrusion Evaluation) on December 30, 2014. The parameters evaluated in the sensitivity analysis included the model input parameters: biotransformation decay coefficients, the retardation factor, hydraulic conductivity, and the effective porosity. As noted earlier in this report, the only change to the input parameters that was made in the current (2016) model runs from those used previously in 2014 was to change the initial time of the release from 1988 to 1991. The most-recent (2016) calibrated model was run to see the changes in the predicted concentrations in 2020; again, changing the key input parameters to see their effect on the predicted downgradient groundwater concentrations.

The 2020 model-year analysis was performed at two distances; 165 feet (the distance downgradient from the source to RW-5) and 320 feet (the distance to the furthest downgradient monitoring well MW-4).For each parameter begin considered, the predicted concentrations at both points of reference were determined for: 1) baseline conditions (the calibrated model value), 2) a value equal to twice the baseline value, and 3) a value equal to one-half of the baseline value. The model parameter inputs and outputs for this sensitivity analysis are provided on **Table 2**.

Similar to the previous sensitivity analysis, the results of the 2016 sensitivity analysis (again) suggest that (for the Emory BIOCHLOR model) changes in the hydraulic conductivity and porosity (which affect the seepage velocity) have almost an equal impact on the final predicted downgradient PCE plume concentrations. And, like before, the most sensitive model input parameter is the 1st order decay coefficient (λ).

With respect to the advection terms of the Emory BIOCHLOR model, the sensitivity analysis indicates that if the hydraulic conductivities of the subsurface materials are less permeable than the values entered into the current model (i.e., the baseline estimate), the PCE plume would generally reach an acceptable concentration (MCLs) at the downgradient points of reference later than anticipated. Whereas, if the hydraulic conductivities of the subsurface materials are more permeable than the baseline estimate, the current PCE plume would reach an acceptable concentration at the points of reference earlier than currently anticipated. Similarly, if the effective porosity of the subsurface materials was significantly less than the baseline estimate, the current PCE plume would take longer to reach an acceptable concentration at the downgradient points of reference; whereas, if the effective porosity of the subsurface materials was significantly greater than the baseline estimate, the current PCE plume would reach an acceptable concentration sooner than currently anticipated at the points of reference.

With respect to the calculated retardation factor in the Emory BIOCHLOR model, decreasing the retardation factor did not have an appreciable difference in the predicted PCE concentrations. However, increasing the retardation factor did increase the predicted concentrations downgradient of the source area and, therefore, the time for groundwater concentrations to decrease to mandated (MCL) levels.

As expected, changes in the 1st order decay coefficient (λ) had an appreciable effect on the modeled predictions. Doubling lambda significantly reduced the predicted PCE plume concentrations downgradient at the points of interest; whereas, reducing lambda (by one-half) significantly increased the predicted PCE plume concentrations downgradient at the points of interest. Since lambda is equal to 0.693 divided by the half-life of the contaminant, the latter point is significant. Greater lambda values are the result of shorter half-lives and smaller lambda values are the result of longer half-lives. As the calibrated model utilized a lambda near the upper range of the typical values indicated by EPA (2000) (a short half-life), any change in future model conditions would be much more likely to require a lessening of the lambda value (i.e., if this were the model parameter requiring change, it can't go much higher); thereby, more likely to result in an increase in the predicted downgradient PCE plume concentrations.

DISCUSSION

Comparison of the current (2106) BIOCHLOR model output to that preciously performed on the 2104 data indicates much similarity. The earlier 2014 model output predicted that, in 2039, maximum PCE concentrations on the order of 5 to 6 ug/L would only be present in groundwater at the source area (vicinity of RW-3). The more-recent (2016) model predicts a source-area groundwater PCE concentration of about 8 ug/L in 2040, with groundwater PCE concentrations less that the MCL noted at all locations by 2043 (see Appendix, Plates 6A/6B). The difference in the modeled predictions for the time to achieve a concentration of PCE in groundwater below the MCL at the Emory site is solely due to changes in the estimate for the time of the initial release, and the subsequent resulting change in model duration.

Attachments: Tables 1,2
Figures 1-7
Appendix- BIOCHLOR output (Plates 1A-7B)

TABLES

TABLE 1

Input Parameters for the Emory (2016) BIOCHLOR Model

Mechanism	Parameter	Value	Units	Basis
Advection	Hydraulic Conductivity	4.00E-04	cm/sec	Average conductivity presented in the 1993 CAP
	Hydraulic Gradient	0.041	ft/ft	Measured gradient under non-pumping conditions, March 2016
	Effective Porosity	0.15	unitless	Typical value for Piedmont Soil, presented in 1993 CAP
Dispersion	Alpha X	24.905	feet	XU and Eckstein (1995) calculation based on estimated 1000 ft. plume length
	Alpha Y/Alpha X	0.1	unitless	EPA model default value
	Alpha Z/Alpha X	1.00E-99	unitless	EPA model default value
Adsorption	Soil Bulk Density	1.7	kg/L	EPA model default value
	Fraction Organic Carbon	1.00E-03	unitless	Conservative estimate within the range of typical values (EPA, 2000)
	Organic Carbon Partitioning Coefficients			
	PCE	426	L/kg	EPA model default value
	TCE	130	L/kg	EPA model default value
	DCE	125	L/kg	EPA model default value
	VC	30	L/kg	EPA model default value
	Ethenes	302	L/kg	EPA model default value
	Retardation Factor	2.47		Calculated value based on input values above
Biotransformation	1st Order Decay Coefficients (λ)			
	PCE->TCE	1.150	1/yr	Within range of typical values (EPA, 2000) after model calibration
	TCE->DCE	0.475	1/yr	Mean of typical values in guidance (EPA, 2000)
	DCE->VC	1.740	1/yr	Mean of typical values in guidance (EPA, 2000)
	VC->Ethene	1.420	1/yr	Mean of typical values in guidance (EPA, 2000)
General	Simulation Time	varies	year	Assumes the release began in 1991
	Model Area Width	250	feet	Assumption based on monitoring well sampling results
	Model Area Length	1000	feet	Assumption based on monitoring well sampling results
	Zone Length	1000	feet	Assumes one zone
Source Data	Type	continuous		Assumes continuous source concentrations throughout time
	Source Thickness in Saturated Zone	40	feet	Based on analysis of site cross-section
	Source Width	20	feet	Approximate width of former cleaning establishment
	Source Concentrations			
	PCE	150.0	mg/L	Aqueous phase solubility of PCE (EPA, 2000)
	TCE	1.0	mg/L	Based on model calibration
	DCE	8.0	mg/L	Based on model calibration
	VC	0.2	mg/L	Based on model calibration
	Ethenes	0	mg/L	Based on model calibration

EPA, 2000: BIOCHLOR Natural Attenuation Decision Support System. User's Manual Version 1.0 USEPA. January 2000

EPA, 2001: BIOCHLOR Natural Attenuation Decision Support System. User's Manual Addendum Version 2.0 USEPA. March 2001

TABLE 2

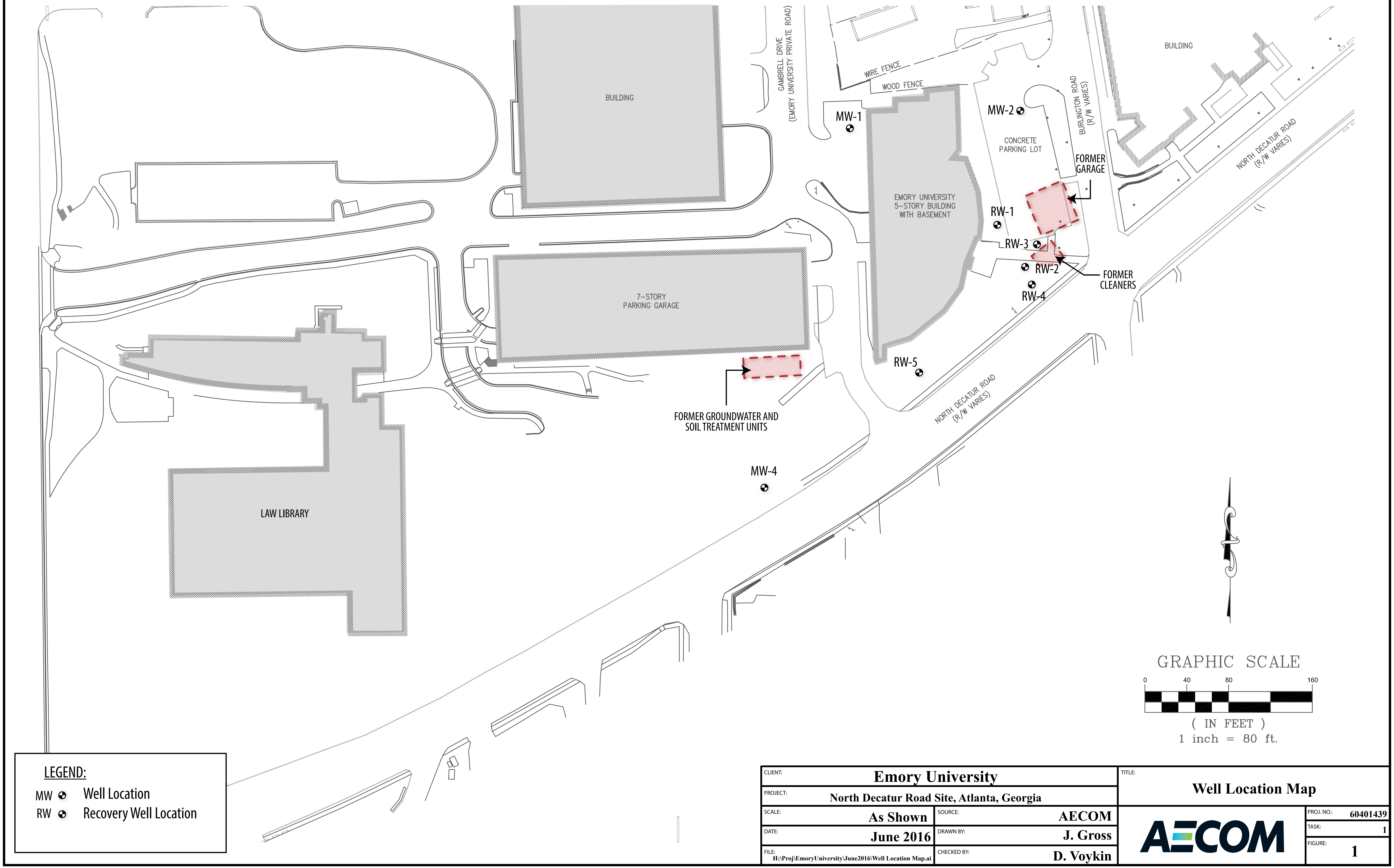
Sensitivity Analysis for the Emory BIOCHLOR Model (Year 2020)

Hydraulic Conductivity (cm/second)						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Constituent	2.00E-04	K=4.0E-04 (Baseline)	8.00E-04	2.00E-04	K=4.0E-04 (Baseline)	8.00E-04
PCE	0.028	0.055	0.083	0.004	0.016	0.036
TCE	0.151	0.107	0.066	0.132	0.111	0.079
DCE	0.034	0.020	0.011	0.036	0.026	0.014
VC	0.029	0.012	0.005	0.038	0.022	0.008
Porosity						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Constituent	n_e=0.075	n_e=0.15 (Baseline)	n_e=0.30	n_e=0.075	n_e=0.15 (Baseline)	n_e=0.30
PCE	0.101	0.055	0.021	0.054	0.016	0.003
TCE	0.087	0.107	0.097	0.130	0.111	0.057
DCE	0.014	0.020	0.022	0.025	0.026	0.015
VC	0.007	0.012	0.017	0.016	0.022	0.016
Retardation Factor						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Constituent	R=1.235	R=2.47 (Baseline)	R=4.940	R=1.235	R=2.47 (Baseline)	R=4.94
PCE	0.042	0.055	0.103	0.008	0.016	0.057
TCE	0.073	0.107	0.268	0.053	0.111	0.554
DCE	0.013	0.020	0.054	0.012	0.026	0.135
VC	0.008	0.012	0.038	0.010	0.022	0.123
1st Order Decay Coefficient - λ (1/year)						
	Concentrations (mg/L) at 165 feet			Concentrations (mg/L) at 340 feet		
Lambda	0.575	1.150 (Baseline)	2.3*	0.575	1.150 (Baseline)	2.3*
PCE	0.116	0.055	0.017	0.072	0.012	0.002
Lambda	0.288	0.475 (Baseline)	0.950	0.288	0.475 (Baseline)	0.950
TCE	0.100	0.107	0.074	0.166	0.072	0.033
Lambda	0.870	1.740 (Baseline)	3.480	0.870	1.740 (Baseline)	3.480
DCE	0.019	0.020	0.016	0.039	0.016	0.009
Lambda	0.710	1.420 (Baseline)	2.840	0.710	1.420 (Baseline)	2.840
VC	0.009	0.012	0.013	0.026	0.013	0.010

basis for sensitivity analysis: 0.5 times and 2.0 times the baseline value

* value for λ outside of typical range for PCE (0.07 to 1.20 yr^{-1})

FIGURES



CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

SCALE: **As Shown**

SOURCE: **AECOM**

DATE: **June 2016**

DRAWN BY: **J. Gross**

FILE: **H:\Proj\EmoryUniversity\June2016\Well Location Map.ai**

CHECKED BY: **D. Voykin**

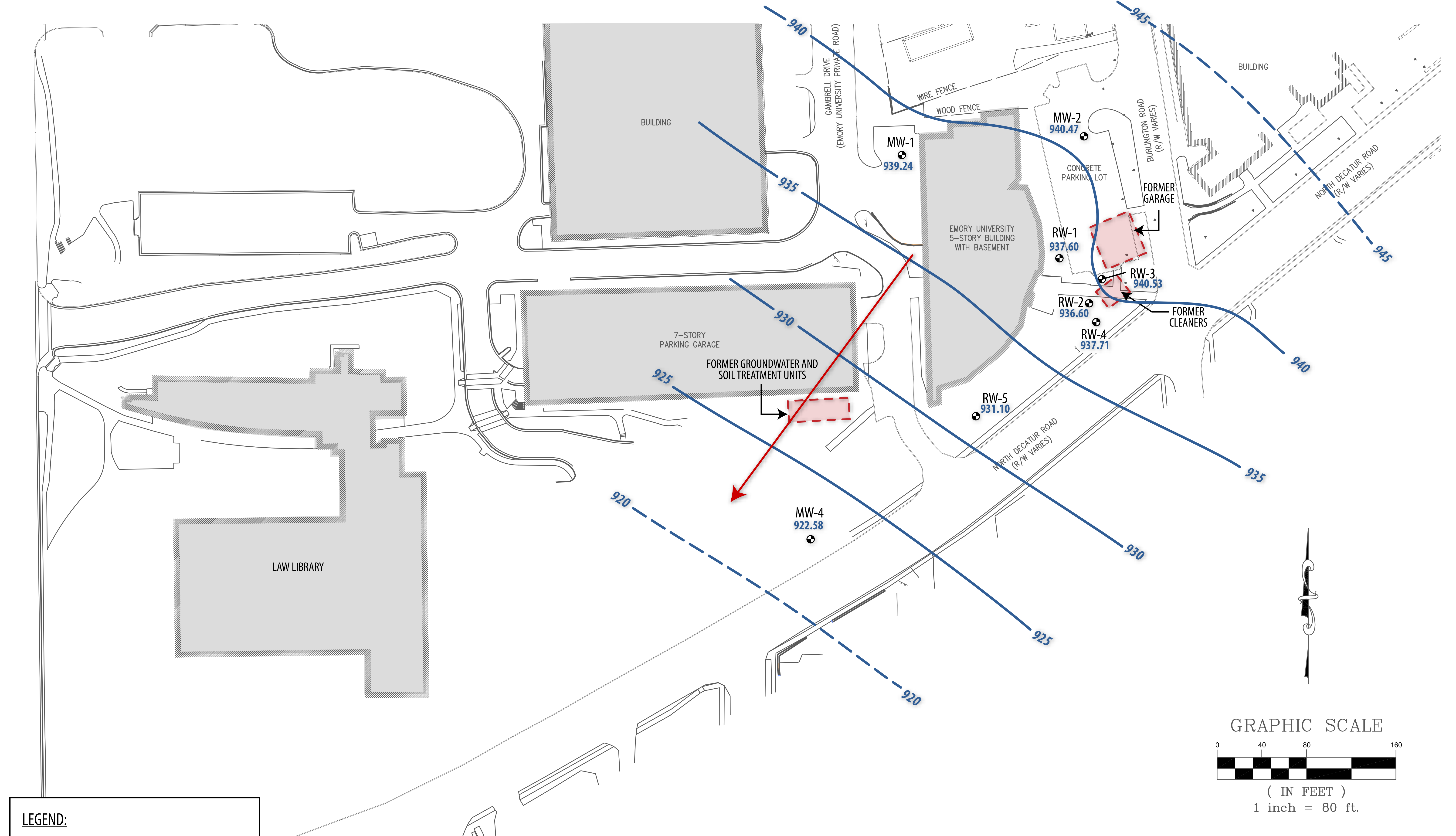
TITLE: **Well Location Map**

AECOM

PROJ. NO.: 60401439

TASK: 1

FIGURE: 1



LEGEND:

MW ●	Well Location
RW ●	Recovery Well Location
922.58	Water Elevation (feet)
←	Direction of Groundwater Flow

CLIENT: **Emory University**

PROJECT: **North Decatur Road Site, Atlanta, Georgia**

SCALE: **As Shown**

SOURCE: **AECOM**

DATE: **June 2016**

DRAWN BY: **J. Gross**

FILE: H:\Proj\EmoryUniversity\June2016\Potmap March 2016.ai

CHECKED BY: **D. Voykin**

TITLE:

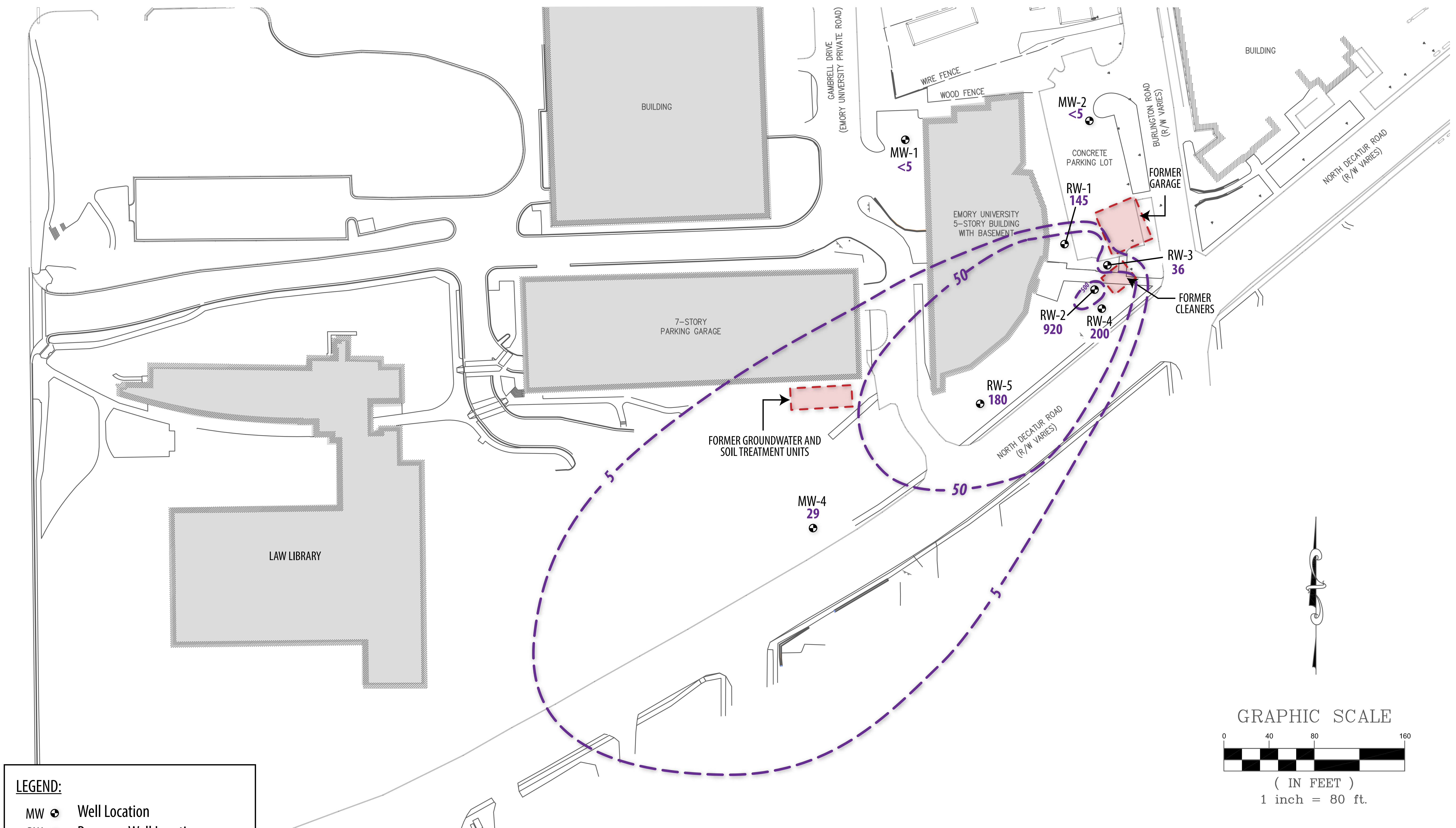
Potemtiometric Map
March 30, 2016

AECOM

PROJ. NO.: 60401439

TASK: 1

FIGURE: 2



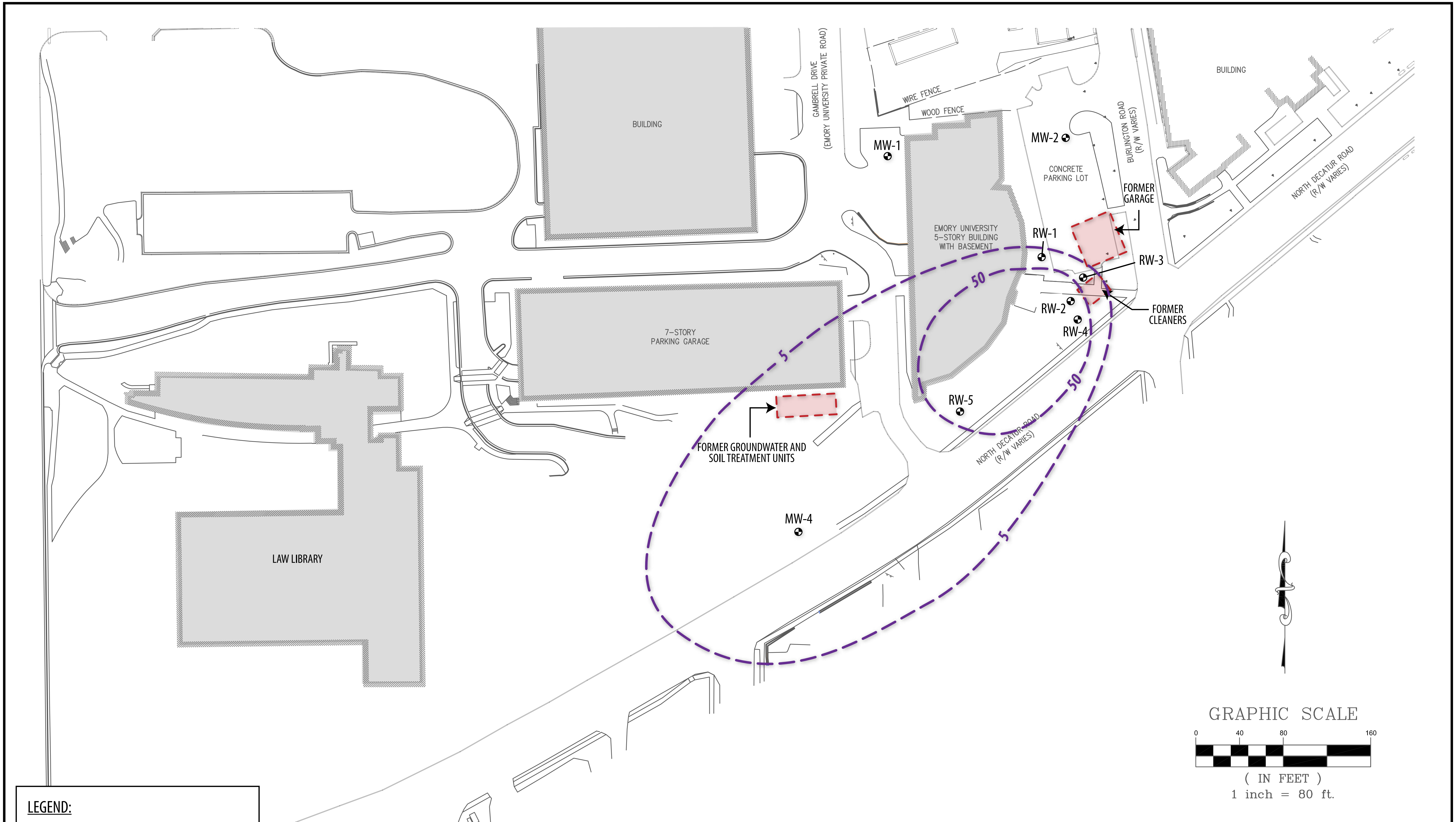
LEGEND:

