

ARCADIS

Appendix F

Pre-Design Investigation Supporting
Information

Appendix F - Pre-Design Investigation Summary Report

Revitalizing Auto Communities Environmental Response Trust (RACER Trust)

Former Delphi Harrison Thermal Systems Moraine Plant
Former General Motors Powertrain Group, Moraine Engine Plant
Former General Motors Truck Group, Moraine Assembly Plant

Moraine, Ohio

December 31, 2012

1. Introduction	1
1.1 Site Description and History	1
1.2 Pre-Design Investigation Objectives	3
1.3 Document Organization	3
2. Field Investigation Summary	5
2.1 Field Methodology	5
2.1.1 Health and Safety	5
2.1.2 Utility Clearance	5
2.1.3 Vertical Aquifer Profile Sampling	5
2.1.4 Hydraulic Testing	7
2.1.4.1 Steady-State Drawdown Testing	7
2.1.4.2 Pneumatic Slug Test	8
2.1.5 Soil Boring Advancements	9
2.1.6 Soil Sampling Activities	9
2.1.7 Monitoring Well Installation	10
2.1.8 Decontamination Procedures	10
2.1.9 Soil Boring Abandonment	10
2.1.10 Investigative Derived Waste Management	11
2.1.11 Laboratory Analysis	11
2.1.12 Surveying	11
2.2 Secondary Source Area Investigation Summary	12
2.2.1 Box Sewer	12
2.2.2 Historic Fill Area	13
2.2.3 West Tank Farm	14
2.2.4 Former Building 21 Area	15
2.3 Upgradient Northern Perimeter Investigation Summary	15

2.4	Process Sump Area Investigation Summary	16
3.	Investigation Findings	18
3.1	Secondary Source Area Investigation Findings	18
3.1.1	Box Sewer	18
3.1.1.1	Lithology	18
3.1.1.2	Hydraulic Testing Results	18
3.1.1.3	Vadose Zone Soil Analytical Results	19
3.1.1.4	Vertical Aquifer Profile Groundwater Analytical Results	19
3.1.2	Historic Fill Area	20
3.1.2.1	Lithology	20
3.1.2.2	Vadose Zone Soil Analytical Results	21
3.1.2.3	Vertical Aquifer Profile Groundwater Analytical Results	21
3.1.3	West Tank Farm	22
3.1.3.1	Lithology	22
3.1.3.2	Hydraulic Testing Results	22
3.1.3.3	Vadose Zone Soil Analytical Results	23
3.1.3.4	Vertical Aquifer Profile Groundwater Analytical Results	23
3.1.3.5	Groundwater Analytical Results	25
3.1.4	Former Building 21 Area	25
3.1.4.1	Lithology	25
3.1.4.2	Hydraulic Testing Results	26
3.1.4.3	Vadose Zone Soil Analytical Results	26
3.1.4.4	Saturated Zone Soil Analytical Results	27
3.1.4.5	Vertical Aquifer Profile Groundwater Analytical Results	27
3.1.4.6	Groundwater Analytical Result	29
3.2	Upgradient Northern Perimeter Investigation Findings	29
3.2.1	Lithology	29

3.2.2	Vertical Aquifer Profile Groundwater Analytical Results	29
3.2.3	Groundwater Analytical Results	31
3.3	Process Sump Area Investigation Findings	31
3.3.1	Lithology	31
3.3.2	Hydraulic Testing Results	33
3.3.3	Vadose Zone Soil Analytical Results	33
3.3.4	Saturated Zone Soil Analytical Results	33
3.3.5	Vertical Aquifer Profile Groundwater Analytical Results	34
3.3.6	Groundwater Analytical Results	36
4.	Conclusions	37
4.1	Secondary Source Area	37
4.2	Upgradient Northern Perimeter	38
4.3	Process Sump Area	38
5.	References	40
Tables		
1	Summary of Secondary Source Area Soil Sample Results	
2	Secondary Source Area Vertical Aquifer Profile Groundwater Sample Results	
3	Pre-Design Investigation Estimated Hydraulic Conductivity Values	
4	Pre-Design Investigation Pneumatic Slug Test Results Summary	
5	Summary of Groundwater Analytical Results	
6	Upgradient Northern Perimeter Vertical Aquifer Profile Groundwater Sample Results	
7	Process Sump Area Vadose Zone Soil Sample Results	
8	Process Sump Area Saturated Zone Soil Sample Results	
9	Process Sump Area Vertical Aquifer Profile Groundwater Sample Results	

Figures

- 1 Site Layout
- 2 Pre-Design Investigation Areas
- 3 Box Sewer Investigation Results
- 4 Historic Fill Area Investigation Results
- 5 West Tank Farm Investigation Results
- 6 Former Building 21 Area Investigation Results
- 7 Upgradient Northern Perimeter Investigation Results
- 8 Process Sump Area Investigation Results
- 9 Groundwater Analytical Results
- 10 Process Sump Area Cross Section Layout
- 11 Process Sump Area Cross Section A-A'
- 12 Process Sump Area Cross Section B-B'
- 13 Process Sump Area Cross Section C-C'

Attachments

- F-1 Pneumatic Slug Test Solutions
- F-2 Soil Boring Logs
- F-3 Groundwater Sampling Logs

AOC	Administrative Order on Consent
AOI	Area of Interest
bls	below land surface
cis-1,2-DCE	cis-1,2-dichloroethene
ft.	feet
ft./day	feet per day
GM Corporation	General Motors Corporation
gpm	gallons per minute
MCLs	Maximum Contaminant Levels
MLC	Motors Liquidation Company
msl	mean sea level
PCE	tetrachloroethene
PID	photo-ionization detector
PVC	poly-vinyl chloride
QA/QC	quality assurance and quality control
QAPP	Quality Assurance Project Plan
RACER Trust	Revitalizing Auto Communities Environmental Response Trust
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
Site	Moraine Facilities
TCE	trichloroethene
trans-1,2-DCE	trans-1,2-dichloroethene
U.S. EPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane

1. Introduction

This *Pre-Design Investigation Summary Report* (Appendix F to the *Corrective Measures Proposal*) and associated field work were completed in accordance with *Pre-Design Investigation Work Plan* (Work Plan) dated April 26, 2012 (ARCADIS, Inc. 2012) and subsequent *Pre-Design Investigation Work Plan Addendum* (Work Plan Addendum) dated August 22, 2012 (RACER Trust 2012) at the former General Motors Facilities (Site) in Moraine, Ohio. The Work Plan and Work Plan Addendum were approved by the United States Environmental Protection Agency (U.S. EPA) on June 1, 2012 and August 31, 2012, respectively. As discussed during meetings between the U.S. EPA and Revitalizing Auto Communities Environmental Response Trust (RACER Trust), a series of focused pre-design investigations were conducted prior to full-scale implementation of the final proposed remedy. The Site includes the former Delphi Harrison Thermal Systems Moraine Plant (former Delphi Thermal Moraine), former General Motors Powertrain Group, Moraine Engine Plant (former Moraine Engine), and former General Motors Truck Group, and Moraine Assembly Plant (former Moraine Assembly) (Figure 1).

Field work commenced in accordance with the Work Plan on June 26, 2012 and was completed by September 27, 2012. Field work associated with the Work Plan Addendum was completed in conjunction with the original Work Plan and commenced on September 7, 2012 and was completed by September 27, 2012. The Pre-Design Investigation work was completed at three main investigation areas including the Secondary Source Areas (Box Sewer, Historic Fill Area, West Tank Farm, and former Building 21 Area), upgradient Northern Perimeter, and the Process Sump Area (Area of Interest [AOI] 26). The Site and investigation area locations are depicted on Figure 2.

1.1 Site Description and History

The RACER Trust Moraine Facilities have been used for industrial purposes since the property was acquired in the mid-1920s by former General Motors Corporation (GM Corporation). The former Moraine Engine and Moraine Assembly facilities occupy approximately 239 acres, while the adjacent former Delphi Thermal Moraine facility occupies approximately 124 acres. The facilities are located in the City of Moraine in Montgomery County in southwestern Ohio. A small portion of the Moraine Assembly facility is located in the City of Kettering. Figure 1 shows the location of each facility, property boundaries, and site features.

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

Frigidaire (a former division of former GM Corporation) produced appliances at the Site from the late 1920's until former GM Corporation announced the shutdown of all Frigidaire operations in January 1979. During 1980 and 1981, the majority of the former Frigidaire Plant 2 was converted to the former Moraine Engine facility, and the former Frigidaire Plant 3 and the northeast corner of former Frigidaire Plant 2 were converted to the Moraine Assembly facility. Since 1981, former Moraine Engine operations have included the machining, painting (this operation was discontinued in September 1995), and assembly of diesel truck engines. Operations at the former Moraine Engine facility ceased in the fall of 2000. The plant building has been decommissioned and demolished, and the majority of this Site has been covered with a parking surface. Former GM Corporation operated a regional haulaway at the location of the former Moraine Engine Plant, which was referred to as the Vehicle Distribution Center until December 2008 when operations ceased.

Since 1981, Moraine Assembly operations included the manufacture, assembly, and painting of small trucks and later sport utility vehicles. Operations at the former Moraine Assembly ceased in December 2008.

Former Delphi Thermal Moraine's major operations, which began in 1941, included the machining and assembly of automotive air conditioning compressors, accumulator dehydrators, and miscellaneous air conditioning valves. Operations at the former Delphi Thermal Moraine Building 14 ceased in September 2003 and the building was decommissioned. Demolition of Building 14 was completed in 2005.

On June 1, 2009, former GM Corporation and certain subsidiaries filed voluntary petitions for relief under Chapter 11 of the Bankruptcy Code. An order was entered approving the sale of substantially all of former GM Corporation's assets to a new and independent company (now known as General Motors Company, LLC) under Section 363 of the Bankruptcy Code on June 5, 2009. The sale closed on July 10, 2009. At that time, former GM Corporation changed its name to Motors Liquidation Company (MLC). RACER Trust was established on March 31, 2011 by a federal bankruptcy court to own, manage, remediate and revitalize the properties from the 2009 former GM Corporation bankruptcy.

On June 30, 2011, RACER Trust sold former Delphi Thermal Moraine, former Moraine Engine Plant, and former Moraine Assembly Plant to IRG Moraine, LLC. As part of the property transfer, RACER Trust retained environmental liability for these properties.

The closed South Settling Lagoon was not included in this property transaction. The closed South Settling Lagoon was retained by RACER Properties, LLC.

On September 29, 2011, the Administrative Order on Consent (AOC) for the Site was fully executed proceeding under Section 3008(h) of the Resource Conservation and Recovery Act, as amended, 42 U.S. C. Section 6928(h), U.S. EPA Docket No: RCRA-05-2011-0016. The performance-based AOC covers corrective action for past releases of hazardous contaminants at or from the Site.

1.2 Pre-Design Investigation Objectives

The pre-design investigations were completed to meet the following technical approaches and objectives in support of the final remedy:

- A focused soil and groundwater investigation was conducted at the Box Sewer, Historic Fill Area, West Tank Farm, and the former Building 21 Area secondary source areas to determine if the areas are contributing to groundwater contamination in the upper aquifer (Figure 2). In addition, a focused and limited groundwater chemistry and hydrogeology investigation was completed in the lower aquifer at the West Tank Farm and the former Building 21 investigation areas to assess the presence or absence of till unit(s) and determine the nature and extent of contamination in the lower aquifer.
- Groundwater quality and plume boundaries have been extensively studied; however, the upgradient off-site groundwater quality located to the north of the Site had not been vertically delineated. Upgradient Northern Perimeter boundary borings were completed to provide further understanding of the geometry (horizontal/vertical) of the upgradient off-site plume near wells HR-9/HR-10.
- A focused soil and groundwater investigation was conducted at the Process Sump Area to evaluate the nature and extent of contamination in both the upper and lower aquifers, confirm the presence or absence of till unit(s), and refine the dimensions of the process sump treatment area.

1.3 Document Organization

The remainder of this document is organized into the following sections:

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

- Section 2 – Field Investigation Summary, describes the methods used to complete pre-design investigation activities and summarizes the activities completed at each investigation area.
- Section 3 – Investigation Findings, describes the findings at each investigation area.
- Section 4 - Conclusions, summarizes the conclusions of each investigation area.
- Section 5 – References, lists documents used in preparation of this Summary Report.

2. Field Investigation Summary

The field activities for the Pre-Design Investigation were completed between June 26, 2012 and September 27, 2012. The following sections describe in more detail the field methods that were utilized at the Box Sewer, Historic Fill Area, West Tank Farm, and the former Building 21 Area secondary source areas, upgradient Northern Perimeter, and the Process Sump Area as well as a summary of the activities completed at each investigation area. Any deviations to the methods presented in Section 2.1 are described in each investigation area's summary section (Sections 2.2 through 2.4).

2.1 Field Methodology

The following sections present the methods utilized to complete the pre-design investigations. Field work was completed in accordance with standard operating procedures as presented in the Work Plan, and utilized sonic drilling and sampling techniques to characterize soil (except at the Northern Perimeter), groundwater (vertical aquifer profile sampling), and stratigraphy data.

2.1.1 Health and Safety

All field work was completed following the procedures identified in the site-specific Health and Safety Plan.

2.1.2 Utility Clearance

Prior to the installation of the soil borings, underground utilities were cleared and locations were surveyed for any overhead utilities. Utilities were cleared following the ARCADIS Utility Location Policy and Procedures. ARCADIS contacted the Ohio Utility Protection Service, reviewed available facility utility drawings, used facility employee knowledge, and conducted a detailed visual site inspection prior to penetrating the ground surface. As necessary, invasive utility clearance procedures were completed, including hydro excavation of each boring to an approximate depth of 8 to 10 feet (ft.) below land surface (bls). At two locations hand augering was utilized to clear the boring.

2.1.3 Vertical Aquifer Profile Sampling

Vertical aquifer profile sampling consisted of collecting groundwater samples at discrete intervals during the advancement of a boring. As soil borings were advanced,

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

groundwater was sampled using a temporary well screen. The sonic drilling techniques required the use of potable water from Montgomery County as a drilling fluid and fluorescein dye was added to the drilling fluid to act as a tracer. Drilling fluids, if used during the drilling process, were removed prior to the collection of a groundwater sample. A groundwater sample was collected at target intervals:

- The water table – first encountered groundwater,
- The basal portion of the upper aquifer above the upper clay till, if encountered,
- The upper portion of the upper aquifer just below the upper clay till, if encountered, and
- The basal portion of the upper aquifer above the regional clay till, if encountered.

At locations where soil borings extended through the regional clay till, to the lower aquifer, additional groundwater samples were collected at target intervals:

- The upper portion of the lower aquifer just below the regional clay till, and
- The terminus of the borehole at a minimum of 100 ft. bls

Additional samples were collected on a nominal 10-ft. interval for vertical resolution of the plume in thicker permeable units.

Sonic drilling methods were utilized; therefore, vertical aquifer profile sampling consisted of installation of a temporary well screen and casing at a specific depth interval following procedures outlined in the Work Plan. A pump equipped with a sampling port was used to extract the groundwater. To verify drilling fluids, if used, were removed before sampling, fluorescein dye was added to the drilling fluid during drilling to act as a qualitative tracer. During purging, the mixture of drilling water and groundwater was compared to visual standards to allow for a quick and accurate determination of drilling fluid recovery. In addition, the purge water was field analyzed for the concentration of fluorescein using a fluorometer to determine proper recovery of the drilling fluid. Sample collection proceeded when greater than 95 % of the drilling fluid was removed. After the removal of the drilling fluid (if used), the pumping rate was lowered as low as possible to a constant rate. Once the pumping rate was constant, a sample was collected using low-flow sampling techniques following procedures outlined in the Work Plan.

Groundwater samples were contained in 40 milliliter volatile organic analysis vials preserved with hydrochloric acid and analyzed for site-specific volatile organic compounds (VOCs) using U.S. EPA Method 8260B including 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), benzene, cis-1,2-dichloroethene (cis-1,2-DCE), ethylbenzene, tetrachloroethene (PCE), toluene, trans-1,2-dichloroethene (trans-1,2-DCE), trichloroethene (TCE), vinyl chloride, and xylenes. Each sample container was labeled by location, sample depth, date, and time. Samples were placed in a cooler with ice under chain-of-custody control following procedures outlined in the Work Plan.

2.1.4 Hydraulic Testing

Hydraulic testing was completed at several locations over discreet intervals to estimate hydraulic conductivity of the upper aquifer using two basic methodologies (steady-state drawdown and pneumatic slug testing). This testing was also completed at one location in the lower aquifer. All tests were completed in accordance with procedures outlined in the Work Plan.

2.1.4.1 *Steady-State Drawdown Testing*

Steady-state drawdown tests were conducted at select locations during the Pre-Design Investigation by pumping the temporary well point deployed for vertical aquifer profile sampling at two low-stress discharge rates. The first flow rate was termed the “high” flow rate and generally ranged between 5.7 to 9 gallons per minute (gpm) and this rate corresponded to the vertical aquifer profile interval purge (i.e., developing the well interval and purging drilling fluids). Purging at a constant discharge rate continued until drawdown in the well point stabilized (and drilling fluids were effectively removed from the surrounding formation). Water levels within the well point during purging were monitored using a pressure transducer programmed to record at one-second intervals. The pressure transducer recorded the water level response within the well point during purging and the subsequent water-level recovery after pumping stopped. Estimated steady-state drawdown was calculated from the pre-test static water level in the well point; however, in some cases, due to noise associated with the start of pumping and well development impacts, the static water level achieved after recovery was used to estimate the stabilized drawdown.

The second flow rate was termed the “low” flow rate and generally ranged between 0.3 to 1.1 gpm and this rate corresponded to the low-flow groundwater sampling of the vertical aquifer profile interval. The “low” flow rate testing was performed using the

same approach that was used during the “high” flow rate testing—pumped until drawdown stabilized (steady-state conditions) followed by subsequent recovery of water levels. Water-level monitoring was also performed in the same manner as the “high” flow rate testing (via pressure transducer). The final, steady-state drawdown for the “low” flow rate testing was calculated from the initial (pre-test) static water level.

Start and stop times, flow rates, and flow rate adjustment times were monitored and recorded for each test. At the end of each test, water-level data was downloaded from the pressure transducer to a field laptop computer, reviewed for data quality, and then analyzed to provide near-well aquifer parameter estimates (i.e., hydraulic conductivity).

Results from the steady-state drawdown testing were analyzed using two methods—one applicable to the “high” flow rate testing and one applicable to the “low” flow rate testing. Results from the “low” flow rate tests were analyzed using a methodology presented by Robbins et al. (2009) for estimating hydraulic conductivity during low-flow sampling. Results from the “high” flow rate tests were analyzed using two different approximation techniques based on the specific capacity of a well. These estimation techniques were developed by Driscoll (1986) and by Neville (2007) based on the Cooper-Jacob (1946) solution and Theis (1935) solution, respectively.

2.1.4.2 Pneumatic Slug Test

Pneumatic slug tests were completed after the collection of select groundwater samples during the Pre-Design Investigation. Pneumatic slug tests were conducted by sealing the well head and applying air pressure to displace the water level. The air pressure acted like a slug to displace water for the hydraulic test. As air pressure was increased in the well, the water level fell until the water pressure and the air pressure returned to equilibrium. After the water level was stable, air was released from the sealed well head by opening an air release valve. The water level recovery was a rising head test that produces high quality data with little interference. A pressure transducer was used to monitor and record the change of the water level in the well during the pneumatic slug test.

To determine hydraulic conductivity estimates from the pneumatic slug testing, the collected data was analyzed using AQTESOLV™ for Windows Pro 4.5. The primary solutions utilized to match the observed pneumatic slug test data were the Bouwer-Rice Solution (1976), the Hyder et. al. (KGS Model) Solution (1994), and the Hvorslev Solution (1951).

- The Bouwer-Rice Solution (1976) is a straight-line solution for a single-well slug test in an unconfined or confined aquifer with a partially or fully penetrating well.
- The Hyder et. al. (KGS Model) Solution (1994) is a full transient solution for a single-well slug test in an unconfined or confined aquifer with a partially or fully penetrating well.
- The Hvorslev Unconfined Solution (1951) is a straight-line solution for a single-well slug test in an unconfined or confined aquifer with a partially or fully penetrating well.

When considering the various solutions used, the geometric mean was taken to estimate the hydraulic conductivities from the specific intervals. Much of the range in estimated hydraulic conductivities is due to the heterogeneous nature of the deposits. The AQTESOLV™ reports are included in Attachment F-1.

Duplicate interval testing with the steady-state drawdown tests was used to verify the result of the steady-state hydraulic conductivity estimates. The agreements between average hydraulic conductivity results of the steady-state drawdown testing and pneumatic slug tests were acceptable.

2.1.5 Soil Boring Advancements

Soil samples were continuously collected for lithologic descriptions during soil boring advancement. When penetrating a competent confining unit (i.e., upper clay till and or regional clay till), the soil boring was cased into the unit approximately 2 ft., if thickness allowed, to prevent communication between aquifers during drilling. Upon retrieval of each soil core in the field, soils were examined for VOCs using a photo-ionization detector (PID) and for soil classification based on the Udden-Wentworth grain size scale. The soil descriptions, including United Soils Classification System classification, grain size distribution, sorting, moisture content, consistency/density, color, and PID readings were recorded on field boring logs. Soil boring logs are included in Attachment F-2.

2.1.6 Soil Sampling Activities

Soil samples exhibiting visual staining, the highest PID reading, and/or located above groundwater saturation were submitted for laboratory analysis of site-specific VOCs using U.S. EPA Method 8260B. Soil samples were collected in soil jars rather than En

Core[®] samplers due to the heterogeneity of the material encountered (i.e., coarse geology). Additionally, any interval exhibiting visual staining and/or elevated PID readings (>100 parts per million VOCs) was field screened for non-aqueous phase liquid using a hydrophobic dye test and following procedures outlined in the Work Plan.

2.1.7 Monitoring Well Installation

Soil borings advanced into the lower aquifer and converted to monitoring wells were constructed of 2-inch diameter Schedule-40 poly-vinyl chloride (PVC) with 10-slot PVC screens 10 ft. in length. Screen length and depth were determined from vertical aquifer profile sampling results and lithologic relationships (i.e., just below the regional clay till). Wells were installed using sonic drilling methods following procedures outlined in the Work Plan. During installation, after the well screen and sand pack were in place, each well was pre-developed to allow proper placement of the filter pack around the well screen. Wells were completed with either a flush mount well vault or lockable stickup with a concrete pad. Once installed, the monitoring wells were developed by method of surge and volumetric purge following procedures outlined in the Work Plan. Each well was sampled using low-flow methodology for site-specific VOCs using U.S. EPA Method 8260B. Field parameters including pH, specific conductance, temperature, oxidation/reduction potential, and dissolved oxygen were measured during purging of each well using a multi-parameter flow-through cell. The low-flow groundwater sampling logs are included in Attachment F-3.

2.1.8 Decontamination Procedures

Between drilling locations, drilling equipment was decontaminated in a temporary decontamination pad using a high-pressure washer following procedures outlined in the Work Plan. Also, all non-dedicated reusable sampling equipment was decontaminated following procedures outlined in the Work Plan.

2.1.9 Soil Boring Abandonment

Following completion of a soil boring, borings not converted into monitoring wells were backfilled using cement/bentonite grout mixture using the tremie method following procedures discussed in the Work Plan. The cement/bentonite mixture was tremie grouted from the bottom of the borehole to the surface to seal the boring.

2.1.10 Investigative Derived Waste Management

A designated staging area was assigned in a secure area for drilling equipment, materials, and investigative derived waste (soil cuttings). In addition, a decontamination area for drilling equipment was constructed in the same area. Each drum or roll-off container was properly labeled with pending analysis waste label containing the type of waste (i.e., soil), sample designations for the contents contained, the generator information, soil boring number, and accumulation start and end dates. Once the materials were characterized and considered non-hazardous, the containers were labeled as non-hazardous. All investigative derived waste was properly disposed off-site.

2.1.11 Laboratory Analysis

All samples collected for the Pre-Design Investigation were submitted to TestAmerica Laboratories in North Canton, Ohio for analysis of site-specific VOCs by U.S. EPA Method 8260B. The samples were submitted under a chain-of-custody and shipped or delivered directly to the laboratory by the field personnel. Laboratory methodology and quality assurance and quality control (QA/QC) information presented in the amended Quality Assurance Project Plan (QAPP) (amended QAPP) (ARCADIS, Inc. 2011) were followed during this investigation. Additional samples (duplicates – 1 per 20 samples, equipment blanks – 1 per 20 samples, and matrix spike/matrix spike duplicate – 1 per 20 samples) for all non-screening type samples were collected and trip blanks added for QA/QC requirements. Additionally, after implementation of the field methodologies described in Section 2 and based on the validated analytical results including QA/QC results, it was determined that the data quality objectives were met, and the data were acceptable for use in the *Corrective Measures Proposal*.

2.1.12 Surveying

All soil boring and monitoring well locations completed during this investigation were surveyed for latitude, longitude, and surface elevation above mean sea level (msl) by a professional surveyor licensed in the State of Ohio. In addition, the top of casing at each monitoring well was surveyed for elevation above msl to serve as a reference point for water level measurements.

2.2 Secondary Source Area Investigation Summary

The Box Sewer, Historic Fill Area, West Tank Farm, and former Building 21 Area have a potential to be a source of site-specific VOCs on-site. For this reason, a focused soil and groundwater investigation was completed at each area to evaluate the relative contribution of site-specific VOCs to groundwater. A description of each area and an investigation summary are presented in the following sections. The current understanding of these areas as they relate to the Site is further discussed in Section 2.7 of the *Corrective Measures Proposal*.

2.2.1 Box Sewer

The Box Sewer is located to the west of Springboro Road and runs parallel to the former east wall of Plants 2 and 3 and is approximately 2,300 linear ft. in length, 9 ft. in width, and 10 ft. high (Figure 3). The top of the Box Sewer is at grade and the bottom of the Box Sewer is 10 ft. below grade. The Box Sewer was used by Frigidaire to convey process water before former GM Corporation converted Frigidaire Plants 2 and 3 into the Moraine Engine and Moraine Assembly facilities in 1979 to 1980. Prior to and as part of the conversion, all process waste connections to the Box Sewer were terminated. Subsequently, only storm water runoff from paved areas and roof drains and non-contact cooling water entered the Box Sewer. Currently, only stormwater runoff enters the Box Sewer. Flow exiting the Box Sewer enters a 54-inch diameter storm sewer that flows west to a stormwater retention basin located at the former Delphi Thermal Moraine facility, which is part of the Storm Water Management System for the Site. All solids were removed from the Box Sewer between June and July 2001 as part of Moraine Engine decommissioning activities. A previous investigation was completed in November 2001 to characterize soil conditions adjacent to the Box Sewer; however, groundwater was not characterized as part of that investigation (ARCADIS, Inc. 2002).

The field investigation at the Box Sewer was completed August 9 through August 14, 2012. A total of three soil borings (BOX-1, BOX-2, and BOX-4) were advanced adjacent to the Box Sewer through the upper aquifer and into the regional clay till unit (Figure 3). Field activities including borehole advancement and vertical aquifer profile groundwater, hydraulic testing, and soil sampling were completed in accordance with the methods outlined in Section 2.1. Initially, the Work Plan proposed four soil borings adjacent to the Box Sewer; however, during the initial advancement of boring BOX-3, refusal was encountered due to a steel obstruction at about 7.5 ft. bls. At that time, the borehole was abandoned and the drilling crew

moved on to the next location. After discussion with the U.S. EPA, it was concluded the Box Sewer area had been sufficiently characterized between BOX-2 and BOX-4 after successful collection of analytical data from each of the completed soil borings and it was not warranted to complete BOX-3 due to its close proximity to BOX-2 (Figure 3). Soil boring logs associated with the Box Sewer investigation can be found in Attachment F-2.

2.2.2 Historic Fill Area

The Historic Fill Area is located north of the historic extension of Stroop Road between Springboro Road and the current railroad tracks operated by Norfolk Southern (Figure 4). This area was undeveloped prior to the expansion of the former Frigidaire Plant 2 in the 1940s. This expansion cut off Stroop Road at Springboro Road. In 1979, the former Frigidaire Plant 2 was decommissioned and converted from 1980 to 1981 to the former Moraine Engine Plant 2 and 3 (Building 2). In 2001, Building 2 was demolished, repaved, and was most recently part of the Vehicle Distribution Center until December 2008 when operations ceased.

A historic aerial photograph of the former Frigidaire Plant 2, which is dated to be approximately pre-1938 based on other visible Site features, shows an area receiving fill with a dirt road entering the area (ARCADIS, Inc. 2012). Fill has presumably been added west of this area to bring the railroad track and railroad spur which enters Plant 2 to the north up to grade. A small historic building, possibly a pole-barn, was located northeast of the intersection of the railroad spur and Stroop Road and south of the Historic Fill Area. It is currently unknown what materials may have been managed in the fill area. No releases were documented or historic environmental investigations completed at the Historic Fill Area. The Historic Fill Area is located to the south of and is downgradient from the former Oil House Area which has been identified as a source area at the Site.

The field investigation at the Historic Fill Area was completed from August 7 through August 11, 2012. A total of three soil borings (HFA-1, HFA-2, and HFA-3) were advanced at various locations within the Historic Fill Area through the upper aquifer to or just above the regional clay till unit (Figure 4). Field activities including borehole advancement and vertical aquifer profile groundwater and soil sampling were completed in accordance with the methods outlined in Section 2.1. Soil boring HFA-3 was not advanced into the regional clay till unit but instead terminated just above the clay till unit. After retrieval of the last soil sample from the soil boring, a sheen attributed to hydraulic oil from the drill rig developed on the outside of the core barrel.

The tooling was taken to the decontamination pad where it was decontaminated thoroughly. Because the soil boring had been advanced deeper than the regional clay till unit encountered at HFA-1 and HFA-2, it was assumed the soil boring was close to the regional clay till unit; therefore, the drilling crew did not return to the borehole to advance the soil boring to the regional clay till unit. Soil boring logs associated with the Historic Fill Area investigation can be found in Attachment F-2.

2.2.3 West Tank Farm

The former West Tank Farm was located on the west side of the former Delphi Thermal Building 14 (Figure 5). The former tank farm was closed under the Ohio EPA Resource Conservation and Recovery Act (RCRA) closure. Closure activities under the Bureau of Underground Storage Tank Regulations were performed and the former West Tank Farm was identified as a solid waste management unit and investigated in the Delphi Thermal Moraine RCRA Facility Investigation (RFI). As part of closure activities, all of the tanks, including RCRA tanks formerly containing PCE were excavated and removed from the West Tank Farm and all of the excavations were backfilled with clean soil in the early 1990's. During the excavation of the PCE tanks, sheet piling was installed surrounding the perimeter of the primary West Tank Farm excavation, which was approximately 21 ft. by 21 ft. The piling was driven to a depth of approximately 34 ft. bls and soil was removed to a depth where groundwater was encountered (27 ft. bls). Outside the sheet piling, soil was excavated to an average depth of 14 ft. bls (which corresponded to the original tank depth). Following the excavation, several investigations were completed to further characterize soil conditions within the vicinity of the former West Tank Farm including Preliminary Closure Assessment of Still Room Perchloroethene Tanks (Geraghty & Miller, Inc. 1991a), Supplemental Soil Sampling and Analysis, Former Still Room Perchloroethene Tank Excavation (Geraghty & Miller, Inc. 1991b), Site Investigation near Underground Product Piping for Quaker 568 Microgrind Coolant (Geraghty & Miller, Inc. 1991c), the Description of Current Conditions (Geraghty & Miller, Inc. 1991d) dated 1991, RFI Report dated 2000 (ARCADIS Geraghty & Miller, Inc. 2000), and the Building 14 investigation dated 2005 (ARCADIS Inc. 2005).