MW ● Well Location
RW ● Recovery Well Location
200 PCE* Concentrations
—5— Isoconcentration Contour

*micrograms per Liter (µg/L)

CLIENT: Emory University	TITLE: Estimated PCE* Plume Extents March 2016
PROJECT: North Decatur Road Site, Atlanta, Georgia	
SCALE: As Shown	SOURCE: AECOM
DATE: June 2016	DRAWN BY: J. Gross
FILE: H:\Proj\EmoryUniversity\June2016\EstPCE03-16.ai	CHECKED BY: D. Voykin

PROJ. NO.: 60401439
TASK: 1
FIGURE: 3



LEGEND:

MW ● Well Location
RW ● Recovery Well Location
—5— PCE* Isoconcentration Contour

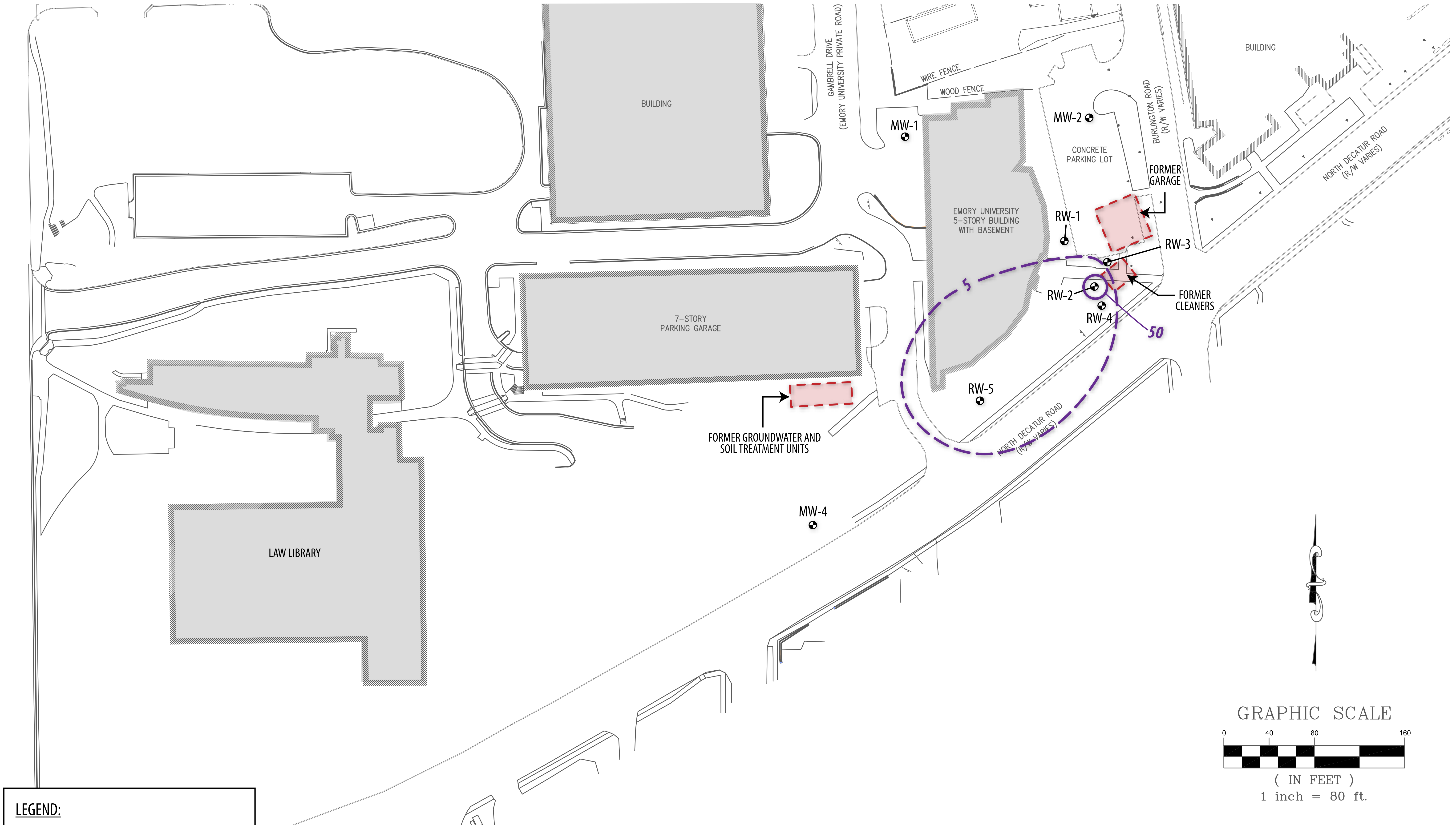
*micrograms per Liter (µg/L)

CLIENT: **Emory University**
PROJECT: **North Decatur Road Site, Atlanta, Georgia**
SCALE: **As Shown**
SOURCE: **AECOM**
DATE: **June 2016**
DRAWN BY: **J. Gross**
FILE: H:\Proj\EmoryUniversity\June2016\EstPCE03-16.ai
CHECKED BY: **D. Voykin**

TITLE: **Estimated PCE* Plume Extents 2020**

AECOM

PROJ. NO.: 60401439
TASK: 1
FIGURE: 4



LEGEND:

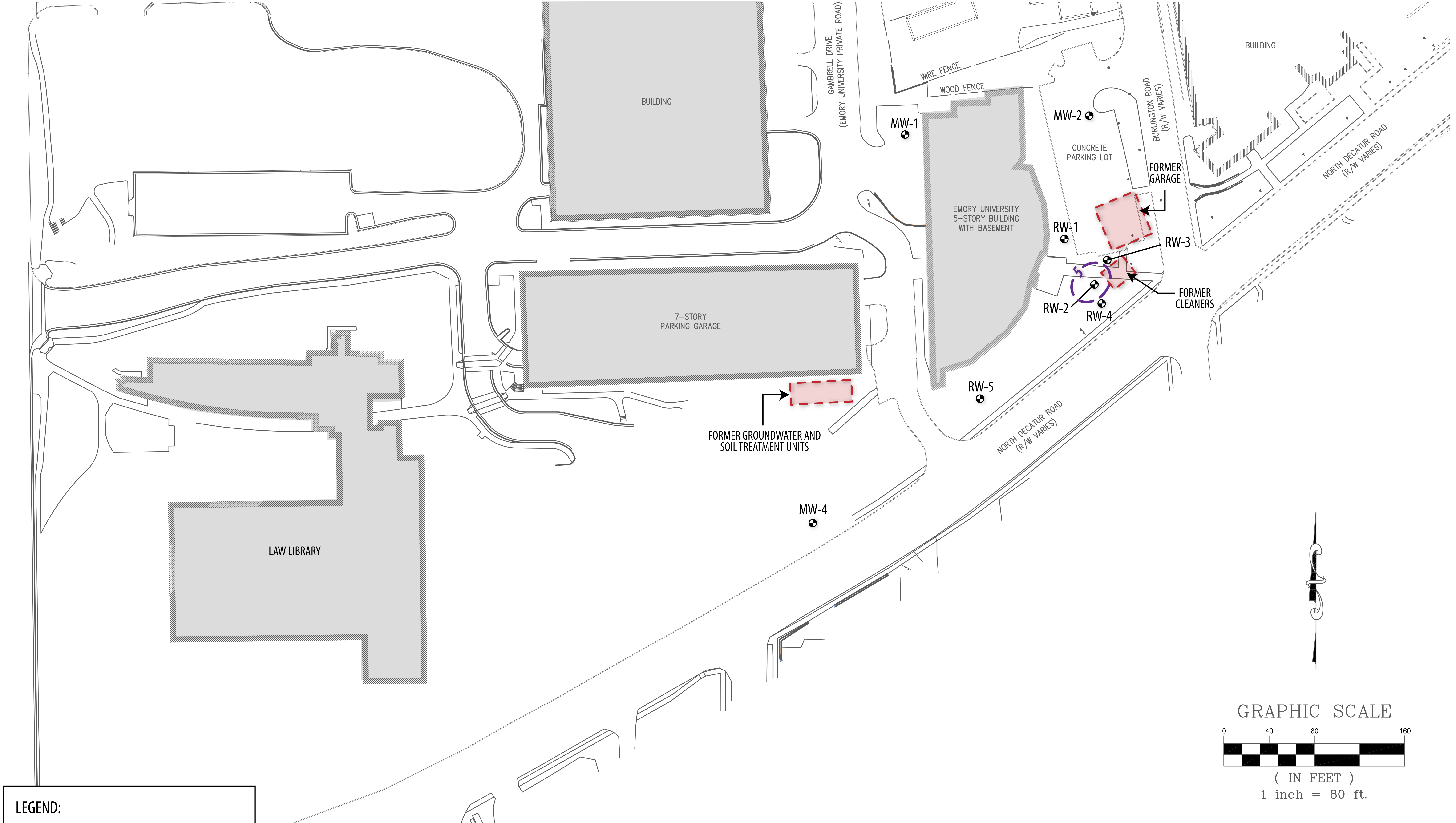
MW ● Well Location

RW ● Recovery Well Location

—5— PCE* Isoconcentration Contour

*micrograms per Liter (µg/L)

CLIENT: Emory University		TITLE: Estimated PCE* Plume Extents 2030	
PROJECT: North Decatur Road Site, Atlanta, Georgia			
SCALE: As Shown	SOURCE: AECOM		PROJ. NO.: 60401439
DATE: June 2016	DRAWN BY: J. Gross	AECOM	TASK: 1
FILE: H:\Proj\EmoryUniversity\June2016\EstPCE2030.ai	CHECKED BY: D. Voykin		FIGURE: 5



LEGEND:

MW ● Well Location

RW ● Recovery Well Location

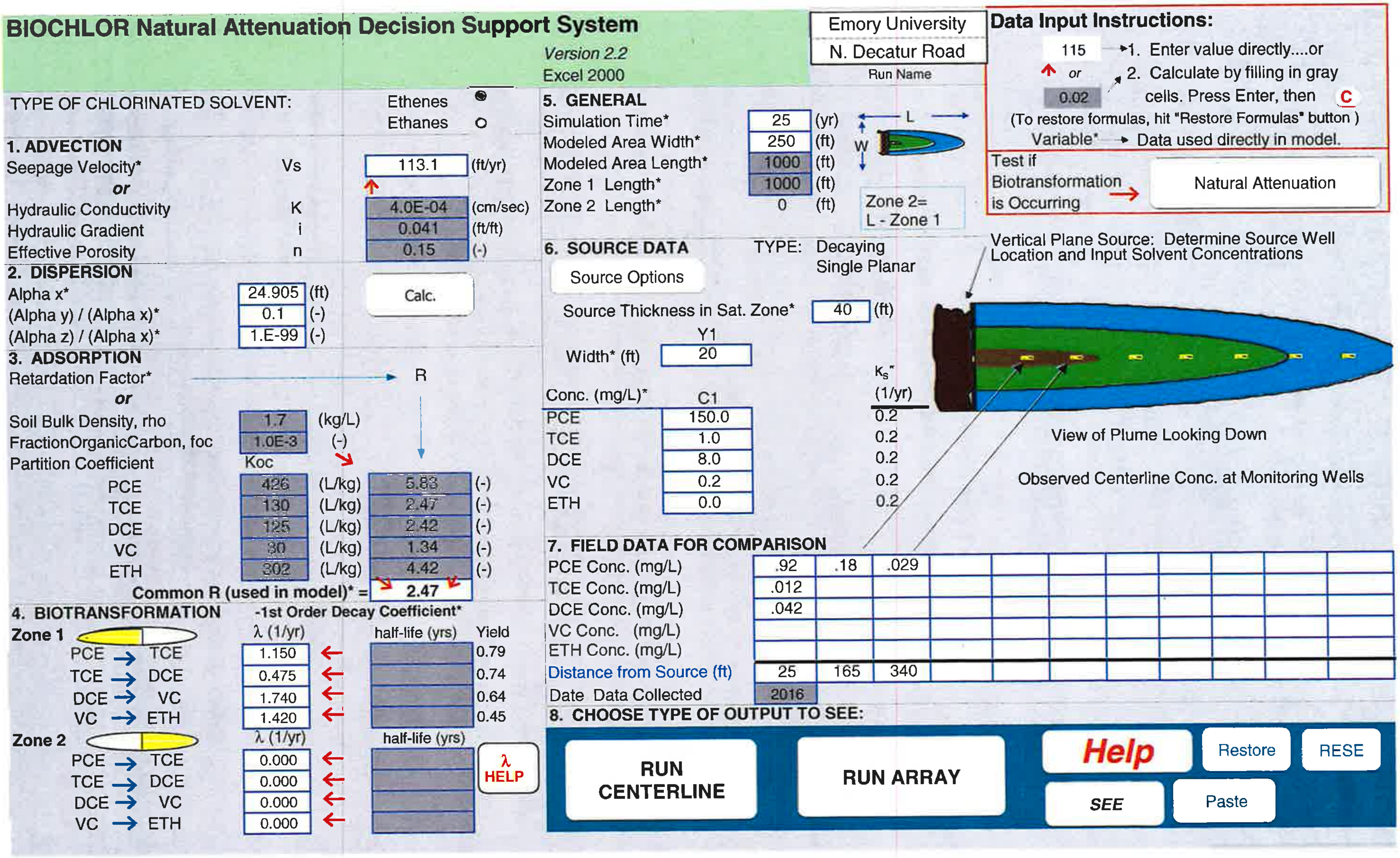
—5— PCE* Isoconcentration Contour

*micrograms per Liter (µg/L)

CLIENT: Emory University		TITLE: Estimated PCE* Plume Extents 2040	
PROJECT: North Decatur Road Site, Atlanta, Georgia			
SCALE: As Shown	SOURCE: AECOM	AECOM	PROJ. NO.: 60401439
DATE: June 2016	DRAWN BY: J. Gross		TASK: 1
FILE: H:\Proj\EmoryUniversity\June2016\EstPCE2040.ai	CHECKED BY: D. Voykin		FIGURE: 6

APPENDIX

BIOCHLOR Model Output



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
Run Name

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity* Vs 113.1 (ft/yr)
or
Hydraulic Conductivity K 4.0E-04 (cm/sec)
Hydraulic Gradient i 0.041 (ft/ft)
Effective Porosity n 0.15 (-)

2. DISPERSION

Alpha x* 24.905 (ft)
(Alpha y) / (Alpha x)* 0.1 (-)
(Alpha z) / (Alpha x)* 1.E-99 (-)

3. ADSORPTION

Retardation Factor* R
or
Soil Bulk Density, rho 1.7 (kg/L)
FractionOrganicCarbon, foc 1.0E-3 (-)
Partition Coefficient

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1

	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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	

5. GENERAL

Simulation Time* 25 (yr)
Modeled Area Width* 250 (ft)
Modeled Area Length* 1000 (ft)
Zone 1 Length* 1000 (ft)
Zone 2 Length* 0 (ft)

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Thickness in Sat. Zone* 40 (ft)

Width* (ft) Y1 20

Conc. (mg/L)*	C1	Ks* (1/yr)
PCE	150.0	0.2
TCE	1.0	0.2
DCE	8.0	0.2
VC	0.2	0.2
ETH	0.0	0.2

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)	.92	.18	.029							
TCE Conc. (mg/L)	.012									
DCE Conc. (mg/L)	.042									
VC Conc. (mg/L)										
ETH Conc. (mg/L)										
Distance from Source (ft)	25	165	340							
Date Data Collected	2016									

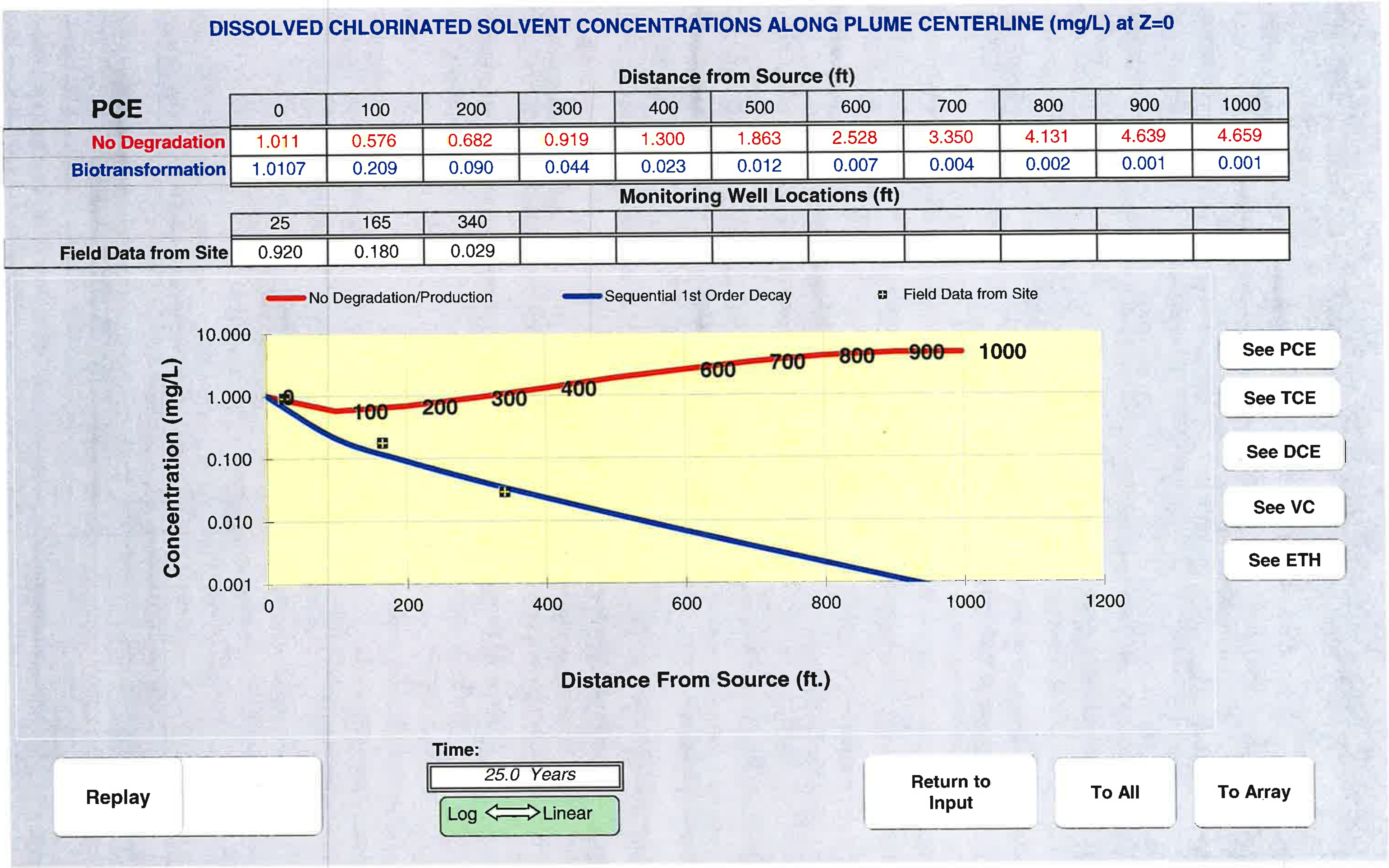
8. CHOOSE TYPE OF OUTPUT TO SEE:

Data Input Instructions:

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

Test if Biotransformation is Occurring

Plate 1A



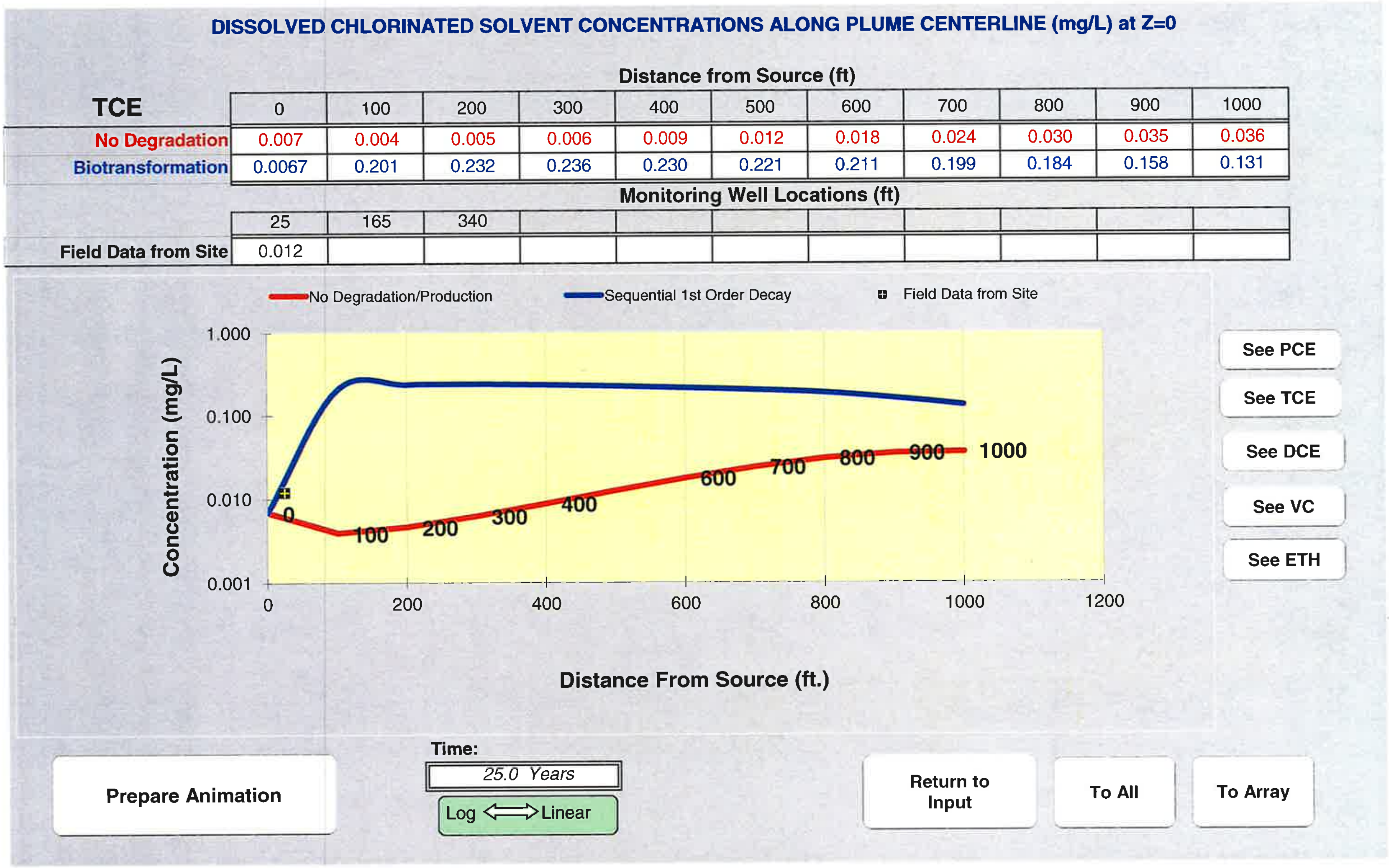
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

PCE	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	1.011	0.576	0.682	0.919	1.300	1.863	2.528	3.350	4.131	4.639	4.659
Biotransformation	1.0107	0.209	0.090	0.044	0.023	0.012	0.007	0.004	0.002	0.001	0.001

	Monitoring Well Locations (ft)										
	25	165	340								
Field Data from Site	0.920	0.180	0.029								