The drilling portion of the field investigation at the West Tank Farm was completed from September 4 through September 17, 2012. A total of three soil borings (WTANKF-1, WTANKF-2, and WTANKF-4) were advanced at various locations within and around the former West Tank Farm through the upper aquifer to the regional clay till unit (Figure 5). One soil boring (WTANKF-3) was advanced through the regional clay till unit into the lower aquifer. At this location, a monitoring well was

installed (RMW-87) in the lower aquifer with the screen set from 67 to 77 ft. bls. This well was sampled on September 26, 2012. Field activities including borehole advancement, monitoring well installation and development, vertical aquifer profile and low-flow groundwater sampling, hydraulic testing, and soil sampling were completed in accordance with methods outlined in Section 2.1. Soil boring and low-flow groundwater sampling logs associated with the West Tank Farm investigation can be found in Attachments F-2 and F-3, respectively.

2.2.4 Former Building 21 Area

Former Building 21 was located south of former Building 14 (Figure 6). Based on a review of historic aerial photographs, Building 21 was present during the time period from approximately the late 1940's to 1996 when the building was demolished. No releases were documented or historical environmental investigations completed at the former Building 21 Area.

The field investigation at the former Building 21 Area was completed from August 15 through August 24, 2012. A total of three soil borings (BLDG21-2, BLDG21-3, and BLDG21-4) were advanced at various locations within and around the former Building 21 footprint through the upper aquifer to the regional clay till unit (Figure 6). One soil boring (BLDG21-1) was advanced through the regional clay till unit into the lower aquifer. At this location a monitoring well was installed (RMW-86) in the lower aquifer with the screen set from 70 to 80 ft. bls. This well was sampled on September 26, 2012. Field activities including borehole advancement, monitoring well installation and development, vertical aquifer profile and low-flow groundwater sampling, hydraulic testing, and soil sampling were completed following the methods outlined in Section 2.1. Soil boring and low-flow groundwater sampling logs associated with the former Building 21 Area investigation can be found in Attachments F-2 and F-3, respectively.

2.3 Upgradient Northern Perimeter Investigation Summary

The upgradient portion of the Site includes the southeastern perimeter of the former West Haulaway now occupied by DMAX Engine Plant (currently owned by General Motors Company LLC) at the northwest end of the Site and the former East Hallaway at the northeast end of the Site. A focused groundwater investigation was completed to refine the lithologic data and upgradient groundwater chemistry. The current understanding of off-site, upgradient groundwater quality as it relates to the Site is discussed in Section 2.7 in the *Corrective Measures Proposal*.

The original Work Plan proposed placement of two of the soil borings (NP-1 and NP-2) on an off-site property to the north of the facility near existing monitoring wells HR-9 and HR-10; however, due to property access issues, new locations for soil borings NP-1 and NP-2 were proposed to the U.S. EPA in the Work Plan Addendum. Upon approval of the Work Plan Addendum, the soil boring locations were moved to the upgradient portion of the IRG Moraine, LLC property south of the drainage ditch (Figure 7).

The field investigation at the upgradient Northern Perimeter was completed from July 10 through July 12, 2012 and September 7 through September 18, 2012. A total of three soil borings (NP-1, NP-2, and NP-3) were advanced at various locations along the northern perimeter through the regional clay till unit, where present, and into the lower aquifer (Figure 7). As described above, the locations of two of these soil borings were modified from the Work Plan due to access issues. One soil boring (NP-2) was converted into a lower aquifer monitoring well (RMW-88) and the screen was set from 90 to 100 ft. bls. This well was sampled on September 26, 2012. Field activities including borehole advancement, monitoring well installation and development, and vertical aquifer profile and low-flow groundwater sampling were completed following methods outlined in Section 2.1. During advancement of soil boring NP-3, a vertical aquifer profile sample was not collected at 100 ft. bls as indicated in the Work Plan due to the volume of samples already collected from the upper and lower aquifer at this location. The deepest vertical aquifer profile sample interval collected at NP-3 was from 85 to 90 ft. bls. Soil boring and low-flow groundwater sampling logs associated with the Northern Perimeter investigation can be found in Attachments F-2 and F-3, respectively.

2.4 Process Sump Area Investigation Summary

The former Moraine Assembly Plant was initially constructed in 1952 (as part of Frigidaire) with expansions in 1979, 1997 to 1998, and 2000 to 2001. The building is located north of Stroop Road and east of Springboro Road (Figure 8). The concrete lined below-grade Process Sump Area is located in the southwest corner of the former Moraine Assembly Plant and was used to collect and process wastewater. A focused soil and groundwater investigation was completed to evaluate whether the Process Sump Area has the potential to be a source of site-specific VOCs. The area was identified during the Supplemental DOCC (Geraghty & Miller, Inc. 1997) and referred to as AOI 26. The current understanding of this area as it relates to the Site is further discussed in Section 2.7 of the *Corrective Measures Proposal*.

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

The field investigation at the Process Sump Area was completed from July 12 through August 7, 2012 and August 27 through August 28, 2012. A total of eight soil borings (PSA-1 through PSA-4 and PSA-7 through PSA-10) were advanced around the perimeter of the Process Sump Area through the upper aquifer to the regional clay till unit (Figure 8). Two soil borings (PSA-5 and PSA-6) were advanced through the regional clay till unit into the lower aquifer. At PSA-5, a monitoring well was installed (RMW-85) in the lower aquifer from 85 to 95 ft. bls. This well was sampled on September 26, 2012. At several intervals at multiple soil boring locations within the upper aquifer at the Process Sump Area, an attempt was made to collect a vertical aquifer profile groundwater sample; however, the saturated formation where the sample interval was screened would not readily produce groundwater. Therefore, a saturated soil sample was collected and submitted to the laboratory for analysis for site-specific VOCs. Field activities including borehole advancement, monitoring well installation and development, vertical aquifer profile and low-flow groundwater sampling, hydraulic testing, and soil sampling were completed following methods outlined in Section 2.1. Soil boring and low-flow groundwater sampling logs associated with the Process Sump Area investigation can be found in Attachments F-2 and F-3, respectively.

3. Investigation Findings

The Pre-Design Investigation was completed at three main investigation areas including the Secondary Source Areas, upgradient Northern Perimeter, and the Process Sump Area. The following sections describe in detail the findings at each investigation area.

3.1 Secondary Source Area Investigation Findings

This section includes discussion of lithology, soil analytical results, and groundwater analytical results at each Secondary Source Area including the Box Sewer, Historic Fill Area, West Tank Farm, and former Building 21 Area.

3.1.1 Box Sewer

The lithology, soil analytical results, and groundwater analytical results for the Box Sewer are discussed in detail in the following sections. Soil and groundwater analytical results are presented in Tables 1 and 2, respectively, and on Figure 3.

3.1.1.1 Lithology

All three soil borings (BOX-1, BOX-2, and BOX-4) completed adjacent to the Box Sewer were advanced through the upper aquifer into the regional clay till unit. Soil boring BOX-1 was advanced to a depth of 60 ft. bls and the regional clay till unit was encountered at 54.5 ft. bls. At this location, the upper aquifer consists predominantly of silty sand with interbedded silt or sand layers. A shallower silty clay unit was encountered at 42.5 ft. bls and was 1.5 ft. thick. Soil boring BOX-2 was advanced to 58 ft. bls and the regional clay till unit was encountered at 51 ft. bls. The upper aquifer at BOX-2 was similar lithologically to BOX-1; however, there were two shallower silty clay units that were encountered at BOX-2. There was a thin stratum of clay from 14 to 16 ft. bls and from 24 to 35 ft. bls the upper clay till unit was encountered. Soil boring BOX-4 was advanced to 65 ft. bls, 25 ft. into the regional clay till unit. The upper aquifer at this location consisted primarily of silty sand with a shallow stratum of silty clay from 14 to 15.5 ft. bls. Soil boring logs are included in Attachment F-2.

3.1.1.2 Hydraulic Testing Results

Steady-state drawdown testing was completed at four discrete intervals at the Box Sewer including BOX-1(26-31 ft.), BOX-1(38-43 ft.), BOX-1(49-54 ft.), and BOX-2(40-

45 ft.). Results from each individual hydraulic test are included in Table 3. In addition to the steady-state drawdown test, a pneumatic slug test was completed at BOX-1(38-43 ft.) and BOX-1(49-54 ft.) and results are presented in Table 4. The average estimated hydraulic conductivity for the upper aquifer at the Box Sewer was 402 feet per day (ft./day).

3.1.1.3 Vadose Zone Soil Analytical Results

At each of the soil boring locations at the Box Sewer, one soil sample was collected in the vadose zone biased towards the interval with the highest PID reading. Detected VOC compounds in sample BOX-1(14-16 ft.) were ethylbenzene, PCE, and xylenes. Concentrations of ethylbenzene, PCE, toluene, and TCE were detected at soil sample BOX-2(16-18 ft.). Sample BOX-4(28-30 ft.) had detected concentrations of ethylbenzene and toluene. Of the three soil samples, the highest ethylbenzene concentration was 2.5J micrograms per kilogram ($\mu\text{g}/\text{kg}$) at BOX-1(14-16 ft.); the highest PCE concentration was 13 $\mu\text{g}/\text{kg}$ at BOX-2(16-18 ft.); the highest toluene concentration was 0.83J $\mu\text{g}/\text{kg}$ at BOX-4(28-30 ft.); the only detected TCE concentration was 0.50J $\mu\text{g}/\text{kg}$ at BOX-2(16-18 ft.); and the only detected xylene concentration was 6.1J $\mu\text{g}/\text{kg}$ at BOX-1(14-16 ft.). Results from the previous investigation at the Box Sewer indicated PCE and TCE concentrations as high as 2,400 and 400 $\mu\text{g}/\text{kg}$, respectively (ARCADIS, Inc. 2002). Soil analytical results for the Box Sewer are included in Table 1 and on Figure 3.

3.1.1.4 Vertical Aquifer Profile Groundwater Analytical Results

Vertical aquifer profile groundwater samples were collected at each Box Sewer soil boring location. As indicated in Section 2.1.3, sample intervals, depths, and frequency were determined by the depth of initial groundwater saturation, the presence or absence of an upper clay till, and the depth of the regional clay till unit. At soil boring BOX-1, three vertical aquifer profile samples were collected at intervals 26 to 31, 38 to 43, and 49 to 54 ft. bls. At soil boring BOX-2, three vertical aquifer profile samples were collected at intervals 24 to 29, 40 to 45, and 46 to 51 ft. bls. At soil boring BOX-4, only one vertical aquifer profile sample was collected at interval 30 to 35 ft. bls due to the thicknesses of both the upper and regional clay till units. The following VOCs were detected at one or more of the sample intervals:

- 1,1,1-TCA (only concentration was 0.34J micrograms per liter ($\mu\text{g}/\text{L}$) at BOX-4[30-35 ft.]);

- Benzene (only concentration was 0.13J µg/L at BOX-4[30-35 ft.]);
- Cis-1,2-DCE (highest concentration was 7.8J µg/L at BOX-1[38-43 ft.]);
- PCE (highest concentration was 2100 µg/L at BOX-1[49-54 ft.]);
- Toluene (only concentration was 0.26J µg/L at BOX-4[30-35 ft.]); and
- TCE (highest concentration was 740 µg/L at BOX-1[49-54 ft.]).

All vertical aquifer profile groundwater analytical results for the Box Sewer are presented in Table 2 and on Figure 3.

3.1.2 Historic Fill Area

The lithology, soil analytical results, and groundwater analytical results for the Historic Fill Area are discussed in detail in the following sections. Soil and groundwater analytical results are presented in Tables 1 and 2, respectively, and on Figure 4.

3.1.2.1 *Lithology*

All three soil borings (HFA-1, HFA-2, and HFA-3) completed within the vicinity of the Historic Fill Area were advanced through the upper aquifer and into or just above the regional clay till unit. Soil boring HFA-1 was advanced to a depth of 55 ft. bls and the regional clay till unit was encountered at 52 ft. bls. At this location, the upper aquifer consists predominantly of silty sand. The upper clay till unit was encountered during advancement from 40 to 45 ft. bls. Soil boring HFA-2 was advanced to a total depth of 56 ft. bls. The regional clay till unit was encountered at 52.5 ft. bls. The upper aquifer at HFA-2 consisted of sand and silty sand and the upper clay till unit was encountered from 33 to 45 ft. bls. Soil boring HFA-3 was advanced to 55 ft. bls, just above the regional clay till unit. The upper clay till unit was encountered at HFA-3 from 40 to 46 ft. bls. Fill materials including metal and asphalt mixed with soil were encountered at HFA-3 from 1.5 to 10 ft. bls. The upper aquifer at this location consisted primarily of silty sand with two thin, shallow silty clay units from 14 to 15.5 ft. bls and 29.6 to 30 ft. bls. Historic Fill Area soil boring logs are included in Attachment F-2.

3.1.2.2 Vadose Zone Soil Analytical Results

At each of the soil boring locations at the Historic Fill Area, one soil sample was collected in the vadose zone corresponding to the interval with the highest PID reading. Detected VOC compounds in sample HFA-1(26-28 ft.) were ethylbenzene, PCE, and TCE. Ethylbenzene, PCE, toluene, TCE, and xylenes were detected at soil sample HFA-2(10-12 ft.). Sample HFA-3(22-24 ft.) had detected concentrations of PCE and TCE. HFA-2 (10-12 ft.) had the most compounds detected as well as the highest concentration of each detected compound of all three soil samples. At HFA-2(10-12 ft.) ethylbenzene was detected at 68 µg/kg, PCE at 42J µg/kg, toluene at 400 µg/kg, TCE at 11J µg/kg, and xylenes at 310 µg/kg. Soil analytical results for the Historic Fill Area are included in Table 1 and on Figure 4.

3.1.2.3 Vertical Aquifer Profile Groundwater Analytical Results

Vertical aquifer profile groundwater samples were collected at each Historic Fill Area soil boring location. As indicated in Section 2.1.3, sample intervals, depths and frequency were determined by the depth of initial groundwater saturation, the presence or absence of an upper clay till, and the depth of the regional clay till unit. At all three soil borings, two vertical aquifer profile samples were collected due to the presence in varying thicknesses of the upper clay till unit. Grab groundwater samples were collected from intervals 28 to 33 and 47 to 52 ft. bls at HFA-1. At HFA-2, grab groundwater samples were collected from intervals 25 to 30 and 45 to 50 ft. bls. At HFA-3, grab groundwater samples were collected from intervals 25 to 30 and 46 to 51 ft. bls. The following VOCs were detected at one or more of the sample intervals:

- 1,1-DCA (highest concentration was 2.3J µg/L at HFA-2[45-50 ft.]);
- Benzene (highest concentration was 2.4J µg/L at HFA-3[46-51 ft.]);
- Cis-1,2-DCE (highest concentration was 110 µg/L at HFA-1[28-33 ft.]);
- PCE (highest concentration was 32 µg/L at HFA-1[28-33 ft.]);
- Toluene (highest concentration was 1.8J µg/L at HFA-3[46-51 ft.]);
- Trans-1,2-DCE (highest concentration was 0.57J µg/L at HFA-3[25-30 ft.]);

- TCE (highest concentration was 290 µg/L at HFA-1[28-33 ft.]); and
- Vinyl chloride (highest concentration was 3.4 µg/L at HFA-2[25-30 ft.]).

All vertical aquifer profile groundwater analytical results for the Historic Fill Area are presented in Table 2 and on Figure 4.

3.1.3 West Tank Farm

The lithology, soil analytical results, and groundwater analytical results for the West Tank Farm are discussed in detail in the following sections. Soil analytical results are presented in Table 1 and groundwater analytical results are presented in Tables 2 and 5. All analytical results are presented on Figure 5.

3.1.3.1 *Lithology*

A total of four soil borings were completed at the West Tank Farm, three of which were terminated in the regional clay till unit (WTANKF-1, WTANKF-2, and WTANKF-4). One of the soil borings (WTANKF-3) was advanced through the regional clay till unit into the lower aquifer. Soil boring WTANKF-1 was advanced to a total depth of 65 ft. bls and the regional clay till unit was encountered at 60 ft. bls. Soil boring WTANKF-2 was advanced to a depth of 65 ft. bls and the regional clay till unit was encountered at 59 ft. bls. Soil boring WTANKF-3 was advanced through the regional clay till unit into the lower aquifer to a depth of 100 ft. bls. The regional clay till at this location was encountered from 59 to 65 ft. bls. The lower aquifer at this location consisted primarily of silty sand and sand with a small stratum of silt from 78 to 80 ft. bls. Soil boring WTANKF-4 was advanced to a total depth of 70 ft. bls and the regional clay till unit was encountered at 65 ft. bls. The upper aquifer at all four soil boring locations was divided in two by varying thicknesses of the upper clay till unit. The thickness of the upper clay till unit ranged from 5 ft. thick at WTANKF-4 to 15 ft. thick at WTANKF-2. The saturated units of the upper aquifer in this area consisted predominantly of interbedded silty sand, sand, and pebbles of varying thicknesses. West Tank Farm soil boring logs are included in Attachment F-2.

3.1.3.2 *Hydraulic Testing Results*

Steady-state drawdown testing was completed at two intervals at the West Tank Farm including WTANKF-2(50-55 ft.) and WTANKF-3(45-50 ft.). Results from each

individual hydraulic test are included in Table 3. The average estimated hydraulic conductivity for the upper aquifer at the West Tank Farm was 1,105 ft./day.

3.1.3.3 Vadose Zone Soil Analytical Results

At each of the soil boring locations at the West Tank Farm one soil sample was collected in the vadose zone corresponding to the interval with the highest PID reading. Detected VOC compounds in sample WTANKF-1(26-28 ft.) were benzene, ethylbenzene, PCE, and TCE. Concentrations of benzene, ethylbenzene, PCE, toluene, and TCE were detected at soil sample WTANKF-2(22-24 ft.). Soil sample WTANKF-3(12-14 ft.) had detected concentrations of ethylbenzene, PCE, and xylenes. Concentrations of benzene, ethylbenzene, PCE, toluene, and TCE were detected at soil sample WTANKF-4(28-30 ft.). Of all the detected compounds in soil at the West Tank Farm, the highest concentrations were observed at WTANKF-2(22-24 ft.) with the exception of TCE and xylenes. At WTANKF-2(22-24 ft.), benzene was detected at 0.51J µg/kg, ethylbenzene at 1.0J µg/kg, PCE at 87 µg/kg, and toluene at 2.4J µg/kg. The highest concentration of TCE was 5.3J µg/kg detected at WTANKF-4(28-30 ft.) and the highest and only detection of xylenes was 2.7J µg/kg at WTANKF-3(12-14 ft.). Results from previous vadose zone soil investigations conducted in 1992 at the West Tank Farm indicated PCE and TCE concentrations as high as 6,200 and 1,390 µg/kg, respectively (ARCADIS Geraghty & Miller, Inc. 2000). Soil analytical results for the West Tank Farm are included in Table 1 and on Figure 5.

3.1.3.4 Vertical Aquifer Profile Groundwater Analytical Results

Vertical aquifer profile groundwater samples were collected at each West Tank Farm soil boring location. As indicated in Section 2.1.3, sample intervals, depths and frequency were determined by the depth of initial groundwater saturation, the presence or absence of the upper clay till, and the depth of the regional clay till unit. Grab groundwater samples were collected in the upper aquifer from intervals 30 to 35, 46 to 51, 55 to 60 ft. bls at WTANKF-1. At WTANKF-2, grab groundwater samples were collected in the upper aquifer from intervals 25 to 30 and 50 to 55 ft. bls. At WTANKF-3, grab groundwater samples were collected from upper aquifer intervals 24 to 29 and 45 to 50 ft. bls, and lower aquifer intervals 65 to 70, 80 to 85, and 95 to 100 ft. bls. Grab groundwater samples were collected in the upper aquifer from intervals 30 to 35, 45 to 50, and 60 to 65 ft. bls at WTANKF-4. The following VOCs were detected at one or more of the sample intervals within the upper aquifer:

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

- 1,1,1-TCA (highest concentration was detected at WTANKF-4[60-65 ft.] at 3.7J $\mu\text{g/L}$);
- 1,1-DCA (highest concentration was detected at WTANKF-4[60-65 ft.] at 3.2J $\mu\text{g/L}$);
- Cis-1,2-DCE (highest detected concentration was 47 $\mu\text{g/L}$ detected at WTANKF-3[45-50 ft.] and WTANKF-4[60-65 ft.]);
- PCE (highest concentration was 240 $\mu\text{g/L}$ detected at WTANKF-1[30-35 ft.]);
- Toluene (highest concentration was 1.0J $\mu\text{g/L}$ detected at WTANKF-3[24-29 ft.]);
- Trans-1,2-DCE (highest concentration was 2.8J $\mu\text{g/L}$ detected at WTANKF-4[60-65 ft.]); and
- TCE (highest concentration was 280 $\mu\text{g/L}$ at WTANKF-1[30-35 ft.]).

The following VOCs were detected at one or more intervals within the lower aquifer at WTANKF-3:

- 1,1-DCA (highest concentration was 19 $\mu\text{g/L}$ detected at interval 65 to 70 ft. bls);
- 1,1-DCE (only concentration was 0.97 $\mu\text{g/L}$ detected at interval 95 to 100 ft. bls);
- Cis-1,2-DCE (highest concentration was 74 $\mu\text{g/L}$ detected at interval 95 to 100 ft. bls);
- Toluene (highest concentration was 0.34J $\mu\text{g/L}$ detected at interval 80 to 85 ft. bls);
- Trans-1,2-DCE (highest concentration was 2.9 $\mu\text{g/L}$ at interval 95 to 100 ft. bls);
- TCE (highest concentration was 19 $\mu\text{g/L}$ at interval 95 to 100 ft. bls); and
- Vinyl chloride (only detected concentration was 1.3 $\mu\text{g/L}$ at interval 65 to 70 ft. bls).

All vertical aquifer profile groundwater analytical results are presented in Table 2 and on Figure 5.

3.1.3.5 *Groundwater Analytical Results*

Upon completion of the soil boring at WTANKF-3 and receipt of the vertical aquifer profile groundwater analytical data, a decision was made to install a monitoring well in the lower aquifer with the screen set from 67 to 77 ft. bls. In conjunction with the Site-wide annual groundwater sampling event, a groundwater sample was collected from monitoring well RMW-87 on September 26, 2012. The following compounds were detected in the groundwater sample: 1,1-DCA (15 µg/L), benzene (0.13J µg/L), cis-1,2-DCE (23 µg/L), toluene (0.39J µg/L), trans-1,2-DCE (1.3 µg/L), TCE (7.5 µg/L), and vinyl chloride (0.93J µg/L). All other site-specific VOCs were not detected above laboratory reporting limits. The groundwater sampling results are presented in Table 5 and on Figure 9.

3.1.4 Former Building 21 Area

The lithology, soil analytical results, and groundwater analytical results for the investigation at the former Building 21 Area are discussed in detail in the following sections. Soil analytical results are presented in Table 1 and groundwater analytical results are presented in Tables 2 and 5. All analytical results are presented on Figure 6.

3.1.4.1 *Lithology*

A total of four soil borings were completed at the former Building 21 Area, two of which were terminated in the regional clay till unit (BLDG21-2 and BLDG21-3). Two of the soil borings (BLDG21-1 and BLDG21-4) were advanced through the regional clay till unit into the lower aquifer. Soil boring BLDG21-1 was advanced through the regional clay till unit into the lower aquifer to a depth of 105 ft. bls. The regional clay till at this location was encountered from 61 to 68 ft. bls. The lower aquifer at this location consisted primarily of silty sand and sand with a small layer of silt from 94 to 95 ft. bls. Soil boring BLDG21-2 was advanced to a depth of 65 ft. bls and the regional clay till unit was encountered at 57 ft. bls. At this location, a sandy clay unit was encountered from 10 to 16 ft. bls. Soil boring BLDG21-3 was advanced to a depth of 65 ft. bls and the regional clay till unit was encountered at 55 ft. bls. At this location, an upper clay till unit was encountered from 41 to 44 ft. bls. Soil boring BLGD21-4 was advanced to a total depth of 75 ft. bls. The regional clay till at this location was encountered from 60 to 69 ft. bls. The lower aquifer at this location consisted of sand with pebbles. The saturated units of the upper aquifer at the former Building 21 Area consisted of

interbedded silt, clayey sand, silty sand, sand, and pebbles of varying thicknesses. The former Building 21 Area soil boring logs are included in Attachment F-2.

3.1.4.2 Hydraulic Testing Results

Steady-state drawdown testing was completed at five intervals at the former Building 21 Area including BLDG21-1(40-45 ft.), BLDG21-2(40-45 ft.), BLDG21-2(50-55 ft.), BLDG21-3(45-50 ft.), and BLDG21-4(45-50 ft.). Results from each individual hydraulic test are included in Table 3. A pneumatic slug test was also completed at interval BLDG21-2(40-45 ft.) and results are presented in Table 4. The average estimated hydraulic conductivity for the upper aquifer at the former Building 21 Area is 845 ft./day.

3.1.4.3 Vadose Zone Soil Analytical Results

At each of the soil boring locations at the former Building 21 Area, at least one soil sample was collected in the vadose zone corresponding with the interval with the highest PID reading. Additional soil samples were collected from the vadose zone at borings BLDG21-3 and BLDG21-4 corresponding with a shallow clay unit that was observed at all four boring locations. Detected VOC compounds in sample BLDG21-1(18-20 ft.) were ethylbenzene, PCE, toluene, and TCE. Concentrations of 1,1,1-TCA, 1,1-DCA, PCE, toluene, and TCE were detected at soil sample BLDG21-2(18-20 ft.). Soil sample BLDG21-3(10-12 ft.) had detected concentrations of ethylbenzene, PCE, toluene, and TCE. Concentrations of PCE and toluene were detected at soil sample BLDG21-3(24-26 ft.). Three vadose zone soil samples were collected from BLDG21-4 from intervals 14 to 15, 15 to 16, and 18 to 20 ft. bls. 1,1-DCA, benzene, cis-1,2-DCE, ethylbenzene, PCE, toluene, TCE, and xylenes were detected at one or more of the vadose zone soil samples collected at BLDG21-4. Of all seven vadose zone soil samples, the only detected concentration of 1,1,1-TCA was 2.0J µg/kg at BLDG21-2(18-20 ft.); the highest concentration of 1,1-DCA was 1.5J µg/kg at BLDG21-2(18-20 ft.); the only concentrations of benzene and cis-1,2-DCE were detected at BLDG21-4(15-16 ft.) at 3.1J and 4.0J µg/kg, respectively; the highest concentrations of ethylbenzene, PCE, and toluene were detected at BLDG21-4(15-16 ft.) at 8.3, 24, and 16 µg/kg, respectively. The highest concentration of TCE was detected at BLDG21-2(18-20 ft.) at 7.7 µg/kg; and the only detection of xylenes was at BLDG21-4(15-16 ft.) at a concentration of 14 µg/kg. Soil analytical results for the former Building 21 Area are included in Table 1 and on Figure 6.

3.1.4.4 Saturated Zone Soil Analytical Results

A saturated soil sample was collected at boring BLDG21-4 because a grab groundwater sample was not able to be collected at the desired interval due to the formation not readily producing groundwater. Saturated soil sample BLDG21-4(58-60 ft.) had detected concentrations of 1,1-DCA (15 µg/kg), cis,1-2-DCE (6.7 µg/kg), toluene (0.92J µg/kg), trans-1,2-DCE (0.83J µg/kg), and TCE (2.6J µg/kg). Soil analytical results for the former Building 21 Area are included in Table 1 and on Figure 6.

3.1.4.5 Vertical Aquifer Profile Groundwater Analytical Results

Vertical aquifer profile groundwater samples were collected at each former Building 21 Area boring location. As indicated in Section 2.1.3, sample intervals, depths and frequency were determined by the depth of initial groundwater saturation, the presence or absence of the upper clay till, and the depth of the regional clay till unit. At BLDG21-1, grab groundwater samples were collected in the upper aquifer from intervals 27 to 32, 40 to 45, and 51 to 56 ft. bls, and in the lower aquifer from intervals 68 to 73, 85 to 90, and 100 to 105 ft. bls. Grab groundwater samples were collected in the upper aquifer from intervals 25 to 30, 40 to 45, and 50 to 55 ft. bls at BLDG21-2. At BLDG21-3, grab groundwater samples were collected from upper aquifer intervals 27 to 32 and 45 to 50 ft. bls. Grab groundwater samples were collected in the upper aquifer from intervals 27 to 32 and 45 to 50 ft. bls at BLDG21-4. The following VOCs were detected at one or more of the sample intervals within the upper aquifer at the former Building 21 Area:

- 1,1,1-TCA (highest concentration was detected at BLDG21-1[51-56 ft.] at 20 µg/L);
- 1,1-DCA (highest concentration was detected at BLDG21-1[51-56 ft.] at 10 µg/L);
- 1,1-DCE (only concentrations was detected at BLDG21-1[51-56 ft.] at 2.8J µg/L);
- Benzene (highest concentration was detected at BLDG21-2[25-30 ft.] at 0.36J µg/L);
- Cis-1,2-DCE (highest concentration was detected at BLDG21-1[51-56 ft.] at 110 µg/L);

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

- PCE (highest concentration was detected at BLDG21-4[45-50 ft.] at 66 µg/L);
- Toluene (highest concentration was detected at BLDG21-3[27-32 ft.] at 0.32J µg/L);
- Trans-1,2-DCE (highest concentration was detected at BLDG21-1[51-56 ft.] at 5.8 µg/L);
- TCE (highest concentration was detected at BLDG21-2[51-56 ft.] at 150 µg/L);
and
- Vinyl chloride (highest concentration was detected at BLDG21-2[50-55 ft.] at 1.3J µg/L).

The following VOCs were detected at one or more sample intervals within the lower aquifer at BLDG21-1:

- 1,1,1-TCA (highest concentration was 13 µg/L detected at interval 68 to 73 ft. bls);
- 1,1-DCA (highest concentration was 15 µg/L detected at intervals 68 to 73 and 85 to 90 ft. bls);
- 1,1-DCE (highest concentration was 1.7J µg/L detected at interval 85 to 90 ft. bls);
- Cis-1,2-DCE (highest concentration was 78 µg/L detected at interval 68 to 73 ft. bls);
- PCE (only concentration was 75 µg/L detected at interval 68 to 73 ft. bls);
- Trans-1,2-DCE (highest concentration was 2.6J µg/L detected at interval 68 to 73 ft. bls);
- TCE (highest concentration was 210 µg/L detected at interval 68 to 73 ft. bls); and
- Vinyl chloride (highest concentration was 1.9J µg/L detected at interval 68 to 73 ft. bls).

All vertical aquifer profile groundwater analytical results for all soil borings at the former Building 21 Area are presented in Table 2 and on Figure 6.

3.1.4.6 Groundwater Analytical Result

Upon completion of the soil boring at BLDG21-1 and receipt of the vertical aquifer profile groundwater analytical data, a decision was made to install a monitoring well in the lower aquifer with the screen set from 70 to 80 ft. bls. In conjunction with the Site-wide annual groundwater sampling event, a groundwater sample was collected from monitoring well RMW-86 on September 26, 2012. The following compounds were detected in the groundwater sample: 1,1,1-TCA (12 µg/L), 1,1-DCA (13 µg/L), 1,1-DCE (1.6J µg/L), cis-1,2-DCE (52 µg/L), PCE (48 µg/L), trans-1,2-DCE (1.6J µg/L), and TCE (190 µg/L). All other site-specific VOCs were not detected above laboratory reporting limits. The groundwater sampling results are presented in Table 5 and on Figure 9.

3.2 Upgradient Northern Perimeter Investigation Findings

The lithology and groundwater analytical results for the upgradient Northern Perimeter are discussed in detail in the following sections. Groundwater analytical results are presented in Tables 5 and 6 and on Figure 7.

3.2.1 Lithology

A total of three soil borings (NP-1, NP-2, and NP-3) were advanced into the lower aquifer to a total depth of 100 ft. bls along the northern perimeter of the Site. At soil boring NP-1, a shallow silt zone was encountered in the vadose zone from 20 to 30 ft. bls. The regional clay till unit was encountered at NP-1 from 60 to 65 ft. bls. The regional clay till unit was not encountered at boring NP-2, however a 15-foot silt zone was encountered in the vadose zone from 10 to 25 ft. bls. At boring NP-3, a silty-clay layer was encountered from 40 to 41 ft. bls. For the Northern Perimeter soil borings, the upper aquifer consisted primarily interbedded of silty sand, sand, and/or pebble layers in varying thicknesses. The lower aquifer at all three soil borings consisted primarily of sand and pebble zones of varying thicknesses. Soil boring logs are included in Attachment F-2.

3.2.2 Vertical Aquifer Profile Groundwater Analytical Results

Vertical aquifer profile groundwater samples were collected at each upgradient Northern Perimeter boring location. As indicated in Section 2.1.3, sample intervals

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

depths and frequency were determined by the depth of initial groundwater saturation, the presence or absence of the upper clay till, and the presence or absence of the regional clay till unit. At NP-1 grab groundwater samples were collected in the upper aquifer from intervals 33 to 38 and 50 to 55 ft. bls, and grab groundwater samples were collected in the lower aquifer from intervals 65 to 70, 80 to 85, and 95 to 100 ft. bls. At NP-2 grab groundwater samples were collected in the upper aquifer from intervals 35 to 40 and 50 to 55 ft. bls and in the lower aquifer from intervals 65 to 70, 80 to 85, and 95 to 100 ft. bls. At NP-3 grab groundwater samples were collected in the upper aquifer from intervals 30 to 35, 41 to 46, and 55 to 60 ft. bls and in the lower aquifer from intervals 70 to 75 and 85 to 90 ft. bls. The following VOCs were detected at one or more of the sample intervals within the upper aquifer at the Northern Perimeter boring locations:

- 1,1,1-TCA (highest concentration was detected at NP-1[33-38 ft.] at 1.6 µg/L);
- 1,1-DCA (highest concentration was detected at NP-1[50-55 ft.] at 4.6 µg/L);
- Benzene (only concentration was detected at NP-1[33-38 ft.] at 0.23J µg/L);
- Ethylbenzene (only concentration was detected at NP-1[33-38 ft.] at 0.21J µg/L);
- Toluene (highest concentration was detected at NP-1[33-38 ft.] at 0.66J µg/L); and
- TCE (highest concentration was detected at NP-1[50-55 ft.] at 1.4 µg/L).

The following VOCs were detected at one or more intervals within the lower aquifer at the Northern Perimeter soil boring locations:

- 1,1,1-TCA (only concentration was detected at NP-2[65-70 ft.] at 4.9 µg/L);
- 1,1-DCA (highest concentration detected at NP-2[95-100 ft.] at 34 µg/L);
- Benzene (highest concentration detected at NP-1[95-100 ft.] at 0.27J µg/L);
- Cis-1,2-DCE (highest concentration detected at NP-2[95-100 ft.] at 83 µg/L);
- Toluene (highest concentration detected at NP-1[95-100 ft.] at 0.41J µg/L);
- Trans-1,2-DCE (highest concentration detected at NP-2[95-100 ft.] at 4.0 µg/L);

- TCE (only concentration was detected at NP-2[65-70 ft.] at 1.3 µg/L); and
- Vinyl chloride (highest concentration was detected at NP-2[80-85 ft.] at 2.7 µg/L).

All vertical aquifer profile groundwater analytical results for all soil borings at the Northern Perimeter are presented in Table 6 and on Figure 7.

3.2.3 Groundwater Analytical Results

Upon completion of the soil boring at NP-2 and receipt of the vertical aquifer profile groundwater analytical data, a decision was made to install a monitoring well in the lower aquifer with the screen set from 90 to 100 ft. bls. In conjunction with the Site-wide annual groundwater sampling event, a groundwater sample was collected from monitoring well RMW-88 on September 26, 2012. The following compounds were detected in the groundwater sample: 1,1-DCA (17 µg/L), cis-1,2-DCE (43 µg/L), toluene (0.21J µg/L), trans-1,2-DCE (1.5 µg/L), and vinyl chloride (1.1J µg/L). All other site-specific VOCs were not detected above laboratory reporting limits. The groundwater sampling results are presented in Table 5 and on Figure 9.

3.3 Process Sump Area Investigation Findings

The lithology, soil analytical results, vertical aquifer profile groundwater, and groundwater analytical results for the Process Sump Area are discussed in detail in the following sections. Soil analytical results are presented in Tables 7 and 8 and groundwater analytical results are presented in Tables 5 and 9. All analytical results are presented on Figure 8.

3.3.1 Lithology

A total of eight soil borings (PSA-1 through PSA-4 and PSA-7 through PSA-10) were advanced through the upper aquifer and into the regional clay till unit. Two soil borings (PSA-5 and PSA-6) were advanced through the regional clay till unit into the lower aquifer. Soil boring PSA-1 was advanced to a depth of 65 ft. bls and the regional clay till unit was encountered at 45 ft. bls. The upper aquifer at PSA-1 was divided by an upper clay till unit from 33.5 to 44 ft. bls. Soil boring PSA-2 was advanced to a depth of 53 ft. bls and the regional clay till unit was encountered at 52 ft. bls. An upper clay till unit was encountered from 34.5 to 40 ft. bls. Soil Boring PSA-3 was advanced to a depth of 65 ft. bls, the regional clay till was encountered at 63 ft. bls, and an upper clay till unit was not encountered at this soil boring. Soil boring PSA-4 was advanced

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

through the upper aquifer to a depth of 64 ft. bls and the regional clay till unit was encountered at 63 ft. bls. An upper clay till unit was encountered from 52 to 57 ft. bls at this location. Soil boring PSA-5 was advanced through the regional clay till unit into the lower aquifer to a depth of 105 ft. bls. An upper clay till was encountered from 50 to 58 ft. bls and the regional clay till unit was encountered from 62 to 69 ft. bls. Soil boring PSA-6 was advanced through the regional clay till into the lower aquifer to a depth of 70 ft. bls. Two upper clay till units were encountered at PSA-6 from depths 33 to 38 ft. bls and 42 to 54 ft. bls, and the regional clay till was encountered from 60 to 68 ft. bls. Soil boring PSA-7 was advanced through the upper aquifer to a depth of 65 ft. bls and the regional clay till was encountered at 64 ft. bls. Two upper clay till units were encountered from depths of 34 to 38 ft. bls and 48 to 52 ft. bls. Soil boring PSA-8 was advanced to a depth of 66.5 ft. bls, and the regional clay till was encountered at 66 ft. bls. Two upper clay till units were also encountered at this soil boring from depths of 36 to 43 ft. bls and 50 to 52 ft. bls. Soil boring PSA-9 was advanced to a depth of 65 ft. bls and the regional clay till unit was encountered at 64 ft. bls. An upper clay till unit was encountered from 54 to 59 ft. bls. Soil boring PSA-10 was advanced to a depth of 65 ft. bls and the regional clay till unit was encountered at 46.5 ft. bls. An upper clay till unit was encountered from 32 to 45.5 ft. bls. Cross sections depicting the locations of the till units including the regional clay till are presented on Figures 10 through 13.

Typical geologic conditions that have been observed at the Site include thick fluvio-glacial sand and gravel outwash deposits separated by discontinuous deposits of fine-grained sand, silt, and clay-rich till. At the Process Sump Area the upper aquifer is layered into several saturated units with varying permeability over several orders of magnitude (gravel, sand, silty sand, clayey sand, and silt) interbedded with dry clay-rich till with varying thicknesses (Figures 11 through 13). At soil boring PSA-3 a clay-rich till unit in the upper aquifer is not present but instead there is a 21-ft. thick gravel deposit from 35 to 56 ft. bls indicating channelization of till units (eroded by glacial melt waters) in some areas. PSA-5 also has a gravel deposit from 35 to 45 ft. bls. The upper aquifer at the Process Sump Area consists of units with varying permeability over several orders of magnitude (gravel, sand, silty sand, clayey sand, and silt). The range of permeability is evident with the results from the hydraulic testing (see Section 3.3.2). The upper aquifer between the deepest clay till unit and the regional clay till unit consists primarily of silty sand with grain sizes ranging from very fine to medium. Although this unit is saturated, groundwater yield is very low compared to the prolific nature of the outwash sand and gravels. To the east of the Process Sump Area, both the clay till unit in the upper aquifer and the regional clay till unit thicken (e.g., PSA-1 and PSA-10 in Figures 11 and 13) and come close together almost pinching out the deposits in between. The channelization of the low permeable units centered around

the area of PSA-5, GM-75S and PSA-3 is a transition zone from more massive outwash sand and gravel with interbedded till deposition to the west to more massive till deposition with little outwash present to the east.

Only at soil borings PSA-5 and PSA-6 was the regional clay till unit penetrated to access the lower aquifer. The lower aquifer at the Process Sump Area consisted initially of a silty sand unit that transitioned into a pebble zone. Soil boring logs for the Process Sump Area are included in Attachment F-2.

3.3.2 Hydraulic Testing Results

Steady-state drawdown testing was completed at 11 intervals at the Process Sump Area including one interval from the lower aquifer at PSA-5 from 69 to 74 ft. bls. Interval locations and results from each individual hydraulic test are included in Table 3. The average estimated hydraulic conductivity for the upper and lower aquifer at the Process Sump Area was 195 and 270 ft./day, respectively.

3.3.3 Vadose Zone Soil Analytical Results

At each of the boring locations at the Process Sump Area, one soil sample was collected in the vadose zone corresponding to the interval with the highest PID reading. VOCs that were detected at one or more of the vadose zone soil samples were ethylbenzene, PCE, toluene, and TCE. Ethylbenzene was detected in six vadose zone soil samples at concentrations ranging from 0.32J to 0.78J $\mu\text{g}/\text{kg}$ from samples PSA-1(18-20) and PSA-7(12-14), respectively. PCE was detected in all 10 vadose zone soil samples at concentrations ranging from 1.5J to 19,000 $\mu\text{g}/\text{kg}$ from samples PSA-4(30-32) and PSA-8(32-34), respectively. Toluene was detected in five of the vadose zone soil samples at concentrations ranging from 0.43J to 0.72J $\mu\text{g}/\text{kg}$ from samples PSA-4(30-32) and PSA-5(28-30), respectively. TCE was detected in six vadose zone soil samples with concentrations ranging from 3.7J to 910 $\mu\text{g}/\text{kg}$ from samples PSA-4(30-32) and PSA-8(32-34), respectively. Soil analytical results from the vadose zone for the Process Sump Area are included in Table 7 and on Figure 8.

3.3.4 Saturated Zone Soil Analytical Results

Saturated soil samples were collected at the Process Sump Area at fine-grained saturated intervals or within clay till units where a groundwater sample could not be collected. In the saturated zones, an attempt was made to collect a groundwater sample; however, the formation at several Process Sump Area soil borings did not

readily produce groundwater. Therefore, a saturated soil sample was collected in place of the vertical aquifer profile groundwater sample. A total of 10 saturated soil samples were collected at the Process Sump Area. Six of the saturated soil samples were collected from a fine-grained, saturated unit in which a groundwater sample could not be collected, and four of the saturated soil samples were collected from clay till units with elevated PID readings (includes PSA-5[54-56 ft.], PSA-6[50-52 ft.], PSA-6[66-68 ft.], and PSA-7[50-52 ft.]). VOCs that were detected at one or more of the saturated soil samples were 1,1,1-TCA, 1,1-DCA, cis-1,2-DCE, PCE, toluene, TCE, and xylenes. 1,1,1-TCA was only detected at PSA-3(56-58 ft.) at a concentration of 160J µg/kg. 1,1-DCA was only detected at PSA-4(58-60 ft.) at a concentration of 9.1J µg/kg. Cis-1,2-DCE was detected at PSA-4(58-60 ft.) and PSA-5(54-56) at concentrations of 13J µg/kg and 170J µg/kg, respectively. PCE was detected in seven of the saturated soil samples with concentrations ranging from 46J to 2,400,000J µg/kg from samples PSA-7(52-54 ft.) and PSA-6(58-60 ft.), respectively. Toluene was detected only in sample PSA-6(66-68 ft.) at a concentration of 24J µg/kg. TCE was detected in all 10 saturated soil samples with concentrations ranging from 560 to 150,000J µg/kg from samples PSA-4(58-60 ft.) and PSA-6(58-60 ft.), respectively. Xylenes were detected only at PSA-5(60-62 ft.) at a concentration of 100JB µg/kg. There was a visual observation of dense non-aqueous phase liquid (DNAPL) globules in saturated soil sample PSA-6(58-60 ft.) and the observation was confirmed with a positive hydrophobic dye smear test. Saturated soil analytical results for the Process Sump Area are included in Table 8 and on Figure 8.

3.3.5 Vertical Aquifer Profile Groundwater Analytical Results

Vertical aquifer profile groundwater samples were collected at each Process Sump Area soil boring location. As indicated in Section 2.1.3, sample intervals, depths and frequency were determined by the depth of initial groundwater saturation, the presence or absence of the upper clay till, and the presence or absence of the regional clay till unit. At PSA-1, grab groundwater samples were collected from upper aquifer intervals 27 to 32 and 42 to 47 ft. bls. Grab groundwater samples were collected from upper aquifer intervals at PSA-2 from 30 to 35 and 40 to 45 ft. bls. At PSA-3, grab groundwater samples were collected from upper aquifer intervals 34 to 39 and 49 to 54 ft. bls. Grab groundwater samples were collected at PSA-4 from upper aquifer intervals 40 to 45 and 58 to 63 ft. bls. At PSA-5, grab groundwater samples were collected from upper aquifer intervals 30 to 35 and 45 to 50 ft. bls and from lower aquifer intervals 69 to 74, 85 to 90, and 100 to 105 ft. bls. Grab groundwater samples were collected at PSA-6 from upper aquifer intervals 29 to 34, 42 to 47, and 52 to 57 ft. bls. At PSA-7, grab groundwater samples were collected

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

from upper aquifer intervals 29 to 34, 40 to 45, and 59 to 64 ft.bl.s. Grab groundwater samples were collected from the upper aquifer at intervals 31 to 36, 43 to 48, and 61 to 66 ft. bl.s at PSA-8. At PSA-9, grab groundwater samples were collected from the upper aquifer at intervals 32 to 37, 47 to 52 ft. bl.s, and 59 to 64 ft. bl.s. A grab groundwater sample was collected at PSA-10 in the upper aquifer from 45 to 50 ft. bl.s. The following VOCs were detected at one or more of the sample intervals within the upper aquifer at the Process Sump Area soil boring locations:

- 1,1,1-TCA (detected concentrations were 0.60J and 3.7J µg/L from PSA-10[45-50 ft.] and PSA-3[49-54 ft.], respectively);
- 1,1-DCA (only detected concentration was 6.7 µg/L at PSA-4[58-63 ft.]);
- 1,1-DCE (only detected concentration was 0.50J µg/L at PSA-4[58-63 ft.]);
- Benzene (only detected concentration was 0.22J µg/L at PSA-4[58-63 ft.]);
- Cis-1,2-DCE (detected concentrations ranged from 1.1 to 340 µg/L from PSA-9[32-37 ft.] and PSA-9[59-64 ft.], respectively);
- PCE (detected concentrations ranged from 0.32J to 34,000 µg/L from PSA-4[58-63 ft.] and PSA-5[45-50 ft.], respectively);
- Toluene (detected concentrations ranged from 0.31J to 0.91J µg/L from PSA-4[58-63 ft.] and PSA-9[32-37 ft.], respectively);
- Trans-1,2-DCE (detected concentrations were 0.41J and 0.87J µg/L from PSA-10[45-50 ft.] and PSA-4[58-63 ft.], respectively); and
- TCE (detected concentrations ranged from 0.44J to 29,000 µg/L from PSA-2[30-35 ft.] and PSA-5[45-50 ft.], respectively).

The following VOCs were detected at one or more of the three intervals sampled within the lower aquifer at soil boring PSA-5:

- 1,1-DCA (only detected concentration was 0.63J µg/L at interval 100 to 105 ft. bl.s);

- Cis-1,2-DCE (only detected concentration was 5.1 µg/L at interval 100 to 105 ft. bls);
- PCE (highest detected concentration was 4,600 µg/L at interval 85 to 90 ft. bls);
- Toluene (only detected concentration was 0.61J µg/L at interval 100 to 105 ft. bls); and
- TCE (highest detected concentration was 1,900 µg/L at interval 69 to 74 ft. bls).

All vertical aquifer profile groundwater analytical results for all soil borings at the Process Sump Area are presented in Table 9 and on Figure 8.

3.3.6 Groundwater Analytical Results

Upon completion of the boring at PSA-5 and receipt of the vertical aquifer profile groundwater analytical data, a decision was made to install a monitoring well in the lower aquifer with a screened interval set from 85 to 95 ft. bls. In conjunction with the Site-wide annual groundwater sampling event, a groundwater sample was collected from monitoring well RMW-85 on September 26, 2012. Of all the site-specific VOCs, only PCE and TCE were detected above reporting limits. PCE and TCE were detected at concentrations of 280 and 120 µg/L, respectively. The groundwater sampling results are presented in Table 5 and on Figure 9.

4. Conclusions

The Pre-Design Investigation was completed to meet certain technical objectives in support of evaluating corrective measures options. A summary of the conclusions of each investigation is presented below and a separate assessment of risk for the secondary source areas and the Process Sump Area are presented in Section 3 of the *Corrective Measures Proposal*. The Pre-Design Investigation findings have been used to refine the current understanding of the Site and the corrective measures evaluation presented in Sections 2.7 and 4 of the *Corrective Measures Proposal*, respectively.

4.1 Secondary Source Area

Focused soil and groundwater investigations were conducted at the Box Sewer, Historic Fill Area, West Tank Farm, and the former Building 21 Area to determine if these areas are contributing to groundwater contamination in the upper aquifer and, in some cases, the lower aquifer.

- The soil concentrations at the Box Sewer, as compared to the previous investigation, are significantly lower. The groundwater profiling data at the Box Sewer indicated that concentrations increased with depth (e.g., BOX-1). The presence of PCE and TCE at elevated concentrations in the deeper portion of the upper aquifer is likely due to the presence of historic releases from the former Oil House Area and the presence of source material near the Process Sump Area.
- Soil at the Historic Fill Area had not been previously characterized. Very little fill material was observed during drilling at the Historic Fill Area and the soil concentrations do not indicate the presence of source material. The groundwater profiling data are consistent with concentrations downgradient of historic releases from the former Oil House Area.
- The soil concentrations at the West Tank Farm, as compared to the previous investigations, are significantly lower. The groundwater profiling data at the West Tank Farm indicate that concentrations are similar with depth. The groundwater data are consistent with previous groundwater concentrations observed in this area and with the current understanding of plume migration.
- Soil at the former Building 21 Area had not been previously characterized and the soil concentrations do not indicate the presence of source material. The groundwater profiling data are consistent with previous groundwater

concentrations observed in this area and with the current understanding of plume migration.

- In addition, a focused and limited groundwater chemistry and hydrogeology investigation was completed in the lower aquifer at the West Tank Farm and the former Building 21 Area. The presence of the regional clay till unit was confirmed at these locations and the nature and extent of contamination in the lower aquifer was characterized. At both locations, a lower aquifer monitoring well was installed to help refine plume dimensions within the lower aquifer.

4.2 Upgradient Northern Perimeter

The groundwater chemistry and lithology at the upgradient Northern Perimeter were further delineated to provide a better understanding of the upgradient off-site groundwater concentrations. The presence and/or absence of the regional clay till unit was confirmed and a lower aquifer monitoring well (RMW-88) was installed to replace monitoring well HR-10. Groundwater concentrations in the upper aquifer were below U.S. EPA Maximum Contaminant Levels (MCLs) and in the lower aquifer were above MCLs (NP-1 for vinyl chloride and NP-2 for cis-1,2-DCE and vinyl chloride). Groundwater concentrations at RMW-88 were below MCLs.

4.3 Process Sump Area

A focused soil and groundwater investigation was conducted at the Process Sump Area to determine if this area is contributing to groundwater contamination in the upper aquifer and lower aquifer.

- Shallow soil concentrations in the vadose zone at the Process Sump Area investigation did not indicate the presence of source material; however, deeper soil concentrations just above the water table (e.g., PSA-8 [32-34 ft.]) and saturated soil concentrations (e.g., samples collected between 50 and 68 ft. bls) do indicate the presence of source material. The soil concentrations just above the water table (e.g., PSA-8 [32-34 ft.]) and the groundwater concentrations just below the water table (e.g., PSA-8 [31-36 ft.]) have detections of PCE and TCE only. The lack of source material in the vadose zone above indicates that the source for the unsaturated material above the water table (e.g., capillary fringe) may be due to groundwater by mechanism of soil sorption by water table fluctuation (e.g., smear zone) and/or soil-gas (U.S. EPA 2005).

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

- Groundwater in both the upper and lower aquifers was characterized and determined to be impacted primarily with PCE and TCE. The most significant impacts occurred in the upper aquifer between the deepest clay till unit and the regional clay till unit indicating the source is likely not from the Process Sump Area. The groundwater impacts at the Process Sump Area may be related to other areas of concern (e.g. former Oil House Area).
- DNAPL globules were visible and the hydrophobic dye test was positive for soil boring PSA-6 (58-60 ft. bls). This confirmed that residual DNAPL is present in the interbedded units at this location of the upper aquifer at the Process Sump Area.
- The geometry of clay till units was characterized in detail. Interbedded areas of the upper aquifer is layered into several saturated deposits of low permeability (fine sands and silts) interbedded with dry clay-rich till with varying thicknesses at the Process Sump Area with thickening of the clay till units to the east (e.g., soil borings PSA-1 and PSA-10). At soil boring PSA-3 there is a 21 ft. thick gravel deposit from 35 to 56 ft. bls indicating channelization of the interbedded units (eroded by glacial melt waters) in some areas. PSA-5 also has a gravel deposit from 35 to 45 ft. bls. A similar sand and gravel deposit was observed in the same vicinity at GM-75S.

5. References

- ARCADIS Geraghty & Miller, Inc., 2000. Resource Conservation and Recovery Act Facility Investigation Final Report Volume I (Methodologies and Results), Delphi Harrison Thermal Systems, Moraine, Ohio. April 2000.
- ARCADIS, Inc., 2002. Box Sewer Investigation Summary Report, General Motors Corporation, Moraine, Ohio. May 2002.
- ARCADIS, Inc. 2005. Former Building 14 Investigation Summary Report, General Motors Corporation, Moraine, Ohio. March 2005.
- ARCADIS U.S., Inc., 2011. Draft Amended Quality Assurance Project Plan, RACER Trust, Moraine, Ohio. Pending approval from the U.S. EPA.
- ARCADIS U.S., Inc., 2012. Pre-Design Investigation Work Plan. RACER Trust, Moraine, Ohio. April 26, 2012.
- Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, *Water Resources Research*, vol. 12, no. 3, pp. 423-428.
- Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, *Am. Geophys. Union Trans.*, vol. 27, pp. 526-534.
- Driscoll, F.G., 1986, *Groundwater and wells* (Second edition): Johnson Division, St. Paul, Minnesota, 1089 p.
- Geraghty & Miller, Inc., 1991a. Preliminary Closure Assessment of Still Room Perchloroethene Tanks, Harrison Radiator Division – GMC, Moraine, Ohio. March 1991.
- Geraghty & Miller, Inc., 1991b. Supplemental Soil Sampling and Analysis, Former Still Room Perchloroethene Tank Excavation, Harrison Radiator Division – GMC, Moraine, Ohio. December 1991.

Pre-Design Investigation Summary Report

RACER Trust
Moraine, Ohio

Geraghty & Miller, Inc., 1991c. Site Investigation near Underground Product Piping for Quaker 568 Microgrind Coolant, Harrison Radiator Division – GMC, Moraine, Ohio. August 1991.

Geraghty & Miller, Inc., 1991d. Description of Current Conditions Task 1 of the RCRA Facility Investigation for Harrison Radiator Division – GMC, Moraine, Ohio. January 1991.

Geraghty & Miller, Inc. 1997. Supplemental DOCC for General Motors Powertrain Group Moraine Engine Plant and General Motors Truck group Moraine Assembly Plant, moraine, Ohio, July 1997.

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bull. No. 36, Waterways Exper. Sta. Corps of Engrs, U.S. Army, Vicksburg, Mississippi, pp. 1-50.

Hyder, Z, J.J. Butler, Jr., C.D. McElwee and W. Liu, 1994. Slug tests in partially penetrating wells, Water Resources Research, vol. 30, no. 11, pp. 2945-2957.

Neville, C.J., 2007. Short Course - Interpretation of Pumping Well Drawdowns.

RACER Trust, 2012. Pre-Design Investigation Work Plan Addendum, RACER Trust Moraine Facilities, Moraine, Ohio. August 22, 2012.

Robbins, G.A., A.T. Aragon-Jose, A. Romero, 2009. Determining Hydraulic Conductivity Using Pumping Data from Low-Flow Sampling. Ground Water, Vol. 47, No. 2, p. 271.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

U.S. EPA, 2005. Review of Recent Research on Vapor Intrusion. EPA/600/R-05/106. September 2005.



Table 1. Summary of Secondary Source Area Soil Sample Results, RACER Trust, Moraine, Ohio.

	Location		Box Sewer			Historic Fill Area			West Tank Farm
	Location Code	Sample Label	BOX-1	BOX-2	BOX-4	HFA-1	HFA-2	HFA-3	WTANKF-1
	Zone	Sample Date	BOX-1(14-16)-S/08092012/ Vadose 8/9/2012	BOX-2(16-18)-S/08132012/ Vadose 8/13/2012	BOX-4(28-30)-S/08142012/ Vadose 8/14/2012	HFA-1(26-28)-S/08072012/ Vadose 8/7/2012	HFA-2(10-12)-S/08082012/ Vadose 8/8/2012	HFA-3(22-24)-S/08112012/ Vadose 8/11/2012	WTANKF-1(26-28)-S/08292012/ Vadose 8/29/2012
Volatile Organic Compounds	Units	Laboratory Analytical Results			Laboratory Analytical Results			Laboratory Analytical Results	
1,1,1-Trichloroethane	µg/kg	< 5.2 U	< 5.2 U	< 5.2 U	< 5.3 U	< 56 U	< 5.3 U	< 5.3 U	
1,1-Dichloroethane	µg/kg	< 5.2 U	< 5.2 U	< 5.2 U	< 5.3 U	< 56 U	< 5.3 U	< 5.3 U	
1,1-Dichloroethene	µg/kg	< 5.2 U	< 5.2 U	< 5.2 U	< 5.3 U	< 56 U	< 5.3 U	< 5.3 U	
Benzene	µg/kg	< 5.2 U	< 5.2 U	< 5.2 U	< 5.3 U	< 56 U	< 5.3 U	0.32 J	
cis-1,2-Dichloroethene	µg/kg	< 5.2 U	< 5.2 U	< 5.2 U	< 5.3 U	< 56 U	< 5.3 U	< 5.3 U	
Ethylbenzene	µg/kg	2.5 J	0.38 J	0.44 J	1.3 J	68	< 5.3 U	0.37 J	
Tetrachloroethene	µg/kg	3.3 J	13	< 5.2 U	32	42 J	9	7.6	
Toluene	µg/kg	< 5.2 UB	0.60 J	0.83 J	< 5.3 UB	400	< 5.3 UB	< 5.3 UB	
trans-1,2-Dichloroethene	µg/kg	< 5.2 U	< 5.2 U	< 5.2 U	< 5.3 U	< 56 U	< 5.3 U	< 5.3 U	
Trichloroethene	µg/kg	< 5.2 U	0.50 J	< 5.2 U	0.74 J	11 J	0.47 J	0.75 J	
Vinyl chloride	µg/kg	< 5.2 U	< 5.2 U	< 5.2 U	< 5.3 U	< 56 U	< 5.3 U	< 5.3 U	
Xylenes	µg/kg	6.1 J	< 10 U	< 10 U	< 11 U	310	< 11 U	< 11 U	

µg/kg - Micrograms per kilogram.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

B - Compound detected in method blank and sample.



Table 1. Summary of Secondary Source Area Soil Sample Results, RACER Trust, Moraine, Ohio.

Location Code	Sample Label	West Tank Farm			Former Building 21			
		WTANKF-2	WTANKF-3	WTANKF-4	BLDG21-1	BLDG21-2	BLDG21-3	BLDG21-3
		WTANKF-2(22-24)-S/09092012/ Vadose 9/9/2012	WTANKF-3(12-14)-S/09042012/ Vadose 9/4/2012	WTANKF-4(28-30)-S/09102012/ Vadose 9/10/2012	BLDG21-1(18-20)-S/08232012/ Vadose 8/23/2012	BLDG21-2(18-20)-S/08152012/ Vadose 8/15/2012	BLDG21-3(10-12)-S/08212012/ Vadose 8/21/2012	BLDG21-3(24-26)-S/08212012/ Vadose 8/21/2012
Volatile Organic Compound	Units	Laboratory Analytical Results			Laboratory Analytical Results			
1,1,1-Trichloroethane	µg/kg	< 5.7 U	< 5.3 U	< 5.6 U	< 5.2 U	2.0 J	< 5.7 U	< 5.9 U
1,1-Dichloroethane	µg/kg	< 5.7 U	< 5.3 U	< 5.6 U	< 5.2 U	1.5 J	< 5.7 U	< 5.9 U
1,1-Dichloroethene	µg/kg	< 5.7 U	< 5.3 U	< 5.6 U	< 5.2 U	< 5.4 U	< 5.7 U	< 5.9 U
Benzene	µg/kg	0.51 J	< 5.3 U	0.26 J	< 5.2 U	< 5.4 U	< 5.7 U	< 5.9 U
cis-1,2-Dichloroethene	µg/kg	< 5.7 U	< 5.3 U	< 5.6 U	< 5.2 U	< 5.4 U	< 5.7 U	< 5.9 U
Ethylbenzene	µg/kg	1.0 J	0.91 J	0.29 J	0.69 J	< 5.4 U	0.73 J	< 5.9 U
Tetrachloroethene	µg/kg	87	1.0 J	22	3.8 J	18	3.6 J	4.4 J
Toluene	µg/kg	2.4 J	< 5.3 UB	0.77 J	1.2 J	0.68 J	1.5 J	0.53 J
trans-1,2-Dichloroethene	µg/kg	< 5.7 U	< 5.3 U	< 5.6 U	< 5.2 U	< 5.4 U	< 5.7 U	< 5.9 U
Trichloroethene	µg/kg	4.2 J	< 5.3 U	5.3 J	1.7 J	7.7	0.65 J	< 5.9 U
Vinyl chloride	µg/kg	< 5.7 U	< 5.3 U	< 5.6 U	< 5.2 U	< 5.4 U	< 5.7 U	< 5.9 U
Xylenes	µg/kg	< 11 U	2.7 J	< 11 UJ	< 10 U	< 11 U	< 11 U	< 12 U

µg/kg - Micrograms per kilogram.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

B - Compound detected in method blank and sample.



Table 1. Summary of Secondary Source Area Soil Sample Results, RACER Trust, Moraine, Ohio.