Time: 25.0 Years

Plate 1B



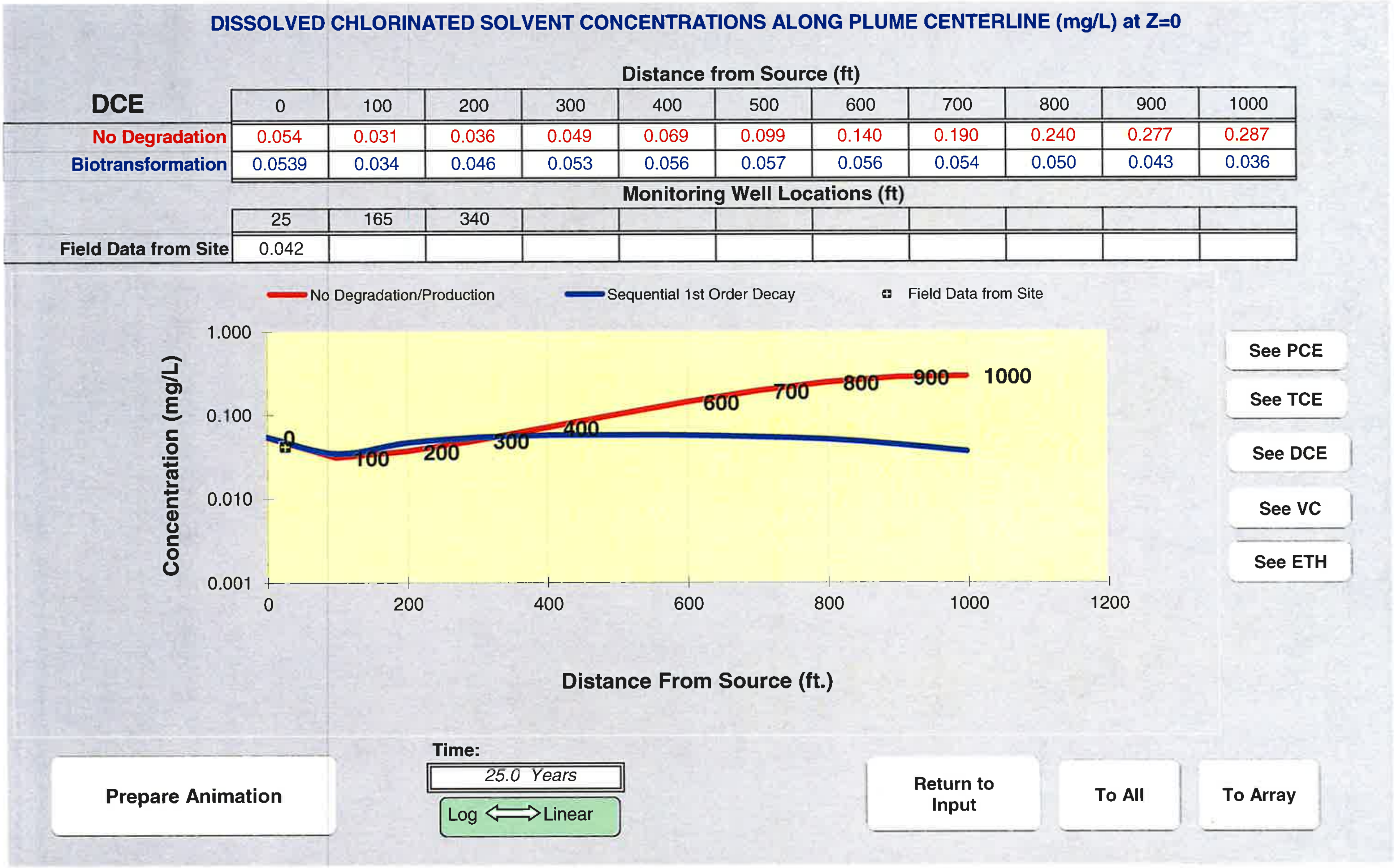
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

TCE	Distance from Source (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.007	0.004	0.005	0.006	0.009	0.012	0.018	0.024	0.030	0.035	0.036
Biotransformation	0.0067	0.201	0.232	0.236	0.230	0.221	0.211	0.199	0.184	0.158	0.131

	Monitoring Well Locations (ft)										
	25	165	340								
Field Data from Site	0.012										

Time: 25.0 Years

Plate 1C



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

Distance from Source (ft)

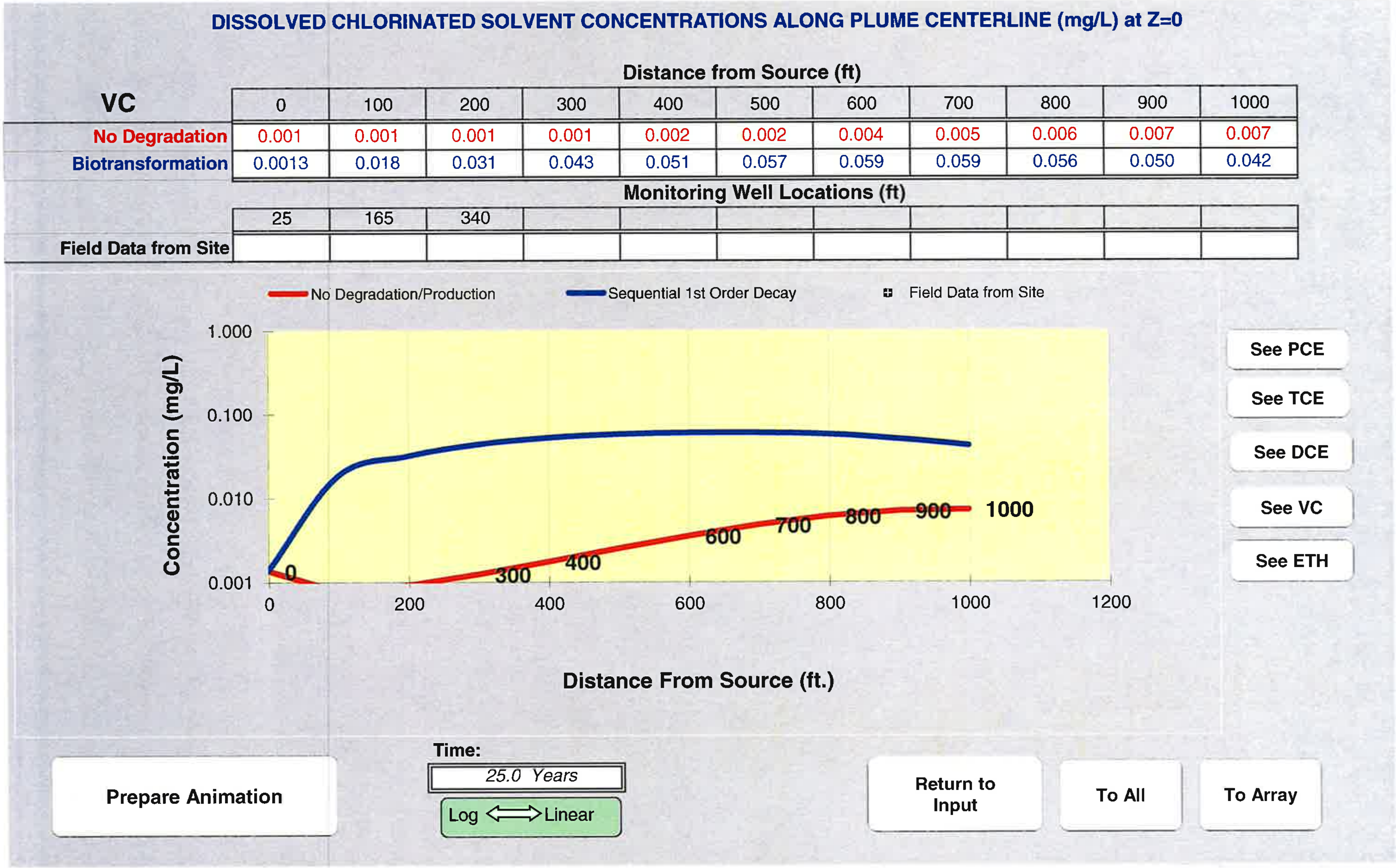
DCE	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.054	0.031	0.036	0.049	0.069	0.099	0.140	0.190	0.240	0.277	0.287
Biotransformation	0.0539	0.034	0.046	0.053	0.056	0.057	0.056	0.054	0.050	0.043	0.036

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site	0.042										

Time: 25.0 Years

Plate 1D



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

Distance from Source (ft)

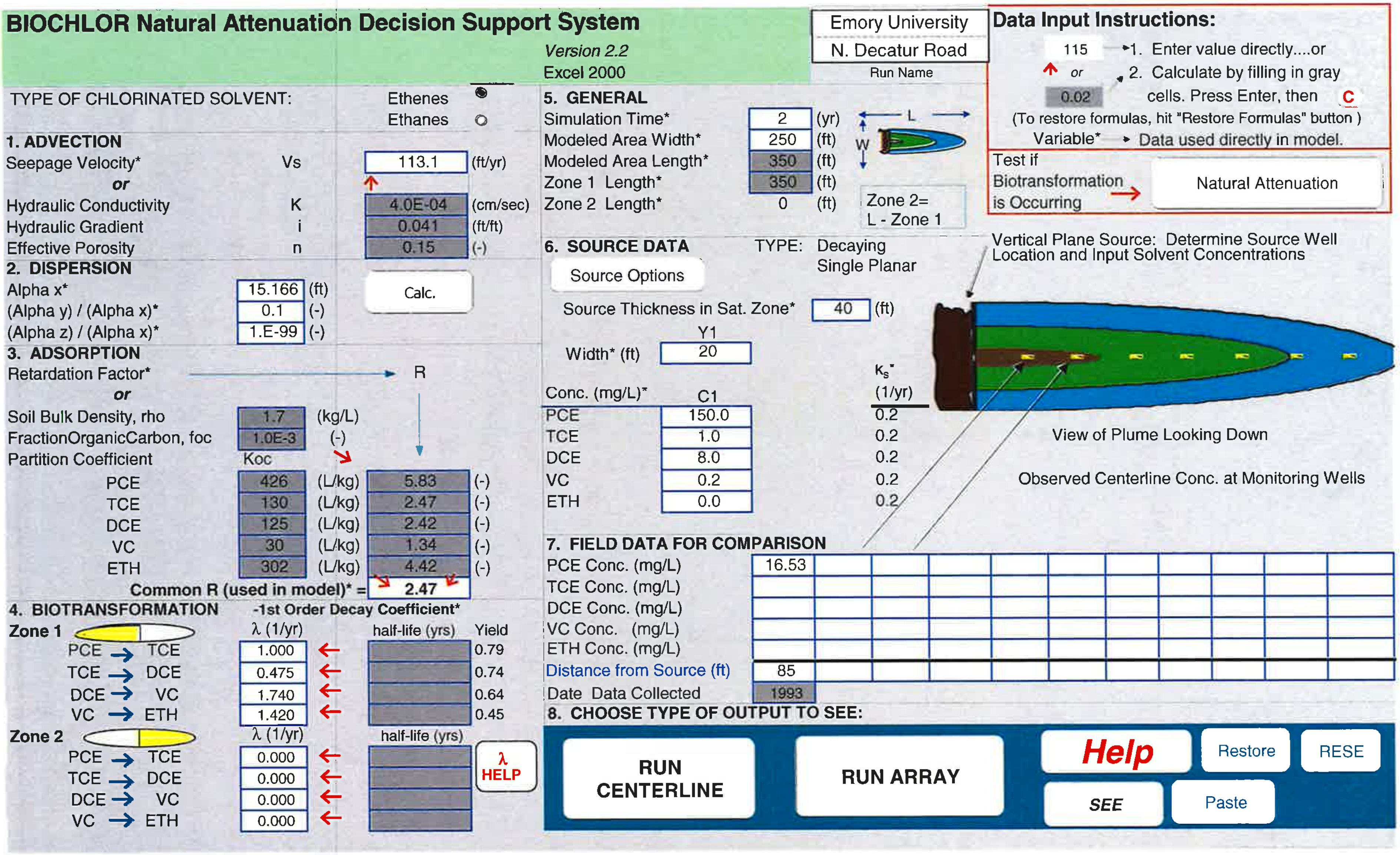
VC	0	100	200	300	400	500	600	700	800	900	1000
No Degradation	0.001	0.001	0.001	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.007
Biotransformation	0.0013	0.018	0.031	0.043	0.051	0.057	0.059	0.059	0.056	0.050	0.042

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Time: 25.0 Years

Plate 1E



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT:
● Ethenes
○ Ethanes

1. ADVECTION

Seepage Velocity*	Vs	113.1	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.041	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	15.166	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	1.7	(kg/L)
FractionOrganicCarbon, foc	1.0E-3	(-)

Partition Coefficient	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.000		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	2	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	350	(ft)
Zone 1 Length*	350	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

Source Thickness in Sat. Zone* 40 (ft)

Width* (ft) Y1: 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	150.0	0.2
TCE	1.0	0.2
DCE	8.0	0.2
VC	0.2	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

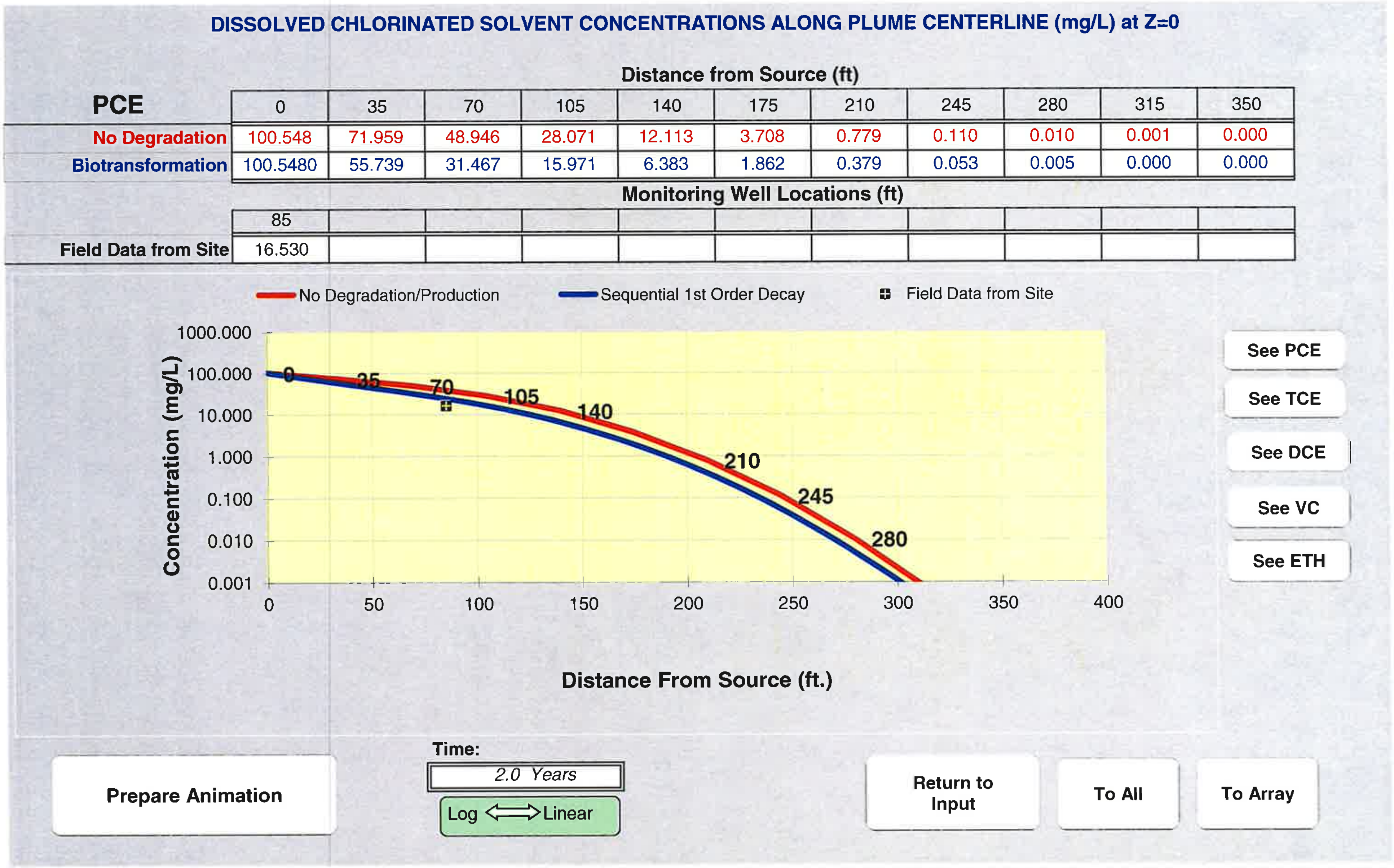
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	16.53										
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	85										
Date Data Collected	1993										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 2A



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

Distance from Source (ft)

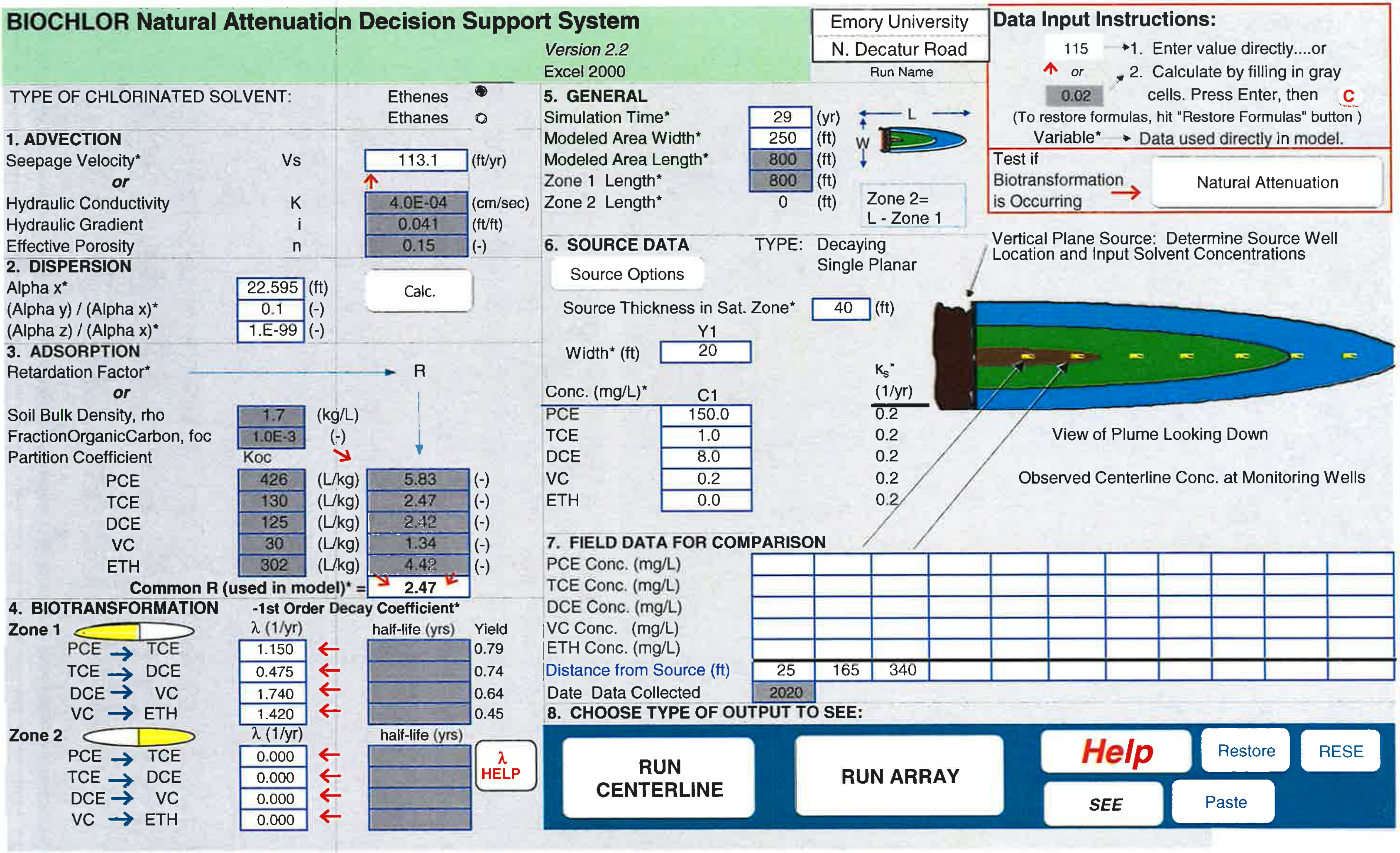
PCE	0	35	70	105	140	175	210	245	280	315	350
No Degradation	100.548	71.959	48.946	28.071	12.113	3.708	0.779	0.110	0.010	0.001	0.000
Biotransformation	100.5480	55.739	31.467	15.971	6.383	1.862	0.379	0.053	0.005	0.000	0.000

Monitoring Well Locations (ft)

	85										
Field Data from Site	16.530										

Time: *2.0 Years*

Plate 2B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
Run Name

Data Input Instructions:
115 → 1. Enter value directly....or
or
0.02 → 2. Calculate by filling in gray 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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION
Seepage Velocity* Vs 113.1 (ft/yr)
or
Hydraulic Conductivity K 4.0E-04 (cm/sec)
Hydraulic Gradient i 0.041 (ft/ft)
Effective Porosity n 0.15 (-)

2. DISPERSION
Alpha x* 22.595 (ft)
(Alpha y) / (Alpha x)* 0.1 (-)
(Alpha z) / (Alpha x)* 1.E-99 (-)
Calc.

3. ADSORPTION
Retardation Factor* R
or
Soil Bulk Density, rho 1.7 (kg/L)
FractionOrganicCarbon, foc 1.0E-3 (-)
Partition Coefficient Koc

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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* 29 (yr)
Modeled Area Width* 250 (ft)
Modeled Area Length* 800 (ft)
Zone 1 Length* 800 (ft)
Zone 2 Length* 0 (ft)
Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar
Source Options
Source Thickness in Sat. Zone* 40 (ft)
Width* (ft) Y1 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	150.0	0.2
TCE	1.0	0.2
DCE	8.0	0.2
VC	0.2	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

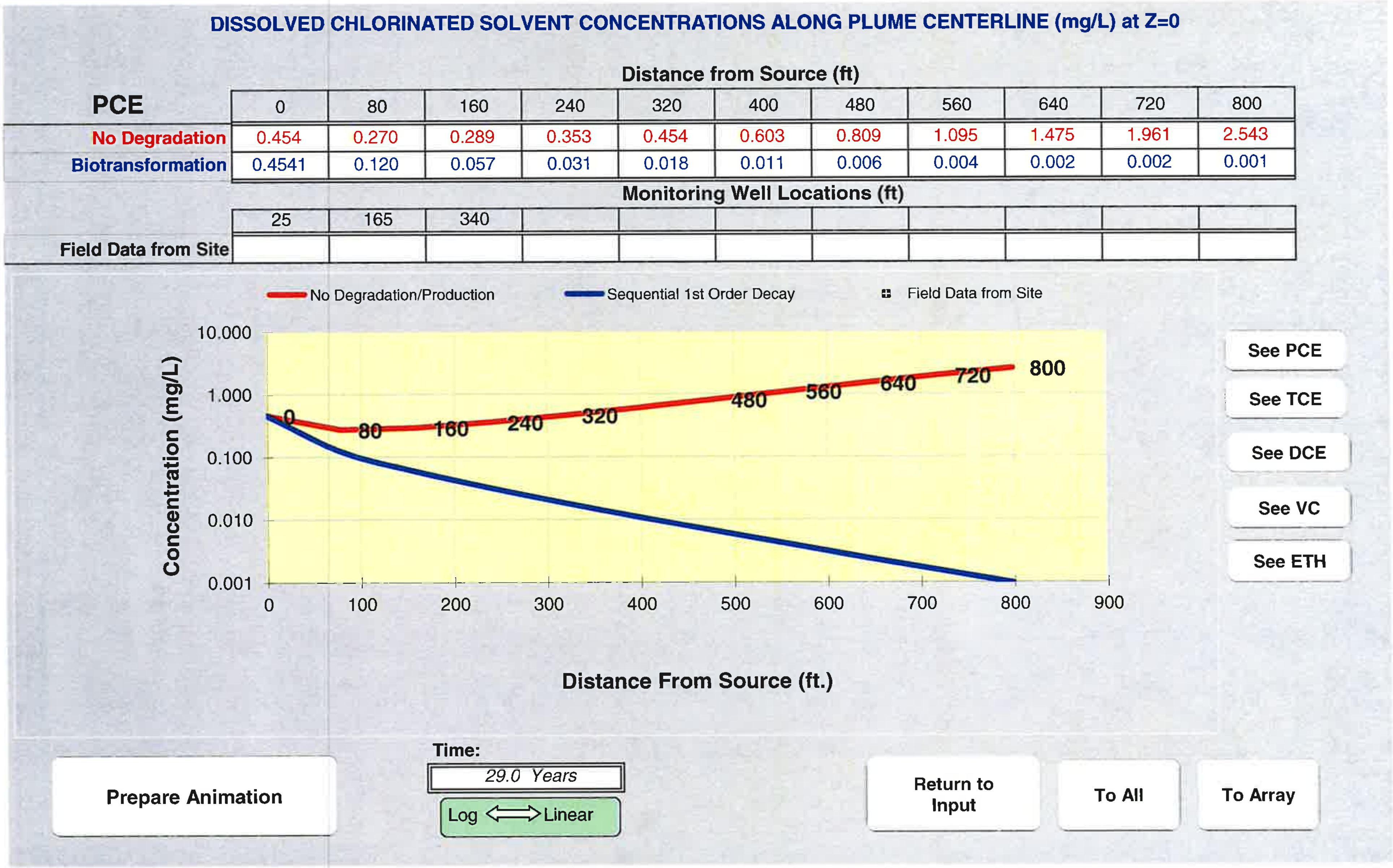
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	25	165	340								
Date Data Collected	2020										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 3A



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

Distance from Source (ft)