	Former Building 21				
	Location				
	Location Code	BLDG21-4	BLDG21-4	BLDG21-4	BLDG21-4
Sample Label	BLDG21-4(14-15)-S/08222012/	BLDG21-4(15-16)-S/08222012/	BLDG21-4(18-20)-S/08222012/	BLDG21-4(58-60)-S/08222012/	
Zone	Vadose	Vadose	Vadose	Saturated	
Sample Date	8/22/2012	8/22/2012	8/22/2012	8/22/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results			
1,1,1-Trichloroethane	µg/kg	< 5.6 U	< 5.6 U	< 5.5 U	< 5.6 U
1,1-Dichloroethane	µg/kg	< 5.6 U	1.1 J	< 5.5 U	15
1,1-Dichloroethene	µg/kg	< 5.6 U	< 5.6 U	< 5.5 U	< 5.6 U
Benzene	µg/kg	< 5.6 U	3.1 J	< 5.5 U	< 5.6 U
cis-1,2-Dichloroethene	µg/kg	< 5.6 U	4.0 J	< 5.5 U	6.7
Ethylbenzene	µg/kg	< 5.6 U	8.3	< 5.5 U	< 5.6 U
Tetrachloroethene	µg/kg	2.9 J	24	2.1 J	< 5.6 U
Toluene	µg/kg	0.85 J	16	1.1 J	0.92 J
trans-1,2-Dichloroethene	µg/kg	< 5.6 U	< 5.6 U	< 5.5 U	0.83 J
Trichloroethene	µg/kg	< 5.6 U	3.5 J	< 5.5 U	2.6 J
Vinyl chloride	µg/kg	< 5.6 U	< 5.6 U	< 5.5 U	< 5.6 U
Xylenes	µg/kg	< 11 U	14	< 11 U	< 11 U

µg/kg - Micrograms per kilogram.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

B - Compound detected in method blank and sample.



Table 2. Secondary Source Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

	Location		Box Sewer					
	Location Code	Sample Label	BOX-1 BOX-1(26-31)-GW/08092012/ Upper Aquifer 8/9/2012	BOX-1 BOX-1(38-43)-GW/08092012/ Upper Aquifer 8/9/2012	BOX-1 BOX-1(49-54)-GW/08102012/ Upper Aquifer 8/10/2012	BOX-2 BOX-2(24-29)-GW/08132012/ Upper Aquifer 8/13/2012	BOX-2 BOX-2(40-45)-GW/08132012/ Upper Aquifer 8/13/2012	BOX-2 BOX-2(46-51)-GW/08132012/ Upper Aquifer 8/13/2012
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	0.34 J
1,1-Dichloroethane	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	< 1.0 U
1,1-Dichloroethene	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	< 1.0 U
Benzene	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	0.13 J
cis-1,2-Dichloroethene	µg/L	1.9 J	7.8 J	< 67 U	< 1.7 U	< 4.0 U	< 10 U	< 1.0 U
Ethylbenzene	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	< 1.0 U
Tetrachloroethene	µg/L	150	420	2100	25	77	92	0.32 J
Toluene	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	0.26 J
trans-1,2-Dichloroethene	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	< 1.0 U
Trichloroethene	µg/L	16	200	740	5.8	6	6.5 J	< 1.0 U
Vinyl chloride	µg/L	< 4.0 U	< 12 U	< 67 U	< 1.7 U	< 4.0 U	< 10 U	< 1.0 U
Xylene (total)	µg/L	< 8.0 U	< 24 U	< 130 U	< 3.3 U	< 8.0 U	< 20 U	< 2.0 U

µg/L - Micrograms per Liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.



Table 2. Secondary Source Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

Location	Historic Fill Area						
	Location Code	HFA-1	HFA-1	HFA-2	HFA-2	HFA-3	HFA-3
Sample Label	HFA-1(28-3')-GW/08072012/	HFA-1(47-52)-GW/08082012/	HFA-2(25-30)-GW/08102012/	HFA-2(45-50)-GW/08112012/	HFA-3(25-30)-GW/08112012/	HFA-3(46-51)-GW/08122012/	
Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer
Sample Date	8/7/2012	8/8/2012	8/10/2012	8/11/2012	8/11/2012	8/12/2012	8/12/2012
Volatile Organic Compounds	Units	Laboratory Analytical Results					
1,1,1-Trichloroethane	µg/L	< 8.0 U	< 5.0 U	< 1.7 U	< 5.7 U	< 1.4 U	< 5.9 U
1,1-Dichloroethane	µg/L	< 8.0 U	1.9 J	0.54 J	2.3 J	< 1.4 U	2.2 J
1,1-Dichloroethene	µg/L	< 8.0 U	< 5.0 U	< 1.7 U	< 5.7 U	< 1.4 U	< 5.9 U
Benzene	µg/L	< 8.0 U	< 5.0 U	0.23 J	< 5.7 U	< 1.4 U	2.4 J
cis-1,2-Dichloroethene	µg/L	110	3.0 J	64	3.8 J	52	4.1 J
Ethylbenzene	µg/L	< 8.0 U	< 5.0 U	< 1.7 U	< 5.7 U	< 1.4 U	< 5.9 U
Tetrachloroethene	µg/L	32	3.9 J	29	< 5.7 U	26	1.8 J
Toluene	µg/L	< 8.0 U	< 5.0 U	0.52 J	< 5.7 U	0.28 J	1.8 J
trans-1,2-Dichloroethene	µg/L	< 8.0 U	< 5.0 U	0.52 J	< 5.7 U	0.57 J	< 5.9 U
Trichloroethene	µg/L	290	120	8.5	180	12	180
Vinyl chloride	µg/L	< 8.0 U	< 5.0 U	3.4	< 5.7 U	0.94 J	< 5.9 U
Xylene (total)	µg/L	< 16 U	< 10 U	< 3.3 U	< 11 U	< 2.9 U	< 12 U

µg/L - Micrograms per Liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.



Table 2. Secondary Source Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

	West Tank Farm						
	Location						
	Location Code	WTANKF-1	WTANKF-1	WTANKF-1	WTANKF-2	WTANKF-2	WTANKF-3
	Sample Label	WTANKF-1(30-35)-GW/08292012/	WTANKF-1(46-51)-GW/08292012/	WTANKF-1(55-60)-GW/09042012/	WTANKF-2(25-30)-GW/09092012/	WTANKF-2(50-55)-GW/09092012/	WTANKF-3(24-29)-GW/09042012/
Aquifer	Upper Aquifer						
Sample Date	8/29/2012	8/29/2012	9/4/2012	9/9/2012	9/9/2012	9/4/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results					
1,1,1-Trichloroethane	µg/L	< 11 U	< 10 U	< 11 U	< 5.0 U	1.0 J	< 6.7 U
1,1-Dichloroethane	µg/L	< 11 U	< 10 U	< 11 U	< 5.0 U	2.4 J	< 6.7 U
1,1-Dichloroethene	µg/L	< 11 U	< 10 U	< 11 U	< 5.0 U	< 3.3 U	< 6.7 U
Benzene	µg/L	< 11 U	< 10 U	< 11 U	< 5.0 U	< 3.3 U	< 6.7 U
cis-1,2-Dichloroethene	µg/L	< 11 U	22	16	4.8 J	26	< 6.7 U
Ethylbenzene	µg/L	< 11 U	< 10 U	< 11 U	< 5.0 U	< 3.3 U	< 6.7 U
Tetrachloroethene	µg/L	240	130	130	96	63	110
Toluene	µg/L	< 11 U	< 10 U	< 11 U	< 5.0 U	< 3.3 U	1.0 J
trans-1,2-Dichloroethene	µg/L	< 11 U	1.9 J	< 11 U	< 5.0 U	2.7 J	< 6.7 U
Trichloroethene	µg/L	280	240	220	130	73	140
Vinyl chloride	µg/L	< 11 U	< 10 U	< 11 U	< 5.0 U	< 3.3 U	< 6.7 U
Xylene (total)	µg/L	< 22 U	< 20 U	< 22 U	< 10 U	< 6.7 U	< 13 U

µg/L - Micrograms per Liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.



Table 2. Secondary Source Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

	West Tank Farm							
	Location	WTANKF-3		WTANKF-3		WTANKF-4		
	Location Code	WTANKF-3(45-50)-GW/09052012/	WTANKF-3(65-70)-GW/09052012/	WTANKF-3(80-85)-GW/09052012/	WTANKF-3(95-100)-GW/09062012/	WTANKF-4(30-35)-GW/09102012/	WTANKF-4(45-50)-GW/09102012/	
	Sample Label	Upper Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Upper Aquifer	Upper Aquifer	
Aquifer								
Sample Date	9/5/2012	9/5/2012	9/5/2012	9/6/2012	9/10/2012	9/10/2012		
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/L	< 8.0 U	< 1.0 U	< 1.4 U	< 2.5	< 13 U	< 13 U	< 13 U
1,1-Dichloroethane	µg/L	< 8.0 U	19	15	7.2	< 13 U	< 13 U	< 13 U
1,1-Dichloroethene	µg/L	< 8.0 U	< 1.0 U	< 1.4 U	0.97 J	< 13 U	< 13 U	< 13 U
Benzene	µg/L	< 8.0 U	< 1.0 U	< 1.4 U	< 2.5	< 13 U	< 13 U	< 13 U
cis-1,2-Dichloroethene	µg/L	47	22	35	74	< 13 U	18	18
Ethylbenzene	µg/L	< 8.0 U	< 1.0 U	< 1.4 U	< 2.5	< 13 U	< 13 U	< 13 U
Tetrachloroethene	µg/L	67	< 1.0 U	< 1.4 U	< 2.5	230	190	190
Toluene	µg/L	< 8.0 U	0.20 J	0.34 J	< 2.5	< 13 U	< 13 U	< 13 U
trans-1,2-Dichloroethene	µg/L	2.0 J	1.6	1.8	2.9	< 13 U	< 13 U	< 13 U
Trichloroethene	µg/L	170	8.9	6	19	190	240	240
Vinyl chloride	µg/L	< 8.0 U	1.3	< 1.4 U	< 2.5	< 13 U	< 13 U	< 13 U
Xylene (total)	µg/L	< 16 U	< 2.0 U	< 2.9 U	< 5.0	< 25 U	< 27 U	< 27 U

µg/L - Micrograms per Liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.



Table 2. Secondary Source Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

	Location		Former Building 21					
	Location Code	West Tank Farm	BLDG21-1	BLDG21-1	BLDG21-1	BLDG21-1	BLDG21-1	BLDG21-1
	Sample Label	WTANKF-4	BLDG21-1	BLDG21-1	BLDG21-1	BLDG21-1	BLDG21-1	BLDG21-1
	Aquifer	WTANKF-4(60-65)-GW/09102012/	BLDG21-1(27-32)-GW/08232012/	BLDG21-1(40-45)-GW/08232012/	BLDG21-1(51-56)-GW/08232012/	BLDG21-1(68-73)-GW/08242012/	BLDG21-1(85-90)-GW/08242012/	BLDG21-1(100-105)-GW/08242012/
	Sample Date	Upper Aquifer	Upper Aquifer	Upper Aquifer	Upper Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
		9/10/2012	8/23/2012	8/23/2012	8/23/2012	8/24/2012	8/24/2012	8/24/2012
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/L	3.7 J	2.4	2.9	20	13	< 5.0 U	< 1.0 U
1,1-Dichloroethane	µg/L	3.2 J	4.8	3.8	10	15	15	1.2
1,1-Dichloroethene	µg/L	< 13 U	< 1.0 U	< 1.7 U	2.8 J	< 8.3 U	1.7 J	0.21 J
Benzene	µg/L	< 13 U	< 1.0 U	< 1.7 U	< 5.0 U	< 8.3 U	< 5.0 U	< 1.0 U
cis-1,2-Dichloroethene	µg/L	47	23	19	110	78	21	33
Ethylbenzene	µg/L	< 13 U	< 1.0 U	< 1.7 U	< 5.0 U	< 8.3 U	< 5.0 U	< 1.0 U
Tetrachloroethene	µg/L	180	34	43	2.4 J	75	< 5.0 U	< 1.0 U
Toluene	µg/L	< 13 U	0.21 J	0.24 J	< 5.0 U	< 8.3 U	< 5.0 U	< 1.0 U
trans-1,2-Dichloroethene	µg/L	2.8 J	0.54 J	0.56 J	5.8	2.6 J	1.1 J	1
Trichloroethene	µg/L	200	19	35	150	210	190	0.24 J
Vinyl chloride	µg/L	< 13 U	< 1.0 U	< 1.7 U	< 5.0 U	1.9 J	< 5.0 U	0.35 J
Xylene (total)	µg/L	< 25 U	< 2.0 U	< 3.3 U	< 10 U	< 17 U	< 10 U	< 2.0 U

µg/L - Micrograms per Liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.



Table 2. Secondary Source Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

Location	Former Building 21							
	BLDG21-2 BLDG21-2(25-30)-GW/08152012/ Upper Aquifer 8/15/2012	BLDG21-2 BLDG21-2(40-45)-GW/08202012/ Upper Aquifer 8/20/2012	BLDG21-2 BLDG21-2(50-55)-GW/08202012/ Upper Aquifer 8/20/2012	BLDG21-3 BLDG21-3(27-32)-GW/08212012/ Upper Aquifer 8/21/2012	BLDG21-3 BLDG21-3(45-50)-GW/08212012/ Upper Aquifer 8/21/2012	BLDG21-4 B21-4(27-32)-GW/08222012/ Upper Aquifer 8/22/2012	BLDG21-4 BLDG21-4(45-50)-GW/08222012/ Upper Aquifer 8/22/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/L	0.73 J	4.4	13	1.8	6.4	0.85 J	5.4
1,1-Dichloroethane	µg/L	7.9	1.4 J	7.8	1	1.4 J	< 1.0 U	2.0 J
1,1-Dichloroethene	µg/L	< 1.0 U	< 1.7 U	< 4.0 U	< 1.0 U	< 2.5 U	< 1.0 U	< 2.5 U
Benzene	µg/L	0.36 J	< 1.7 U	< 4.0 U	0.17 J	< 2.5 U	< 1.0 U	< 2.5 U
cis-1,2-Dichloroethene	µg/L	1.6	12	66	2.1	36	0.63 J	6.4
Ethylbenzene	µg/L	< 1.0 U	< 1.7 U	< 4.0 U	< 1.0 U	< 2.5 U	< 1.0 U	< 2.5 U
Tetrachloroethene	µg/L	1.7	45	47	23	61	17	66
Toluene	µg/L	0.29 J	0.22 J	< 4.0 U	0.32 J	< 2.5 U	0.18 J	< 2.5 U
trans-1,2-Dichloroethene	µg/L	0.79 J	< 1.7 U	2.3 J	< 1.0 U	0.58 J	< 1.0 U	< 2.5 U
Trichloroethene	µg/L	2	14	130	4.7	26	3.5	18
Vinyl chloride	µg/L	0.39 J	< 1.7 U	1.3 J	< 1.0 U	< 2.5 U	< 1.0 U	< 2.5 U
Xylene (total)	µg/L	< 2.0 U	< 3.3 U	< 8.0 U	< 2.0 U	< 5.0 U	< 2.0 U	< 5.0 U

µg/L - Micrograms per Liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.



Table 3. Pre-Design Investigation Estimated Hydraulic Conductivity Values, RACER Trust, Moraine, Ohio.

Test ID	Pumping Scenario	Flow Rate (gpm)	Displacement (ft.)	Estimated Hydraulic Conductivity (ft./day)						Slug Test Results ¹ ft./day	Estimated Hydraulic Conductivity (Geomean) ft./day	Estimated Hydraulic Conductivity (Geomean) cm/sec	Overall Estimated Hydraulic Conductivity (Geomean) ft./day	
				Robbins et al. (2009)			Driscoll (1986)	Neville (2007)						
				Radial Flow	Half Ellipsoid	Full Ellipsoid	Cooper and Jacob (1946)	Cooper and Jacob (1946)						
UPPER AQUIFER														
Box Sewer														
BOX-1(26-31)	Low Flow Purge	1.1	0.07	439	--	--	--	--	--	--	439	1.55E-01	402	
	High Flow Purge	--	--	--	--	--	--	--	--	--	--	--		
BOX-1(38-43)	Low Flow Purge	1.1	0.21	141	--	--	--	--	--	184	229	8.06E-02		
	High Flow Purge	7.7	1.18	--	--	--	347	304	--	--	--	--		
BOX-1(49-54)	Low Flow Purge	--	--	--	--	--	--	--	--	125	218	7.69E-02		
	High Flow Purge	7.7	1.35	--	--	--	307	269	--	--	--	--		
BOX-2(40-45)	Low Flow Purge	--	--	--	--	--	--	--	--	--	1192	4.21E-01		
	High Flow Purge	8.1	0.34	--	--	--	1274	1115	--	--	--	--		
West Tank Farm														
WTANKF-2(50-55)	Low Flow Purge	--	--	--	--	--	--	--	--	--	647	2.28E-01		1105
	High Flow Purge	6.2	0.48	--	--	--	692	605	--	--	--	--		
WTANKF-3(45-50)	Low Flow Purge	--	--	--	--	--	--	--	--	--	1888	6.66E-01		
	High Flow Purge	7.9	0.21	--	--	--	2019	1766	--	--	--	--		
Building 21														
BLDG21-1(40-45)	Low Flow Purge	0.9	0.03	--	--	766	--	--	--	--	1082	3.82E-01	845	
	High Flow Purge	6.4	0.25	--	--	--	1375	1203	--	--	--	--		
BLDG21-2(40-45)	Low Flow Purge	0.7	0.06	--	--	287	--	--	--	192	410	1.45E-01		
	High Flow Purge	8.0	0.56	--	--	--	765	670	--	--	--	--		
BLDG21-2(50-55)	Low Flow Purge	--	--	--	--	--	--	--	--	--	225	7.92E-02		
	High Flow Purge	6.9	1.53	--	--	--	240	210	--	--	--	--		
BLDG21-3(45-50)	Low Flow Purge	0.7	0.02	--	969	--	--	--	--	--	1237	4.37E-01		
	High Flow Purge	6.4	0.23	--	--	--	1495	1308	--	--	--	--		
BLDG21-4(45-50)	Low Flow Purge	--	--	--	--	--	--	--	--	--	3482	1.23E+00		
	High Flow Purge	6.4	0.08	--	--	--	3223	3761	--	--	--	--		
Process Sump Area														
PSA-2(30-45)	Low Flow Purge	0.8	0.09	278	--	--	--	--	--	--	278	9.82E-02		195
	High Flow Purge	--	--	--	--	--	--	--	--	--	--	--		
PSA-2(40-45)	Low Flow Purge	0.7	0.92	--	22	--	--	--	--	--	43	1.50E-02		
	High Flow Purge	5.7	4.79	--	--	--	64	56	--	--	--	--		
PSA-3(34-39)	Low Flow Purge	0.8	0.12	178	--	--	--	--	--	--	178	6.29E-02		
	High Flow Purge	--	--	--	--	--	--	--	--	--	--	--		
PSA-3(49-54)	Low Flow Purge	0.7	0.15	--	134	--	--	--	--	--	361	1.27E-01		
	High Flow Purge	9.0	0.76	--	--	--	632	553	--	--	--	--		
PSA-5(45-50)	Low Flow Purge	0.9	0.12	--	224	--	--	--	--	--	562	1.98E-01		
	High Flow Purge	8.7	0.49	--	--	--	952	833	--	--	--	--		
PSA-6(52-57)	Low Flow Purge	0.3	0.06	--	153	--	--	--	--	--	134	4.74E-02		
	High Flow Purge	6.6	2.62	--	--	--	135	118	--	--	--	--		
PSA-7(40-45)	Low Flow Purge	--	--	--	--	--	--	--	--	--	584	2.06E-01		
	High Flow Purge	5.7	0.49	--	--	--	625	547	--	--	--	--		
PSA-7(59-64)	Low Flow Purge	0.3	0.67	--	13	--	--	--	--	--	10	3.68E-03		
	High Flow Purge	4.5	24.13	--	--	--	10	9	--	--	--	--		
PSA-8(43-48)	Low Flow Purge	--	--	--	--	--	--	--	--	--	154	5.43E-02		
	High Flow Purge	6.3	2.05	--	--	--	165	144	--	--	--	--		
PSA-9(47-52)	Low Flow Purge	0.7	0.03	--	--	545	--	--	--	--	1444	5.09E-01		
	High Flow Purge	8.4	0.18	--	--	--	2512	2198	--	--	--	--		
LOWER AQUIFER														
Process Sump Area														
PSA-5(69-74)	Low Flow Purge	0.8	0.19	--	120	--	--	--	--	--	270	9.53E-02	270	
	High Flow Purge	8.3	1.02	--	--	--	434	380	--	--	--	--		

gpm - Gallons per minute.
 ft. - Feet.
 ft./day - Feet per day.
 cm/sec - Centimeters per second.
 1. Refer to Table 4 for slug test results summary.

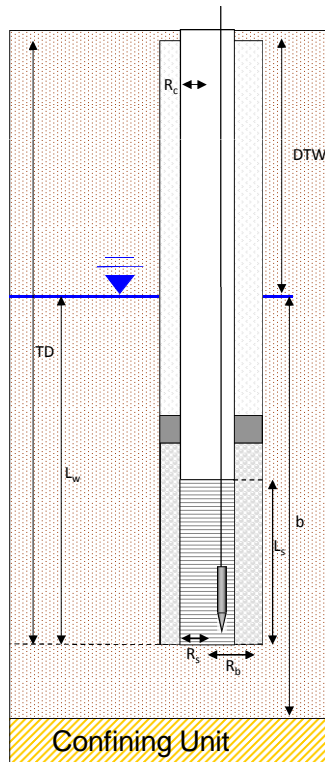
References

Robbins, G.A., A.T. Aragon-Jose, A. Romero, 2009. Determining Hydraulic Conductivity Using Pumping data from Low-Flow Sampling. Ground Water, Vol. 47, No. 2, p. 271.
 Driscoll, F.G., 1986, Groundwater and wells (Second edition): Johnson Division, St. Paul, Minnesota, 1089 p.
 Neville, C.J., 2007. Short Course - Interpretation of Pumping Well Drawdowns.
 Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.

Table 4. Pre-Design Investigation Pneumatic Slug Test Results Summary, RACER Trust, Moraine, Ohio.

Test ID	Test Number	Estimated Hydraulic Conductivity (ft./day)			Geometric Mean (ft./day)	Interval Geometric Mean (ft./day)	Interval Geometric Mean (cm/sec)	Screened Interval (ft. bgs)	Aquifer Condition	General Screened Interval Lithologic Description
		Solution								
		Hyder et al. (KGS Model)	Hvorslev	Bouwer and Rice						
BOX-1 (37-42)	1	191.5	212.2	174.0	191.9	184	6.49E-02	37-42	unconfined	sand with pebbles and some silt
	2	159.3	185.8	152.5	165.3					
	3	189.5	221.2	181.4	196.6					
BOX-1 (49-54)	1	174.9	118.0	87.5	121.8	125	4.43E-02	49-54	confined	sand with pebbles and some silt
	2	166.1	111.7	86.5	117.1					
	3	196.5	125.3	107.8	138.5					
BLDG21-2 (40-45)	1	209.1	205.9	167.0	193.0	192	6.79E-02	40-45	confined	pebbles with sand and little silt
	2	188.6	154.3	124.4	153.5					
	3	316.9	230.8	189.5	240.2					

cm/sec - centimeters per second
 ft./day - Feet per day.
 ft. bgs - feet below ground surface.



Well	Ls	Lw	Rs	Rc	DTW	TD	b
BOX-1(37-42)	5.00	17.88	0.08	0.19	24.12	42.00	17.88
BOX-1(49-54)	5.00	29.98	0.08	0.19	23.96	53.94	10.50
BLDG21-2(40-45)	5.00	20.50	0.08	0.19	24.38	44.88	30.00

All units in ft.

- L_s True screen length
- L_w Length of water column in Well (TD-SWL)
- R_s Screen radius
- R_c Casing radius
- DTW Static depth to water
- TD Total depth of well screen
- b Saturated thickness of aquifer

References

Bouwer, H., 1989. The Bouwer and Rice slug test--an update, *Ground Water*, vol. 27, no. 3, pp. 304-309.

Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, *Water Resources Research*, vol. 12, no. 3, pp. 423-428.

Butler, J.J., Jr., 1998. *The Design, Performance, and Analysis of Slug Tests*, Lewis Publishers, Boca Raton, 252p.

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, *Bull. No. 36, Waterways Exper. Sta. Corps of Er Army, Vicksburg, Mississippi*, pp. 1-50.

Hyder, Z, J.J. Butler, Jr., C.D. McElwee and W. Liu, 1994. Slug tests in partially penetrating wells, *Water Resources Research*, vol. 30 2945-2957.



Table 5. Summary of Groundwater Analytical Results, RACER Trust, Moraine, Ohio.

	Well ID	RMW-85	RMW-86	RMW-87	RMW-88⁽¹⁾
	Date Sampled	9/26/2012	9/26/2012	9/26/2012	9/26/2012
	Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer	Lower Aquifer
	Units	Laboratory Analytical Results			
<u>Volatile Organic Compounds</u>					
1,1,1-Trichloroethane	µg/L	< 10 U	12	< 1.0 U	< 1.4 U
1,1-Dichloroethane	µg/L	< 10 U	13	15	17
1,1-Dichloroethene	µg/L	< 10 U	1.6 J	< 1.0 U	< 1.4 U
Benzene	µg/L	< 10 U	< 6.7 U	0.13 J	< 1.4 U
cis-1,2-Dichloroethene	µg/L	< 10 U	52	23	43
Ethylbenzene	µg/L	< 10 U	< 6.7 U	< 1.0 U	< 1.4 U
Tetrachloroethene	µg/L	280	48	< 1.0 U	< 1.4 U
Toluene	µg/L	< 10 U	< 6.7 U	0.39 J	0.21 J
trans-1,2-Dichloroethene	µg/L	< 10 U	1.6 J	1.3	1.5
Trichloroethene	µg/L	120	190	7.5	< 1.4 U
Vinyl chloride	µg/L	< 10 U	< 6.7 U	0.93 J	1.1 J
Xylene (total)	µg/L	< 20 U	< 13 U	< 2.0 U	< 2.9 U
Total VOCs	µg/L	400	318	48.3	62.8

µg/L - Micrograms per liter.

VOCs - Volatile organic compounds.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

(1) - RMW-88 is located at the northern property boundary and represents upgradient groundwater quality. The Concentrations at RMW-88 are below the United States Environmental Protection Agency's Maximum Contaminant Levels.



Table 6. Upgradient Northern Perimeter Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

Location	Northern Perimeter									
	Location Code	NP-1	NP-1	NP-1	NP-1	NP-1	NP-2	NP-2	NP-2	
	Sample Label Aquifer Sample Date	NP-1(33-38)-GW/09072012/ Upper Aquifer 9/7/2012	NP-1(50-55)-GW/09072012/ Upper Aquifer 9/7/2012	NP-1(65-70)-GW/09082012/ Lower Aquifer 9/8/2012	NP-1(80-85)-GW/09082012/ Lower Aquifer 9/8/2012	NP-1(95-100)-GW/09082012/ Lower Aquifer 9/8/2012	NP-2(35-40)-GW/09172012/ Upper Aquifer 9/17/2012	NP-2(50-55)-GW/09172012/ Upper Aquifer 9/17/2012	NP-2(65-70)-GW/09182012/ Lower Aquifer 9/18/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results								
1,1,1-Trichloroethane	µg/L	1.6	0.99 J	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	0.91 J	4.9	
1,1-Dichloroethane	µg/L	0.82 J	4.6	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	1.1	17	
1,1-Dichloroethene	µg/L	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
Benzene	µg/L	0.23 J	< 1.0 U	< 1.0 U	< 1.0 U	0.27 J	< 1.0 U	< 1.0 U	0.14 J	
cis-1,2-Dichloroethene	µg/L	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	7.6	
Ethylbenzene	µg/L	0.21 J	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
Tetrachloroethene	µg/L	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
Toluene	µg/L	0.66 J	0.17 J	0.16 J	0.13 J	0.41 J	0.27 J	0.19 J	0.36 J	
trans-1,2-Dichloroethene	µg/L	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	1.2	
Trichloroethene	µg/L	0.73 J	1.4	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	0.40 J	1.3	
Vinyl chloride	µg/L	< 1.0 U	< 1.0 U	< 1.0 U	2.4 ⁽¹⁾	0.83 J	< 1.0 U	< 1.0 U	< 1.0 U	
Xylene (total)	µg/L	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	

µg/L - Micrograms per liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

(1) - Value exceeds the United States Environmental Protection Agency's Maximum Contaminant Level for the specified compound.



Table 6. Upgradient Northern Perimeter Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

Location Code	Northern Perimeter								
	NP-2	NP-2	NP-3	NP-3	NP-3	NP-3	NP-3	NP-3	
	NP-2(80-85)-GW/09182012/ Lower Aquifer 9/18/2012	NP-2(95-100)-GW/09182012/ Lower Aquifer 9/18/2012	NP-3(30-35)-GW/07102012/ Upper Aquifer 7/10/2012	NP-3(41-46)-GW/07112012/ Upper Aquifer 7/11/2012	NP-3(55-60)-GW/07112012/ Upper Aquifer 7/11/2012	NP-3(70-75)-GW/07112012/ Lower Aquifer 7/11/2012	NP-3(85-90)-GW/07122012/ Lower Aquifer 7/12/2012		
Volatile Organic Compounds	Units	Laboratory Analytical Results							
1,1,1-Trichloroethane	µg/L	< 1.0 U	< 2.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
1,1-Dichloroethane	µg/L	13	34	< 1.0 U	< 1.0 U	1.2	5.3	11	
1,1-Dichloroethene	µg/L	< 1.0 U	< 2.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
Benzene	µg/L	< 1.0 U	< 2.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
cis-1,2-Dichloroethene	µg/L	26	83 ⁽¹⁾	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	8.7	
Ethylbenzene	µg/L	< 1.0 U	< 2.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
Tetrachloroethene	µg/L	< 1.0 U	< 2.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
Toluene	µg/L	< 1.0 U	< 2.5 U	0.26 J	0.13 J	0.17 J	0.22 J	< 1.0 U	
trans-1,2-Dichloroethene	µg/L	1.2	4.0	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	0.67 J	
Trichloroethene	µg/L	< 1.0 U	< 2.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	
Vinyl chloride	µg/L	2.7 ⁽¹⁾	2.0 J	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	0.66 J	
Xylene (total)	µg/L	< 2.0 U	< 5.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	

µg/L - Micrograms per liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

(1) - Value exceeds the United States Environmental Protection Agency's Maximum Contaminant Level for the specified compound.



Table 7. Process Sump Area Vadose Zone Soil Sample Results, RACER Trust, Moraine, Ohio.

	Location		Process Sump Area					
	Location Code	PSA-1	PSA-2	PSA-3	PSA-4	PSA-5	PSA-6	
	Sample Label Sample Date	PSA-1(18-20)-S/07122012/ 7/12/2012	PSA-2(24-26)-S/07142012/ 7/14/2012	PSA-3(32-34)-S/07152012/ 7/15/2012	PSA-4(30-32)-S/07242012/ 7/24/2012	PSA-5(28-30)-S/07172012/ 7/17/2012	PSA-6(22-24)-S/07262012/ 7/26/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	< 5.9 U	< 5.6 U	< 7.2 U	
1,1-Dichloroethane	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	< 5.9 U	< 5.6 U	< 7.2 U	
1,1-Dichloroethene	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	< 5.9 U	< 5.6 U	< 7.2 U	
Benzene	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	< 5.9 U	< 5.6 U	< 7.2 U	
cis-1,2-Dichloroethene	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	< 5.9 U	< 5.6 U	< 7.2 U	
Ethylbenzene	µg/kg	0.32 J	< 5.5 U	< 5.6 U	0.34 J	0.45 J	0.38 J	
Tetrachloroethene	µg/kg	4.2 J	8.4	4.8 J	1.5 J	30	71	
Toluene	µg/kg	0.46 J	< 5.5 U	< 5.6 U	0.43 J	0.72 J	0.50 J	
trans-1,2-Dichloroethene	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	< 5.9 U	< 5.6 U	< 7.2 U	
Trichloroethene	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	3.7 J	6.3	110	
Vinyl chloride	µg/kg	< 5.3 U	< 5.5 U	< 5.6 U	< 5.9 U	< 5.6 U	< 7.2 U	
Xylenes	µg/kg	< 11 U	< 11 U	< 11 U	< 12 U	< 11 U	< 14 U	

µg/kg - Micrograms per kilogram.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

B - Compound detected in method blank and sample.