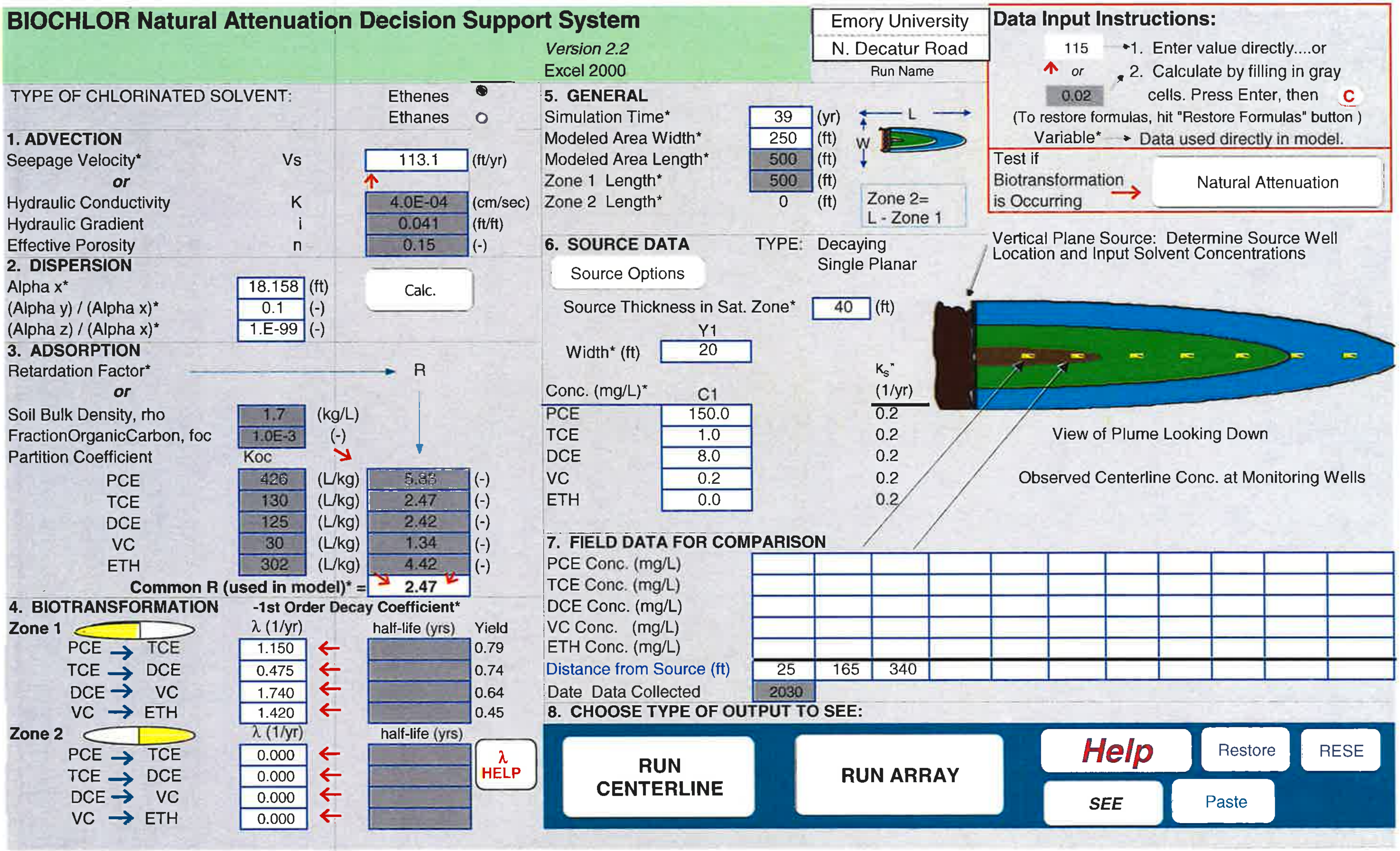
PCE	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.454	0.270	0.289	0.353	0.454	0.603	0.809	1.095	1.475	1.961	2.543
Biotransformation	0.4541	0.120	0.057	0.031	0.018	0.011	0.006	0.004	0.002	0.002	0.001

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Time: 29.0 Years

Plate 3B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION
Seepage Velocity* Vs 113.1 (ft/yr)
or
Hydraulic Conductivity K 4.0E-04 (cm/sec)
Hydraulic Gradient i 0.041 (ft/ft)
Effective Porosity n 0.15 (-)

2. DISPERSION
Alpha x* 18.158 (ft)
(Alpha y) / (Alpha x)* 0.1 (-)
(Alpha z) / (Alpha x)* 1.E-99 (-)
Calc.

3. ADSORPTION
Retardation Factor* → R
or
Soil Bulk Density, rho 1.7 (kg/L)
FractionOrganicCarbon, foc 1.0E-3 (-)

Partition Coefficient	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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* 39 (yr)
Modeled Area Width* 250 (ft)
Modeled Area Length* 500 (ft)
Zone 1 Length* 500 (ft)
Zone 2 Length* 0 (ft)
Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar
Source Options
Source Thickness in Sat. Zone* 40 (ft)
Width* (ft) Y1 20

Conc. (mg/L)*	C1	k_s^* (1/yr)
PCE	150.0	0.2
TCE	1.0	0.2
DCE	8.0	0.2
VC	0.2	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

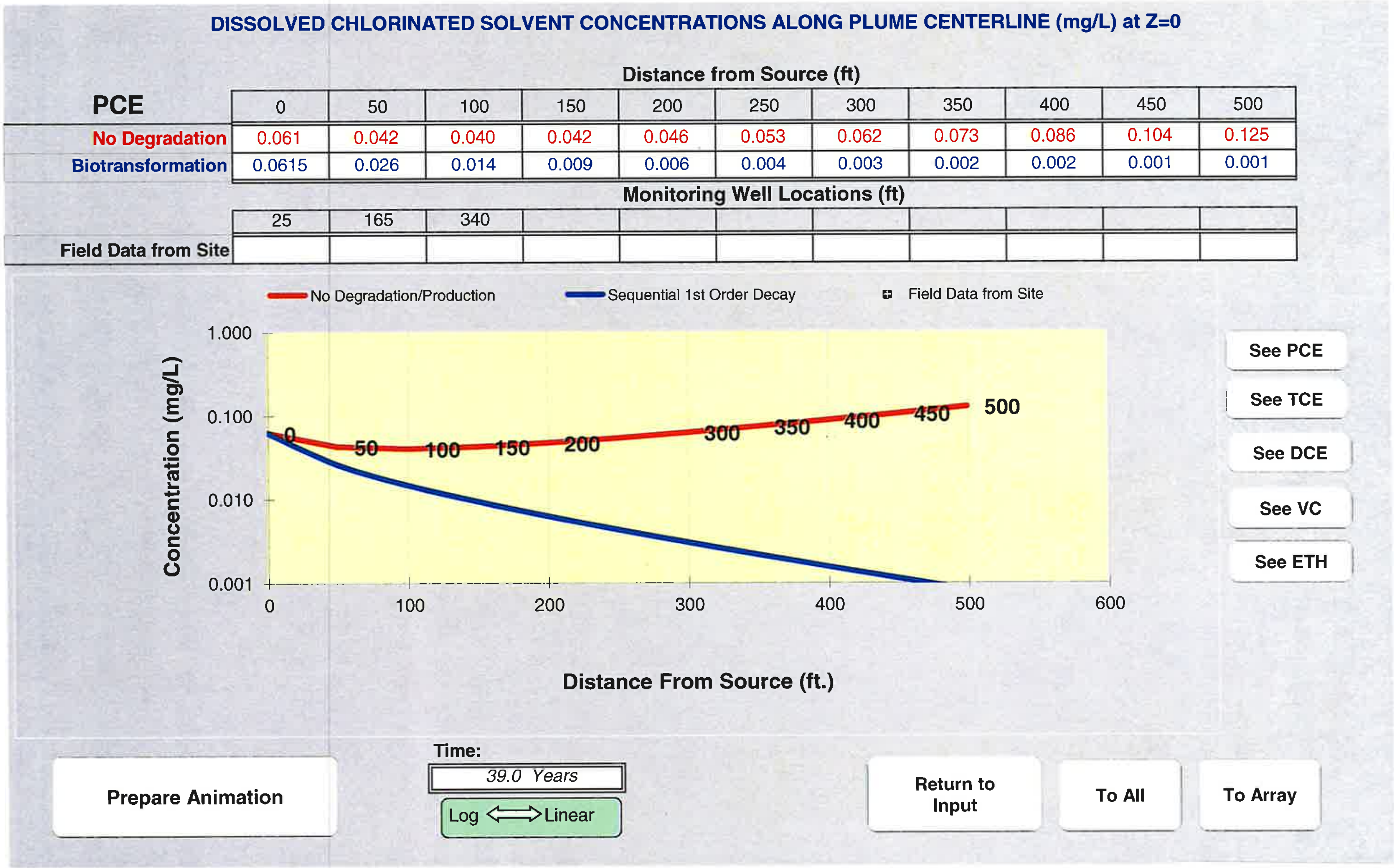
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	25	165	340								
Date Data Collected	2030										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 4A



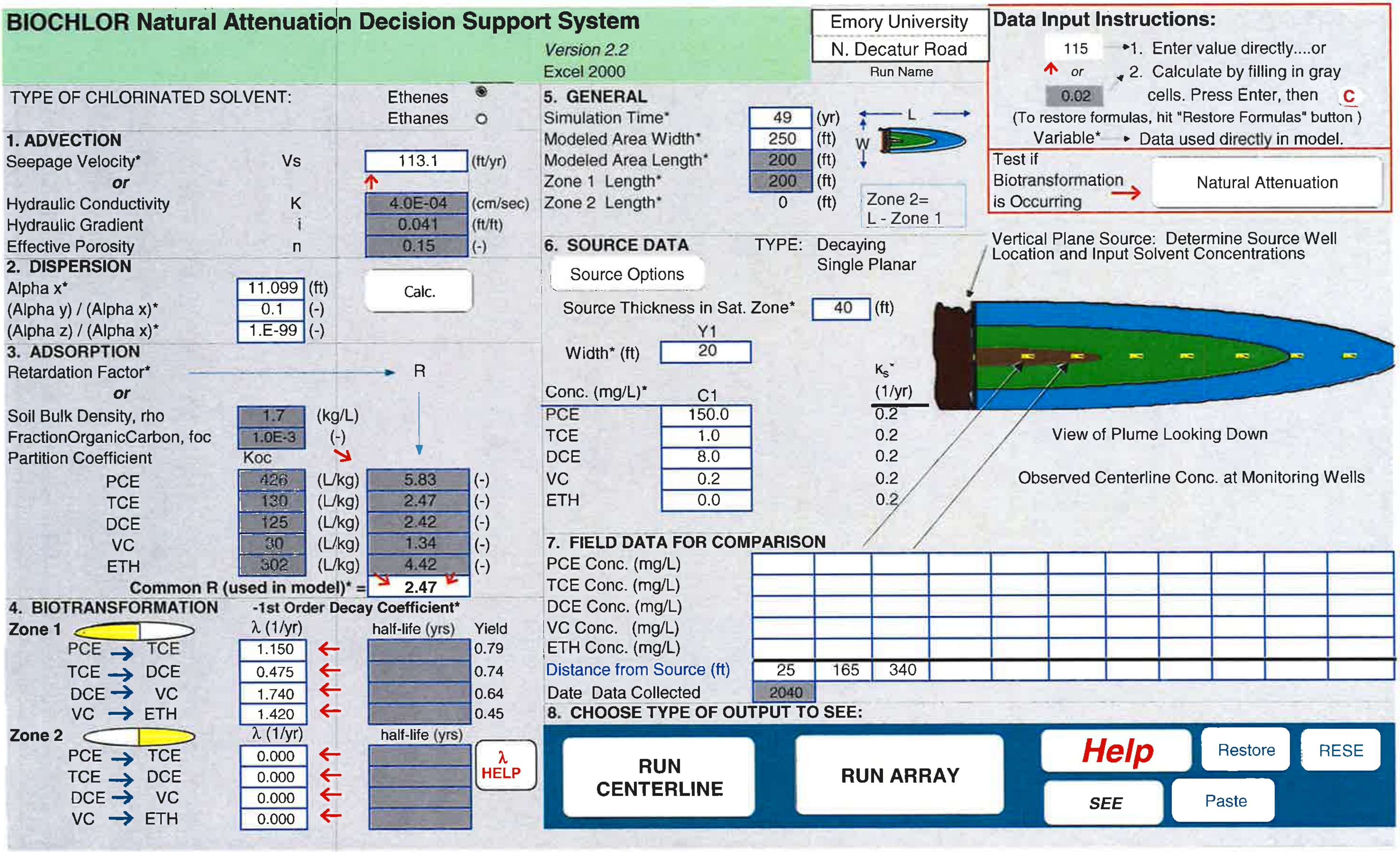
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

PCE	Distance from Source (ft)										
	0	50	100	150	200	250	300	350	400	450	500
No Degradation	0.061	0.042	0.040	0.042	0.046	0.053	0.062	0.073	0.086	0.104	0.125
Biotransformation	0.0615	0.026	0.014	0.009	0.006	0.004	0.003	0.002	0.002	0.001	0.001

	Monitoring Well Locations (ft)										
	25	165	340								
Field Data from Site											

Time: 39.0 Years

Plate 4B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	113.1	(ft/yr)
or			
Hydraulic Conductivity	K	4.0E-04	(cm/sec)
Hydraulic Gradient	i	0.041	(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	11.099	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	1.7	(kg/L)
FractionOrganicCarbon, foc	1.0E-3	(-)

Partition Coefficient

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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*	49	(yr)
Modeled Area Width*	250	(ft)
Modeled Area Length*	200	(ft)
Zone 1 Length*	200	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar

Source Options

Source Thickness in Sat. Zone* 40 (ft)

Width* (ft) Y1 20

Conc. (mg/L)*	C1	K_s^* (1/yr)
PCE	150.0	0.2
TCE	1.0	0.2
DCE	8.0	0.2
VC	0.2	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

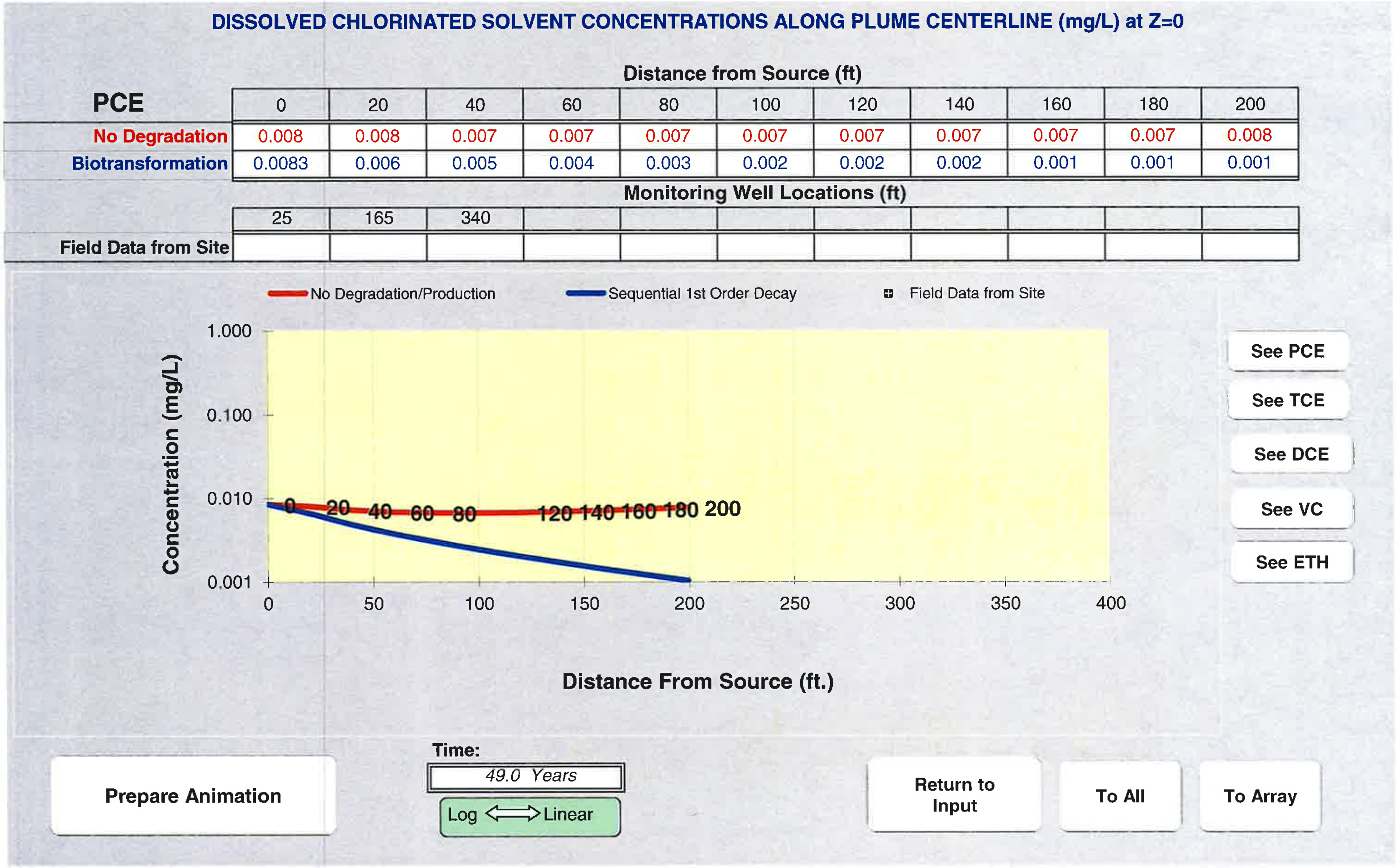
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)										
TCE Conc. (mg/L)										
DCE Conc. (mg/L)										
VC Conc. (mg/L)										
ETH Conc. (mg/L)										
Distance from Source (ft)	25	165	340							
Date Data Collected	2040									

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 5A

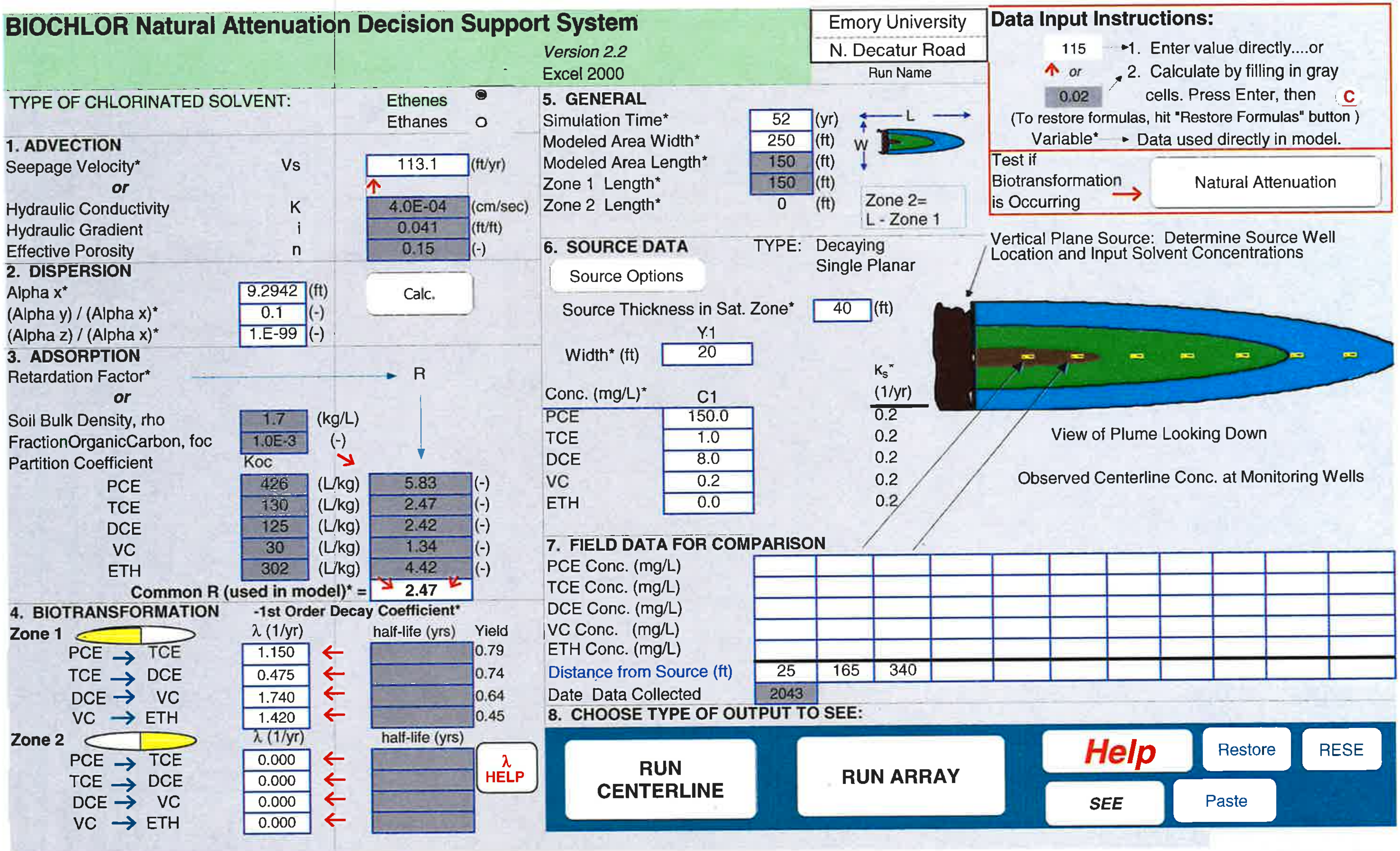


DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

	Distance from Source (ft)										
PCE	0	20	40	60	80	100	120	140	160	180	200
No Degradation	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008
Biotransformation	0.0083	0.006	0.005	0.004	0.003	0.002	0.002	0.002	0.001	0.001	0.001
	Monitoring Well Locations (ft)										
	25	165	340								
Field Data from Site											

Time: 49.0 Years

Plate 5B



BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Emory University
N. Decatur Road
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

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION
Seepage Velocity* Vs 113.1 (ft/yr)
or
Hydraulic Conductivity K 4.0E-04 (cm/sec)
Hydraulic Gradient i 0.041 (ft/ft)
Effective Porosity n 0.15 (-)

2. DISPERSION
Alpha x* 9.2942 (ft)
(Alpha y) / (Alpha x)* 0.1 (-)
(Alpha z) / (Alpha x)* 1.E-99 (-)
Calc.

3. ADSORPTION
Retardation Factor* R
or
Soil Bulk Density, rho 1.7 (kg/L)
FractionOrganicCarbon, foc 1.0E-3 (-)
Partition Coefficient

	Koc		R	
PCE	426	(L/kg)	5.83	(-)
TCE	130	(L/kg)	2.47	(-)
DCE	125	(L/kg)	2.42	(-)
VC	30	(L/kg)	1.34	(-)
ETH	302	(L/kg)	4.42	(-)

Common R (used in model)* = 2.47

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	1.150		0.79
TCE → DCE	0.475		0.74
DCE → VC	1.740		0.64
VC → ETH	1.420		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* 52 (yr)
Modeled Area Width* 250 (ft)
Modeled Area Length* 150 (ft)
Zone 1 Length* 150 (ft)
Zone 2 Length* 0 (ft)
Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Decaying Single Planar
Source Options
Source Thickness in Sat. Zone* 40 (ft)
Y1
Width* (ft) 20

Conc. (mg/L)*	C1	K_s* (1/yr)
PCE	150.0	0.2
TCE	1.0	0.2
DCE	8.0	0.2
VC	0.2	0.2
ETH	0.0	0.2

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

View of Plume Looking Down

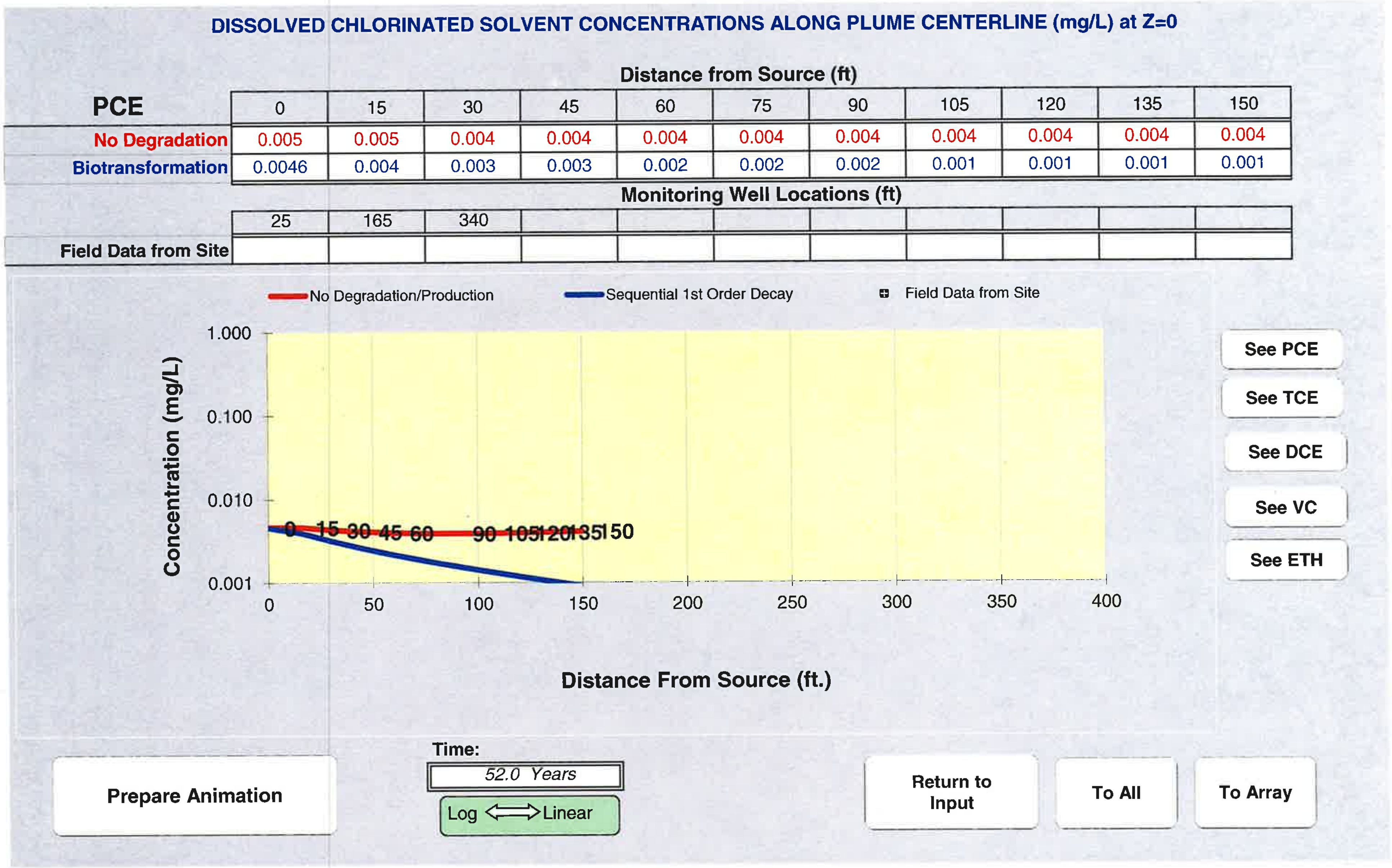
Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)											
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	25	165	340								
Date Data Collected	2043										

8. CHOOSE TYPE OF OUTPUT TO SEE:

Plate 6A



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

Distance from Source (ft)

PCE	0	15	30	45	60	75	90	105	120	135	150
No Degradation	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Biotransformation	0.0046	0.004	0.003	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.001

Monitoring Well Locations (ft)

	25	165	340								
Field Data from Site											

Plate 6B

APPENDIX G

2016 Vapor Intrusion Evaluation

2016 VAPOR INTRUSION EVALAUTION
EMORY UNIVERSITY
NORTH DECATUR ROAD/BURLINGTON ROAD
HSI No. 10121
ATLANTA, GEORGIA

An evaluation for potential vapor intrusion from groundwater and soil pathways was conducted for the site. The evaluation utilized a weight of evidence approach consistent with ITRC's *Vapor Intrusion Pathway: A Practical Guideline* (ITRC, 2007) and follows the principles in EPA's *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (VI Guidance - EPA, 2015a). Lines of evidence used in the data evaluation included building-specific factors (such as size and air exchange rate) and analytical data (groundwater) collected during the investigation. The findings from this evaluation are presented in this Section.

1.1 Approach

A tiered evaluation was performed to assess whether the vapor intrusion exposure pathway is complete. The evaluation consists of the following three steps, summarized below and detailed in the following sub-sections.

- Tier 1 Screen– Identification of constituents of potential concern (COPCs) for vapor intrusion
- Tier 2 Screen– Comparison of groundwater data to risk-based screening concentrations
- Tier 3 Screen (Site-specific Assessment) – Comparison of groundwater concentrations to screening concentrations derived using the Johnson & Ettinger (J&E) Model

1.2 Tier 1 Screening Summary

Groundwater samples have been collected at and adjacent to the site as part of various investigations. Four shallow monitoring wells and four recovery wells, which are in the vicinity of the groundwater and soil former treatment units (**Figure 1**), were selected as part of this evaluation. Results from these wells indicate various volatile organic compounds (VOCs) listed in EPA's *Vapor Intrusion Screening Level (VISL) Calculator* (November 2015 edition - EPA, 2015b) are present in the site's shallow groundwater (**Table 1**). Historical groundwater monitoring data have been collected from these locations since 1998. However for this evaluation, only the more recent data collected from monitoring events conducted between 2014 and 2016 were evaluated to reflect current conditions.

EPA's VI Guidance does not recommend the use of soil concentrations for assessing whether or not the vapor intrusion pathway is complete because of the large uncertainties associated with using them. However, soil concentrations provide useful information in identifying potential source areas. As previously discussed in the 2015 Annual VRP Progress Report, the source of VOCs in the subsurface has been identified and remediated.

1.3 Tier 2 Screening Summary

The site is currently used for non-residential land use. However, volatile constituents detected in shallow groundwater were compared to both commercial/industrial and residential VISLs to identify COPCs for indoor air.

Table 2 presents the screening levels and the comparison to the on-site groundwater data. The following observations were noted.

- Tetrachloroethylene (PCE) was detected above commercial/industrial VISLs and residential VISLs in each of the recovery well locations (RW-1 through RW-5) and one monitoring well location (MW-4).
- The maximum detected PCE concentration was observed in recovery well location RW-2.
- Trichloroethene (TCE) was detected above above commercial/industrial VISLs and residential VISLs in two recovery well locations (RW-2 and RW-3).
- No other constituents were detected above VISLs.

1.4 Tier 3: Site-Specific Assessment

Consistent with the prior evaluation conducted in 2014 and approved by GAEPD, concentrations detected in shallow groundwater were compared to site-specific groundwater screening levels derived using the J&E model. **Table 2** summarizes the results of the J&E Model. As presented in the table, the groundwater exposure point concentration (EPC)[1] calculated for TCE was less than the site-specific screening levels for residential or commercial/industrial land use.

The groundwater EPC for PCE were less than site-specific screening level for commercial/industrial land use. However, concentrations of PCE were detected above the site-specific screening level for residential land use in one location RW-2. However, exceedances were not observed in cross-gradient location RW-4 and downgradient locations RW-5 and MW-4. PCE concentrations (44 ug/L) in off-site location (University Inn, 1743, 1767, 1775, and 1785 North Decatur Road) were also less than the site-specific screening level.

1.5 Summary

The results of this site-specific evaluation indicate that vapor intrusion from groundwater to indoor air is not expected to be a concern at this time. Constituents

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[1] Consistent with EPA's OSWER Directive 9283.1-42 entitled *Determining Groundwater Exposure Point Concentrations*, the 95 percent (%) upper confidence limit (UCL) of the arithmetic mean was calculated from monitoring wells (RW-1, RW-2, RW-3, RW-4 and RW-5) located within the core/center of the plume.

detected in groundwater were less than risk-based screening levels derived using site-specific assumptions.

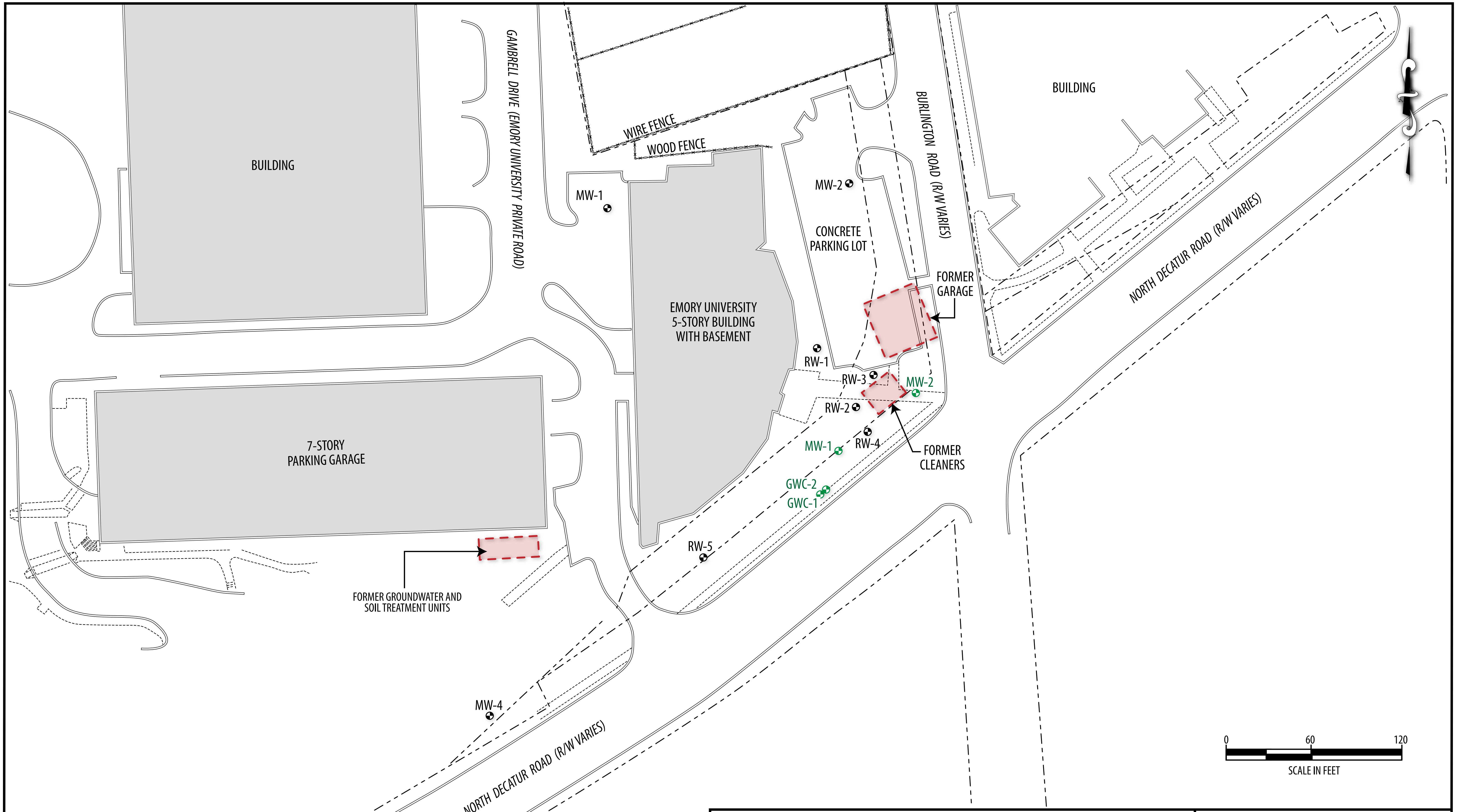
REFERENCES

Interstate Technical and Regulatory Guidance (ITRC), 2007. *Vapor Intrusion Pathway: A Practical Guideline*. January.

EPA, 2012. *EPA's Superfund Vapor Intrusion FAQs*. February. Available on-line at http://www.epa.gov/oswer/vaporintrusion/.

EPA, 2015a. OSWER Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air. External Review Draft. June 2015.

EPA, 2015b. *Vapor Intrusion Screening Level Calculator*. May 2014 edition. Available on-line at http://www.epa.gov/oswer/vaporintrusion/.



LEGEND

- ● - Well Location
- ● - Former (Abandoned) Monitoring Well

CLIENT: **Emory University**	TITLE: **Site Map**
PROJECT: **North Decatur Road Site, Atlanta, Georgia**	
DATE: **December 2015**	SOURCE: **URS**
SCALE: **As Shown**	DRAWN BY: **J. Gross**
FILE: H:\Proj\EmoryUniversity\Nov2015\WellLocationMap.ai	CHKD BY: **B. Jacobs**

AECOM

PROJ. NO.: 60401439

TASK NO.: 01

FIGURE: 1

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-1	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	04/08/15	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/30/16	BRL	BRL	BRL	BRL	BRL	BRL	NA
MW-2	02/05/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	BRL	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	BRL	19	BRL	BRL	BRL	BRL	NA
	01/09/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	BRL	BRL	BRL	BRL	BRL	BRL	NA
	04/08/15	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/30/16	BRL	BRL	BRL	BRL	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
MW-3/RW-5*	02/05/01	65	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	78	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	89.2	BRL	BRL	BRL	BRL	BRL	NA
	02/14/02	90	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	66.6	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	43.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	75	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	53	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	56	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	47	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	40	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	57	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	66	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	50	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	14	BRL	BRL	120	BRL	BRL	NA
	03/01/08	39	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	44	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	40	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	66	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	71	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	73	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	160	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	190	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	200	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	230	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	150	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	180	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	190	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	160	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	200	BRL	BRL	BRL	BRL	BRL	NA
	03/31/16	180	BRL	BRL	BRL	BRL	BRL	NA
MW-4	02/05/01	3.4	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	4.0	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	3.8	BRL	BRL	BRL	BRL	BRL	NA
	05/02/02	4.8	BRL	BRL	BRL	BRL	BRL	NA
	12/09/02	3.0	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	4.1	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	4.0	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	3.7	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	BRL	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	BRL	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	BRL	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	5.0	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	8.7	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12		BRL	BRL	BRL	BRL	BRL	NA
	06/26/12	14	BRL	BRL	BRL	BRL	BRL	NA
	01/09/13	15	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	14	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	20	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	29	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	29	BRL	BRL	BRL	BRL	BRL	NA
	4/8/2015 (DUP-1)	33 38	BRL	BRL	BRL	BRL	BRL	NA
	03/31/16	29	BRL	BRL	BRL	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-1	Jun-98	8.4	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	BRL	NA	NA	NA	NA	NA	NA
	07/09/99	12.4	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	20	NA	NA	NA	NA	NA	NA
	07/07/00	56.4	NA	NA	NA	NA	NA	NA
	02/05/01	59.0	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	85.4	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	107	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	144	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	170	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	200	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	200	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	190	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	190	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	140	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	160	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	110	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	160	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	90	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	130	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	99	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	120	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	170	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	200	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	180	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	130	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	120	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	110	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	57	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	160	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	130	BRL	BRL	BRL	BRL	BRL	NA
	3/31/2016 (DUP-1)	140 130	BRL BRL	BRL BRL	5.5 6	BRL BRL	BRL BRL	NA NA
RW-2	Jun-98	127	NA	NA	NA	NA	NA	NA
	Jun-98	150	NA	NA	NA	NA	NA	NA
	01/08/99	270	NA	NA	NA	NA	NA	NA
	07/09/99	55	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	197	NA	NA	NA	NA	NA	NA
	07/07/00	382	NA	NA	NA	NA	NA	NA
	02/05/01	549	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	119	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	710	2.2	NS	NS	NS	NS	NS
	01/29/03	138	2.1	BRL	1.5	BRL	BRL	NA
	06/19/03	630	1.0	BRL	2.0	BRL	BRL	NA
	01/15/04	890	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	650	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	490	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	860	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	970	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	1,000	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	440	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	780	5.7	BRL	8.1	BRL	BRL	NA
	03/01/08	300	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	460	120	BRL	190	BRL	BRL	BRL
	03/11/09	NS	NS	NS	NS	NS	NS	NS
	06/30/09	NS	NS	NS	NS	NS	NS	NS

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-2 (continued)	01/22/10	NS	NS	NS	NS	NS	NS	NS
	07/08/10	1,200	13	BRL	27	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	790	9.5	BRL	25	BRL	BRL	NA
	06/27/12	570	BRL	BRL	11	BRL	BRL	NA
	01/10/13	37	BRL	BRL	90	BRL	BRL	NA
	06/27/13	490	BRL	BRL	12	BRL	BRL	NA
	01/21/14	700	7.4	BRL	20	BRL	BRL	NA
	08/04/14	670	6.9	BRL	18	BRL	BRL	NA
	10/15/14	550	7.5	BRL	24	BRL	BRL	NA
	04/09/15	830	10	BRL	34	BRL	BRL	NA
	03/31/16	920	12	BRL	42	BRL	BRL	NA
RW-3	Jun-98	6.9	NA	NA	NA	NA	NA	NA
	Jun-98	NS	NS	NS	NS	NS	NS	NS
	01/08/99	6.8	NA	NA	NA	NA	NA	NA
	07/09/99	8.8	NA	NA	NA	NA	NA	NA
	07/27/99	NS	NS	NS	NS	NS	NS	NS
	01/06/00	8.0	NA	NA	NA	NA	NA	NA
	07/07/00	35.9	NA	NA	NA	NA	NA	NA
	02/05/01	39	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	27.1	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	27.7	BRL	BRL	BRL	BRL	BRL	NA
	07/10/02	31.5	BRL	BRL	BRL	BRL	BRL	NA
	01/29/03	55.4	BRL	BRL	BRL	BRL	BRL	NA
	06/19/03	58	BRL	BRL	BRL	BRL	BRL	NA
	01/15/04	57	BRL	BRL	BRL	BRL	BRL	NA
	06/18/04	71	BRL	BRL	BRL	BRL	BRL	NA
	01/28/05	38	BRL	BRL	BRL	BRL	BRL	NA
	07/01/05	91	BRL	BRL	BRL	BRL	BRL	NA
	02/01/06	53	BRL	BRL	BRL	BRL	BRL	NA
	06/20/06	70	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	33	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	71	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	38	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	67	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	55	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	71	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	84	BRL	BRL	BRL	BRL	BRL	BRL
	07/08/10	130	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	NS	NS	NS	NS	NS	NS	NS
	01/04/12	NS	NS	NS	NS	NS	NS	NS
	06/27/12	50	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	54	BRL	BRL	BRL	BRL	BRL	NA
	06/27/13	85	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	37	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	62	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	110	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	42	37	BRL	130	BRL	BRL	NA
	03/31/16	36	8.9	BRL	20	BRL	BRL	NA

Table 1
Summary of Groundwater Analytical Results
Emory University North Decatur Road Site
HSI Site No. 10121
Atlanta, Georgia

Well Number	Sample Dat	PCE (µg/L)	TCE (µg/L)	1,1-DCE (µg/L)	CIS-1,2-DCE (µg/L)	TRANS-1,2-DCE (µg/L)	VINYL CHLORIDE (µg/L)	1,4-DIOXANE (µg/L)
RW-4**	Jun-98	19	NA	NA	NA	NA	NA	NA
	Jun-98	25	NA	NA	NA	NA	NA	NA
	01/08/99	57	NA	NA	NA	NA	NA	NA
	07/09/99	225	NA	NA	NA	NA	NA	NA
	07/27/99	187	NA	NA	NA	NA	NA	NA
	01/06/00	128	NA	NA	NA	NA	NA	NA
	07/07/00	189	NA	NA	NA	NA	NA	NA
	02/05/01	174	BRL	BRL	BRL	BRL	BRL	NA
	07/18/01	NS	NS	NS	NS	NS	NS	NS
	08/06/01	253	BRL	BRL	BRL	BRL	BRL	NA
	11/06/01	NS	NS	NS	NS	NS	NS	NS
	02/14/02	NS	NS	NS	NS	NS	NS	NS
	07/10/02	NS	NS	NS	NS	NS	NS	NS
	01/29/03	NS	NS	NS	NS	NS	NS	NS
	06/19/03	NS	NS	NS	NS	NS	NS	NS
	01/15/04	NS	NS	NS	NS	NS	NS	NS
	06/18/04	NS	NS	NS	NS	NS	NS	NS
	01/28/05	NS	NS	NS	NS	NS	NS	NS
	07/01/05	NS	NS	NS	NS	NS	NS	NS
	02/01/06	NS	NS	NS	NS	NS	NS	NS
	06/20/06	980	BRL	BRL	BRL	BRL	BRL	NA
	02/28/07	540	BRL	BRL	BRL	BRL	BRL	NA
	06/19/07	640	BRL	BRL	BRL	BRL	BRL	NA
	03/01/08	370	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/08	380	BRL	BRL	BRL	BRL	BRL	BRL
	03/11/09	640	BRL	BRL	BRL	BRL	BRL	BRL
	06/30/09	220	BRL	BRL	BRL	BRL	BRL	BRL
	01/22/10	360	BRL	BRL	BRL	BRL	BRL	BRL
	07/09/10	420	BRL	BRL	BRL	BRL	BRL	BRL
	06/27/11	270	BRL	BRL	BRL	BRL	BRL	NA
	01/04/12	150	BRL	BRL	BRL	BRL	BRL	NA
	06/27/12	160	BRL	BRL	BRL	BRL	BRL	NA
	01/10/13	93	BRL	BRL	BRL	BRL	BRL	NA
	06/26/13	68	BRL	BRL	BRL	BRL	BRL	NA
	01/21/14	160	BRL	BRL	BRL	BRL	BRL	NA
	08/04/14	180	BRL	BRL	BRL	BRL	BRL	NA
	10/15/14	250	BRL	BRL	BRL	BRL	BRL	NA
	04/09/15	330	BRL	BRL	BRL	BRL	BRL	NA
	03/31/16	200	BRL	BRL	BRL	BRL	BRL	NA

Notes:

µg/L – micrograms per liter or part
BRL – Not detected above laboratory method reporting limits
NA – Not analyzed
NS – Not sampled
Monitoring wells MW-1, -2, -3, and -4 were installed between December 2000 and January 2001
* – MW-3 was converted to recovery well RW-5 and became operational on August 6, 2001
** – RW-4 was converted to a monitoring well on June 14, 2006

Table 2
Comparison of Constituents Detected in Groundwater to Vapor Intrusion Screening Levels
Empory University
HSI 10121
Atlanta, Georgia

	A	B	C	D	E	F	G	H	I	J
1	**Analyte[1]**	**Units**	**Minimum Detect**	**Maximum Detect**	**Location of Max Detect**	**EPA VISL GW-to-Indoor Air - Com/Ind[2]**	**J&E Modeled GW SL Com/Ind[3]**	**EPA VISL GW-to-Indoor Air - Res[2]**	**J&E Modeled GW SL - Res[3]**	
2	1,1-Dichloroethene	ug/L	<5.0	<5.0	-	820	-	200	-	
3	cis-1,2-Dichloroethene	ug/L	12	90	RW-2	NV	-	NV	-	
4	trans-1,2-Dichloroethene	ug/L	<5.0	<5.0	-	NV	-	NV	-	
5	Tetrachloroethene	ug/L	14	700	RW-2	65	1275	15	292	
6	Trichloroethene	ug/L	<5.0	7.4	RW-2	7.4	131	1.2	22	
7	Vinyl Chloride	ug/L	<2.0	<2.0	-	2.5	-	0.15	-	
8										
9	Notes:									
10	1 - Analytes reported during most recent 2013 and 2014 sampling events									
11	2 - EPA Vapor Intrusion Screening Level (VISL) for Groundwater (May 2014 version)									
12	3 - Johnson and Ettinger Site-Specific Groundwater Screening Level (SL)									
13	*Model Assumptions:*									
14	GW Screen version 3.1									
15	Slab-on-grade									
16	Site-specific soil type: sandy silt (sandy loam used in the model per instructions)									
17	Site-specific depth to water: 38 feet (most shallow depth in RW locations)									
18	Region-specific groundwater temperature: 18 deg C (65 deg F)									
19	Toxicity factors updated consistent with those consistent with EPA's VISL Calculator									
20	Model output multiplied by a factor of 3 to account for an 8-hour exposure for a worker									
21	For TCE , the resident model results are applied by a factor of 0.72 to account for mutagenic mechanisms.									

APPENDIX H

2001 Soil Sampling Report and 2001 Installation of Four Monitoring Wells, Sampling, and Analysis

<<REPORT>>
SOIL SAMPLING AND ANALYSIS
1784 NORTH DECATUR ROAD BUILDING
EMORY UNIVERSITY
ATLANTA, GEORGIA

AUGUST 22, 2000

Prepared for:
Emory University
Job No. 39103-038

Prepared by:
URS Corporation/Dames & Moore
235 Peachtree Street, N.E.
North Tower, Suite 2000
Atlanta, Georgia 30303-1405

Soil Sampling and Analysis Report
1784 North Decatur Road
Emory University
Atlanta, Georgia

August 22, 2000

1.0 INTRODUCTION

URS Corporation/Dames & Moore (URS/D&M) collected soil samples at Emory University's building at 1784 North Decatur Road on August 3, 2000. Mr. Charles G. Way, P.G. performed the fieldwork. The soil samples were located at three (3) locations (GP-01, GP-02, and GP-03) as depicted on Figure 1. At each location, two soil samples were collected: one at a depth of two (2) feet below ground surface (bgs) and the other at four (4) feet bgs, for a total of six soil samples.

2.0 SAMPLING PROCEDURES

URS/D&M hand augered each borings at the North Decatur Building property. The auger was cleaned with a liquinox solution and rinsed with distilled water before each boring was augered. The soil samples from the two depths were collected from each boring using an encore sampler to minimize the release of volatile organic compounds (VOCs) from the soil. Three encore soil sample containers and a soil sample jar (for calculation of dry weight concentrations of sample analyses) were collected for each of the six soil samples. The soil samples were labeled with the identification of the sample location and depth and placed in plastic bags. The bagged samples were placed on ice in a cooler to prevent loss of VOCs. A chain of custody form was completed and signed by URS/D&M and placed in the cooler. The cooler of soil samples was shipped by overnight delivery to the laboratory for analysis

3.0 LABORATORY ANALYSIS OF SOIL SAMPLES

TestAmerica Incorporated performed the analyses (Laboratory Certification Number 387). The six soil samples were analyzed for tetrachloroethene and daughter products (trichloroethene, dichloroethenes, and vinyl chloride). The laboratory used EPA Method 8260B for the analyses of these VOCs. The analyses of the encore soil samples were performed within three days of the sample collection date. The laboratory report for the six soil samples is included in this report as Appendix A. Table 1 summarizes the analytical results.

4.0 CONCLUSIONS REGARDING SOIL SAMPLE RESULTS

As shown on Table 1, the VOC analyses of the six soil samples indicate that tetrachloroethene is present at very low levels in all six soil samples. The daughter products from degeneration of tetrachloroethene were not present at concentrations above the laboratory reporting limit (0.002 milligrams per kilogram or mg/kg) in any of the soil samples. The concentration of tetrachloroethene in the six soil samples ranged from 0.0101 mg/kg (sample GP-03 4') to 0.0238 mg/kg (sample GP-02 4').