Table 7. Process Sump Area Vadose Zone Soil Sample Results, RACER Trust, Moraine, Ohio.

	Location		Process Sump Area			
	Location Code	PSA-7	PSA-8	PSA-9	PSA-10	
	Sample Label Sample Date	PSA-7(12-14)-S/07282012/ 7/28/2012	PSA-8(32-34)-S/07302012/ 7/30/2012	PSA-9(26-28)-S/08012012/ 8/1/2012	PSA-10(30-32)-S/08272012/ 8/30/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results				
1,1,1-Trichloroethane	µg/kg	< 13 U	< 760 U	< 5.2 U	< 5.8 U	
1,1-Dichloroethane	µg/kg	< 13 U	< 760 U	< 5.2 U	< 5.8 U	
1,1-Dichloroethene	µg/kg	< 13 U	< 760 U	< 5.2 U	< 5.8 U	
Benzene	µg/kg	< 13 U	< 760 U	< 5.2 U	< 5.8 U	
cis-1,2-Dichloroethene	µg/kg	< 13 U	< 760 U	< 5.2 U	< 5.8 U	
Ethylbenzene	µg/kg	0.78 J	< 760 U	0.62 J	< 5.8 U	
Tetrachloroethene	µg/kg	340	19000	71	3.2 J	
Toluene	µg/kg	< 13 U	< 760 U	< 5.2 UB	0.47 J	
trans-1,2-Dichloroethene	µg/kg	< 13 U	< 760 U	< 5.2 U	< 5.8 U	
Trichloroethene	µg/kg	77	910	4.2 J	< 5.8 U	
Vinyl chloride	µg/kg	< 13 U	< 760 U	< 5.2 U	< 5.8 U	
Xylenes	µg/kg	< 26 U	< 1500 U	< 10 U	< 12 U	

µg/kg - Micrograms per kilogram.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

B - Compound detected in method blank and sample.



Table 8. Process Sump Area Saturated Zone Soil Sample Results, RACER Trust, Moraine, Ohio.

	Location		Process Sump Area					
	Location Code	PSA-3	PSA-4	PSA-5	PSA-5	PSA-6	PSA-6	PSA-6
	Sample Label Sample Date	PSA-3(56-58)-S/07162012/ 7/16/2012	PSA-4(58-60)-S/07252012/ 7/25/2012	PSA-5(54-56)-S/07172012/ 7/17/2012	PSA-5(60-62)-S/07172012/ 7/17/2012	PSA-6(50-52)-S/07272012/ 7/27/2012	PSA-6(58-60)-S/07272012/ 7/27/2012	PSA-6(66-68)-S/07272012/ 7/27/2012
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/kg	160 J	< 30 U	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
1,1-Dichloroethane	µg/kg	< 280 U	9.1 J	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
1,1-Dichloroethene	µg/kg	< 280 U	< 30 U	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
Benzene	µg/kg	< 280 U	< 30 U	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
cis-1,2-Dichloroethene	µg/kg	< 280 U	13 J	170 J	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
Ethylbenzene	µg/kg	< 280 U	< 30 U	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
Tetrachloroethene	µg/kg	< 280 U	< 30 U	1200 J	45000	4000 J	2400000 J	9200
Toluene	µg/kg	< 280 U	< 30 U	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	24 J
trans-1,2-Dichloroethene	µg/kg	< 280 U	< 30 U	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
Trichloroethene	µg/kg	5800	560	44000	8300	130000	150000 J	8800
Vinyl chloride	µg/kg	< 280 U	< 30 U	< 2400 U	< 2900 U	< 5400 U	< 130000 UJ	< 330 U
Xylenes	µg/kg	< 560 U	< 59 U	< 4800 U	100 JB	< 11000 U	< 260000 UJ	< 660 U

µg/kg - Micrograms per kilogram.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

B - Compound detected in method blank and sample.



Table 8. Process Sump Area Saturated Zone Soil Sample Results, RACER Trust, Moraine, Ohio.

	Location	Process Sump Area		
	Location Code	PSA-7	PSA-7	PSA-8
	Sample Label Sample Date	PSA-7(50-52)-S/07292012/ 7/29/2012	PSA-7(52-54)-S/07292012/ 7/29/2012	PSA-8(56-58)-S/07312012/ 7/31/2012
Volatil Organic Compounds	Units	Laboratory Analytical Results		
1,1,1-Trichloroethane	µg/kg	< 2700 U	< 710 U	< 9600 U
1,1-Dichloroethane	µg/kg	< 2700 U	< 710 U	< 9600 U
1,1-Dichloroethene	µg/kg	< 2700 U	< 710 U	< 9600 U
Benzene	µg/kg	< 2700 U	< 710 U	< 9600 U
cis-1,2-Dichloroethene	µg/kg	< 2700 U	< 710 U	< 9600 U
Ethylbenzene	µg/kg	< 2700 U	< 710 U	< 9600 U
Tetrachloroethene	µg/kg	< 2700 U	46 J	270000 J
Toluene	µg/kg	< 2700 U	< 710 U	< 9600 U
trans-1,2-Dichloroethene	µg/kg	< 2700 U	< 710 U	< 9600 U
Trichloroethene	µg/kg	93000	20000	15000 J
Vinyl chloride	µg/kg	< 2700 U	< 710 U	< 9600 U
Xylenes	µg/kg	< 5400 U	< 1400 U	< 19000 U

µg/kg - Micrograms per kilogram.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

B - Compound detected in method blank and sample.



Table 9. Process Sump Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

	Process Sump Area							
	Location	PSA-1		PSA-2		PSA-3		
	Location Code Sample Label Aquifer Sample Date	PSA-1(27-32)-GW/07122012/ Upper Aquifer 7/12/2012	PSA-1(42-47)-GW/07132012/ Upper Aquifer 7/13/2012	PSA-2(30-35)-GW/07142012/ Upper Aquifer 7/14/2012	PSA-2(40-45)-GW/07142012/ Upper Aquifer 7/14/2012	PSA-3(34-39)-GW/07152012/ Upper Aquifer 7/15/2012	PSA-3(49-54)-GW/07152012/ Upper Aquifer 7/15/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	3.7 J	
1,1-Dichloroethane	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	< 11 U	
1,1-Dichloroethene	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	< 11 U	
Benzene	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	< 11 U	
cis-1,2-Dichloroethene	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	< 11 U	
Ethylbenzene	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	< 11 U	
Tetrachloroethene	µg/L	73	35	49	360	120	380	
Toluene	µg/L	0.43 J	< 1.4 U	0.32 J	< 13 U	< 5.0 U	< 11 U	
trans-1,2-Dichloroethene	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	< 11 U	
Trichloroethene	µg/L	< 2.5 U	0.82 J	0.44 J	24	1.3 J	95	
Vinyl chloride	µg/L	< 2.5 U	< 1.4 U	< 2.0 U	< 13 U	< 5.0 U	< 11 U	
Xylene (total)	µg/L	< 5.0 U	< 2.9 U	< 4.0 U	< 25 U	< 10 U	< 22 U	

µg/L - Micrograms per liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

1 - See RMW-85 groundwater data on Table 5. Vertical aquifer profile grab groundwater sample at this interval is not representative.



Table 9. Process Sump Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

	Process Sump Area							
	Location	PSA-4		PSA-5		PSA-5 ¹		PSA-5
	Location Code Sample Label Aquifer Sample Date	PSA-4(40-45)-GW/07242012/ Upper Aquifer 7/24/2012	PSA-4(58-63)-GW/07262012/ Upper Aquifer 7/26/2012	PSA-5(30-35)-GW/07172012/ Upper Aquifer 7/17/2012	PSA-5(45-50)-GW/07172012/ Upper Aquifer 7/17/2012	PSA-5(69-74)-GW/07182012/ Lower Aquifer 7/18/2012	PSA-5(85-90)-GW/07182012/ Lower Aquifer 7/18/2012	PSA-5(100-105)-GW/07232012/ Lower Aquifer 7/23/2012
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/L	< 14 U	< 1.0 U	< 8.0 U	< 1700 U	< 110 U	< 130 U	< 2.5 U
1,1-Dichloroethane	µg/L	< 14 U	6.7	< 8.0 U	< 1700 U	< 110 U	< 130 U	0.63 J
1,1-Dichloroethene	µg/L	< 14 U	0.50 J	< 8.0 U	< 1700 U	< 110 U	< 130 U	< 2.5 U
Benzene	µg/L	< 14 U	0.22 J	< 8.0 U	< 1700 U	< 110 U	< 130 U	< 2.5 U
cis-1,2-Dichloroethene	µg/L	< 14 U	5.7	< 8.0 U	< 1700 U	< 110 U	< 130 U	5.1
Ethylbenzene	µg/L	< 14 U	< 1.0 U	< 8.0 U	< 1700 U	< 110 U	< 130 U	< 2.5 U
Tetrachloroethene	µg/L	380	0.32 J	110	34000	3200	4600	74
Toluene	µg/L	< 14 U	0.31 J	< 8.0 U	< 1700 U	< 110 U	< 130 U	0.61 J
trans-1,2-Dichloroethene	µg/L	< 14 U	0.87 J	< 8.0 U	< 1700 U	< 110 U	< 130 U	< 2.5 U
Trichloroethene	µg/L	97	27	230	29000	1900	470	57
Vinyl chloride	µg/L	< 14 U	< 1.0 U	< 8.0 U	< 1700 U	< 110 U	< 130 U	< 2.5 U
Xylene (total)	µg/L	< 29 U	< 2.0 U	< 16 U	< 3300 U	< 220 U	< 250 U	< 5.0 U

µg/L - Micrograms per liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

1 - See RMW-85 groundwater data on Table 5. Vertical aquifer profile grab groundwater sample at this interval is not representative.



Table 9. Process Sump Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

Location Code Sample Label Aquifer Sample Date	Process Sump Area								
	PSA-6	PSA-6	PSA-6	PSA-7	PSA-7	PSA-7	PSA-8		
	PSA-6(29-34)-GW/07272012/ Upper Aquifer	PSA-6(42-47)-GW/07272012/ Upper Aquifer	PSA-6(52-57)-GW/07272012/ Upper Aquifer	PSA-7(29-34)-GW/07282012/ Upper Aquifer	PSA-7(40-45)-GW/07292012/ Upper Aquifer	PSA-7(59-64)-GW/07292012/ Upper Aquifer	PSA-8(31-36)-GW/07302012/ Upper Aquifer		
	7/27/2012	7/27/2012	7/27/2012	7/28/2012	7/29/2012	7/29/2012	7/30/2012		
Volatile Organic Compounds	Units	Laboratory Analytical Results							
1,1,1-Trichloroethane	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
1,1-Dichloroethane	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
1,1-Dichloroethene	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
Benzene	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
cis-1,2-Dichloroethene	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	5.9 J	93 J	< 67 U	
Ethylbenzene	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
Tetrachloroethene	µg/L	230	520	16000	130	130	< 100 U	1500	
Toluene	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
trans-1,2-Dichloroethene	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
Trichloroethene	µg/L	1700	7800	23000	630	430	2100	850	
Vinyl chloride	µg/L	< 71 U	< 330 U	< 830 U	< 25 U	< 15 U	< 100 U	< 67 U	
Xylene (total)	µg/L	< 140 U	< 670 U	< 1700 U	< 50 U	< 31 U	< 200 U	< 130 U	

µg/L - Micrograms per liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

1 - See RMW-85 groundwater data on Table 5. Vertical aquifer profile grab groundwater sample at this interval is not representative.



Table 9. Process Sump Area Vertical Aquifer Profile Groundwater Sample Results, RACER Trust, Moraine, Ohio.

Location	Process Pump Area							
	Location Code	PSA-8	PSA-8	PSA-9	PSA-9	PSA-9	PSA-10	
	Sample Label Aquifer Sample Date	PSA-8(43-48)-GW/07312012/ Upper Aquifer 7/31/2012	PSA-8(61-66)-GW/08012012/ Upper Aquifer 8/1/2012	PSA-9(32-37)-GW/08062012/ Upper Aquifer 8/6/2012	PSA-9(47-52)-GW/08062012/ Upper Aquifer 8/6/2012	PSA-9(59-64)-GW/08072012/ Upper Aquifer 8/7/2012	PSA-10(45-50)-GW/08272012/ Upper Aquifer 8/30/2012	
Volatile Organic Compounds	Units	Laboratory Analytical Results						
1,1,1-Trichloroethane	µg/L	< 200 U	< 500 U	< 6.3 U	< 20 U	< 140 U	0.60 J	
1,1-Dichloroethane	µg/L	< 200 U	< 500 U	< 6.3 U	< 20 U	< 140 U	< 1.7 U	
1,1-Dichloroethene	µg/L	< 200 U	< 500 U	< 6.3 U	< 20 U	< 140 U	< 1.7 U	
Benzene	µg/L	< 200 U	< 500 U	< 6.3 U	< 20 U	< 140 U	< 1.7 U	
cis-1,2-Dichloroethene	µg/L	< 200 U	250 J	1.1	< 20 U	340	2.3	
Ethylbenzene	µg/L	< 200 U	< 500 U	< 6.3 U	< 20 U	< 140 U	< 1.7 U	
Tetrachloroethene	µg/L	3600	19000	180	590	< 140 U	52	
Toluene	µg/L	< 200 U	< 500 U	0.91 J	< 20 U	< 140 U	< 1.7 U	
trans-1,2-Dichloroethene	µg/L	< 200 U	< 500 U	< 6.3 U	< 20 U	< 140 U	0.41 J	
Trichloroethene	µg/L	6000	4600	20	40	3500	13	
Vinyl chloride	µg/L	< 200 U	< 500 U	< 6.3 U	< 20 U	< 140 U	< 1.7 U	
Xylene (total)	µg/L	< 400 U	< 1000 U	< 13 U	< 40 U	< 290 U	< 3.3 U	

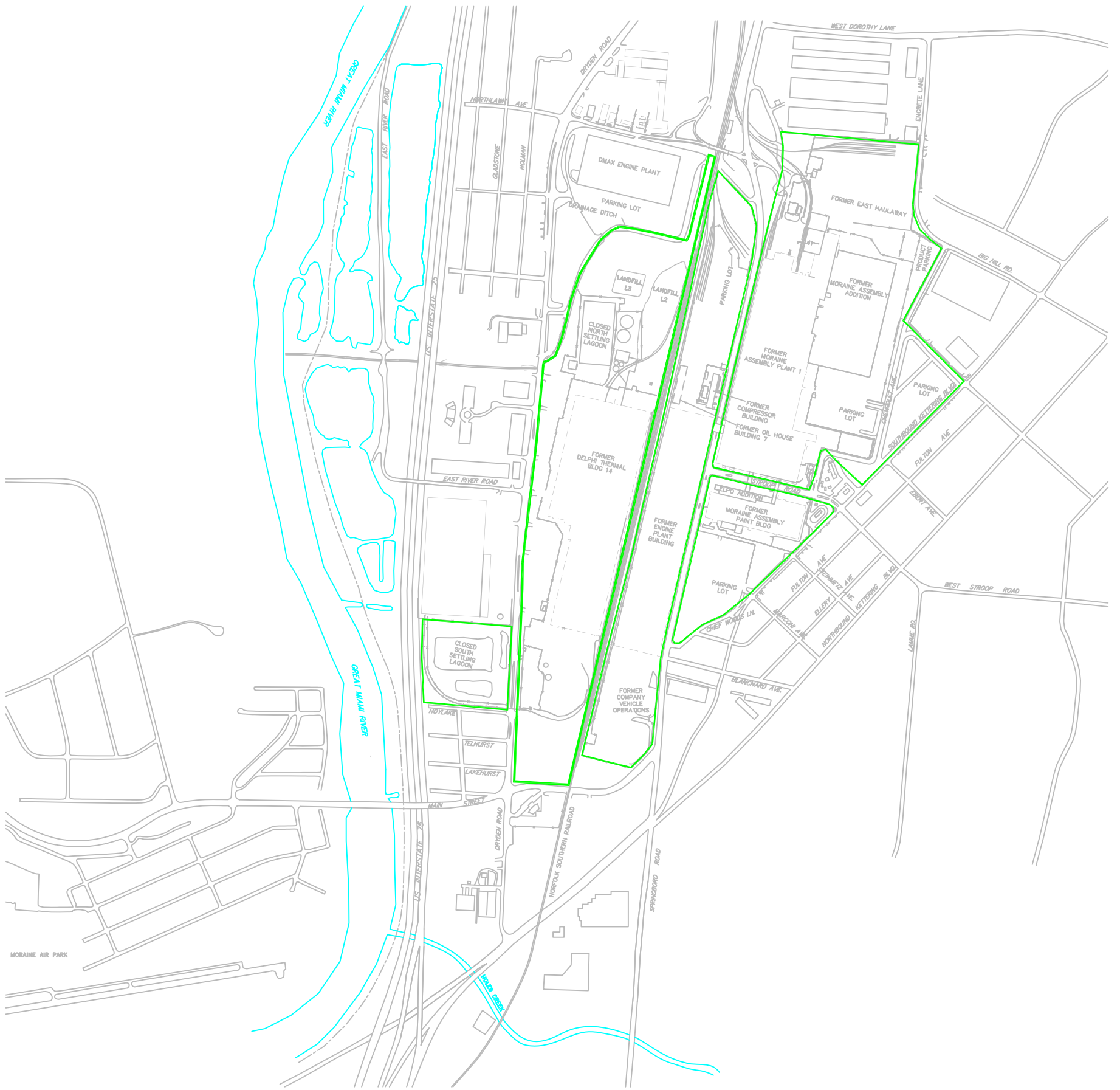
µg/L - Micrograms per liter.

< - Chemical of concern not detected above laboratory reporting limit shown.

U - Chemical of concern not detected above laboratory reporting limit shown.

J - Value estimated.

1 - See RMW-85 groundwater data on Table 5. Vertical aquifer profile grab groundwater sample at this interval is not representative.



- LEGEND**
- PROPERTY BOUNDARY
 - RIVER LEVEE
 - FORMER BUILDING FOOTPRINT
 - SURFACE WATER FEATURE

RACER TRUST
 MORaine, OHIO
 OH000294.2012

SITE LAYOUT



XREFS:
 MLCBASE MAP 2010



LEGEND

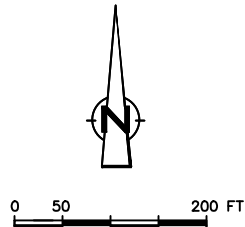
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE

RACER TRUST
 MORAINE, OHIO
 OH000294.2012

PRE-DESIGN INVESTIGATION AREAS



CITY:(DUBLIN) DIV:GROUP:(SER2) DB:(R. SMITH) LD:(OPI) PIC:(OPI) PM:(T. FORTNER) TM:(OPI) LVR:(OPI)ON:OFF-REF
 G:\ENV\CAD\Columbus-OH\ACT\1000294 - RACER\2012\000294-2012-02B-01.dwg LAYOUT: FIG 6 FORMER BLDG 21 AREA SAVER: 12/12/2012 4:12 PM ACADVER: 18.15 (LMS TECH) PAGES: 10 PLOTSTYLETABLE: ACAD.CTB PLOTTED: 12/12/2012 4:13 PM BY: SMITH, BOB
 PROJECTNAME: MLCBASE MAP 2010

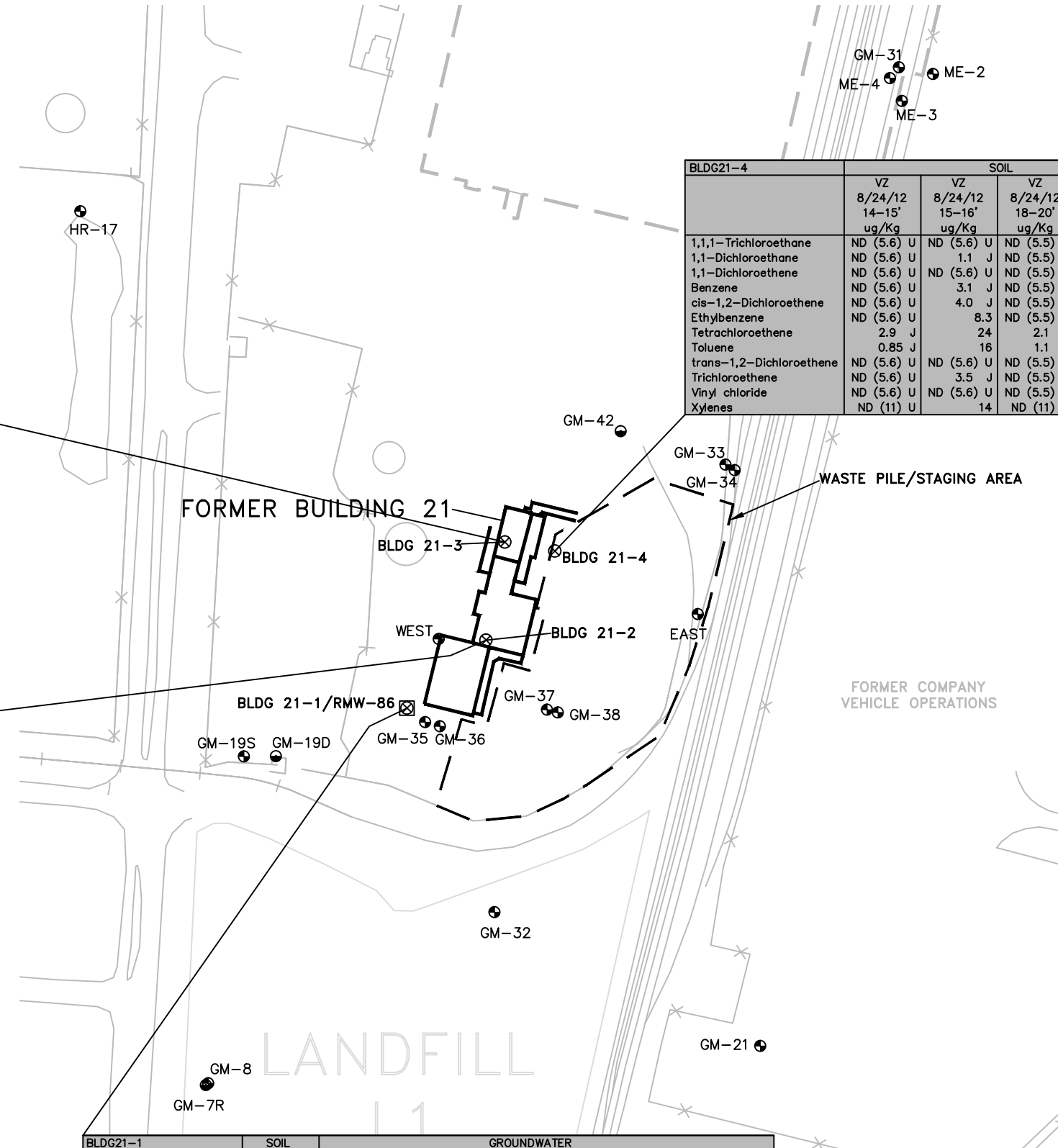


BLDG21-3	SOIL		GROUNDWATER	
	VZ 8/21/12 10-12' ug/Kg	VZ 8/21/12 24-26' ug/Kg	UA 8/21/12 27-32' ug/L	UA 8/21/12 45-50' ug/L
1,1,1-Trichloroethane	ND (5.7) U	ND (5.9) U	1.8	6.4
1,1-Dichloroethane	ND (5.7) U	ND (5.9) U	1.0	1.4 J
1,1-Dichloroethene	ND (5.7) U	ND (5.9) U	ND (1.0) U	ND (2.5) U
Benzene	ND (5.7) U	ND (5.9) U	0.17 J	ND (2.5) U
cis-1,2-Dichloroethene	ND (5.7) U	ND (5.9) U	2.1	36
Ethylbenzene	0.73 J	ND (5.9) U	ND (1.0) U	ND (2.5) U
Tetrachloroethene	3.6 J	4.4 J	23	61
Toluene	1.5 J	0.53 J	0.32 J	ND (2.5) U
trans-1,2-Dichloroethene	ND (5.7) U	ND (5.9) U	ND (1.0) U	0.58 J
Trichloroethene	0.65 J	ND (5.9) U	4.7	26
Vinyl chloride	ND (5.7) U	ND (5.9) U	ND (1.0) U	ND (2.5) U
Xylenes	ND (11) U	ND (12) U	ND (2.0) U	ND (5.0) U

BLDG21-2	SOIL		GROUNDWATER	
	VZ 8/15/12 18-20' ug/Kg	UA 8/15/12 25-30' ug/L	UA 8/15/12 40-45' ug/L	UA 8/15/12 50-55' ug/L
1,1,1-Trichloroethane	2.0 J	0.73 J	4.4	13
1,1-Dichloroethane	1.5 J	7.9	1.4 J	7.8
1,1-Dichloroethene	ND (5.4) U	ND (1.0) U	ND (1.7) U	ND (4.0) U
Benzene	ND (5.4) U	0.36 J	ND (1.7) U	ND (4.0) U
cis-1,2-Dichloroethene	ND (5.4) U	1.6	12	66
Ethylbenzene	ND (5.4) U	ND (1.0) U	ND (1.7) U	ND (4.0) U
Tetrachloroethene	18	1.7	45	47
Toluene	0.68 J	0.29 J	0.22 J	ND (4.0) U
trans-1,2-Dichloroethene	ND (5.4) U	0.79 J	ND (1.7) U	2.3 J
Trichloroethene	7.7	2.0	14	130
Vinyl chloride	ND (5.4) U	0.39 J	ND (1.7) U	1.3 J
Xylenes	ND (11) U	ND (2.0) U	ND (3.3) U	ND (8.0) U

BLDG21-1	SOIL		GROUNDWATER				
	VZ 8/23/12 18-20' ug/Kg	UA 8/23/12 27-32' ug/L	UA 8/23/12 40-45' ug/L	UA 8/23/12 51-56' ug/L	LA 8/23/12 68-73' ug/L	LA 8/23/12 85-90' ug/L	LA 8/23/12 100-105' ug/L
1,1,1-Trichloroethane	ND (5.2) U	2.4	2.9	20	13	ND (5.0) U	ND (1.0) U
1,1-Dichloroethane	ND (5.2) U	4.8	3.8	10	15	15	1.2
1,1-Dichloroethene	ND (5.2) U	ND (1.0) U	ND (1.7) U	2.8 J	< 8.3 U	1.7 J	0.21 J
Benzene	ND (5.2) U	ND (1.0) U	ND (1.7) U	ND (5.0) U	< 8.3 U	ND (5.0) U	ND (1.0) U
cis-1,2-Dichloroethene	ND (5.2) U	23	19	110	78	21	33
Ethylbenzene	0.69 J	ND (1.0) U	ND (1.7) U	ND (5.0) U	< 8.3 U	ND (5.0) U	ND (1.0) U
Tetrachloroethene	3.8 J	34	43	2.4 J	75	ND (5.0) U	ND (1.0) U
Toluene	1.2 J	0.21 J	0.24 J	ND (5.0) U	< 8.3 U	ND (5.0) U	ND (1.0) U
trans-1,2-Dichloroethene	ND (5.2) U	0.54 J	0.56 J	5.8	2.6 J	1.1 J	1.0
Trichloroethene	1.7 J	19	35	150	210	190	0.24 J
Vinyl chloride	ND (5.2) U	ND (1.0) U	ND (1.7) U	ND (5.0) U	1.9 J	ND (5.0) U	0.35 J
Xylenes	ND (10) U	ND (2.0) U	ND (3.3) U	ND (10) U	ND (17) U	ND (10) U	ND (2.0) U

BLDG21-4	SOIL				GROUNDWATER	
	VZ 8/24/12 14-15' ug/Kg	VZ 8/24/12 15-16' ug/Kg	VZ 8/24/12 18-20' ug/Kg	SZ 8/24/12 58-60' ug/Kg	UA 8/22/12 27-32' ug/L	UA 8/22/12 45-50' ug/L
1,1,1-Trichloroethane	ND (5.6) U	ND (5.6) U	ND (5.5) U	ND (5.6) U	0.85 J	5.4
1,1-Dichloroethane	ND (5.6) U	1.1 J	ND (5.5) U	15	ND (1.0) U	2.0 J
1,1-Dichloroethene	ND (5.6) U	ND (5.6) U	ND (5.5) U	ND (5.6) U	ND (1.0) U	ND (2.5) U
Benzene	ND (5.6) U	3.1 J	ND (5.5) U	ND (5.6) U	ND (1.0) U	ND (2.5) U
cis-1,2-Dichloroethene	ND (5.6) U	4.0 J	ND (5.5) U	6.7	0.63 J	6.4
Ethylbenzene	ND (5.6) U	8.3	ND (5.5) U	ND (5.6) U	ND (1.0) U	ND (2.5) U
Tetrachloroethene	2.9 J	24	2.1 J	ND (5.6) U	17	66
Toluene	0.85 J	16	1.1 J	0.92 J	0.18 J	ND (2.5) U
trans-1,2-Dichloroethene	ND (5.6) U	ND (5.6) U	ND (5.5) U	0.83 J	ND (1.0) U	ND (2.5) U
Trichloroethene	ND (5.6) U	3.5 J	ND (5.5) U	2.6 J	3.5	18
Vinyl chloride	ND (5.6) U	ND (5.6) U	ND (5.5) U	ND (5.6) U	ND (1.0) U	ND (2.5) U
Xylenes	ND (11) U	14	ND (11) U	ND (11) U	ND (2.0) U	ND (5.0) U



- LEGEND**
- ⊗ PRE-DESIGN INVESTIGATION BORING LOCATION
 - ⊗ PRE-DESIGN INVESTIGATION BORING LOCATION INTO LOWER AQUIFER
 - ⊕ UPPER AQUIFER MONITORING WELL
 - ⊙ LOWER AQUIFER MONITORING WELL
 - ND NON-DETECT, IF RESULT IS ND THE DETECTION LIMIT IS SHOWN IN PARENTHESIS
 - 30-35' DEPTH GROUNDWATER GRAB SAMPLE WAS COLLECTED
 - ug/L MICROGRAMS PER LITER
 - ug/kg MICROGRAMS PER KILOGRAM
 - LA LOWER AQUIFER
 - UA UPPER AQUIFER
 - VZ VADOSE ZONE
 - SZ SATURATED ZONE
 - J ESTIMATED VALUE
 - U LESS THAN REPORTING LIMIT

RACER TRUST
 MORaine, OHIO
 OH000294.2012

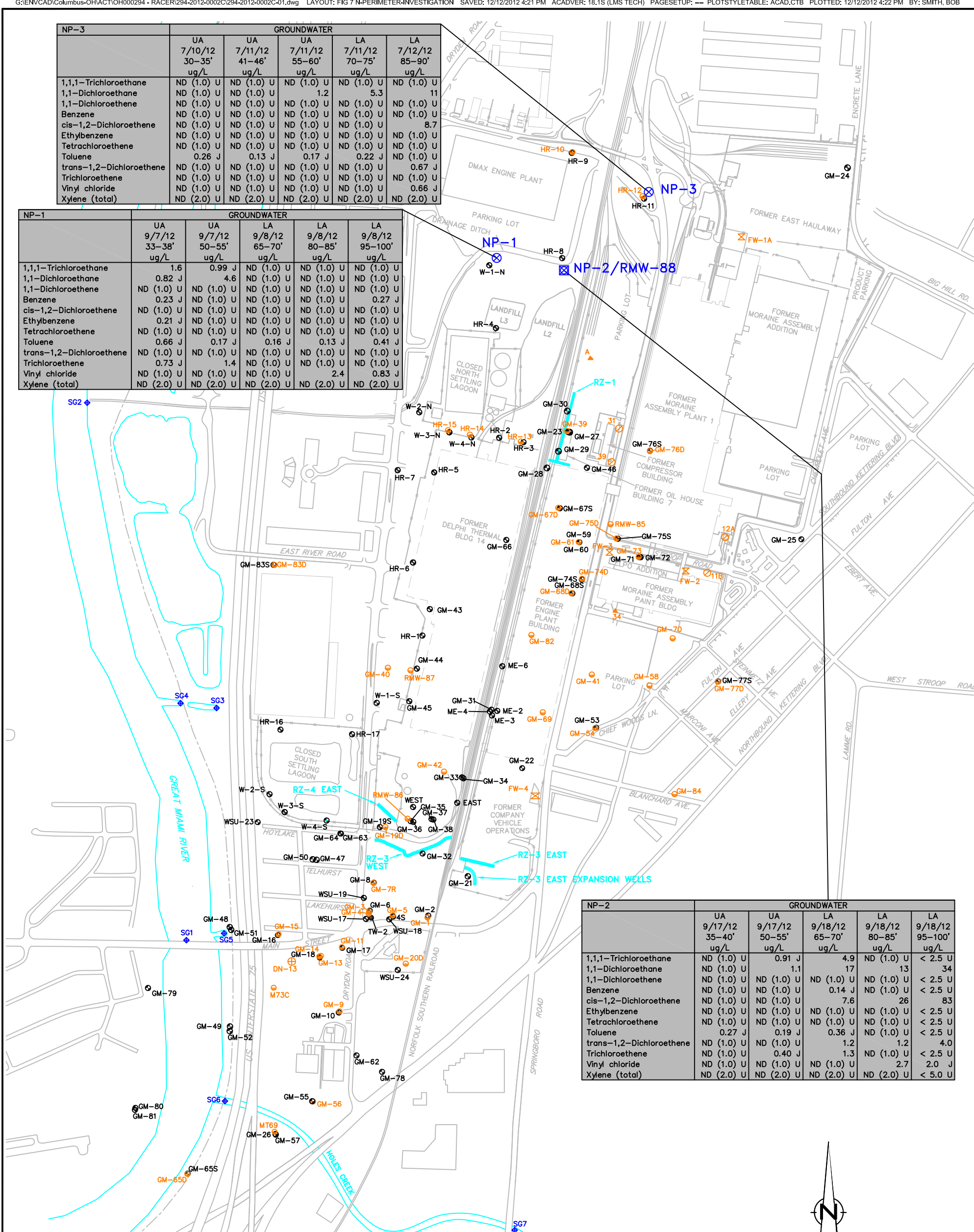
**FORMER BUILDING 21 AREA
 INVESTIGATION RESULTS**

FIGURE
6

NP-3	GROUNDWATER				
	UA 7/10/12 30-35' ug/L	UA 7/11/12 41-46' ug/L	UA 7/11/12 55-60' ug/L	LA 7/11/12 70-75' ug/L	LA 7/12/12 85-90' ug/L
1,1,1-Trichloroethane	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
1,1-Dichloroethane	ND (1.0) U	ND (1.0) U	1.2	5.3	11
1,1-Dichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Benzene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
cis-1,2-Dichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	8.7
Ethylbenzene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Tetrachloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Toluene	0.26 J	0.13 J	0.17 J	0.22 J	ND (1.0) U
trans-1,2-Dichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	0.67 J
Trichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Vinyl chloride	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	0.66 J
Xylene (total)	ND (2.0) U	ND (2.0) U	ND (2.0) U	ND (2.0) U	ND (2.0) U

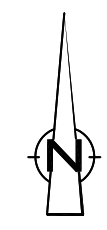
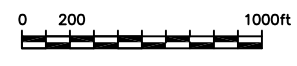
NP-1	GROUNDWATER				
	UA 9/7/12 33-38' ug/L	UA 9/7/12 50-55' ug/L	LA 9/8/12 65-70' ug/L	LA 9/8/12 80-85' ug/L	LA 9/8/12 95-100' ug/L
1,1,1-Trichloroethane	1.6	0.99 J	ND (1.0) U	ND (1.0) U	ND (1.0) U
1,1-Dichloroethane	0.82 J	4.6	ND (1.0) U	ND (1.0) U	ND (1.0) U
1,1-Dichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Benzene	0.23 J	ND (1.0) U	ND (1.0) U	ND (1.0) U	0.27 J
cis-1,2-Dichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Ethylbenzene	0.21 J	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Tetrachloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Toluene	0.66 J	0.17 J	0.16 J	0.13 J	0.41 J
trans-1,2-Dichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U
Trichloroethene	0.73 J	1.4	ND (1.0) U	ND (1.0) U	ND (1.0) U
Vinyl chloride	ND (1.0) U	ND (1.0) U	ND (1.0) U	2.4	0.83 J
Xylene (total)	ND (2.0) U	ND (2.0) U	ND (2.0) U	ND (2.0) U	ND (2.0) U

NP-2	GROUNDWATER				
	UA 9/17/12 35-40' ug/L	UA 9/17/12 50-55' ug/L	LA 9/18/12 65-70' ug/L	LA 9/18/12 80-85' ug/L	LA 9/18/12 95-100' ug/L
1,1,1-Trichloroethane	ND (1.0) U	0.91 J	4.9	ND (1.0) U	< 2.5 U
1,1-Dichloroethane	ND (1.0) U	1.1	17	13	34
1,1-Dichloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	< 2.5 U
Benzene	ND (1.0) U	ND (1.0) U	0.14 J	ND (1.0) U	< 2.5 U
cis-1,2-Dichloroethene	ND (1.0) U	ND (1.0) U	7.6	26	83
Ethylbenzene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	< 2.5 U
Tetrachloroethene	ND (1.0) U	ND (1.0) U	ND (1.0) U	ND (1.0) U	< 2.5 U
Toluene	0.27 J	0.19 J	0.36 J	ND (1.0) U	< 2.5 U
trans-1,2-Dichloroethene	ND (1.0) U	ND (1.0) U	1.2	1.2	4.0
Trichloroethene	ND (1.0) U	0.40 J	1.3	ND (1.0) U	< 2.5 U
Vinyl chloride	ND (1.0) U	ND (1.0) U	ND (1.0) U	2.7	2.0 J
Xylene (total)	ND (2.0) U	ND (2.0) U	ND (2.0) U	ND (2.0) U	< 5.0 U



LEGEND

- MONITORING WELL (UPPER AQUIFER)
- RECOVERY WELL (TW-2)
- MONITORING WELL (LOWER AQUIFER)
- CARBON SOURCE INTRODUCTION WELLS, REACTIVE ZONES (RZ-1, RZ-3, AND RZ-4)
- ⊗ FIRE WELL
- ▲ PRODUCTION WELL CONVERTED TO MONITORING WELL (34, A)
- INACTIVE PRODUCTION WELL (31, 39, 11B, 12A)
- ⊕ MONTGOMERY COUNTY WELL (USED BY RACER TRUST FOR LOWER AQUIFER PUMP TO WASTE PROGRAM)
- ◆ STREAM GAUGE
- RIVER LEVEE
- ⊗ PRE-DESIGN INVESTIGATION MONITORING WELL INSTALLED IN LOWER AQUIFER
- ⊗ PRE-DESIGN INVESTIGATION BORING LOCATION (ON-SITE)
- ND NON-DETECT, IF RESULT IS ND THE DETECTION LIMIT IS SHOWN IN PARENTHESIS
- 30-35' DEPTH GROUNDWATER GRAB SAMPLE WAS COLLECTED
- ug/L MICROGRAMS PER LITER
- LA LOWER AQUIFER
- UA UPPER AQUIFER
- J ESTIMATED VALUE
- U LESS THAN REPORTING LIMIT



RACER TRUST
MORaine, OHIO
OH000294.2012

**UPGRADIENT NORTHERN PERIMETER
INVESTIGATION RESULTS**

ARCADIS

FIGURE
7

CITY: DUBLIN, OH; COUNTY: MIDDLESEX; PROJECT: RACER TRUST MORAINE, OHIO; DRAWING: PROCESS SUMP AREA INVESTIGATION RESULTS; DATE: 12/27/2012; 5:13 PM; BY: DOWNEY, CONNIE; PLOTSTYLE: ALLPLOTTERS-COLOR.CTB; PLOTTED: 12/27/2012 5:13 PM; BY: DOWNEY, CONNIE;

PSA-8	SOIL		GROUNDWATER		
	VZ 7/30/12 32-34' ug/Kg	SZ 7/31/12 56-58' ug/L	UA 7/30/12 31-36' ug/L	UA 7/31/12 43-48' ug/L	UA 8/1/12 61-66' ug/L
1,1,1-Trichloroethane	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
1,1-Dichloroethane	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
1,1-Dichloroethene	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
Benzene	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
cis-1,2-Dichloroethene	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	250 J
Ethylbenzene	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
Tetrachloroethene	19000	270000 J	1500	3600	19000
Toluene	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
trans-1,2-Dichloroethene	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
Trichloroethene	910	15000 J	850	6000	4600
Vinyl chloride	ND (760) U	ND (9600) U	ND (67) U	ND (200) U	ND (500) U
Xylenes	ND (1500) U	ND (19000) U	ND (130) U	ND (400) U	ND (1000) U

PSA-5	SOIL			GROUNDWATER				
	VZ 7/17/12 28-30' ug/Kg	SZ 7/17/12 54-56' ug/Kg	SZ 7/17/12 60-62' ug/Kg	UA 7/17/12 30-35' ug/L	UA 7/17/12 45-50' ug/L	LA 7/18/12 *69-74' ug/L	LA 7/18/12 *85-90' ug/L	LA 7/23/12 100-105' ug/L
1,1,1-Trichloroethane	ND (5.6) U	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	ND (2.5) U
1,1-Dichloroethane	ND (5.6) U	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	0.63 J
1,1-Dichloroethene	ND (5.6) U	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	ND (2.5) U
Benzene	ND (5.6) U	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	ND (2.5) U
cis-1,2-Dichloroethene	ND (5.6) U	170 J	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	5.1
Ethylbenzene	0.45 J	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	ND (2.5) U
Tetrachloroethene	30	1200 J	45000	110	34000	3200	4600	74
Toluene	0.72 J	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	0.61 J
trans-1,2-Dichloroethene	ND (5.6) U	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	ND (2.5) U
Trichloroethene	6.3	44000	8300	230	29000	1900	470	57
Vinyl chloride	ND (5.6) U	ND (2400) U	ND (2900) U	ND (8.0) U	ND (1700) U	ND (110) U	ND (130) U	ND (2.5) U
Xylenes	ND (11) U	ND (4800) U	100 JB	ND (16) U	ND (3300) U	ND (220) U	ND (250) U	ND (5.0) U

PSA-7	SOIL			GROUNDWATER		
	VZ 7/28/12 12-14' ug/Kg	SZ 7/29/12 50-52' ug/Kg	SZ 7/29/12 52-54' ug/Kg	UA 7/28/12 29-34' ug/L	UA 7/29/12 40-45' ug/L	UA 7/29/12 59-64' ug/L
1,1,1-Trichloroethane	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
1,1-Dichloroethane	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
1,1-Dichloroethene	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
Benzene	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
cis-1,2-Dichloroethene	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	5.9 J	93 J
Ethylbenzene	0.78 J	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
Tetrachloroethene	340	ND (2700) U	46 J	130	130	ND (100) U
Toluene	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
trans-1,2-Dichloroethene	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
Trichloroethene	77	93000	20000	630	430	2100
Vinyl chloride	ND (13) U	ND (2700) U	ND (710) U	ND (25) U	ND (15) U	ND (100) U
Xylenes	ND (26) U	ND (5400) U	ND (1400) U	ND (50) U	ND (31) U	ND (200) U

PSA-6	SOIL				GROUNDWATER		
	VZ 7/26/12 22-24' ug/Kg	SZ 7/27/12 50-52' ug/Kg	SZ 7/27/12 58-60' ug/Kg	SZ 7/27/12 66-68' ug/Kg	UA 7/26/12 29-34' ug/L	UA 7/26/12 42-47' ug/L	UA 7/26/12 52-57' ug/L
1,1,1-Trichloroethane	ND (7.2) U	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
1,1-Dichloroethane	ND (7.2) U	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
1,1-Dichloroethene	ND (7.2) U	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
Benzene	ND (7.2) U	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
cis-1,2-Dichloroethene	ND (7.2) U	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
Ethylbenzene	0.38 J	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
Tetrachloroethene	71	4000 J	2400000 J	9200	230	520	16000
Toluene	0.50 J	ND (5400) U	ND (130000) U	24 J	ND (71) U	ND (330) U	ND (830) U
trans-1,2-Dichloroethene	ND (7.2) U	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
Trichloroethene	110	130000	150000 J	8800	1700	7800	23000
Vinyl chloride	ND (7.2) U	ND (5400) U	ND (130000) U	ND (330) U	ND (71) U	ND (330) U	ND (830) U
Xylenes	ND (14) U	ND (11000) U	ND (260000) U	ND (660) U	ND (140) U	ND (670) U	ND (1700) U

PSA-4	SOIL		GROUNDWATER	
	VZ 7/24/12 30-32' ug/Kg	SZ 7/25/12 58-60' ug/Kg	UA 7/24/12 40-45' ug/L	UA 7/26/12 58-63' ug/L
1,1,1-Trichloroethane	ND (5.9) U	ND (30) U	ND (14) U	ND (1.0) U
1,1-Dichloroethane	ND (5.9) U	9.1 J	ND (14) U	6.7
1,1-Dichloroethene	ND (5.9) U	ND (30) U	ND (14) U	0.50 J
Benzene	ND (5.9) U	ND (30) U	ND (14) U	0.22 J
cis-1,2-Dichloroethene	ND (5.9) U	13 J	ND (14) U	5.7
Ethylbenzene	0.34 J	ND (30) U	ND (14) U	ND (1.0) U
Tetrachloroethene	1.5 J	ND (30) U	380	0.32 J
Toluene	0.43 J	ND (30) U	ND (14) U	0.31 J
trans-1,2-Dichloroethene	ND (5.9) U	ND (30) U	ND (14) U	0.87 J
Trichloroethene	3.7 J	560	97	27
Vinyl chloride	ND (5.9) U	ND (30) U	ND (14) U	ND (1.0) U
Xylenes	ND (12) U	ND (59) U	ND (29) U	ND (2.0) U

PSA-3	SOIL		GROUNDWATER	
	VZ 7/15/12 32-34' ug/Kg	SZ 7/16/12 56-58' ug/Kg	UA 7/15/12 34-39' ug/L	UA 7/15/12 49-54' ug/L
1,1,1-Trichloroethane	ND (5.6) U	160 J	ND (5.0) U	3.7 J
1,1-Dichloroethane	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
1,1-Dichloroethene	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
Benzene	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
cis-1,2-Dichloroethene	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
Ethylbenzene	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
Tetrachloroethene	4.8 J	ND (280) U	120	380
Toluene	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
trans-1,2-Dichloroethene	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
Trichloroethene	ND (5.6) U	5800	1.3 J	95
Vinyl chloride	ND (5.6) U	ND (280) U	ND (5.0) U	ND (11) U
Xylenes	< 11 U	ND (560) U	ND (10) U	ND (22) U

PSA-2	SOIL		GROUNDWATER	
	VZ 7/14/12 24-26' ug/Kg	UA 7/14/12 30-35' ug/L	UA 7/14/12 40-45' ug/L	UA 7/13/12 42-47' ug/L
1,1,1-Trichloroethane	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
1,1-Dichloroethane	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
1,1-Dichloroethene	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
Benzene	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
cis-1,2-Dichloroethene	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
Ethylbenzene	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
Tetrachloroethene	8.4	49	360	
Toluene	ND (5.5) U	0.32 J	ND (13) U	ND (13) U
trans-1,2-Dichloroethene	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
Trichloroethene	ND (5.5) U	0.44 J	24	
Vinyl chloride	ND (5.5) U	ND (2.0) U	ND (13) U	ND (13) U
Xylenes	ND (11) U	ND (4.0) U	ND (25) U	ND (25) U

PSA-1	SOIL		GROUNDWATER	
	VZ 7/12/12 18-20' ug/Kg	UA 7/12/12 27-32' ug/L	UA 7/13/12 42-47' ug/L	UA 7/13/12 42-47' ug/L
1,1,1-Trichloroethane	ND (5.3) U	ND (2.5) U	ND (1.4) U	ND (1.4) U
1,1-Dichloroethane	ND (5.3) U	ND (2.5) U	ND (1.4) U	ND (1.4) U
1,1-Dichloroethene	ND (5.3) U	ND (2.5) U	ND (1.4) U	ND (1.4) U
Benzene	ND (5.3) U	ND (2.5) U	ND (1.4) U	ND (1.4) U
cis-1,2-Dichloroethene	ND (5.3) U	ND (2.5) U	ND (1.4) U	ND (1.4) U
Ethylbenzene	0.32 J	ND (2.5) U	ND (1.4) U	ND (1.4) U
Tetrachloroethene	4.2 J	73	35	
Toluene	0.46 J	0.43 J	ND (1.4) U	ND (1.4) U
trans-1,2-Dichloroethene	ND (5.3) U	ND (2.5) U	ND (1.4) U	ND (1.4) U
Trichloroethene	ND (5.3) U	ND (2.5) U	0.82 J	
Vinyl chloride	ND (5.3) U	ND (2.5) U	ND (1.4) U	ND (1.4) U
Xylenes	ND (11) U	ND (5.0) U	ND (2.9) U	ND (2.9) U

PSA-9	SOIL		GROUNDWATER	
	VZ 8/1/12 26-28' ug/Kg	UA 8/6/12 32-37' ug/L	UA 8/6/12 47-52' ug/L	UA 8/7/12 59-64' ug/L
1,1,1-Trichloroethane	ND (5.2) U	ND (6.3) U	ND (20) U	ND (140) U
1,1-Dichloroethane	ND (5.2) U	ND (6.3) U	ND (20) U	ND (140) U
1,1-Dichloroethene	ND (5.2) U	ND (6.3) U	ND (20) U	ND (140) U
Benzene	ND (5.2) U	1.1 J	ND (20) U	340
cis-1,2-Dichloroethene	ND (5.2) U	0.62 J	ND (20) U	ND (140) U
Ethylbenzene	0.62 J	ND (6.3) U	ND (20) U	ND (140) U
Tetrachloroethene	71	180	590	ND (140) U
Toluene	ND (5.2) UB	0.91 J	ND (20) U	ND (140) U
trans-1,2-Dichloroethene	ND (5.2) U	ND (6.3) U	ND (20) U	ND (140) U
Trichloroethene	4.2 J	20	40	3500
Vinyl chloride	ND (5.2) U	ND (6.3) U	ND (20) U	ND (140) U
Xylenes	ND (10) U	ND (13) U	ND (40) U	ND (290) U

PSA-10	SOIL		GROUNDWATER	
	VZ 8/30/12 30-32' ug/kg	UA 8/30/12 45-50' ug/L	UA 8/30/12 45-50' ug/L	UA 8/30/12 45-50' ug/L
1,1,1-Trichloroethane	ND (5.8) U	0.60 J		
1,1-Dichloroethane	ND (5.8) U	ND (1.7) U		
1,1-Dichloroethene	ND (5.8) U	ND (1.7) U		
Benzene	ND (5.8) U	ND (1.7) U		
cis-1,2-Dichloroethene	ND (5.8) U	2.3		
Ethylbenzene	ND (5.8) U	ND (1.7) U		
Tetrachloroethene	3.2 J	52		
Toluene	0.47 J	ND (1.7) U		
trans-1,2-Dichloroethene	ND (5.8) U	0.41 J		
Trichloroethene	ND (5.8) U	13		
Vinyl chloride	ND (5.8) U	ND (1.7) U		
Xylenes	ND (12) U	ND (3.3) U		

- LEGEND**
- ⊗ PRE-DESIGN INVESTIGATION BORING LOCATION
 - ⊗ PRE-DESIGN INVESTIGATION BORING LOCATION INTO LOWER AQUIFER
 - ⊕ UPPER AQUIFER MONITORING WELL
 - ⊖ LOWER AQUIFER MONITORING WELL
 - ND NON-DETECT, IF RESULT IS ND THE DETECTION LIMIT IS SHOWN IN PARENTHESIS
- 30-35' DEPTH GROUNDWATER GRAB SAMPLE WAS COLLECTED
- ug/L MICROGRAMS PER LITER
- ug/kg MICROGRAMS PER KILOGRAM
- UA UPPER AQUIFER
- LA LOWER AQUIFER
- VZ VADOSE ZONE
- SZ SATURATED ZONE
- * SEE RMW-85 GROUNDWATER DATA ON TABLE 5, VERTICAL AQUIFER PROFILE GRAB GROUNDWATER SAMPLE AT THIS INTERVAL IS NOT REPRESENTATIVE.

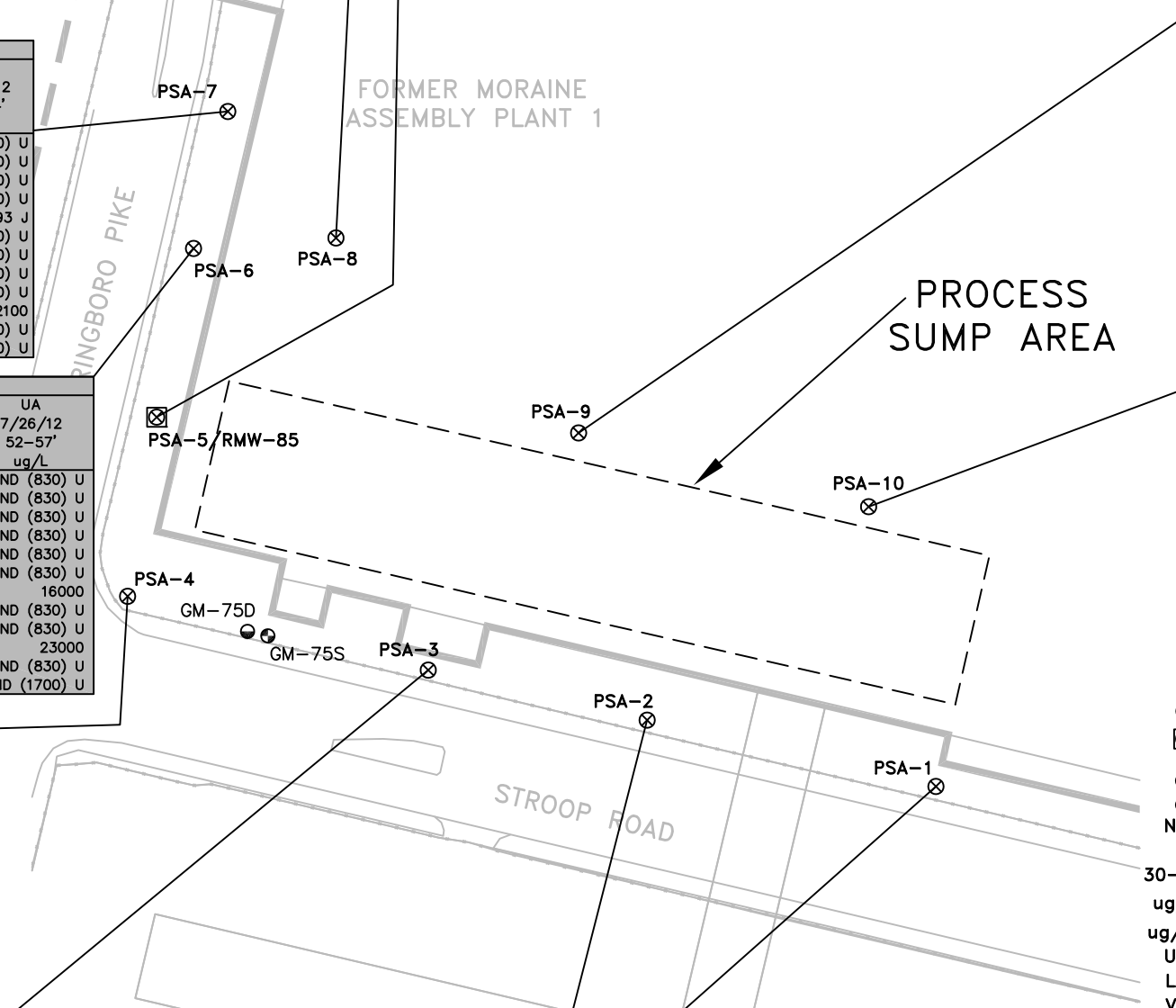
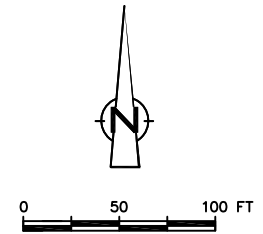
RACER TRUST
MORAINE, OHIO

OH000294.2012

PROCESS SUMP AREA INVESTIGATION RESULTS



FIGURE
8

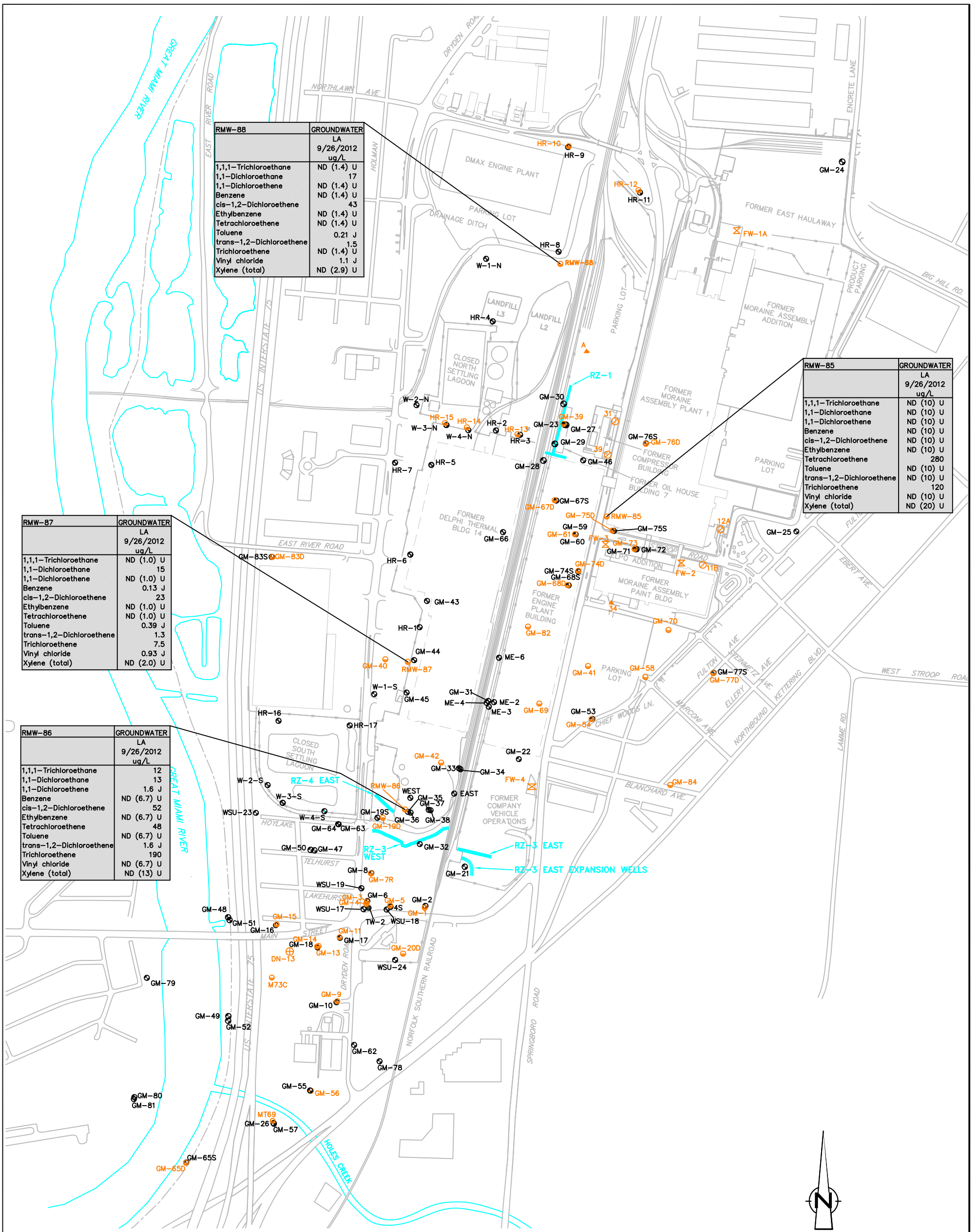


RMW-88	GROUNDWATER
	LA
	9/26/2012
	ug/L
1,1,1-Trichloroethane	ND (1.4) U
1,1-Dichloroethane	17
1,1-Dichloroethane	ND (1.4) U
Benzene	ND (1.4) U
cis-1,2-Dichloroethane	43
Ethylbenzene	ND (1.4) U
Tetrachloroethane	ND (1.4) U
Toluene	0.21 J
trans-1,2-Dichloroethane	1.5
Trichloroethane	ND (1.4) U
Vinyl chloride	1.1 J
Xylene (total)	ND (2.9) U

RMW-85	GROUNDWATER
	LA
	9/26/2012
	ug/L
1,1,1-Trichloroethane	ND (10) U
1,1-Dichloroethane	ND (10) U
1,1-Dichloroethane	ND (10) U
Benzene	ND (10) U
cis-1,2-Dichloroethane	ND (10) U
Ethylbenzene	ND (10) U
Tetrachloroethane	280
Toluene	ND (10) U
trans-1,2-Dichloroethane	ND (10) U
Trichloroethane	120
Vinyl chloride	ND (10) U
Xylene (total)	ND (20) U

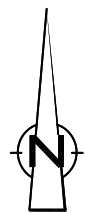
RMW-87	GROUNDWATER
	LA
	9/26/2012
	ug/L
1,1,1-Trichloroethane	ND (1.0) U
1,1-Dichloroethane	15
1,1-Dichloroethane	ND (1.0) U
Benzene	0.13 J
cis-1,2-Dichloroethane	23
Ethylbenzene	ND (1.0) U
Tetrachloroethane	ND (1.0) U
Toluene	0.39 J
trans-1,2-Dichloroethane	1.3
Trichloroethane	7.5
Vinyl chloride	0.93 J
Xylene (total)	ND (2.0) U

RMW-86	GROUNDWATER
	LA
	9/26/2012
	ug/L
1,1,1-Trichloroethane	12
1,1-Dichloroethane	13
1,1-Dichloroethane	1.6 J
Benzene	ND (6.7) U
cis-1,2-Dichloroethane	52
Ethylbenzene	ND (6.7) U
Tetrachloroethane	48
Toluene	ND (6.7) U
trans-1,2-Dichloroethane	1.6 J
Trichloroethane	190
Vinyl chloride	ND (6.7) U
Xylene (total)	ND (13) U



LEGEND

- MONITORING WELL (UPPER AQUIFER)
- RECOVERY WELL (TW-2)
- MONITORING WELL (LOWER AQUIFER)
- CARBON SOURCE INTRODUCTION WELLS, REACTIVE ZONES (RZ-1, RZ-3, AND RZ-4)
- ⊗ FIRE WELL
- ▲ PRODUCTION WELL CONVERTED TO MONITORING WELL (34, A)
- INACTIVE PRODUCTION WELL (31, 39, 11B, 12A)
- ⊕ MONTGOMERY COUNTY WELL (USED BY RACER TRUST FOR LOWER AQUIFER PUMP TO WASTE PROGRAM)
- RIVER LEVEE
- ND NON-DETECT, IF RESULT IS ND THE DETECTION LIMIT IS SHOWN IN PARENTHESIS
- ug/L MICROGRAMS PER LITER
- LA LOWER AQUIFER
- J ESTIMATED VALUE
- U LESS THAN REPORTING LIMIT

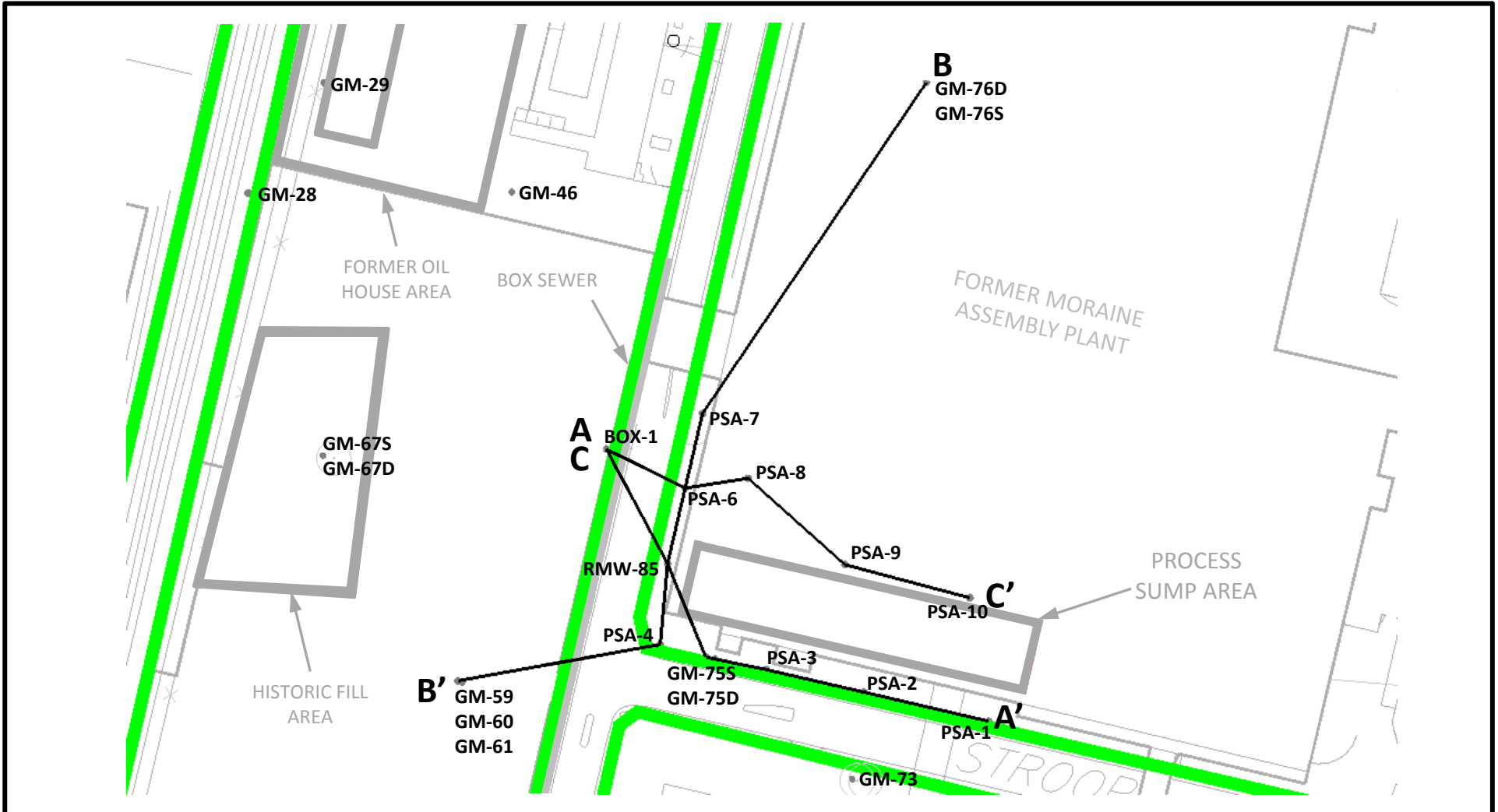


RACER TRUST
MORAINE, OHIO
OH000294.2012

GROUNDWATER ANALYTICAL RESULTS

ARCADIS

FIGURE
9



Notes:

1. Units of measurement are in feet (ft.).
2. All elevations referenced to feet above mean sea level.
3. Please refer to Appendix J of the Corrective Measures Proposal for additional information on Site geology.

RACER Trust
 MORaine, OHIO
 OH000294.2012

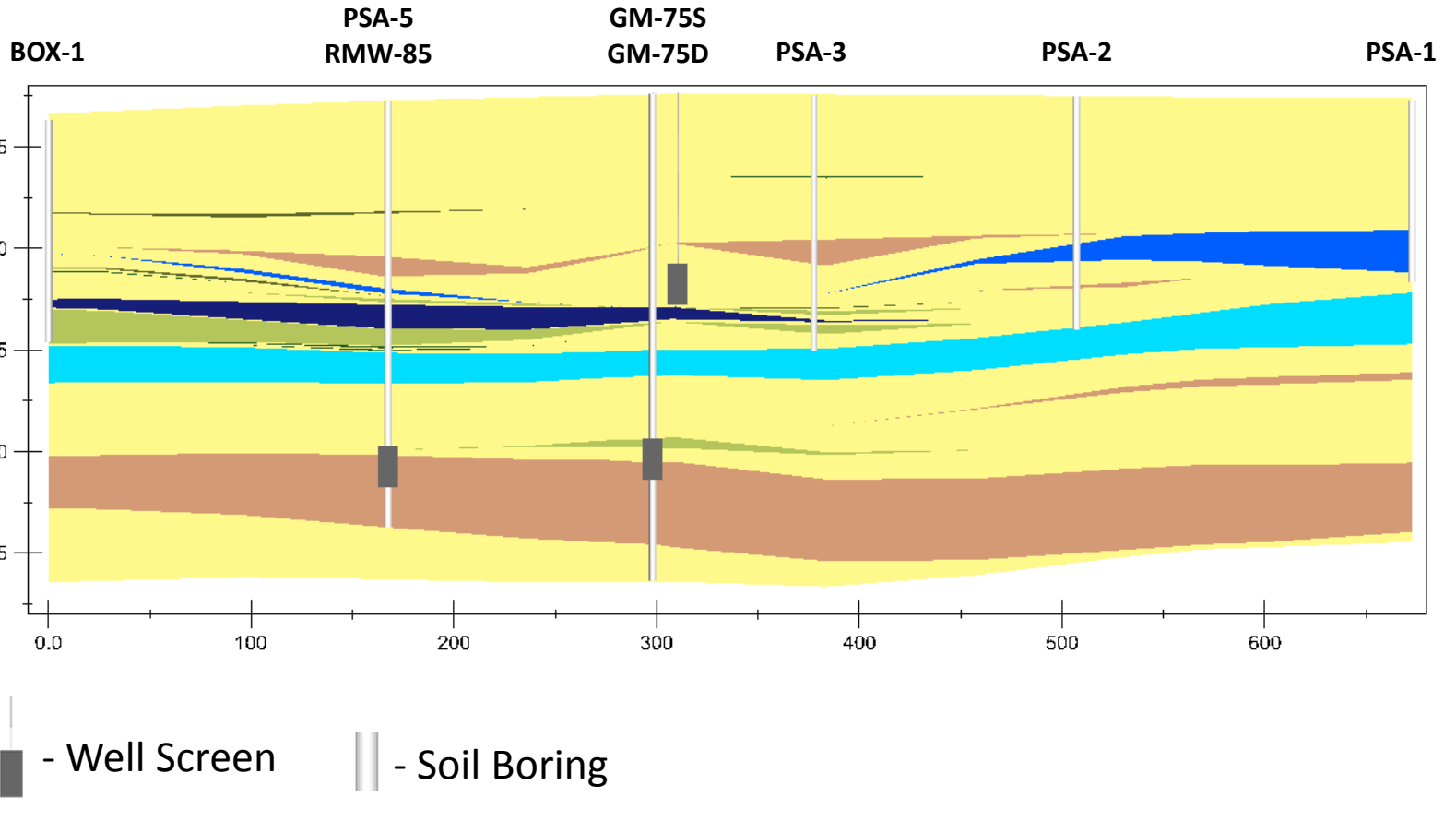
**PROCESS SUMP AREA
 CROSS SECTION LAYOUT**



Figure
10

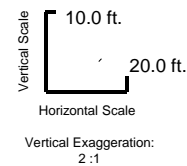
A
West

A'
East



Notes:

1. Units of measurement are in feet (ft.).
2. All elevations referenced to feet above mean sea level.
3. Please refer to Appendix J of the Corrective Measures Proposal for additional information on Site geology.



RACER Trust
MORaine, OHIO
OH000294.2012

PROCESS SUMP AREA
Cross Section A-A'



Figure
11

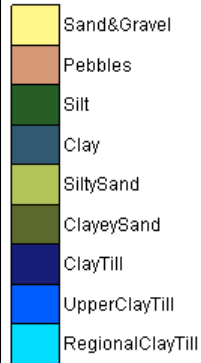
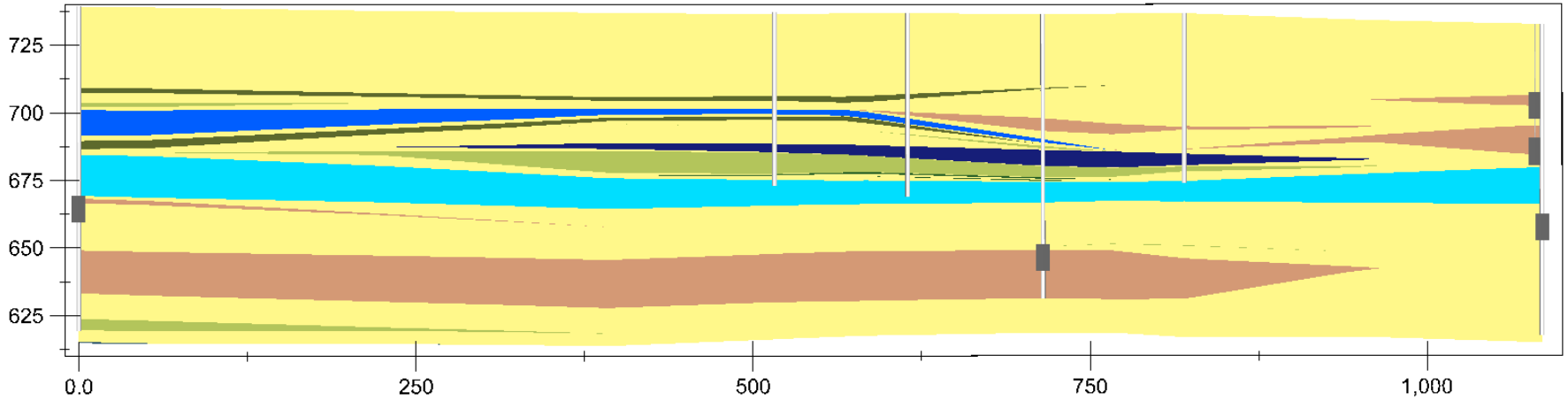
B
Northeast

B'
Southwest

GM-76D

PSA-7 PSA-6 PSA-5
RMW-85 PSA-4

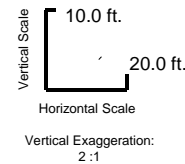
GM-59
GM-60
GM-61



- Well Screen - Soil Boring

Notes:

1. Units of measurement are in feet (ft.).
2. All elevations referenced to feet above mean sea level.
3. Please refer to Appendix J of the Corrective Measures Proposal for additional information on Site geology.



RACER Trust
MORAINE, OHIO
OH000294.2012

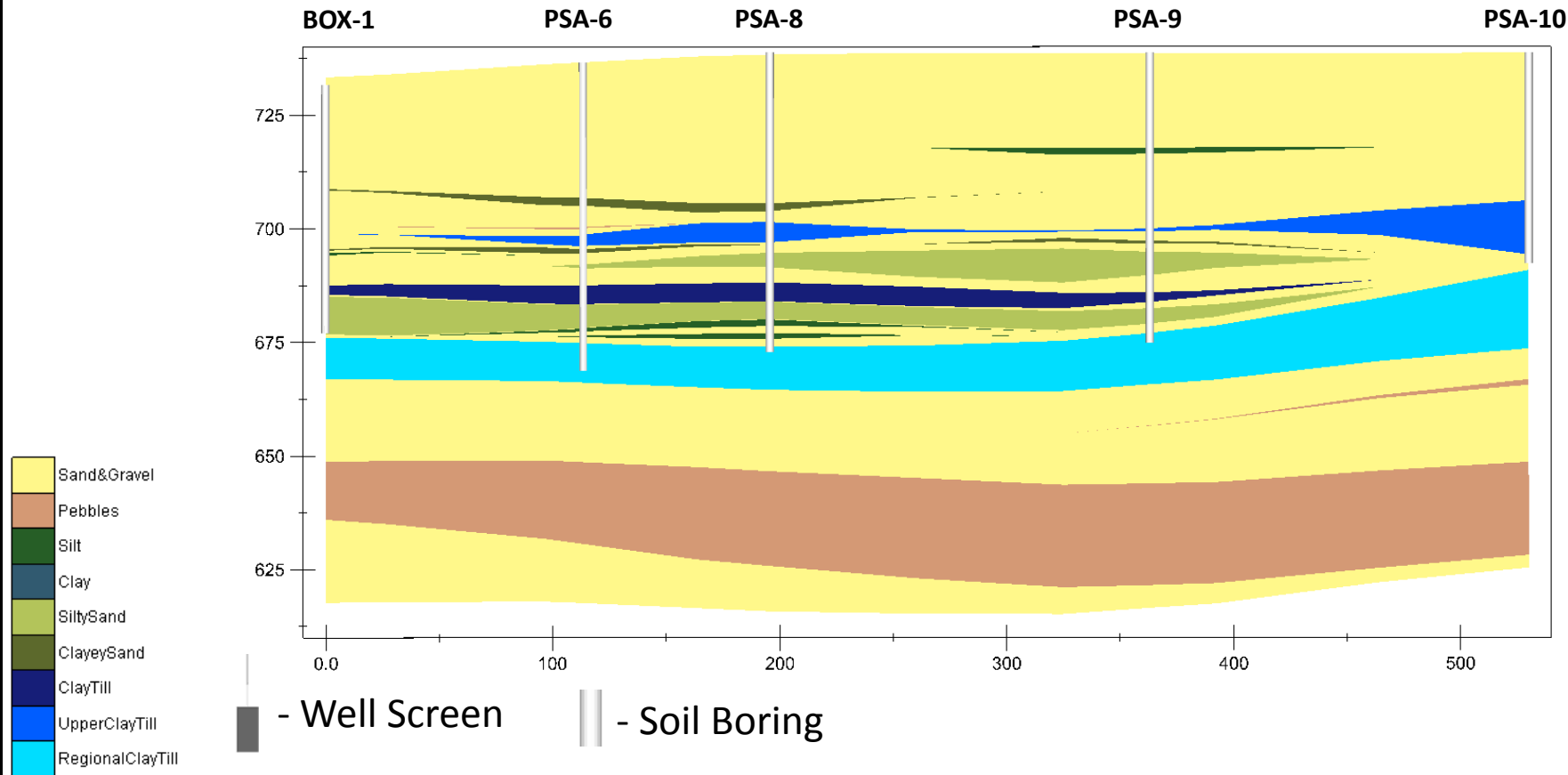
**PROCESS SUMP AREA
Cross Section B-B'**



Figure
12

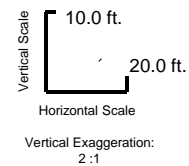
C
West

C'
East



Notes:

1. Units of measurement are in feet (ft.).
2. All elevations referenced to feet above mean sea level.
3. Please refer to Appendix J of the Corrective Measures Proposal for additional information on Site geology.



RACER Trust
MORAIN, OHIO
OH000294.2012

PROCESS SUMP AREA
Cross Section C-C'

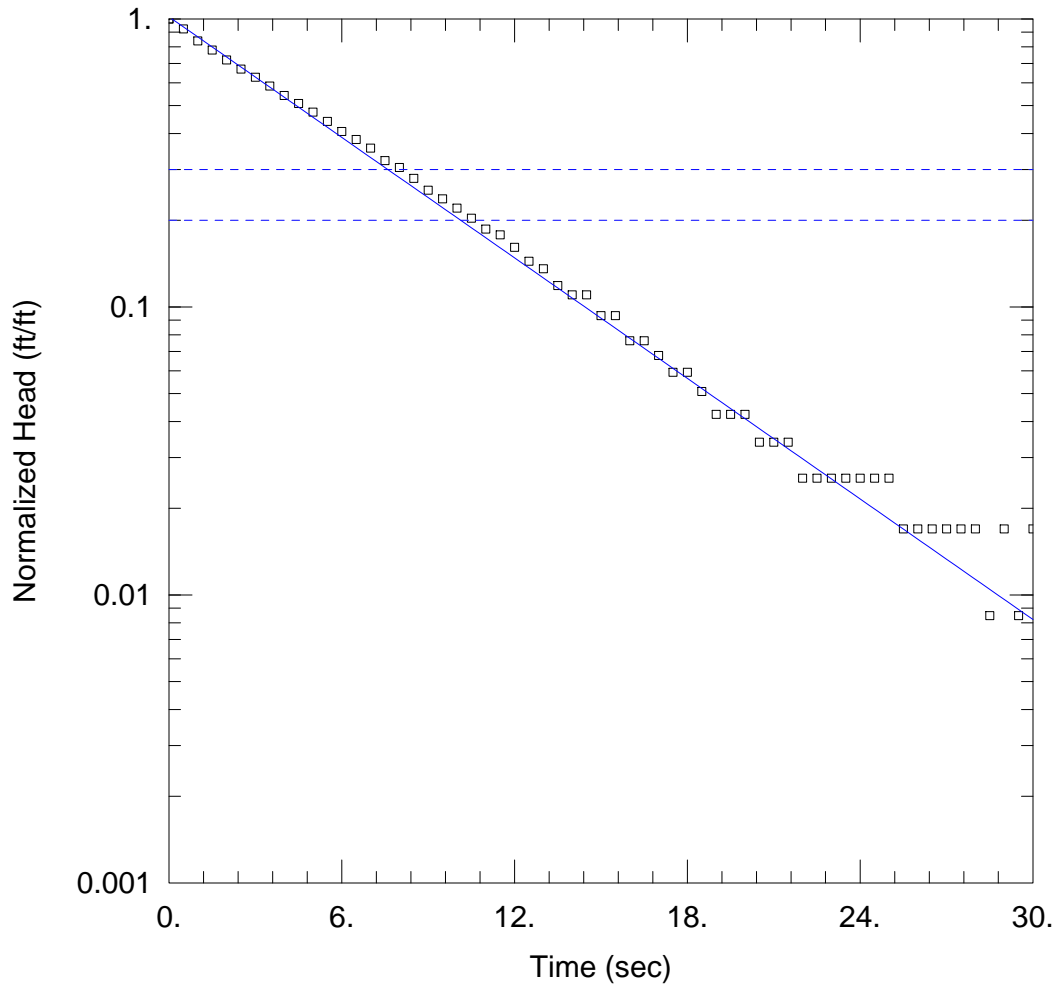


Figure
13

ARCADIS

Attachment F-1

Pneumatic Slug Test Solutions



TEST 1

Data Set: G:\...\BLDG21-2 (40-45)_B&R_C_TEST 1.aqt

Date: 12/14/12

Time: 10:11:42

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 1.18 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20. ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

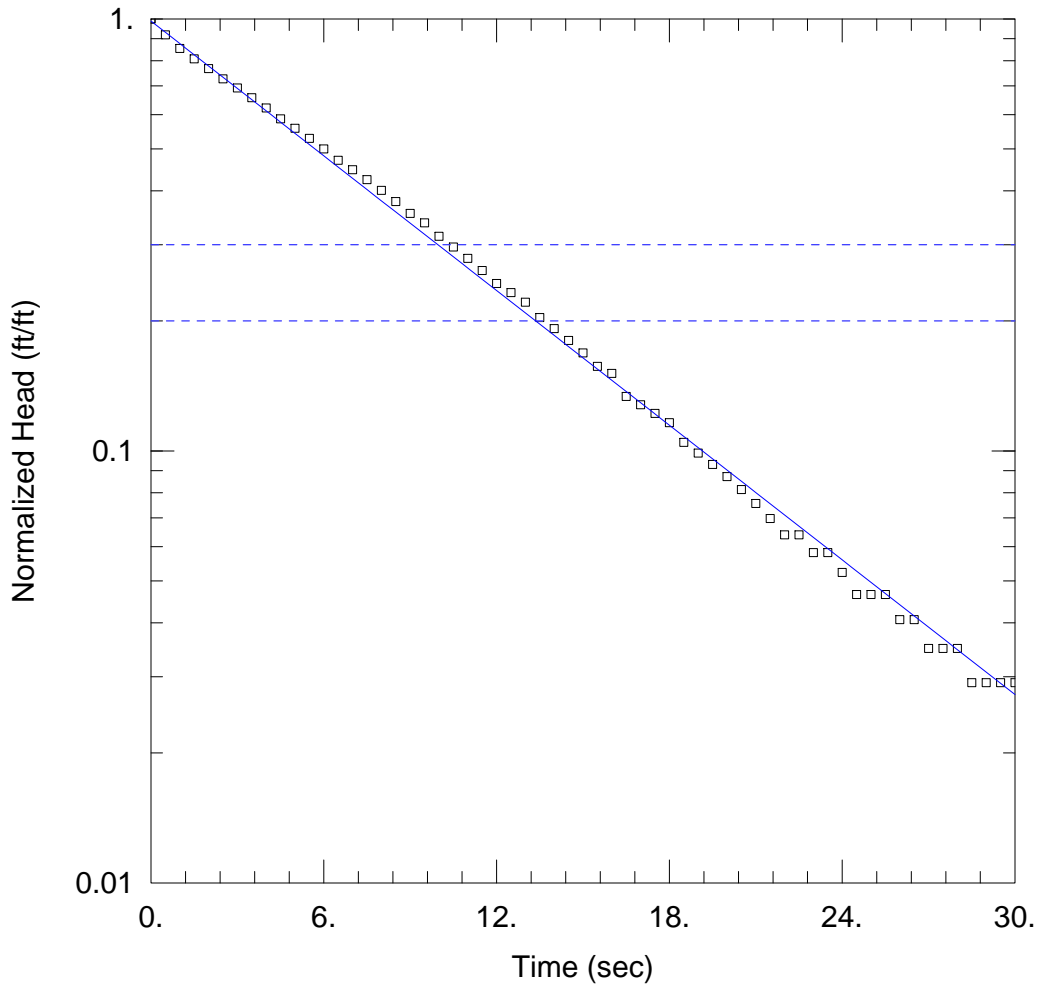
SOLUTION

Aquifer Model: Confined

Solution Method: Bower-Rice

K = 167. ft/day

y0 = 1.2 ft



TEST 2

Data Set: G:\...\BLDG21-2 (40-45)_B&R_C_TEST 2.aqt

Date: 12/14/12

Time: 10:12:12

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 1.72 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20. ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

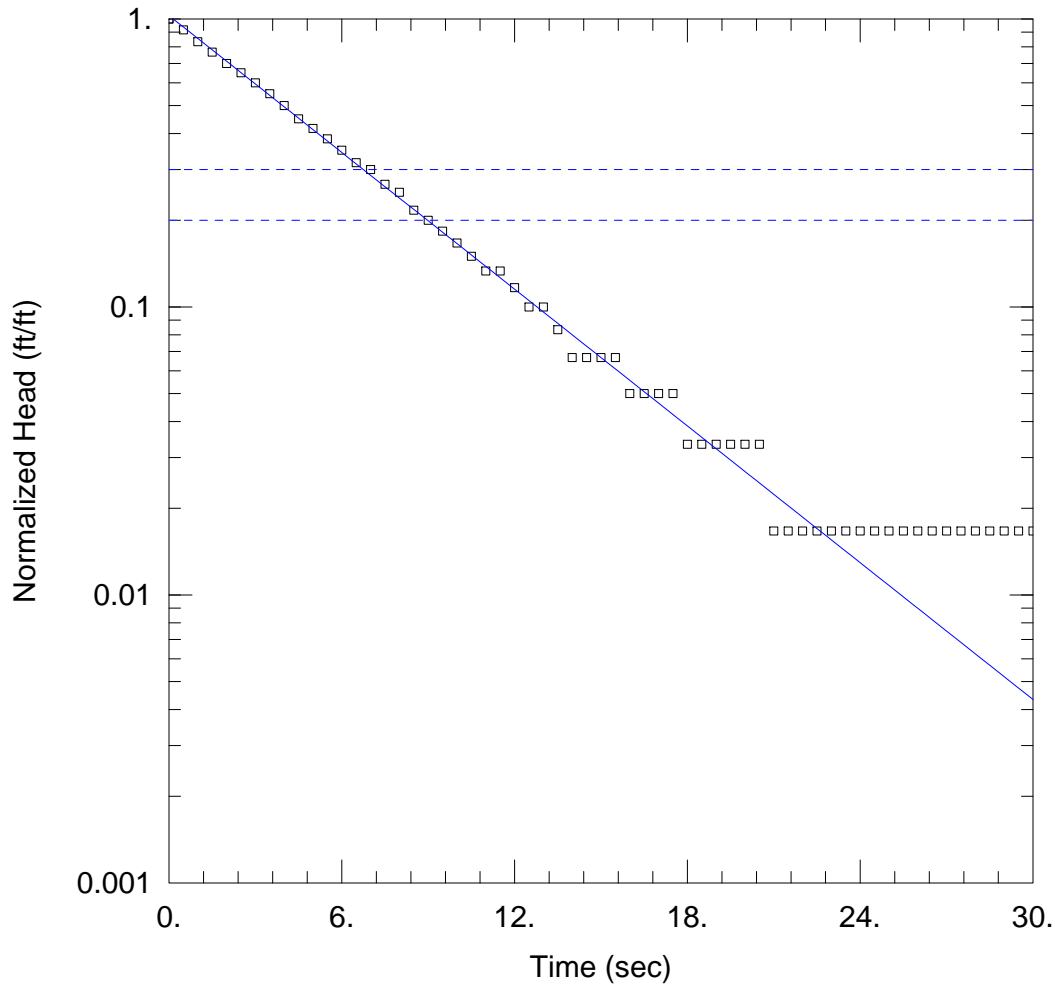
SOLUTION

Aquifer Model: Confined

Solution Method: Bower-Rice

K = 124.4 ft/day

y0 = 1.7 ft



TEST 3

Data Set: G:\...\BLDG21-2 (40-45)_B&R_C_TEST 3.aqt

Date: 12/14/12

Time: 10:12:39

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 0.6 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20. ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

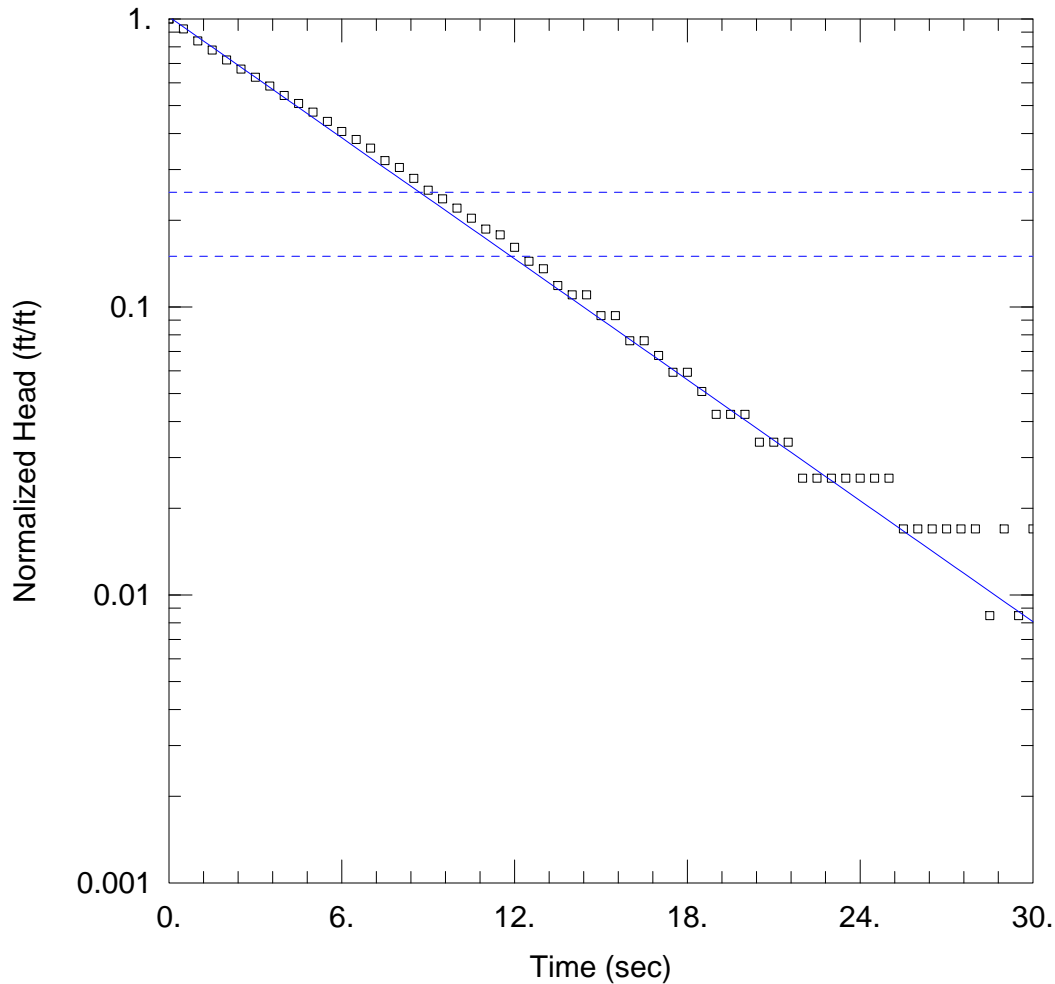
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 189.5 ft/day

y0 = 0.6159 ft



TEST 1

Data Set: G:\...\BLDG21-2 (40-45)_Hv_C_TEST 1.aqt

Date: 12/14/12

Time: 10:13:08

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 1.18 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20. ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