Pursuant to the Hazardous Site Response Act (HSRA) regulations, the concentration of tetrachloroethene in soil that requires notification of the Georgia Environmental Protection Division (EPD) is 0.18 mg/kg [see GA Rule 391-3-19-.04(3)]. All of the six soil samples collected at the 1784 North Decatur Road Building on August 3, 2000 were below this notification threshold.

For sites on the HSRA Hazardous Site Inventory, such as the North Decatur Road Building, the HSRA regulations require remediation of contamination to Risk Reduction Standards [GA Rule 391-3-19-.07]. The Georgia EPD provides guidance regarding target soil concentrations for compliance with Risk Reduction Standards for residential and non-residential situations. Pursuant to the chart in Figure 1 of the Georgia EPD guidance for Type 1 Risk Reduction Standards (residential standard), the target concentration for remediation of tetrachloroethene is 0.5 mg/kg. The concentrations of tetrachloroethene in the six soil samples were all an order of magnitude below this Type 1 Risk Reduction Standard. Therefore, the soil sample results indicate that soil remediation is not necessary in the areas sampled.

-oOo-

The attached table, figure and appendix complete this report.

Respectfully submitted,

DAMES & MOORE, a subsidiary of URS Corporation

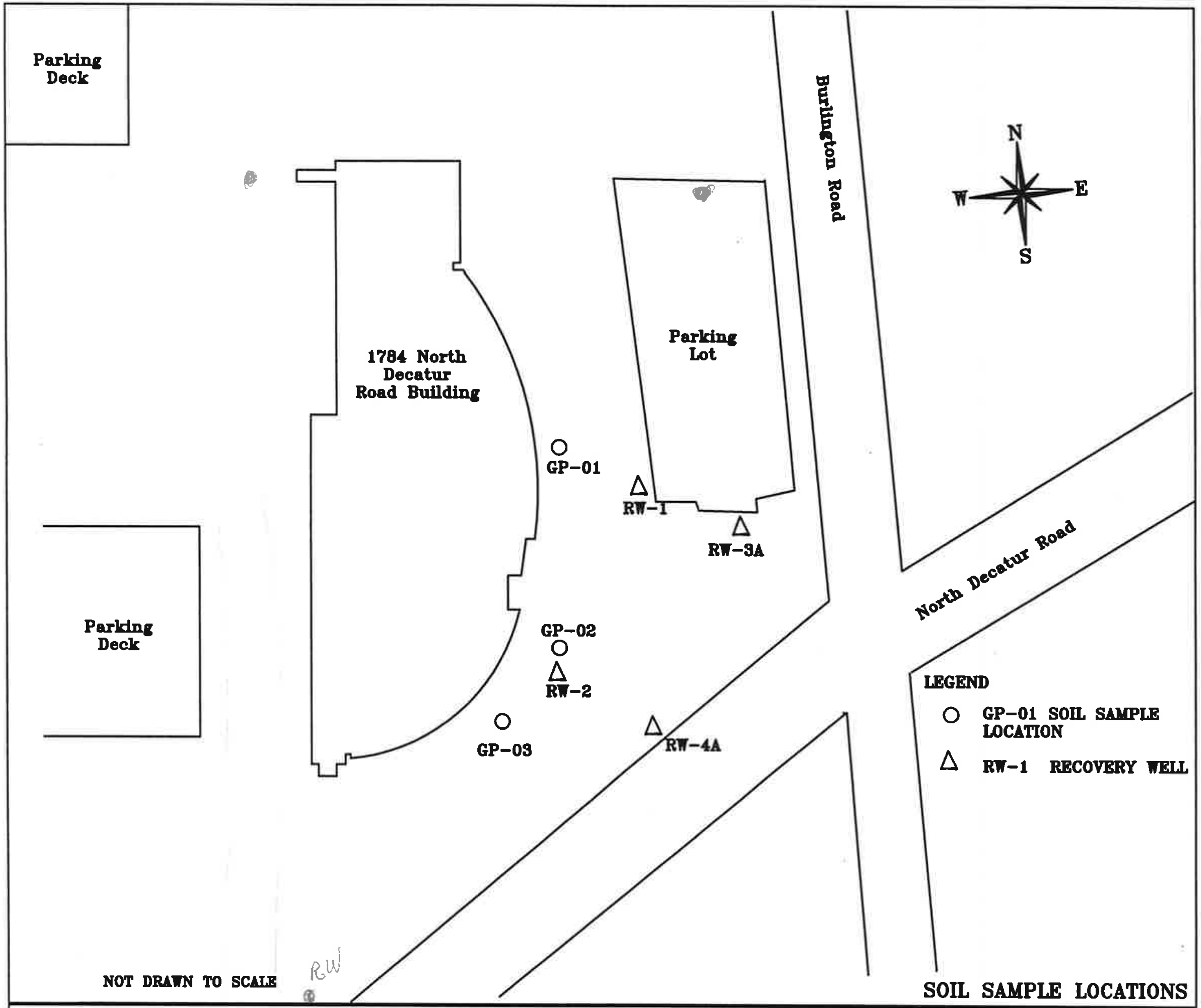
Jane P. MacGregor

Jane P. MacGregor
Project Manager

TABLE 1
SOIL SAMPLES ANALYSES
SIX VOLATILE ORGANIC COMPOUNDS (mg/kg)
1784 NORTH DECATUR ROAD BUILDING

VOCs	GP-01 2'	GP-01 4'	GP-02 2'	GP-02 4'	GP-03 2'	GP-03 4'
Tetrachloroethene	0.0201	0.0194	0.0214	0.0238	0.0123	0.0101
Trichloroethene	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND

mg/kg = milligrams per kilogram
ND = Not Detected above laboratory reporting limit



SOIL SAMPLE LOCATIONS

1784 North Decatur Road Building
Emory University
ATLANTA, DEKALB COUNTY, GEORGIA

JOB NUMBER: 39103-038-8003 | **DATE: AUGUST, 2000**

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

MW

APPENDIX A

ANALYTICAL REPORT

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103
Project Name: URS
Sampler: C WAY

Lab Number: 00-A108739
Sample ID: GP-01 2
Sample Type: Soil
Site ID:

Date Collected: 8/ 2/00
Time Collected: 9:30
Date Received: 8/ 3/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0021	0.0018	1	8/ 5/00	10:02	R.Ward	8260B	193
cis-1,2-Dichloroethene	ND	mg/kg	0.0021	0.0018	1	8/ 5/00	10:02	R.Ward	8260B	193
trans-1,2-Dichloroethene	ND	mg/kg	0.0021	0.0018	1	8/ 5/00	10:02	R.Ward	8260B	193
Tetrachloroethene	0.0201	mg/kg	0.0021	0.0018	1	8/ 5/00	10:02	R.Ward	8260B	193
Trichloroethene	ND	mg/kg	0.0021	0.0018	1	8/ 5/00	10:02	R.Ward	8260B	193
Vinyl chloride	ND	mg/kg	0.0021	0.0018	1	8/ 5/00	10:02	R.Ward	8260B	193
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	87.	%			1	8/ 4/00	9:45	J. Rudden	CLP	9582

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
Volatile Organics	5.5 g	5.0 ml	8/ 4/00	C.Bates	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	107.	50. - 140.
surr-Toluene d8	124.	73. - 139.
surr-4-Bromofluorobenzene	106.	62. - 131.
surr-Dibromofluoromethane	123.	64. - 145.

Sample report continued . . .

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

Laboratory Number: 00-A108739
Sample ID: GP-01 2

All metal and organic results have been corrected for dry weight.

These results relate only to the items tested.
This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By: ______________ Report Date: 8/10/00

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
Michael H. Dunn, M.S., Technical Director	Glenn L. Norton, Technical Serv.
Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

RS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103
roject Name: URS
ampler: C WAY

Lab Number: 00-A108740
Sample ID: GP-01 4
Sample Type: Soil
Site ID:

Date Collected: 8/ 2/00
Time Collected: 9:45
Date Received: 8/ 3/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0025	0.0016	1	8/ 5/00	10:39	R.Ward	8260B	193
cis-1,2-Dichloroethene	ND	mg/kg	0.0025	0.0016	1	8/ 5/00	10:39	R.Ward	8260B	193
trans-1,2-Dichloroethene	ND	mg/kg	0.0025	0.0016	1	8/ 5/00	10:39	R.Ward	8260B	193
Tetrachloroethene	0.0194	mg/kg	0.0025	0.0016	1	8/ 5/00	10:39	R.Ward	8260B	193
Trichloroethene	ND	mg/kg	0.0025	0.0016	1	8/ 5/00	10:39	R.Ward	8260B	193
Vinyl chloride	ND	mg/kg	0.0025	0.0016	1	8/ 5/00	10:39	R.Ward	8260B	193
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	65.	%			1	8/ 4/00	9:45	J. Rudden	CLP	9582

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
Volatile Organics	6.1 g	5.0 ml	8/ 4/00	C.Bates	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	109.	50. - 140.
surr-Toluene d8	122.	73. - 139.
surr-4-Bromofluorobenzene	107.	62. - 131.
surr-Dibromofluoromethane	117.	64. - 145.

Sample report continued . . .

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

Laboratory Number: 00-A108740
Sample ID: GP-01 4

All metal and organic results have been corrected for dry weight.

These results relate only to the items tested.
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permission of the laboratory.

Report Approved By: ____________ Report Date: 8/10/00

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
Michael H. Dunn, M.S., Technical Director	Glenn L. Norton, Technical Serv.
Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

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Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103
Project Name: URS
Sampler: C WAY

Lab Number: 00-A108741
Sample ID: GP-02 2
Sample Type: Soil
Site ID:

Date Collected: 8/ 2/00
Time Collected: 10:10
Date Received: 8/ 3/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0024	0.0020	1	8/ 5/00	11:16	R.Ward	8260B	193
cis-1,2-Dichloroethene	ND	mg/kg	0.0024	0.0020	1	8/ 5/00	11:16	R.Ward	8260B	193
trans-1,2-Dichloroethene	ND	mg/kg	0.0024	0.0020	1	8/ 5/00	11:16	R.Ward	8260B	193
Tetrachloroethene	0.0214	mg/kg	0.0024	0.0020	1	8/ 5/00	11:16	R.Ward	8260B	193
Trichloroethene	ND	mg/kg	0.0024	0.0020	1	8/ 5/00	11:16	R.Ward	8260B	193
Vinyl chloride	ND	mg/kg	0.0024	0.0020	1	8/ 5/00	11:16	R.Ward	8260B	193
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	85.	%			1	8/ 4/00	9:45	J. Rudden	CLP	9582

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
Volatile Organics	5.0 g	5.0 ml	8/ 4/00	C.Bates	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	103.	58. - 140.
surr-Toluene d8	120.	73. - 139.
surr-4-Bromofluorobenzene	101.	62. - 131.
surr-Dibromofluoromethane	122.	64. - 145.

Sample report continued . . .

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Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

Laboratory Number: 00-A108741
Sample ID: GP-02 2

Page 2

All metal and organic results have been corrected for dry weight.

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Report Approved By: ________________ Report Date: 8/10/00

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
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Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

IRS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103
roject Name: URS
ampler: C WAY

Lab Number: 00-A108742
Sample ID: GP-02 4
Sample Type: Soil
Site ID:

Date Collected: 8/ 2/00
Time Collected: 10:30
Date Received: 8/ 3/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0021	0.0017	1	8/ 5/00	11:53	R.Ward	8260B	193
cis-1,2-Dichloroethene	ND	mg/kg	0.0021	0.0017	1	8/ 5/00	11:53	R.Ward	8260B	193
trans-1,2-Dichloroethene	ND	mg/kg	0.0021	0.0017	1	8/ 5/00	11:53	R.Ward	8260B	193
Tetrachloroethene	0.0238	mg/kg	0.0021	0.0017	1	8/ 5/00	11:53	R.Ward	8260B	193
Trichloroethene	ND	mg/kg	0.0021	0.0017	1	8/ 5/00	11:53	R.Ward	8260B	193
Vinyl chloride	ND	mg/kg	0.0021	0.0017	1	8/ 5/00	11:53	R.Ward	8260B	193
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	81.	%			1	8/ 4/00	9:45	J. Rudden	CLP	9582

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
Volatile Organics	6.0 g	5.0 ml	8/ 4/00	C.Bates	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	113.	50. - 140.
surr-Toluene d8	126.	73. - 137.
surr-4-Bromofluorobenzene	113.	62. - 131.
surr-Dibromofluoromethane	126.	64. - 145.

Sample report continued . . .

TestAmerica
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2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

Laboratory Number: 00-A108742
Sample ID: GP-02 4

All metal and organic results have been corrected for dry weight.

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Report Approved By: ______________ Report Date: 8/10/00

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Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103
roject Name: URS
ampler: C WAY

Lab Number: 00-A108743
Sample ID: GP-03 2
Sample Type: Soil
Site ID:

Date Collected: 8/ 2/00
Time Collected: 11:00
Date Received: 8/ 3/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0020	0.0016	1	8/ 5/00	12:30	R.Ward	8260B	193
cis-1,2-Dichloroethene	ND	mg/kg	0.0020	0.0016	1	8/ 5/00	12:30	R.Ward	8260B	193
trans-1,2-Dichloroethene	ND	mg/kg	0.0020	0.0016	1	8/ 5/00	12:30	R.Ward	8260B	193
Tetrachloroethene	0.0123	mg/kg	0.0020	0.0016	1	8/ 5/00	12:30	R.Ward	8260B	193
Trichloroethene	ND	mg/kg	0.0020	0.0016	1	8/ 5/00	12:30	R.Ward	8260B	193
Vinyl chloride	ND	mg/kg	0.0020	0.0016	1	8/ 5/00	12:30	R.Ward	8260B	193
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	82.	%			1	8/ 4/00	9:45	J. Rudden	CLP	9582

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
Volatile Organics	6.1 g	5.0 ml	8/ 4/00	C.Bates	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	111.	50. - 140.
surr-Toluene d8	126.	73. - 139.
surr-4-Bromofluorobenzene	104.	62. - 131.
surr-Dibromofluoromethane	120.	64. - 145.

Sample report continued . . .

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2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

Laboratory Number: 00-A108743
Sample ID: GP-03 2

All metal and organic results have been corrected for dry weight.

These results relate only to the items tested.
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Report Approved By: ________________ Report Date: 8/10/00

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
Michael H. Dunn, M.S., Technical Director	Glenn L. Norton, Technical Serv.
Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

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Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103
roject Name: URS
ampler: C WAY

Lab Number: 00-A108744
Sample ID: GP-03 4
Sample Type: Soil
Site ID:

Date Collected: 8/ 2/00
Time Collected: 11:20
Date Received: 8/ 3/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0022	0.0018	1	8/ 5/00	13:07	R.Ward	8260B	193
cis-1,2-Dichloroethene	ND	mg/kg	0.0022	0.0018	1	8/ 5/00	13:07	R.Ward	8260B	193
trans-1,2-Dichloroethene	ND	mg/kg	0.0022	0.0018	1	8/ 5/00	13:07	R.Ward	8260B	193
Tetrachloroethene	0.0101	mg/kg	0.0022	0.0018	1	8/ 5/00	13:07	R.Ward	8260B	193
Trichloroethene	ND	mg/kg	0.0022	0.0018	1	8/ 5/00	13:07	R.Ward	8260B	193
Vinyl chloride	ND	mg/kg	0.0022	0.0018	1	8/ 5/00	13:07	R.Ward	8260B	193
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	82.	%			1	8/ 4/00	9:45	J. Rudden	CLP	9582

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Analyst	Method
Volatile Organics	5.6 g	5.0 ml	8/ 4/00	C.Bates	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	113.	50. - 140.
surr-Toluene d8	125.	73. - 137.
surr-4-Bromofluorobenzene	107.	62. - 131.
surr-Dibromofluoromethane	123.	64. - 145.

Sample report continued . . .

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

ANALYTICAL REPORT

Laboratory Number: 00-A108744
Sample ID: GP-03 4

Page 2

All metal and organic results have been corrected for dry weight.

These results relate only to the items tested.
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Report Approved By: ____________ Report Date: 8/10/00

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
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Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

2960 Foster Creighton Dr
Nashville, TN 37204
615-726-0177
Fax: 615-726-0954

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
1,1-Dichloroethene	mg/kg	< 0.0020	0.0557	0.0500	111	64. - 119.	193	blank
Trichloroethene	mg/kg	< 0.0020	0.0578	0.0500	116#	59. - 114.	193	blank

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
1,1-Dichloroethene	mg/kg	0.0557	0.0532	4.59	33.	193
Trichloroethene	mg/kg	0.0578	0.0538	7.17	32.	193

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
1,1-Dichloroethene	mg/kg	0.0500	0.0565	113	79 - 122	193
cis-1,2-Dichloroethene	mg/kg	0.0500	0.0583	117	81 - 121	193
trans-1,2-Dichloroethene	mg/kg	0.0500	0.0553	111	77 - 129	193
Tetrachloroethene	mg/l	0.0500	0.0483	97	74 - 127	4363
Tetrachloroethene	mg/kg	0.0500	0.0498	100	82 - 116	193
Trichloroethene	mg/kg	0.0500	0.0547	109	78 - 116	193
Vinyl chloride	mg/kg	0.0500	0.0495	99	63 - 131	193

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
1,1-Dichloroethene	< 0.0020	mg/kg	193
cis-1,2-Dichloroethene	< 0.0020	mg/kg	193
trans-1,2-Dichloroethene	< 0.0020	mg/kg	193
Tetrachloroethene	< 0.0050	mg/l	4363
Tetrachloroethene	< 0.0020	mg/kg	193
Trichloroethene	< 0.0020	mg/kg	193
Vinyl chloride	< 0.0020	mg/kg	193

En of Report for Project 202512

Chain of Custody Record

TESTAMERICA INC.

Page____ of ____

☐ Asheville, NC (A) (828) 254-5169
☐ Atlanta, GA (B) (770) 368-0636
☐ Bartlett, IL (C) (630) 289-3100
☐ Brighton, CO (D) (303) 659-0497
☐ Cedar Falls, IA (E) (319) 277-2401
☐ Charleston, SC (F) (843) 849-6550
☐ Charlotte, NC (G) (704) 392-1164
☐ Columbia, SC (H) (803) 796-8989
☐ Dayton, OH (I) (937) 294-6856
☐ Davenport, IA (J) (319) 323-7944
☐ Lumberton, NC (K) (910) 738-6190
☐ Indianapolis, IN (L) (317) 842-4261
☐ Nashville, TN (M) (615) 726-0177
☐ Macon, GA (N) (912) 757-0811
☐ Pontiac, MI (O) (248) 332-1940
☐ Orlando, FL (P) (407) 851-2560
☐ Rockford, Il (Q) (815) 874-2171
☐ Watertown, WI (R) (920) 261-1660

Client: URS
Report Address: 235 Peachtree St N.E. N. Tower, Ste 2000 Atlanta, Ga. 30303
Attn: Jane MacGregor
Phone No.: 404-478-8644
Fax No.: 404-577-5120

Project No.: 39103 --
Invoice Address: Same
Attn: Same
Sampled By: C. Way
P.O. No:
Quote No.
State Samples Collected Ga

TURNAROUND TIME
☒ Standard
☐ Rush (surcharges may apply)
Date Needed:

REQUESTED PARAMETERS

202512
[illegible]

Is this work being conducted for regulatory compliance monitoring? Yes___ No___
Is this work being conducted for regulatory enforcement action? Yes___ No___
Which regulations apply: RCRA___ NPDESWastewater___ UST___ Drinking Water___ Other___ None___

Sample ID	Date	Time	Comp (C) Grab (G)	Matrix	Lab Use	Perc 624	PCE	TCE	DCE's	Vinyl chloride					# and type of containers HCl	NaOH	HNO_3	H_2SO_4	Other	None	REMARKS
GP-01 2'	8/2/00	9:30	G	Soil	108739		✓	✓	✓	✓											Jar for Density included
GP-01 4'	"	9:45	G	Soil	40		✓	✓	✓	✓											
GP-02 2'	"	10:10	G	Soil	41		✓	✓	✓	✓											
GP-02 4'	"	10:30	G	Soil	42		✓	✓	✓	✓											
GP-03 2'	"	11:00	G	Soil	43		✓	✓	✓	✓											
GP-03 4'	"	11:20	G	Soil	44		✓	✓	✓	✓											
Influent	"	1:00	G	H2O	106738✓																

QC Deliverables: ☐ None ☐ Level 2 - Batch QC ☐ Level 3 ☐ Level 4 ☐ Other

Init Lab Temp
Rec Lab Temp

COMMENTS: Acct 2676

FAX COC TO NORCROSS

Relinquished By: Charles Way	8/2	4:00	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date 8-3-00	Time 900
Relinquished By:	Date	Time	Received By:	Date	Time

LAB USE ONLY:
Custody Seal: ☐ Yes ☐ No ☐ N/A
Bottles Supplied by TA: ☐ Yes ☐ No

REPORT
SOIL SAMPLING REPORT
1784 North Decatur Road Building
Emory University
Atlanta, Georgia

Submitted To:
Emory University

Job No. 39103-044
January 19, 2001

URS CORPORATION
235 Peachtree Street, Suite 2000
Atlanta, Georgia 30303

SOIL SAMPLING REPORT
EMORY UNIVERSITY
1784 NORTH DECATUR ROAD BUILDING

JANUARY 19, 2001

1.0 Background

Prior to Emory University's purchase of the property at 1784 North Decatur Road, a dry cleaner was located on the property. Emory University identified a release of tetrachloroethene (perchloroethene or perc) on the property. Previous studies located the highest concentration of perc near the recovery well RW-2, the location of which is shown on the attached Figure 1 - Soil Boring Locations.

Dames & Moore, a subsidiary of URS Corporation (URS/Dames & Moore) conducted soil sampling during installation of four additional monitoring wells at the 1784 North Decatur Road Building of Emory University. Three of these wells were located to establish the horizontal extent of the groundwater plume. The fourth well was installed as a recovery well. The soil samples were taken during drilling of the four wells to define the horizontal extent of soil contamination for the site. The following paragraphs provide the details regarding the soil sample locations, procedures, analyses, and results.

2.0 Soil Sample Locations

Figure 1 provides the layout of the property and the locations of the four well borings. As shown on Figure 1, the borings were located as follows:

- MW-1 is located near the loading dock at the northwest corner of the 1784 North Decatur Road Building.
- MW-2 is located in the parking lot northeast of the building near Burlington Road.
- MW-3, the recovery well, is located between North Decatur Road and the south side of the 1784 North Decatur Road Building.

- MW-4 is located near the North Decatur Road right-of-way, approximately 450 feet southwest of the Burlington Road intersection.

At each of these locations, soil samples were collected at the following depths:

- 0 - 2 feet below ground surface (bgs)
- 5 feet bgs
- 10 feet bgs
- 15 feet bgs

3.0 Soil Sampling Procedures

The four borings were installed on the following dates:

December 18, 2000	MW-3
December 20, 2000	MW-4, then MW-1
January 2, 2001	MW-2

URS/Dames & Moore used a split spoon sampler at the four sampling depths to obtain a core of soil. All down-hole equipment was steam cleaned between each boring, and the split spoon sampler was cleaned using liquinox and water prior to collection of each soil core.

URS/Dames & Moore followed the procedures of Environmental Protection Agency (EPA) Method 5035, as described in the EPA Laboratory Manual SW-846 to obtain a sample for analysis from the soil core at each depth. The sampler donned a new pair of latex gloves prior to collection of the samples from the soil core at each depth interval. The samples were collected as soon as the split spoon was opened at each depth interval. Three samples were collected from the soil core from each depth interval in order for the laboratory to have sufficient quantity for the analysis.

The analytical laboratory for the project, TestAmerica, Inc. provided the sampling device and laboratory vials (with preservative added) for collection of the soil samples. A special syringe designed to collect a 5-gram sample was inserted into the soil core from each depth interval to obtain the three samples. Using the plunger for the syringe, the 5-gram sample was immediately inserted into a laboratory vial containing the preservative solution (sodium bisulfate).

The preserved soil samples were wrapped in bubblewrap and placed into a cooler containing sufficient ice to store the samples at a temperature of four degrees Celsius during transport to the laboratory. The samples were shipped to the laboratory on the days that they were collected from each boring. The samples were sent via Federal Express overnight delivery to the TestAmerica, Inc. laboratory in Nashville, TN for analysis. A chain of custody form for the samples was included in the cooler with each sample shipment. A copy of each chain of custody forms is attached in Appendix A.

4.0 Laboratory Analysis

TestAmerica, Inc. analyzed the soil samples using EPA Method 8260B for tetrachloroethene and its daughter products (trichloroethene, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride). The soil samples from the depth intervals of 0 -2 feet, 5 feet, and 10 feet of each boring were analyzed first. If tetrachloroethene or daughter products were detected in the samples from these intervals, the 15-foot sample was analyzed.

The TestAmerica reports are attached as Appendix A and are presented in chronological order with the chain of custody for the sample attached. As shown on the laboratory report, all of the soil samples had concentrations below the laboratory detection limit (0.0019 milligrams per kilogram) except one. The one sample that had a concentration of one of the analytes above the detection limit was the sample from the 5-foot depth interval of MW-3, and its concentration was reported as 0.0022.

5.0 Conclusion

The soil samples from the borings located at MW-1, MW-2, and MW-4 did not have any detectable concentration of tetrachloroethene or daughter products. Therefore, these sample locations represent the horizontal extent of soil contamination at the 1784 North Decatur Road Building of Emory University due to the known release of tetrachloroethene.

-oOo-

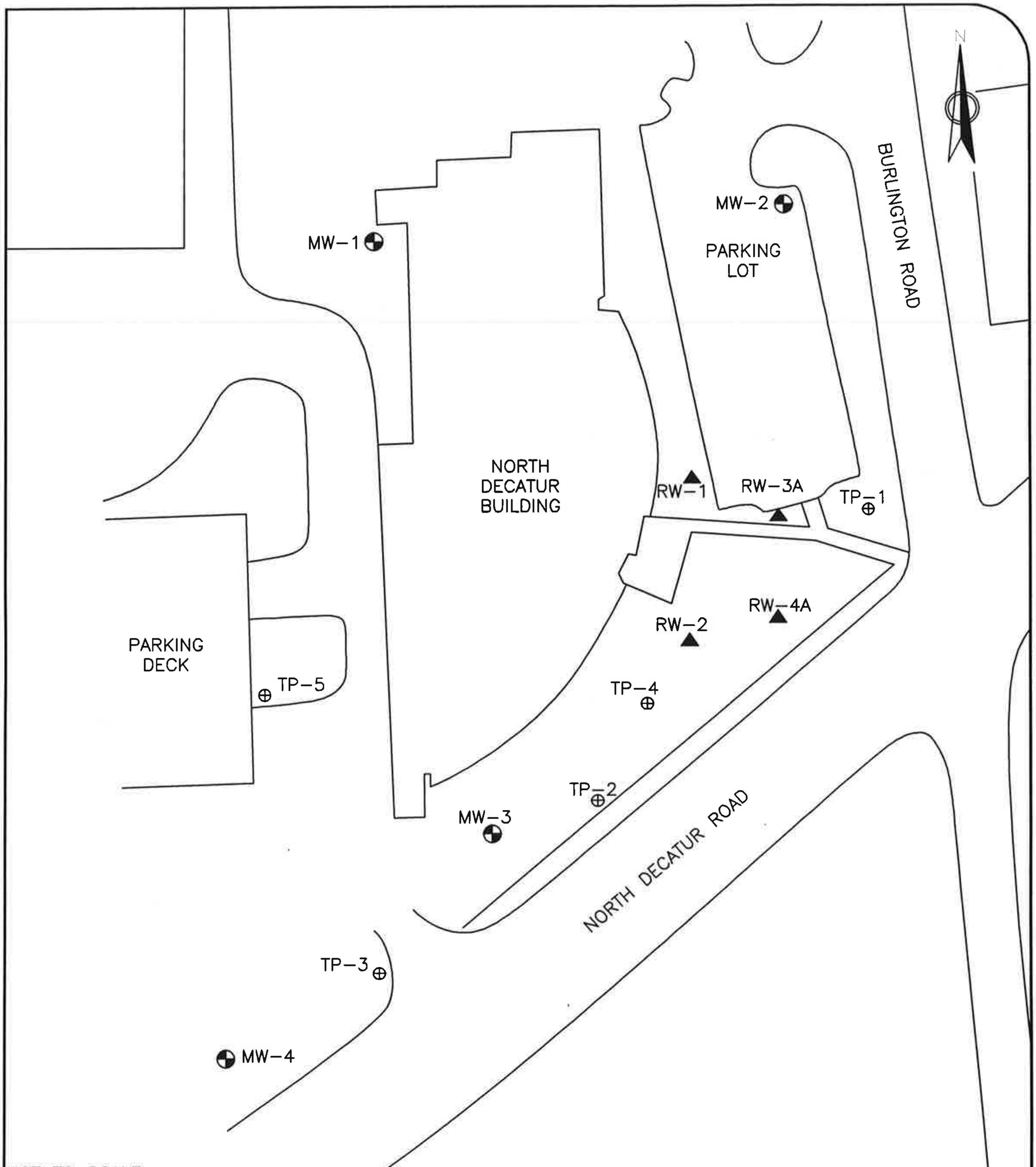
The attached figure and laboratory reports complete this report.

Respectfully submitted,

Dames & Moore, a subsidiary of URS Corporation

Jane P MacGregor

Jane P. MacGregor
Project Manager



NOT TO SCALE

SOIL BORING LOCATIONS
1784 NORTH DECATUR ROAD BUILDING
EMORY UNIVERSITY
ATLANTA, GEORGIA

DCM GROUP DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

JOB NO. 39103-044	DATE: JANUARY 2001	FIGURE: 1

APPENDIX A

LABORATORY REPORTS

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A181849
Sample ID: MW-3 0-2
Sample Type: Soil
Site ID:

Date Collected: 12/18/00
Time Collected: 12:00
Date Received: 12/19/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0024	0.0020	1	12/29/00	2:18	R.Ward	8260B	4357
cis-1,2-Dichloroethene	ND	mg/kg	0.0024	0.0020	1	12/29/00	2:18	R.Ward	8260B	4357
trans-1,2-Dichloroethene	ND	mg/kg	0.0024	0.0020	1	12/29/00	2:18	R.Ward	8260B	4357
Tetrachloroethene	ND	mg/kg	0.0024	0.0020	1	12/29/00	2:18	R.Ward	8260B	4357
Trichloroethene	ND	mg/kg	0.0024	0.0020	1	12/29/00	2:18	R.Ward	8260B	4357
Vinyl chloride	ND	mg/kg	0.0024	0.0020	1	12/29/00	2:18	R.Ward	8260B	4357

ND = Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	4.2 g	5.0 ml	12/18/00	12:00	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	108.	50. - 140.
surr-Toluene d8	89.	73. - 139.
surr-4-Bromofluorobenzene	92.	62. - 131.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A181849
Sample ID: MW-3 0-2

Page 2

Surrogate	% Recovery	Target Range
surr-Dibromofluoromethane	96.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

These results relate only to the items tested.
This report shall not be reproduced except in full and with
permission of the laboratory.

Report Approved By: ______________________ Report Date: 12/30/00

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
Michael H. Dunn, M.S., Technical Director	Glenn L. Norton, Technical Serv.
Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A181850
Sample ID: MW-3 5
Sample Type: Soil
Site ID:

Date Collected: 12/18/00
Time Collected: 12:10
Date Received: 12/19/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0021	0.0020	1	12/29/00	2:56	R.Ward	8260B	4357
cis-1,2-Dichloroethene	ND	mg/kg	0.0021	0.0020	1	12/29/00	2:56	R.Ward	8260B	4357
trans-1,2-Dichloroethene	ND	mg/kg	0.0021	0.0020	1	12/29/00	2:56	R.Ward	8260B	4357
Tetrachloroethene	0.0022	mg/kg	0.0021	0.0020	1	12/29/00	2:56	R.Ward	8260B	4357
Trichloroethene	ND	mg/kg	0.0021	0.0020	1	12/29/00	2:56	R.Ward	8260B	4357
Vinyl chloride	ND	mg/kg	0.0021	0.0020	1	12/29/00	2:56	R.Ward	8260B	4357

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	4.8 g	5.0 ml	12/18/00	12:10	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	106.	50. - 140.
surr-Toluene d8	87.	73. - 139.
surr-4-Bromofluorobenzene	96.	62. - 131.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A181850
Sample ID: MW-3 5

Surrogate	% Recovery	Target Range
surr-Dibromofluoromethane	100.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

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Report Approved By: Gail aLage　　Report Date: 12/30/00

Paul E. Lane, Jr., Lab Director
Michael H. Dunn, M.S., Technical Director
Johnny A. Mitchell, Dir. Technical Serv.
Eric S. Smith, Assistant Technical Director

Gail A. Lage, Technical Serv.
Glenn L. Norton, Technical Serv.
Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A181851
Sample ID: MW-3 15
Sample Type: Soil
Site ID:

Date Collected: 12/18/00
Time Collected: 12:20
Date Received: 12/19/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/29/00	3:34	R.Ward	8260B	4357
cis-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/29/00	3:34	R.Ward	8260B	4357
trans-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/29/00	3:34	R.Ward	8260B	4357
Tetrachloroethene	ND	mg/kg	0.0019	0.0019	1	12/29/00	3:34	R.Ward	8260B	4357
Trichloroethene	ND	mg/kg	0.0019	0.0019	1	12/29/00	3:34	R.Ward	8260B	4357
Vinyl chloride	ND	mg/kg	0.0019	0.0019	1	12/29/00	3:34	R.Ward	8260B	4357

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	5.2 g	5.0 ml	12/18/00	12:20	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	104.	50. - 140.
surr-Toluene d8	88.	73. - 139.
surr-4-Bromofluorobenzene	98.	62. - 131.
surr-Dibromofluoromethane	99.	64. - 145.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A181851
Sample ID: MW-3 15

- Recovery outside Laboratory historical limits.

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Report Approved By: ____________________ Report Date: 12/30/00

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Laboratory Certification Number: 387

End of Sample Report.

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
1,1-Dichloroethene	mg/kg	< 0.0020	0.0484	0.0500	97	64. - 119.	4357	blank
Trichloroethene	mg/kg	< 0.0020	0.0459	0.0500	92	54. - 114.	4357	blank

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
1,1-Dichloroethene	mg/kg	0.0484	0.0537	10.38	33.	4357
Trichloroethene	mg/kg	0.0459	0.0445	3.10	32.	4357

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
1,1-Dichloroethene	mg/kg	0.0500	0.0575	115	79 - 122	4357
cis-1,2-Dichloroethene	mg/kg	0.0500	0.0565	113	81 - 121	4357
trans-1,2-Dichloroethene	mg/kg	0.0500	0.0548	110	77 - 129	4357
Tetrachloroethene	mg/kg	0.0500	0.0449	90	82 - 116	4357
Trichloroethene	mg/kg	0.0500	0.0464	93	78 - 116	4357
Vinyl chloride	mg/kg	0.0500	0.0615	123	65 - 140	4357

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
1,1-Dichloroethene	< 0.0020	mg/kg	4357
cis-1,2-Dichloroethene	< 0.0020	mg/kg	4357
trans-1,2-Dichloroethene	< 0.0020	mg/kg	4357
Tetrachloroethene	< 0.0020	mg/kg	4357
Trichloroethene	< 0.0020	mg/kg	4357
Vinyl chloride	< 0.0020	mg/kg	4357

- Value outside Laboratory historical QC limits.

End of Report for Project 220248

FAX COC TO NORCROSS

TestAmerica INCORPORATED

Division/Laboratory Name:

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring

Client Name: URS-Dames + Moore
Client #: 2643 220248
Address: 235 Peachtree St, N.E., N. Tower, Ste 2000
City/State/Zip Code: Atlanta, Ga. 30303
Project Manager: Jane MacGregor
Telephone Number: 404-478-8644
Fax: 404-577-5120
Sampler Name: (Print Name) Charles Way
Sampler Signature: Charles Way

Project Name: Emory
Project #: 39103-018
Site/Location ID: Emory, Atlanta
State: Ga
Report To: Jane MacGregor
Invoice To: Jane MacGregor
Quote #:
PO#:

TAT
___ Standard
X Rush (surcharges may apply)
4 day turnaround
Date Needed:

Fax Results: Y N

QC Deliverables
___ None
___ Level 2 (Batch QC)
___ Level 3
___ Level 4
Other:

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix SL - Sludge DW - Drinking Water GW - Groundwater S - Soil/Solid WW - Wastewater Specify Other	Preservation & # of Containers HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	Analyze For: tetrachloroethene and daughter products	(trichloroethene dichloroethenes	and vinyl chloride								REMARKS
MW-3 0-2'	12/19/00	1200	G		S								✓	✓	–								181849
MW-3 5'	11	1210	G		S								–	–	–								181850
MW-3 10'	11	1215	G		S								–	–	–								181851
MW-3 15'	11	1220	G		S								–	–	–								* See Below

Special Instructions:
* Hold until 0-2, 5' + 10' sample are analyzed. If tetrachloroethene or daughter products are found in 0-2, 5' + 10 samples, then analyze.
* No Cont for Dry wt. *

Relinquished By: Charles Way	Date: 12/19/00	Time: 4:00	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date: 12-19-00	Time: 600

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp:
Custody Seals: Y N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

TestAmerica
INCORPORATED

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A182880
Sample ID: MW-4
Sample Type: Soil
Site ID:

Date Collected: 12/20/00
Time Collected: 11:00
Date Received: 12/21/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil **Factor**	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0018	0.0018	1	12/31/00	8:16	R.Ward	8260B	3597
cis-1,2-Dichloroethene	ND	mg/kg	0.0018	0.0018	1	12/31/00	8:16	R.Ward	8260B	3597
trans-1,2-Dichloroethene	ND	mg/kg	0.0018	0.0018	1	12/31/00	8:16	R.Ward	8260B	3597
Tetrachloroethene	ND	mg/kg	0.0018	0.0018	1	12/31/00	8:16	R.Ward	8260B	3597
Trichloroethene	ND	mg/kg	0.0018	0.0018	1	12/31/00	8:16	R.Ward	8260B	3597
Vinyl chloride	ND	mg/kg	0.0018	0.0018	1	12/31/00	8:16	R.Ward	8260B	3597
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	84.	%			1	12/22/00	9:39	J. Rudden	CLP	374

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	5.6 g	5.0 ml	12/22/00	11:00	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	100.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A182880
Sample ID: MW-4
Project: 39103-018
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	112.	73. - 139.
surr-4-Bromofluorobenzene	97.	62. - 131.
surr-Dibromofluoromethane	122.	64. - 145.

\# - Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

These results relate only to the items tested.
This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By: Report Date: 1/ 3/01

Paul E. Lane, Jr., Lab Director
Michael H. Dunn, M.S., Technical Director
Johnny A. Mitchell, Dir. Technical Serv.
Eric S. Smith, Assistant Technical Director

Gail A. Lage, Technical Serv.
Glenn L. Norton, Technical Serv.
Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A182881
Sample ID: MW-4
Sample Type: Soil
Site ID:

Date Collected: 12/20/00
Time Collected: 11:10
Date Received: 12/21/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	8:54	R.Ward	8260B	3597
cis-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	8:54	R.Ward	8260B	3597
trans-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	8:54	R.Ward	8260B	3597
Tetrachloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	8:54	R.Ward	8260B	3597
Trichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	8:54	R.Ward	8260B	3597
Vinyl chloride	ND	mg/kg	0.0019	0.0019	1	12/31/00	8:54	R.Ward	8260B	3597
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	82.	%			1	12/22/00	9:39	J. Rudden	CLP	374

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	5.2 g	5.0 ml	12/22/00	11:10	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	99.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A182881
Sample ID: MW-4
Project: 39103-018
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	127.	73. - 139.
surr-4-Bromofluorobenzene	100.	62. - 131.
surr-Dibromofluoromethane	110.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

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Report Approved By: ________________ Report Date: 1/ 3/01

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Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A182882
Sample ID: MW-4
Sample Type: Soil
Site ID:

Date Collected: 12/20/00
Time Collected: 11:15
Date Received: 12/21/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0016	0.0016	1	12/30/00	23:57	R.Ward	8260B	3597
cis-1,2-Dichloroethene	ND	mg/kg	0.0016	0.0016	1	12/30/00	23:57	R.Ward	8260B	3597
trans-1,2-Dichloroethene	ND	mg/kg	0.0016	0.0016	1	12/30/00	23:57	R.Ward	8260B	3597
Tetrachloroethene	ND	mg/kg	0.0016	0.0016	1	12/30/00	23:57	R.Ward	8260B	3597
Trichloroethene	ND	mg/kg	0.0016	0.0016	1	12/30/00	23:57	R.Ward	8260B	3597
Vinyl chloride	ND	mg/kg	0.0016	0.0016	1	12/30/00	23:57	R.Ward	8260B	3597
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	80.	%			1	12/22/00	9:39	J. Rudden	CLP	374

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	6.4 g	5.0 ml	12/22/00	11:15	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	105.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A182882
Sample ID: MW-4
Project: 39103-018
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	118.	73. - 139.
surr-4-Bromofluorobenzene	106.	62. - 131.
surr-Dibromofluoromethane	126.	64. - 145.

\# - Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

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Report Approved By: ______________ Report Date: 1/ 3/01

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Eric S. Smith, Assistant Technical Director

Gail A. Lage, Technical Serv.
Glenn L. Norton, Technical Serv.
Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A182883
Sample ID: MW-1
Sample Type: Soil
Site ID:

Date Collected: 12/20/00
Time Collected: 15:45
Date Received: 12/21/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0016	0.0016	1	12/31/00	0:35	R.Ward	8260B	3597
cis-1,2-Dichloroethene	ND	mg/kg	0.0016	0.0016	1	12/31/00	0:35	R.Ward	8260B	3597
trans-1,2-Dichloroethene	ND	mg/kg	0.0016	0.0016	1	12/31/00	0:35	R.Ward	8260B	3597
Tetrachloroethene	ND	mg/kg	0.0016	0.0016	1	12/31/00	0:35	R.Ward	8260B	3597
Trichloroethene	ND	mg/kg	0.0016	0.0016	1	12/31/00	0:35	R.Ward	8260B	3597
Vinyl chloride	ND	mg/kg	0.0016	0.0016	1	12/31/00	0:35	R.Ward	8260B	3597
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	84.	%			1	12/22/00	9:39	J. Rudden	CLP	374

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	6.4 g	5.0 ml	12/22/00	15:45	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	99.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A182883
Sample ID: MW-1
Project: 39103-018
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	112.	73. - 139.
surr-4-Bromofluorobenzene	99.	62. - 131.
surr-Dibromofluoromethane	109.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

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Laboratory Certification Number: 387

End of Sample Report.

TestAmerica
INCORPORATED

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A182884
Sample ID: MW-1
Sample Type: Soil
Site ID:

Date Collected: 12/20/00
Time Collected: 15:50
Date Received: 12/21/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	1:14	R.Ward	8260B	3597
cis-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	1:14	R.Ward	8260B	3597
trans-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	1:14	R.Ward	8260B	3597
Tetrachloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	1:14	R.Ward	8260B	3597
Trichloroethene	ND	mg/kg	0.0019	0.0019	1	12/31/00	1:14	R.Ward	8260B	3597
Vinyl chloride	ND	mg/kg	0.0019	0.0019	1	12/31/00	1:14	R.Ward	8260B	3597
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	80.	%			1	12/22/00	9:39	J. Rudden	CLP	374

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	5.2 g	5.0 ml	12/22/00	15:50	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	94.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 00-A182884
Sample ID: MW-1
Project: 39103-018
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	129.	73. - 139.
surr-4-Bromofluorobenzene	101.	62. - 131.
surr-Dibromofluoromethane	105.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

These results relate only to the items tested.
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Report Approved By: _______________ Report Date: 1/ 3/01

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
Michael H. Dunn, M.S., Technical Director	Glenn L. Norton, Technical Serv.
Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: 39103-018
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 00-A182885
Sample ID: MW-1
Sample Type: Soil
Site ID:

Date Collected: 12/20/00
Time Collected: 15:55
Date Received: 12/21/00
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0014	0.0014	1	12/31/00	1:52	R.Ward	8260B	3597
cis-1,2-Dichloroethene	ND	mg/kg	0.0014	0.0014	1	12/31/00	1:52	R.Ward	8260B	3597
trans-1,2-Dichloroethene	ND	mg/kg	0.0014	0.0014	1	12/31/00	1:52	R.Ward	8260B	3597
Tetrachloroethene	ND	mg/kg	0.0014	0.0014	1	12/31/00	1:52	R.Ward	8260B	3597
Trichloroethene	ND	mg/kg	0.0014	0.0014	1	12/31/00	1:52	R.Ward	8260B	3597
Vinyl chloride	ND	mg/kg	0.0014	0.0014	1	12/31/00	1:52	R.Ward	8260B	3597
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	87.	%			1	12/22/00	9:39	J. Rudden	CLP	374

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	7.0 g	5.0 ml	12/22/00	15:55	LMcDaniel	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	99.	50. - 140.

Sample report continued . . .

TestAmerica
INCORPORATED

ANALYTICAL REPORT

Laboratory Number: 00-A182885
Sample ID: MW-1
Project: 39103-018
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	119.	73. - 139.
surr-4-Bromofluorobenzene	101.	62. - 131.
surr-Dibromofluoromethane	106.	64. - 145.

\# - Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

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Report Approved By: ______________ Report Date: 1/ 3/01

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Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
1,1-Dichloroethene	mg/kg	< 0.0020	0.0526	0.0500	105	64. - 119.	3597	blank
Trichloroethene	mg/kg	< 0.0020	0.0485	0.0500	97	54. - 114.	3597	blank

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
1,1-Dichloroethene	mg/kg	0.0526	0.0471	11.03	33.	3597
Trichloroethene	mg/kg	0.0485	0.0434	11.10	32.	3597

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
1,1-Dichloroethene	mg/kg	0.0500	0.0473	95	79 - 122	3597
cis-1,2-Dichloroethene	mg/kg	0.0500	0.0476	95	81 - 121	3597
trans-1,2-Dichloroethene	mg/kg	0.0500	0.0495	99	77 - 129	3597
Tetrachloroethene	mg/kg	0.0500	0.0441	88	82 - 116	3597
Trichloroethene	mg/kg	0.0500	0.0467	93	78 - 116	3597
Vinyl chloride	mg/kg	0.0500	0.0492	98	65 - 140	3597

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
1,1-Dichloroethene	< 0.0020	mg/kg	3597
cis-1,2-Dichloroethene	< 0.0020	mg/kg	3597
trans-1,2-Dichloroethene	< 0.0020	mg/kg	3597
Tetrachloroethene	< 0.0020	mg/kg	3597
Trichloroethene	< 0.0020	mg/kg	3597
Vinyl chloride	< 0.0020	mg/kg	3597

- Value outside Laboratory historical QC limits.

End of Report for Project 220547

TestAmerica
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PROJECT QUALITY CONTROL DATA

****
****
****
****

The previous group of samples has a request for additional testing based upon these results. See the chain of custody!

Do not destroy this sheet until login has requested the appropriate tests.

BC
220547

TestAmerica
INCORPORATED

Division/Laboratory Name: ~~FAX~~ COC TO NORCROSS

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring ______

Client Name: URS - Dames + Moore
Client #: 2243
Address: 135 Peachtree St, N.E., North Tower, Suite 2000
City/State/Zip Code: Atlanta, Ga. 30303
Project Manager: Jane MacGregor
Telephone Number: 404-478-8644
Fax: 404-577-5120
Sampler Name: (Print Name) Charles Way
Sampler Signature: Charles Way

Project Name: Emory
Project #: 39103-018
Site/Location ID: Atlanta
State: Ga
Report To: Jane MacGregor
Invoice To: Jane MacGregor
Quote #: ______
PO#: ______

TAT
___ Standard
✓ Rush (surcharges may apply)
4 day turnaround
Date Needed: ______

Fax Results: Y N

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix: SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other	Preservation & # of Containers: HNO$_3$	HCl	NaOH	H$_2$SO$_4$	Methanol	None	Other (Specify)	Analyze For: tetrachloroethene and daughter products trichloroethene dichloroethenes + vinyl chloride	Dry wt	REMARKS
MW-4 0-2'	12/20/00	11:00	G		S								—	✓	# 182880
MW-4 5'	"	11:10	G		S								—	✓	881
MW-4 10'	"	11:15	G		S								—	✓	882
MW-4 15'	"	11:20	G		S								—	✓	*
MW-1 0-2	"	3:45	G		S								—	✓	883
MW-1 5'	"	3:50	G		S								—	✓	884
MW-1 10'	"	3:55	G		S								—	✓	885
MW-1 15'	"	4:00	G		S								—	✓	*

QC Deliverables
___ None
___ Level 2 (Batch QC)
___ Level 3
___ Level 4
Other: ______

Special Instructions: * Analyze 15' sample only if you detect constituent in above samples

Relinquished By: Charles Way	Date: 12-20-00	Time: 4:30	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By: C. Allen	Date: 12·21·00	Time: 0900h

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp:
Custody Seals: Y N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: #39103
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 01-A136
Sample ID: MW-2 0-2'
Sample Type: Soil
Site ID:

Date Collected: 1/ 2/01
Time Collected: 10:15
Date Received: 1/ 3/01
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	1/ 5/01	17:44	R.Ward	8260B	6924
cis-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	1/ 5/01	17:44	R.Ward	8260B	6924
trans-1,2-Dichloroethene	ND	mg/kg	0.0019	0.0019	1	1/ 5/01	17:44	R.Ward	8260B	6924
Tetrachloroethene	ND	mg/kg	0.0019	0.0019	1	1/ 5/01	17:44	R.Ward	8260B	6924
Trichloroethene	ND	mg/kg	0.0019	0.0019	1	1/ 5/01	17:44	R.Ward	8260B	6924
Vinyl chloride	ND	mg/kg	0.0019	0.0019	1	1/ 5/01	17:44	R.Ward	8260B	6924
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	85.	%			1	1/ 3/01	9:24	D.Yeager	CLP	6062

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	5.2 g	5.0 ml	1/ 2/01	14:58	S. Wani	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	106.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 01-A136
Sample ID: MW-2 0-2'
Project: #39103
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	118.	73. - 139.
surr-4-Bromofluorobenzene	106.	62. - 131.
surr-Dibromofluoromethane	116.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

These results relate only to the items tested.
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Report Approved By: ______________________ Report Date: 1/10/01

Paul E. Lane, Jr., Lab Director
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Eric S. Smith, Assistant Technical Director

Gail A. Lage, Technical Serv.
Glenn L. Norton, Technical Serv.
Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: #39103
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 01-A137
Sample ID: MW-2 5'
Sample Type: Soil
Site ID:

Date Collected: 1/ 2/01
Time Collected: 10:20
Date Received: 1/ 3/01
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0023	0.0020	1	1/ 5/01	18:21	R.Ward	8260B	6924
cis-1,2-Dichloroethene	ND	mg/kg	0.0023	0.0020	1	1/ 5/01	18:21	R.Ward	8260B	6924
trans-1,2-Dichloroethene	ND	mg/kg	0.0023	0.0020	1	1/ 5/01	18:21	R.Ward	8260B	6924
Tetrachloroethene	ND	mg/kg	0.0023	0.0020	1	1/ 5/01	18:21	R.Ward	8260B	6924
Trichloroethene	ND	mg/kg	0.0023	0.0020	1	1/ 5/01	18:21	R.Ward	8260B	6924
Vinyl chloride	ND	mg/kg	0.0023	0.0020	1	1/ 5/01	18:21	R.Ward	8260B	6924
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	82.	%			1	1/ 3/01	9:24	D.Yeager	CLP	6062

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	4.4 g	5.0 ml	1/ 2/01	14:58	S. Wani	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	106.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 01-A137
Sample ID: MW-2 5'
Project: #39103
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	117.	73. - 139.
surr-4-Bromofluorobenzene	104.	62. - 131.
surr-Dibromofluoromethane	115.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

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Report Approved By: E S Sth   Report Date: 1/10/01

Paul E. Lane, Jr., Lab Director	Gail A. Lage, Technical Serv.
Michael H. Dunn, M.S., Technical Director	Glenn L. Norton, Technical Serv.
Johnny A. Mitchell, Dir. Technical Serv.	Kelly S. Comstock, Technical Serv.
Eric S. Smith, Assistant Technical Director	Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

ANALYTICAL REPORT

URS 2643

235 PEACHTREE ST, NE NORTH TOW
ATLANTA, GA 30303

Project: #39103
Project Name: EMORY
Sampler: CHARLES WAY

Lab Number: 01-A138
Sample ID: MW-2 10'
Sample Type: Soil
Site ID:

Date Collected: 1/ 2/01
Time Collected: 10:30
Date Received: 1/ 3/01
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
VOLATILE ORGANICS										
1,1-Dichloroethene	ND	mg/kg	0.0020	0.0020	1	1/ 5/01	18:58	R.Ward	8260B	6924
cis-1,2-Dichloroethene	ND	mg/kg	0.0020	0.0020	1	1/ 5/01	18:58	R.Ward	8260B	6924
trans-1,2-Dichloroethene	ND	mg/kg	0.0020	0.0020	1	1/ 5/01	18:58	R.Ward	8260B	6924
Tetrachloroethene	ND	mg/kg	0.0020	0.0020	1	1/ 5/01	18:58	R.Ward	8260B	6924
Trichloroethene	ND	mg/kg	0.0020	0.0020	1	1/ 5/01	18:58	R.Ward	8260B	6924
Vinyl chloride	ND	mg/kg	0.0020	0.0020	1	1/ 5/01	18:58	R.Ward	8260B	6924
GENERAL CHEMISTRY PARAMETERS										
% Dry Weight	92.	%			1	1/ 3/01	9:24	D.Yeager	CLP	6062

ND - Not detected at the report limit.