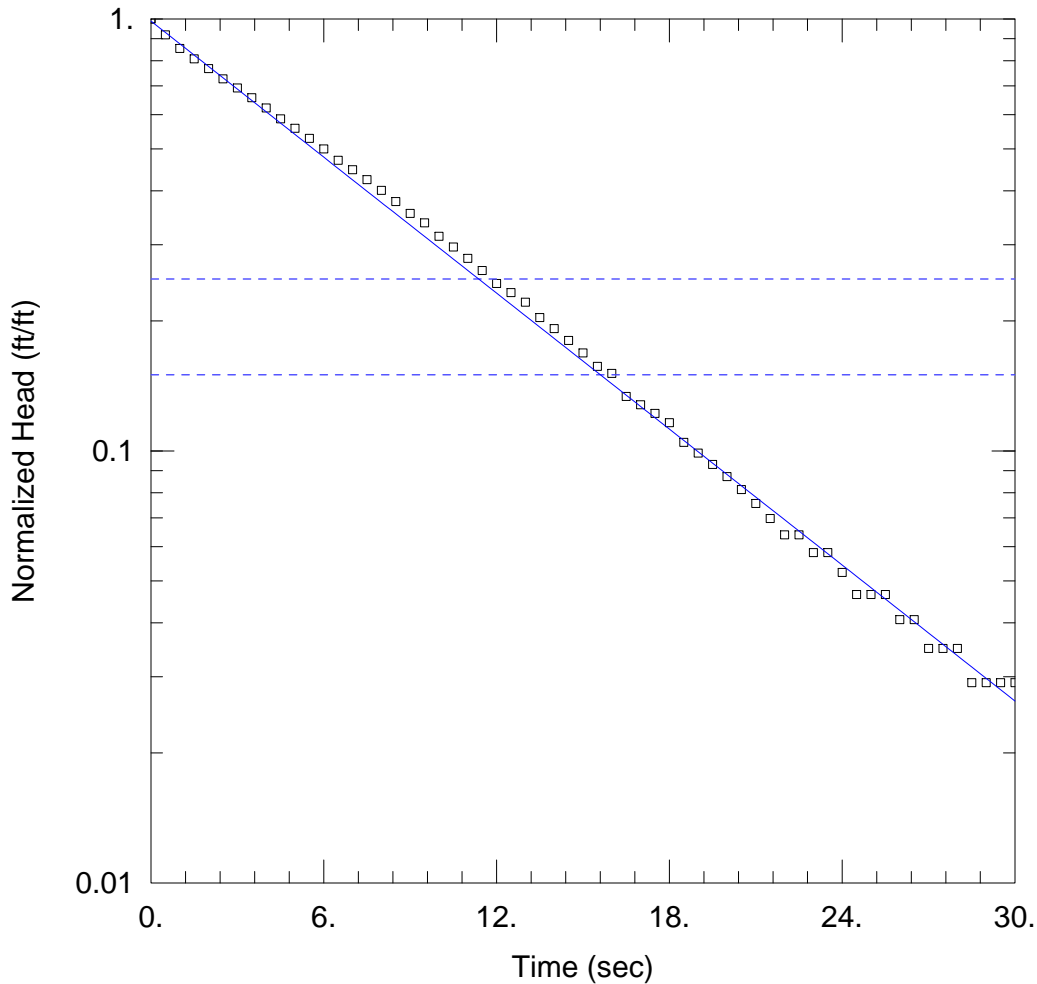
SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 205.9 ft/day

y0 = 1.2 ft



TEST 2

Data Set: G:\...\BLDG21-2 (40-45)_Hv_C_TEST 2.aqt

Date: 12/14/12

Time: 10:16:06

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 1.72 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20. ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

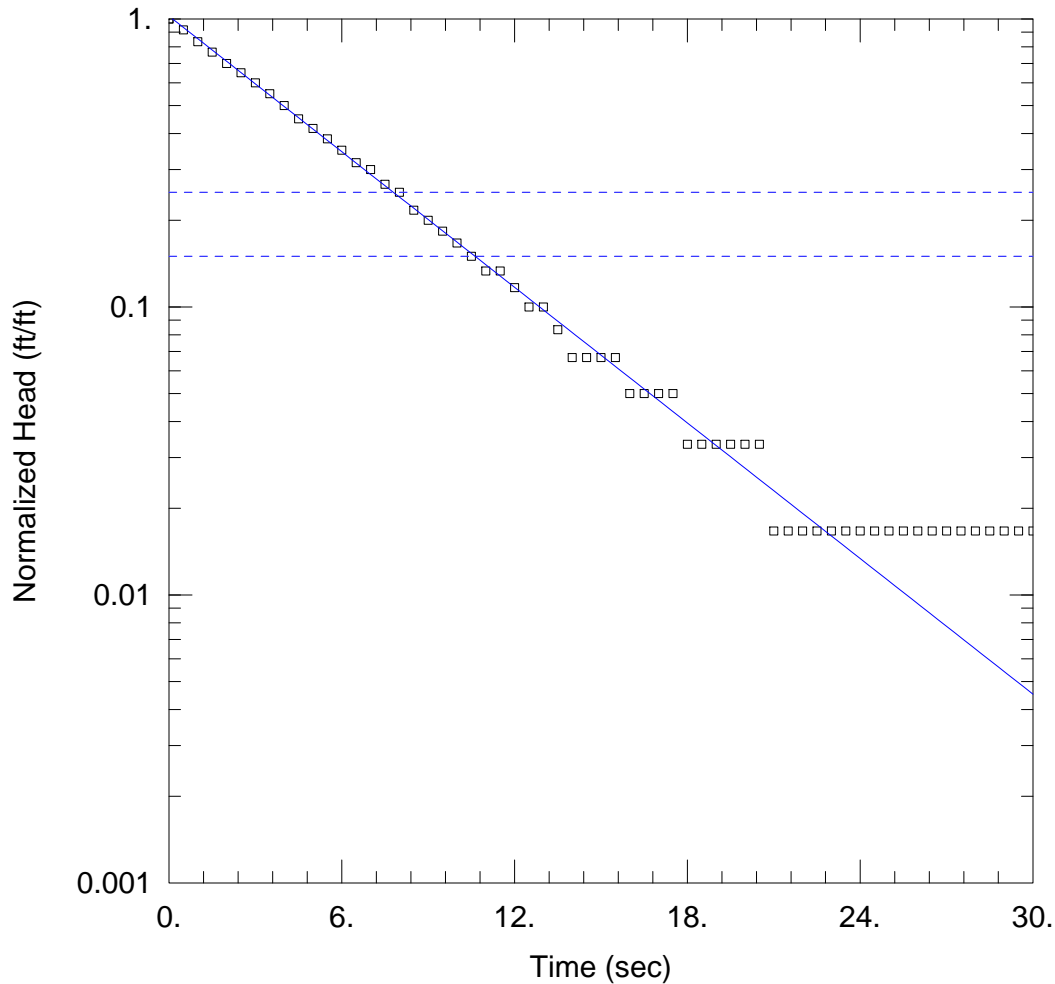
SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 154.3 ft/day

y0 = 1.7 ft



TEST 3

Data Set: G:\...\BLDG21-2 (40-45)_Hv_C_TEST 3.aqt

Date: 12/14/12

Time: 10:16:41

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 0.6 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20. ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

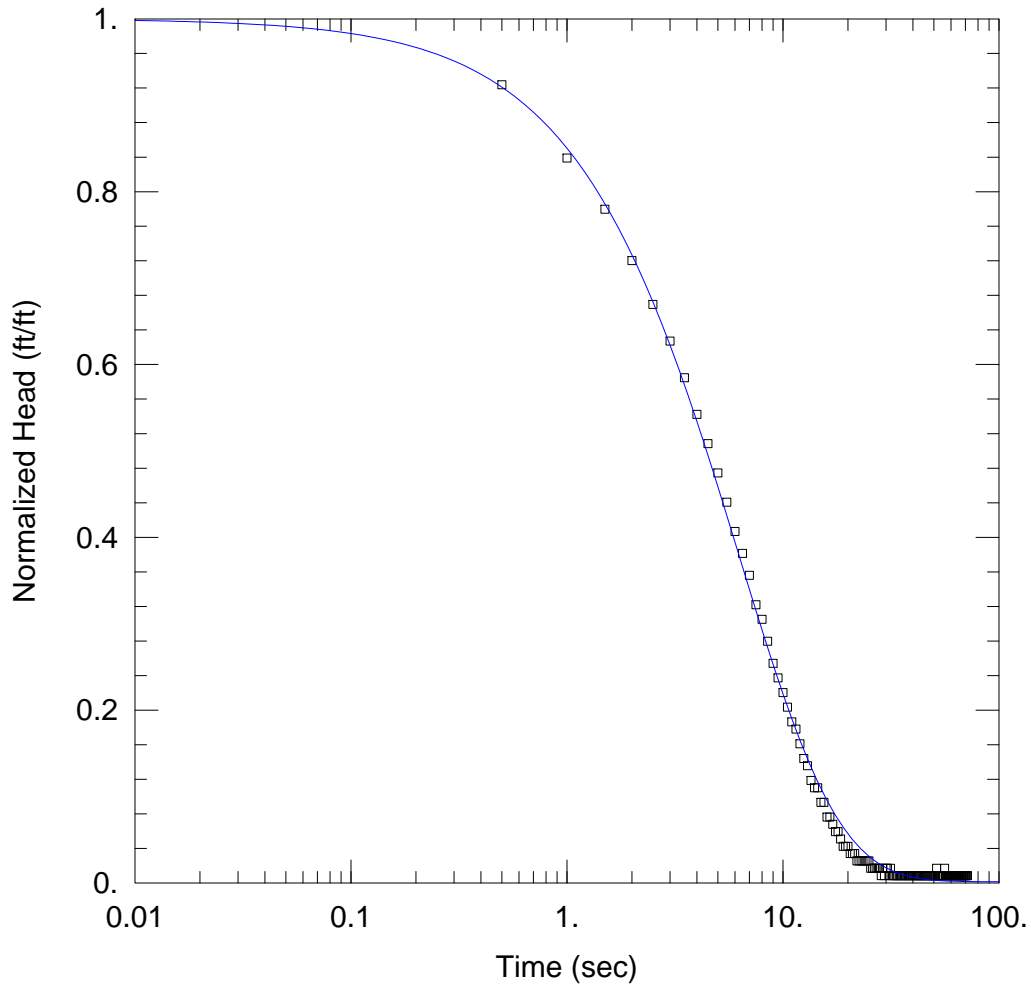
SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 230.8 ft/day

y0 = 0.6137 ft



TEST 1

Data Set: G:\...\BLDG21-2 (40-45)_KGS_C_TEST 1.aqt

Date: 12/14/12

Time: 10:17:59

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 1.18 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20.5 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

SOLUTION

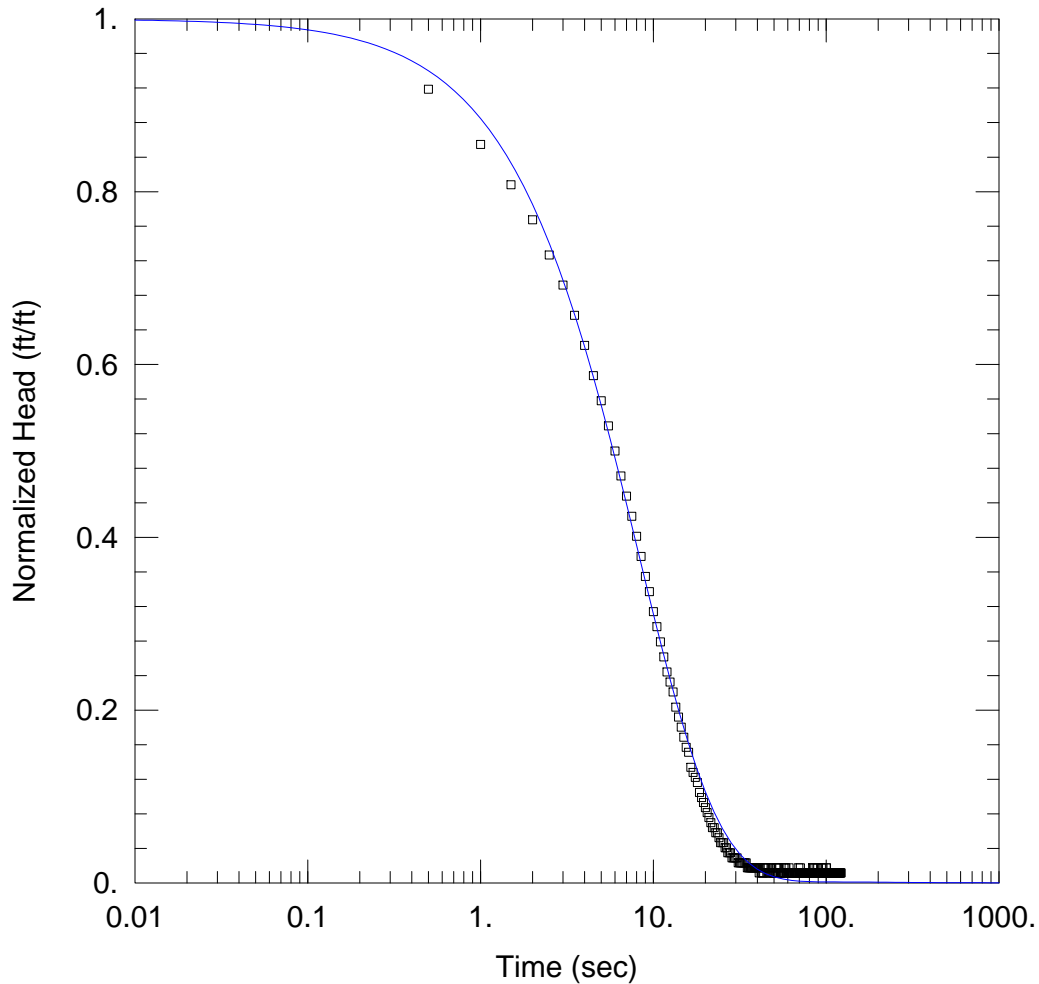
Aquifer Model: Confined

Solution Method: KGS Model

Kr = 209.1 ft/day

Ss = 4.733E-8 ft⁻¹

Kz/Kr = 1.



TEST 2

Data Set: G:\...\BLDG21-2 (40-45)_KGS_C_TEST 2.aqt

Date: 12/14/12

Time: 10:18:27

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 1.72 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20.5 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

SOLUTION

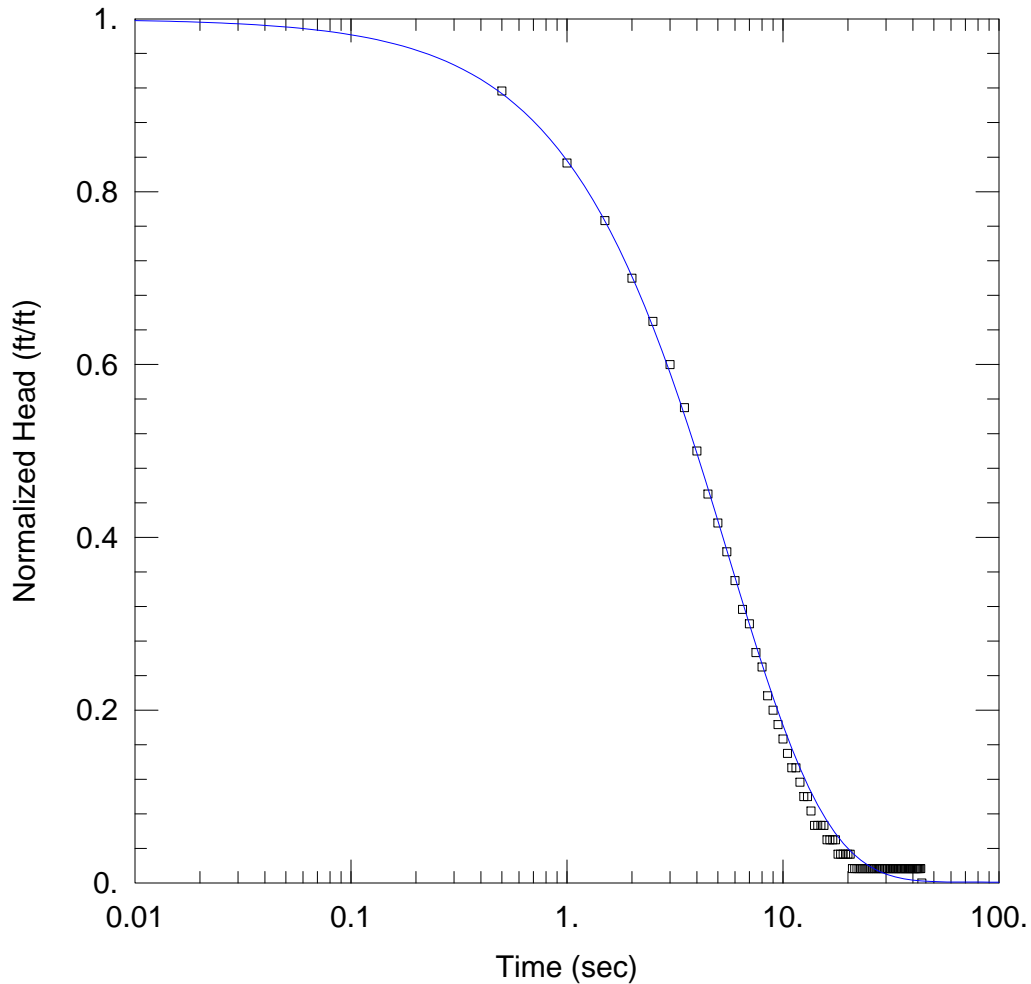
Aquifer Model: Confined

Solution Method: KGS Model

Kr = 188.6 ft/day

Ss = 2.8E-12 ft⁻¹

Kz/Kr = 1.



TEST 3

Data Set: G:\...\BLDG21-2 (40-45)_KGS_C_TEST 3.aqt

Date: 12/14/12

Time: 10:19:00

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BDLG21-2 (40-45)

Test Date: 8/20/2012

AQUIFER DATA

Saturated Thickness: 30. ft

WELL DATA (BDLG21-2 (40-45))

Initial Displacement: 0.6 ft

Static Water Column Height: 20.5 ft

Total Well Penetration Depth: 20.5 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

SOLUTION

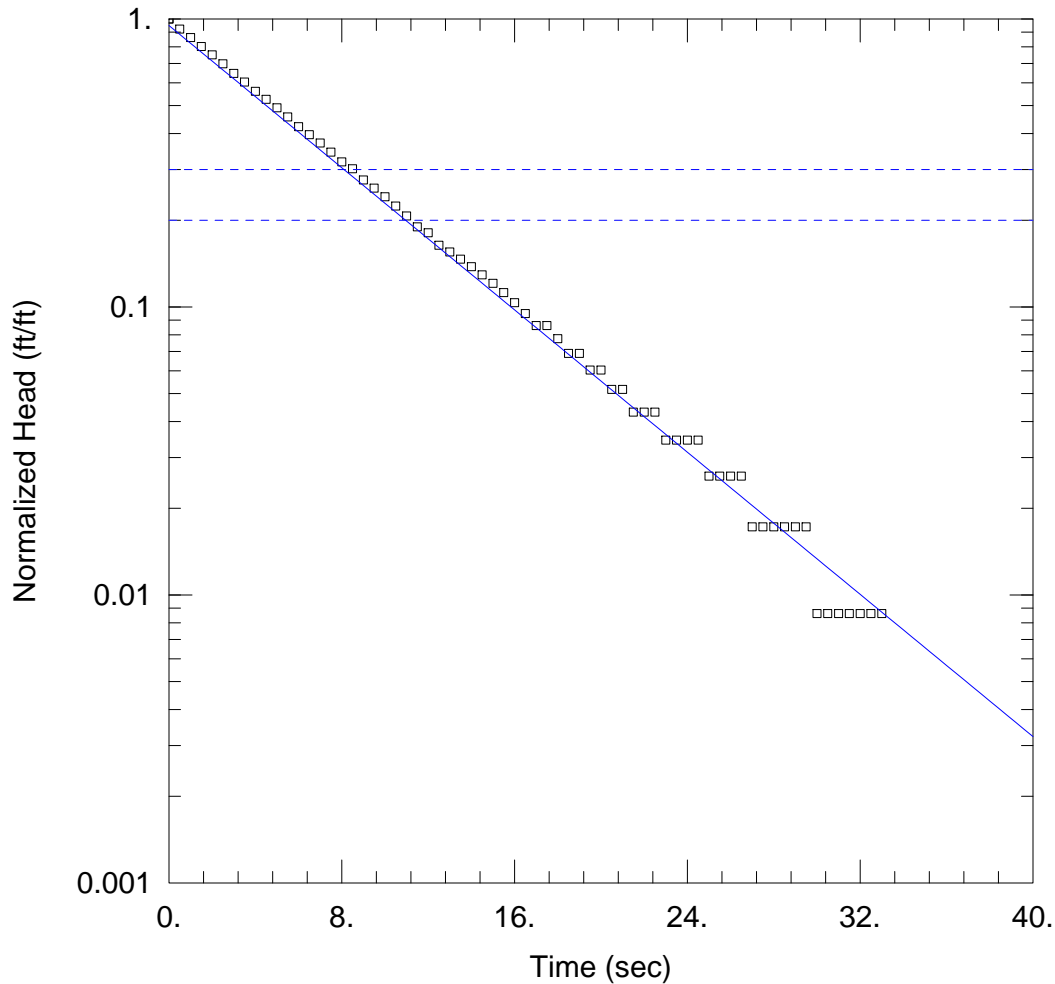
Aquifer Model: Confined

Solution Method: KGS Model

Kr = 316.9 ft/day

Ss = 6.9E-16 ft⁻¹

Kz/Kr = 1.



TEST 1

Data Set: G:\...\BOX-1(37-42)_B&R_UC_TEST 1.aqt

Date: 12/14/12

Time: 10:19:28

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (37-42)

Test Date: 8/09/2012

AQUIFER DATA

Saturated Thickness: 17.88 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(37-42))

Initial Displacement: 1.16 ft

Static Water Column Height: 17.88 ft

Total Well Penetration Depth: 17.88 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

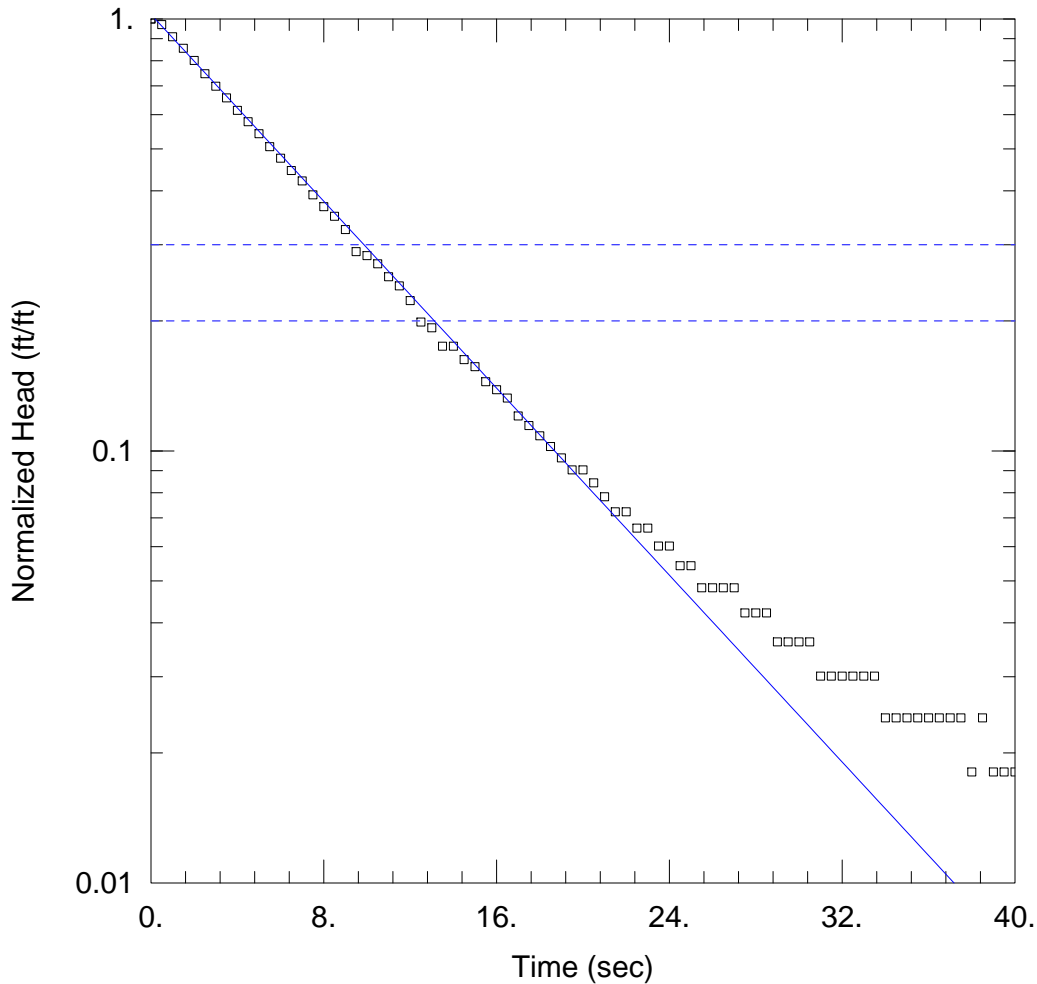
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 174. ft/day

y0 = 1.1 ft



TEST 2

Data Set: G:\...\BOX-1(37-42)_B&R_UC_TEST 2.aqt

Date: 12/14/12

Time: 10:20:36

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (37-42)

Test Date: 8/09/2012

AQUIFER DATA

Saturated Thickness: 17.88 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(37-42))

Initial Displacement: 1.66 ft

Static Water Column Height: 17.88 ft

Total Well Penetration Depth: 17.88 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

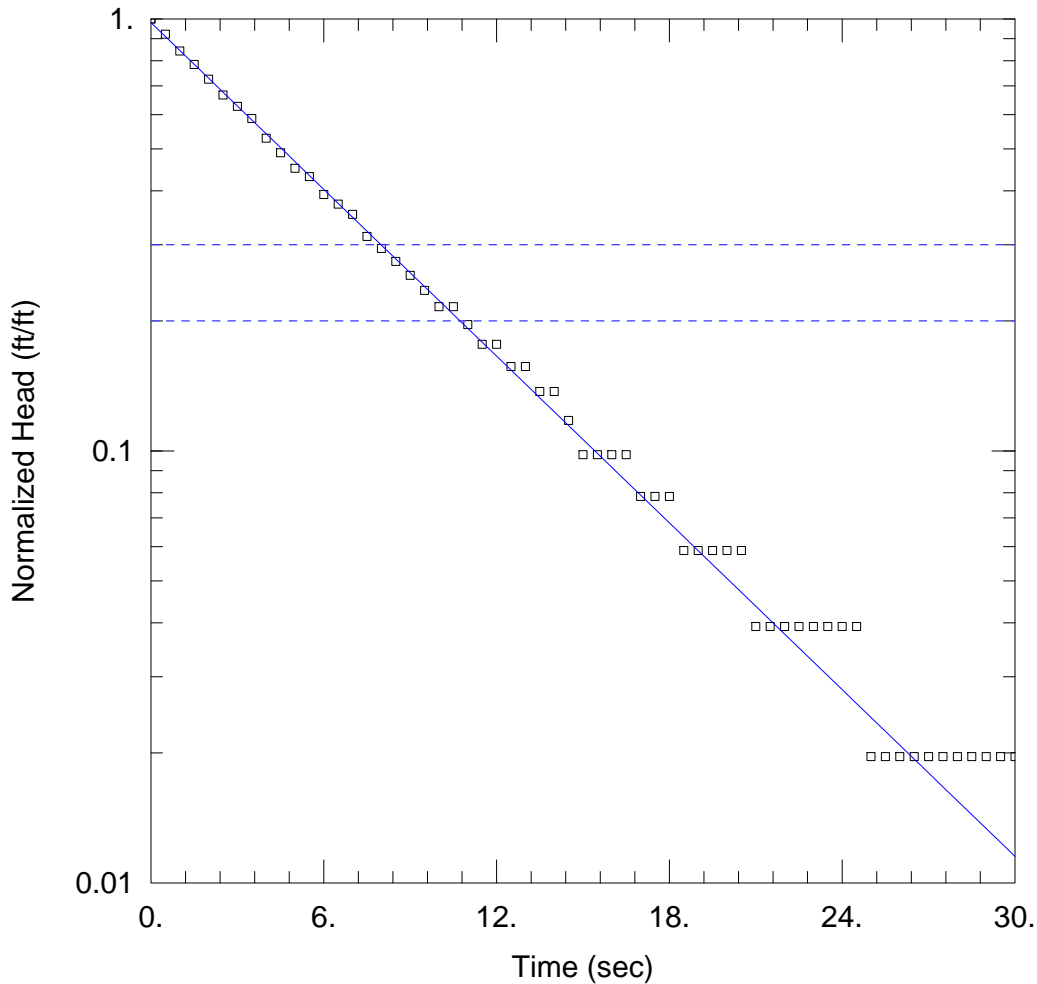
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

K = 152.5 ft/day

y0 = 1.7 ft



TEST 3

Data Set: G:\...\BOX-1(37-42)_B&R_UC_TEST 3.aqt

Date: 12/14/12

Time: 10:21:02

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (37-42)

Test Date: 8/09/2012

AQUIFER DATA

Saturated Thickness: 17.88 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(37-42))

Initial Displacement: 0.51 ft

Static Water Column Height: 17.88 ft

Total Well Penetration Depth: 17.88 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

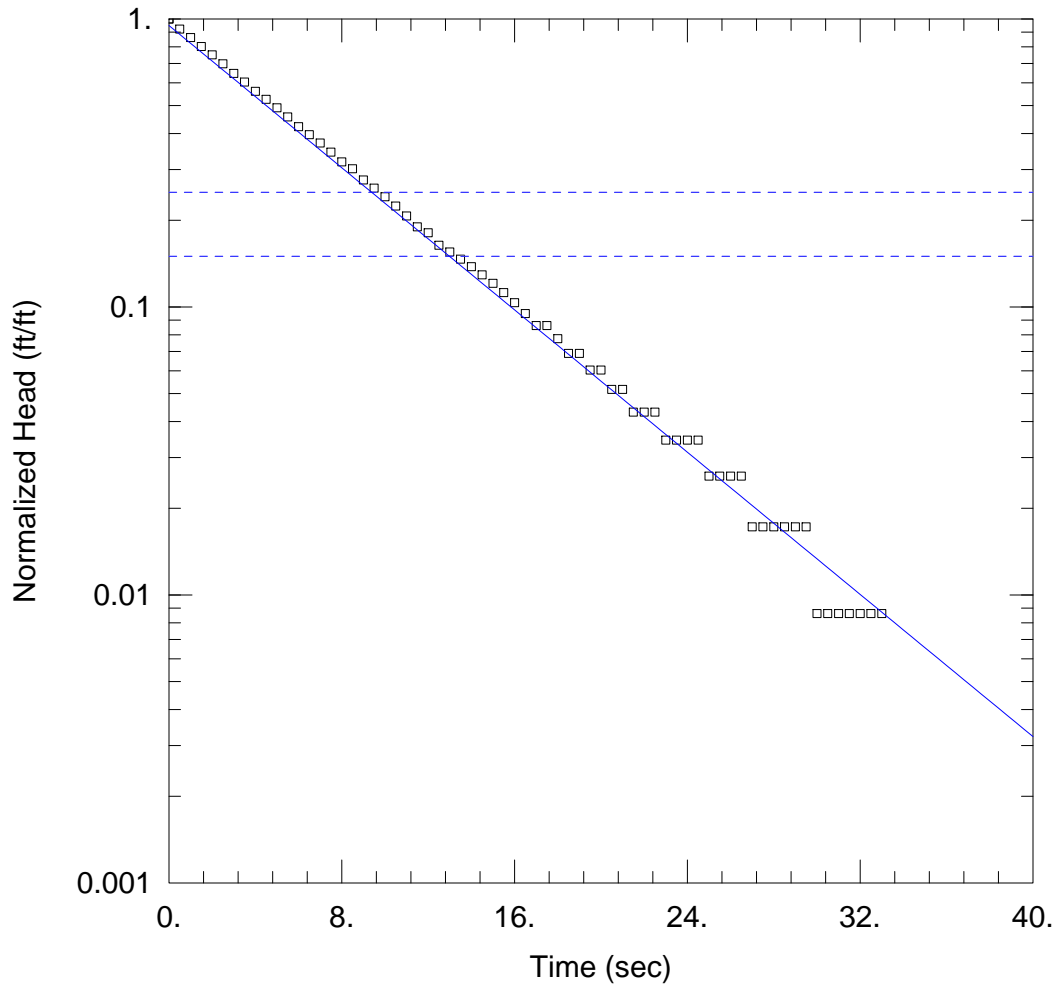
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

K = 181.4 ft/day

y0 = 0.5 ft



TEST 1

Data Set: G:\...\BOX-1(37-42)_Hv_UC_TEST 1.aqt
 Date: 12/14/12 Time: 10:21:29

PROJECT INFORMATION

Company: ARCADIS
 Client: RACER Trust
 Project: OH000294.2012
 Location: Moraine, Ohio
 Test Well: BOX-1 (37-42)
 Test Date: 8/09/2012

AQUIFER DATA