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Volatile Organics	5.0 g	5.0 ml	1/ 2/01	14:58	S. Wani	5035

Surrogate	% Recovery	Target Range
surr-1,2-Dichloroethane, d4	111.	50. - 140.

Sample report continued . . .

ANALYTICAL REPORT

Laboratory Number: 01-A138
Sample ID: MW-2 10'
Project: #39103
Page 2

Surrogate	% Recovery	Target Range
surr-Toluene d8	114.	73. - 139.
surr-4-Bromofluorobenzene	103.	62. - 131.
surr-Dibromofluoromethane	118.	64. - 145.

- Recovery outside Laboratory historical limits.

All results reported on a wet weight basis.

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Report Approved By: Report Date: 1/10/01

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Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: 387

End of Sample Report.

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
VOA PARAMETERS								
Benzene	mg/l	< 0.00200	0.0400	0.0500	80	53. - 134.	9193	blank
Benzene	mg/l	< 0.00200	0.0410	0.0500	82	53. - 134.	9193	blank
Carbon tetrachloride	mg/l	< 0.00200	0.0400	0.0500	80	66. - 135.	9193	blank
Carbon tetrachloride	mg/l	< 0.00200	0.0410	0.0500	82	66. - 135.	9193	blank
Chlorobenzene	mg/l	< 0.00200	0.0430	0.0500	86	62. - 131.	9193	blank
Chlorobenzene	mg/l	< 0.00200	0.0530	0.0500	106	62. - 131.	9193	blank
Chloroform	mg/l	< 0.00200	0.0480	0.0500	96	67. - 130.	9193	blank
Chloroform	mg/l	< 0.00200	0.0530	0.0500	106	67. - 130.	9193	blank
1,2-Dichloroethane	mg/l	< 0.00200	0.0520	0.0500	104	70. - 129.	9193	blank
1,2-Dichloroethane	mg/l	< 0.00200	0.0550	0.0500	110	70. - 129.	9193	blank
1,1-Dichloroethene	mg/l	< 0.00200	0.0460	0.0500	92	42. - 149.	9193	blank
1,1-Dichloroethene	mg/l	< 0.00200	0.0500	0.0500	100	42. - 149.	9193	blank
Methylethylketone	mg/l	< 0.0100	0.229	0.250	92	29. - 167.	9193	blank
Methylethylketone	mg/l	< 0.0100	0.251	0.250	100	29. - 167.	9193	blank
Tetrachloroethene	mg/l	< 0.00200	0.0450	0.0500	90	49. - 148.	9193	blank
Tetrachloroethene	mg/l	< 0.00200	0.0420	0.0500	84	49. - 148.	9193	blank
Trichloroethene	mg/l	< 0.00200	0.0450	0.0500	90	51. - 139.	9193	blank
Trichloroethene	mg/l	< 0.00200	0.0450	0.0500	90	51. - 139.	9193	blank
Vinyl Chloride	mg/l	< 0.00200	0.0430	0.0500	86	52. - 160.	9193	blank
Vinyl Chloride	mg/l	< 0.00200	0.0480	0.0500	96	52. - 160.	9193	blank
1,1-Dichloroethene	mg/kg	< 0.0020	0.0572	0.0500	114	64. - 119.	6924	blank
Trichloroethene	mg/kg	< 0.0020	0.0568	0.0500	114	54. - 114.	6924	blank

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
BNA PARAMETERS								
Cresols	mg/l	< 0.0100	0.220	0.300	73	23. - 123.	8672	blank
Cresols	mg/l	< 0.0100	0.208	0.300	69	23. - 123.	8672	blank

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
1,4-Dichlorobenzene	mg/l	< 0.0100	0.0800	0.100	80	18. - 143.	8672	blank
1,4-Dichlorobenzene	mg/l	< 0.0100	0.0760	0.100	76	18. - 143.	8672	blank
2,4-Dinitrotoluene	mg/l	< 0.0100	0.0760	0.100	76	22. - 148.	8672	blank
2,4-Dinitrotoluene	mg/l	< 0.0100	0.0780	0.100	78	22. - 148.	8672	blank
Hexachlorobenzene	mg/l	< 0.0100	0.0620	0.100	62	11. - 116.	8672	blank
Hexachlorobenzene	mg/l	< 0.0100	0.0560	0.100	56	11. - 116.	8672	blank
Hexchlor-1,3-butadien	mg/l	< 0.0100	0.0800	0.100	80	18. - 157.	8672	blank
Hexchlor-1,3-butadien	mg/l	< 0.0100	0.0800	0.100	80	18. - 157.	8672	blank
Hexachloroethane	mg/l	< 0.0100	0.0800	0.100	80	13. - 155.	8672	blank
Hexachloroethane	mg/l	< 0.0100	0.0780	0.100	78	13. - 155.	8672	blank
Nitrobenzene	mg/l	< 0.0100	0.0720	0.100	72	17. - 153.	8672	blank
Nitrobenzene	mg/l	< 0.0100	0.0740	0.100	74	17. - 153.	8672	blank
Pentachlorophenol	mg/l	< 0.0100	0.0840	0.100	84	20. - 144.	8672	blank
Pentachlorophenol	mg/l	< 0.0100	0.0780	0.100	78	20. - 144.	8672	blank
Pyridine	mg/l	< 0.0100	0.0900	0.100	90	8. - 142.	8672	blank
Pyridine	mg/l	< 0.0100	0.0840	0.100	84	8. - 142.	8672	blank
2,4,5-Trichlorophenol	mg/l	< 0.0100	0.0880	0.100	88	20. - 147.	8672	blank
2,4,5-Trichlorophenol	mg/l	< 0.0100	0.0840	0.100	84	20. - 147.	8672	blank
2,4,6-Trichlorophenol	mg/l	< 0.0100	0.0800	0.100	80	19. - 145.	8672	blank
2,4,6-Trichlorophenol	mg/l	< 0.0100	0.0800	0.100	80	19. - 145.	8672	blank

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
PEST/PCB/HERB PARAMETERS								
2,4-D	mg/l	< 0.100	0.800	1.00	80	12. - 150.	8040	01-A52
2,4-D	mg/l	< 0.100	0.770	1.00	77	12. - 150.	8040	01-A52
Endrin	mg/l	< 0.00050	0.00840	0.01000	84	55. - 154.	8687	blank
Endrin	mg/l	< 0.00050	0.00840	0.01000	84	55. - 154.	8687	blank
Heptachlor	mg/l	< 0.00050	0.00830	0.01000	83	37. - 139.	8687	blank
Heptachlor	mg/l	< 0.00050	0.00800	0.01000	80	37. - 139.	8687	blank
Lindane	mg/l	< 0.00050	0.00990	0.01000	99	45. - 139.	8687	blank

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
Lindane	mg/l	< 0.00050	0.00890	0.01000	89	45. - 139.	8687	blank
Methoxychlor	mg/l	< 0.00050	0.00800	0.01000	80	50. - 150.	8687	blank
Methoxychlor	mg/l	< 0.00050	0.00990	0.01000	99	50. - 150.	8687	blank
Silvex	mg/l	< 0.0100	0.0800	0.100	80	15. - 132.	8040	01-A52
Silvex	mg/l	< 0.0100	0.0800	0.100	80	15. - 132.	8040	01-A52

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
METALS								
Arsenic	mg/l	< 0.100	10.3	10.0	103	80 - 120	6490	01-A122
Barium	mg/l	< 1.00	98.0	100.	98	80 - 120	6490	01-A122
Cadmium	mg/l	< 0.100	10.1	10.0	101	80 - 120	6490	01-A122
Chromium	mg/l	< 0.500	48.6	50.0	97	80 - 120	6490	01-A122
Lead	mg/l	< 0.500	50.50	50.00	101	80 - 120	6490	01-A122
Mercury	mg/l	< 0.0100	1.060	1.000	106	80 - 120	6489	01-A122
Selenium	mg/l	< 0.100	10.9	10.0	109	80 - 120	6490	01-A122
Silver	mg/l	< 0.100	9.47	10.0	95	80 - 120	6490	01-A122
Chlordane	mg/l	< 0.00050	0.00510	0.00400	128#	80 - 120	8687	blank
Chlordane	mg/l	< 0.00050	0.00490	0.00400	122#	80 - 120	8687	blank
Toxaphene	mg/l	< 0.010	0.024	0.040	60#	80 - 120	8687	blank
Toxaphene	mg/l	< 0.010	0.031	0.040	78#	80 - 120	8687	blank
Heptachlor epoxide	mg/l	< 0.00050	0.00850	0.01000	85	80 - 120	8687	blank
Heptachlor epoxide	mg/l	< 0.00050	0.00880	0.01000	88	80 - 120	8687	blank

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
VOA PARAMETERS						

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
Benzene	mg/l	0.0400	0.0410	2.47	25.	9193
Carbon tetrachloride	mg/l	0.0400	0.0410	2.47	28.	9193
Chlorobenzene	mg/l	0.0430	0.0530	20.83	25.	9193
Chloroform	mg/l	0.0480	0.0530	9.90	23.	9193
1,2-Dichloroethane	mg/l	0.0520	0.0550	5.61	25.	9193
1,1-Dichloroethene	mg/l	0.0460	0.0500	8.33	36.	9193
Methylethylketone	mg/l	0.229	0.251	9.17	50.	9193
Tetrachloroethene	mg/l	0.0450	0.0420	6.90	27.	9193
Trichloroethene	mg/l	0.0450	0.0450	0.00	30.	9193
Vinyl Chloride	mg/l	0.0430	0.0480	10.99	44.	9193
1,1-Dichloroethene	mg/kg	0.0572	0.0540	5.76	33.	6924
Trichloroethene	mg/kg	0.0568	0.0543	4.50	32.	6924

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
BNA PARAMETERS						
Cresols	mg/l	0.220	0.208	5.61	63.	8672
1,4-Dichlorobenzene	mg/l	0.0800	0.0760	5.13	67.	8672
2,4-Dinitrotoluene	mg/l	0.0760	0.0780	2.60	72.	8672
Hexachlorobenzene	mg/l	0.0620	0.0560	10.17	70.	8672
Hexchlor-1,3-butadien	mg/l	0.0800	0.0800	0.00	66.	8672
Hexachloroethane	mg/l	0.0800	0.0780	2.53	66.	8672
Nitrobenzene	mg/l	0.0720	0.0740	2.74	63.	8672
Pentachlorophenol	mg/l	0.0840	0.0780	7.41	76.	8672
Pyridine	mg/l	0.0900	0.0840	6.90	100.	8672
2,4,5-Trichlorophenol	mg/l	0.0880	0.0840	4.65	73.	8672
2,4,6-Trichlorophenol	mg/l	0.0800	0.0800	0.00	71.	8672

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
PEST/PCB/HERB PARAMETERS						
2,4-D	mg/l	0.800	0.770	3.82	41.	8040
Endrin	mg/l	0.00840	0.00840	0.00	42.	8687
Heptachlor	mg/l	0.00830	0.00800	3.68	46.	8687
Lindane	mg/l	0.00990	0.00890	10.64	47.	8687
Methoxychlor	mg/l	0.00800	0.00990	21.23#	20.	8687
Silvex	mg/l	0.0800	0.0800	0.00	45.	8040

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
METALS						
Arsenic	mg/l	10.3	10.2	0.98	20	6490
Barium	mg/l	98.0	97.4	0.61	20	6490
Cadmium	mg/l	10.1	9.99	1.10	20	6490
Chromium	mg/l	48.6	48.2	0.83	20	6490
Lead	mg/l	50.50	49.80	1.40	20	6490
Mercury	mg/l	1.060	1.070	0.94	20	6489
Selenium	mg/l	10.9	11.0	0.91	20	6490
Silver	mg/l	9.47	9.39	0.85	20	6490

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
VOA PARAMETERS						
Benzene	mg/l	0.0500	0.0410	82	73 - 113	9193
Carbon tetrachloride	mg/l	0.0500	0.0390	78	70 - 122	9193
Chlorobenzene	mg/l	0.0500	0.0470	94	82 - 122	9193
Chloroform	mg/l	0.0500	0.0500	100	69 - 120	9193
1,2-Dichloroethane	mg/l	0.0500	0.0530	106	65 - 125	9193

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
1,1-Dichloroethene	mg/l	0.0500	0.0460	92	70 - 121	9193
Methylethylketone	mg/l	0.250	0.267	107	48 - 138	9193
Tetrachloroethene	mg/l	0.0500	0.0390	78 #	79 - 111	9193
Trichloroethene	mg/l	0.0500	0.0410	82	70 - 121	9193
Vinyl Chloride	mg/l	0.0500	0.0580	116	61 - 143	9193
1,1-Dichloroethene	mg/kg	0.0500	0.0561	112	79 - 122	6924
cis-1,2-Dichloroethene	mg/kg	0.0500	0.0590	118	81 - 121	6924
trans-1,2-Dichloroethene	mg/kg	0.0500	0.0575	115	77 - 129	6924
Tetrachloroethene	mg/kg	0.0500	0.0573	115	82 - 116	6924
Trichloroethene	mg/kg	0.0500	0.0568	114	78 - 116	6924
Vinyl chloride	mg/kg	0.0500	0.0575	115	65 - 140	6924

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
BNA PARAMETERS						
Cresols	mg/l	0.300	0.228	76	43 - 113	8672
1,4-Dichlorobenzene	mg/l	0.100	0.0800	80	32 - 140	8672
2,4-Dinitrotoluene	mg/l	0.100	0.0780	78	39 - 145	8672
Hexachlorobenzene	mg/l	0.100	0.0560	56	23 - 113	8672
Hexchlor-1,3-butadien	mg/l	0.100	0.0800	80	36 - 154	8672
Hexachloroethane	mg/l	0.100	0.0800	80	25 - 157	8672
Nitrobenzene	mg/l	0.100	0.0720	72	33 - 148	8672
Pentachlorophenol	mg/l	0.100	0.0760	76	37 - 128	8672
Pyridine	mg/l	0.100	0.0940	94	35 - 143	8672
2,4,5-Trichlorophenol	mg/l	0.100	0.0860	86	41 - 134	8672
2,4,6-Trichlorophenol	mg/l	0.100	0.0820	82	36 - 139	8672

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
PEST/PCB/HERB PARAMETERS						
Chlordane	mg/l	0.00400	0.00510	128	52 - 135	8687
Endrin	mg/l	0.01000	0.00870	87	61 - 153	8687
Heptachlor	mg/l	0.01000	0.00820	82	46 - 133	8687
Lindane	mg/l	0.01000	0.00970	97	53 - 135	8687
Methoxychlor	mg/l	0.01000	0.00820	82	53 - 165	8687
Toxaphene	mg/l	0.040	0.024	60	60 - 140	8687

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
METALS						
Arsenic	mg/l	1.00	1.04	104	80 - 120	6490
Barium	mg/l	10.0	10.1	101	80 - 120	6490
Cadmium	mg/l	1.00	1.02	102	80 - 120	6490
Chromium	mg/l	5.00	5.03	101	80 - 120	6490
Lead	mg/l	5.000	5.040	101	80 - 120	6490
Mercury	mg/l	0.1000	0.1140	114	85 - 115	6489
Selenium	mg/l	1.00	1.07	107	80 - 120	6490
Silver	mg/l	1.00	1.00	100	80 - 120	6490

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Date Analyzed	Time Analyzed
VOA PARAMETERS					

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Analysis Date	Analysis Time
Benzene	< 0.00200	mg/l	9193	1/10/01	12:03
Carbon tetrachloride	< 0.00200	mg/l	9193	1/10/01	12:03
Chlorobenzene	< 0.00200	mg/l	9193	1/10/01	12:03
Chloroform	< 0.00200	mg/l	9193	1/10/01	12:03
1,2-Dichloroethane	< 0.00200	mg/l	9193	1/10/01	12:03
1,1-Dichloroethene	< 0.00200	mg/l	9193	1/10/01	12:03
Methylethylketone	< 0.0100	mg/l	9193	1/10/01	12:03
Tetrachloroethene	< 0.00200	mg/l	9193	1/10/01	12:03
Trichloroethene	< 0.00200	mg/l	9193	1/10/01	12:03
Vinyl Chloride	< 0.00200	mg/l	9193	1/10/01	12:03
1,1-Dichloroethene	< 0.0020	mg/kg	6924	1/ 5/01	11:47
cis-1,2-Dichloroethene	< 0.0020	mg/kg	6924	1/ 5/01	11:47
trans-1,2-Dichloroethene	< 0.0020	mg/kg	6924	1/ 5/01	11:47
Tetrachloroethene	< 0.0020	mg/kg	6924	1/ 5/01	11:47
Trichloroethene	< 0.0020	mg/kg	6924	1/ 5/01	11:47
Vinyl chloride	< 0.0020	mg/kg	6924	1/ 5/01	11:47
VOA Surr, 1,2-DCA, d4	99.	% Rec	9193	1/10/01	12:03
surr-1,2-Dichloroethane, d4	99.	% Rec	6924	1/ 5/01	11:47
VOA Surr, Toluene d8	87.	% Rec	9193	1/10/01	12:03
surr-Toluene d8	115.	% Rec	6924	1/ 5/01	11:47
VOA Surr, 4-BFB	79.	% Rec	9193	1/10/01	12:03
surr-4-Bromofluorobenzene	99.	% Rec	6924	1/ 5/01	11:47
surr-Dibromofluoromethane	113.	% Rec	6924	1/ 5/01	11:47

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Date Analyzed	Time Analyzed
BNA PARAMETERS					
Cresols	< 0.0100	mg/l	8672	1/ 6/01	15:08
1,4-Dichlorobenzene	< 0.0100	mg/l	8672	1/ 6/01	15:08
2,4-Dinitrotoluene	< 0.0100	mg/l	8672	1/ 6/01	15:08
Hexachlorobenzene	< 0.0100	mg/l	8672	1/ 6/01	15:08
Hexchlor-1,3-butadien	< 0.0100	mg/l	8672	1/ 6/01	15:08

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Analysis Date	Analysis Time
Hexachloroethane	< 0.0100	mg/l	8672	1/ 6/01	15:08
Nitrobenzene	< 0.0100	mg/l	8672	1/ 6/01	15:08
Pentachlorophenol	< 0.0100	mg/l	8672	1/ 6/01	15:08
Pyridine	< 0.0100	mg/l	8672	1/ 6/01	15:08
2,4,5-Trichlorophenol	< 0.0100	mg/l	8672	1/ 6/01	15:08
2,4,6-Trichlorophenol	< 0.0100	mg/l	8672	1/ 6/01	15:08

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Date Analyzed	Time Analyzed
PEST/PCB/HERB PARAMETERS					
Chlordane	< 0.00050	mg/l	8687	1/ 8/01	15:50
2,4-D	< 0.100	mg/l	8040	1/ 6/01	13:08
Endrin	< 0.00050	mg/l	8687	1/ 8/01	15:50
Heptachlor	< 0.00050	mg/l	8687	1/ 8/01	15:50
Lindane	< 0.00050	mg/l	8687	1/ 8/01	15:50
Methoxychlor	< 0.00050	mg/l	8687	1/ 8/01	15:50
Toxaphene	< 0.010	mg/l	8687	1/ 8/01	15:50
Silvex	< 0.0100	mg/l	8040	1/ 6/01	13:08
pest surr-TCMX	36.	% Rec	8687	1/ 8/01	15:50
surr-Dibutylchlorendate	44.	% Rec	8687	1/ 8/01	15:50
surr-DCPAA	70.	% Rec	8040	1/ 6/01	13:08

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Date Analyzed	Time Analyzed
METALS					
Arsenic	< 0.100	mg/l	6490	1/ 4/01	18:44
Barium	< 1.00	mg/l	6490	1/ 4/01	18:44
Cadmium	< 0.100	mg/l	6490	1/ 4/01	18:44
Chromium	< 0.500	mg/l	6490	1/ 4/01	18:44

Project QC continued . . .

PROJECT QUALITY CONTROL DATA

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Analysis Date	Analysis Time
Lead	< 0.500	mg/l	6490	1/ 4/01	18:44
Mercury	< 0.0100	mg/l	6489	1/ 4/01	15:00
Selenium	< 0.100	mg/l	6490	1/ 4/01	18:44
Silver	< 0.100	mg/l	6490	1/ 4/01	18:44

- Value outside Laboratory historical QC limits.

End of Report for Project 221419

TestAmerica INCORPORATED

Division/Laboratory Name: FAX COC TO NORCROSS

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring ______

221419

Client Name: URS- Dames + Moore
Client #: 2643
Address: 235 Peachtree St. N.E. North Tower, Suite 2000
City/State/Zip Code: Atlanta, Ga. 30303
Project Manager: Jane MacGregor
Telephone Number: 404-428-3644
Fax: 404-577-5120
Sampler Name: (Print Name) Charles Way
Sampler Signature: Charles Way

Project Name: Emory
Project #: 39103
Site/Location ID: Atlanta
State: Ga
Report To: Jane MacGregor
Invoice To: Jane Mac Gregor
Quote #:
PO#:

TAT
___ Standard
✓ Rush (surcharges may apply)
4 day turnaround
Date Needed: ______
Fax Results: Y N

QC Deliverables
___ None
___ Level 2 (Batch QC)
___ Level 3
___ Level 4
Other: ______

					Matrix	Preservation & # of Containers							Analyze For:										
SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	SL - Sludge DW - Drinking Water GW - Groundwater S - Soil/Solid WW - Wastewater Specify Other	HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	tetrachloroethene and daughter products	trichloroethene	dichloroethenes + vinyl chloride	Dry wt		TCLP Organics	TCLP Metals				**REMARKS**
MW-2 0-2'	1/2/01	10:15	G		S								✓			✓							136
MW-2 5'	"	10:20	G		S								✓			✓							137
MW-2 10'	"	10:30	G		S								✓			✓							138
MW 2 15'	"	10:40	G		S								✓			✓							*
Soil Cuttings	"	12:00	C		S													✓	✓				135

Special Instructions:
* only analyze if contamination present in above samples

Relinquished By: Charles Way	Date: 1-2-01	Time: 4:00	Received By: J Jacobs	Date: 01/03/01	Time: 900
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 3°C
Custody Seals: Y N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment: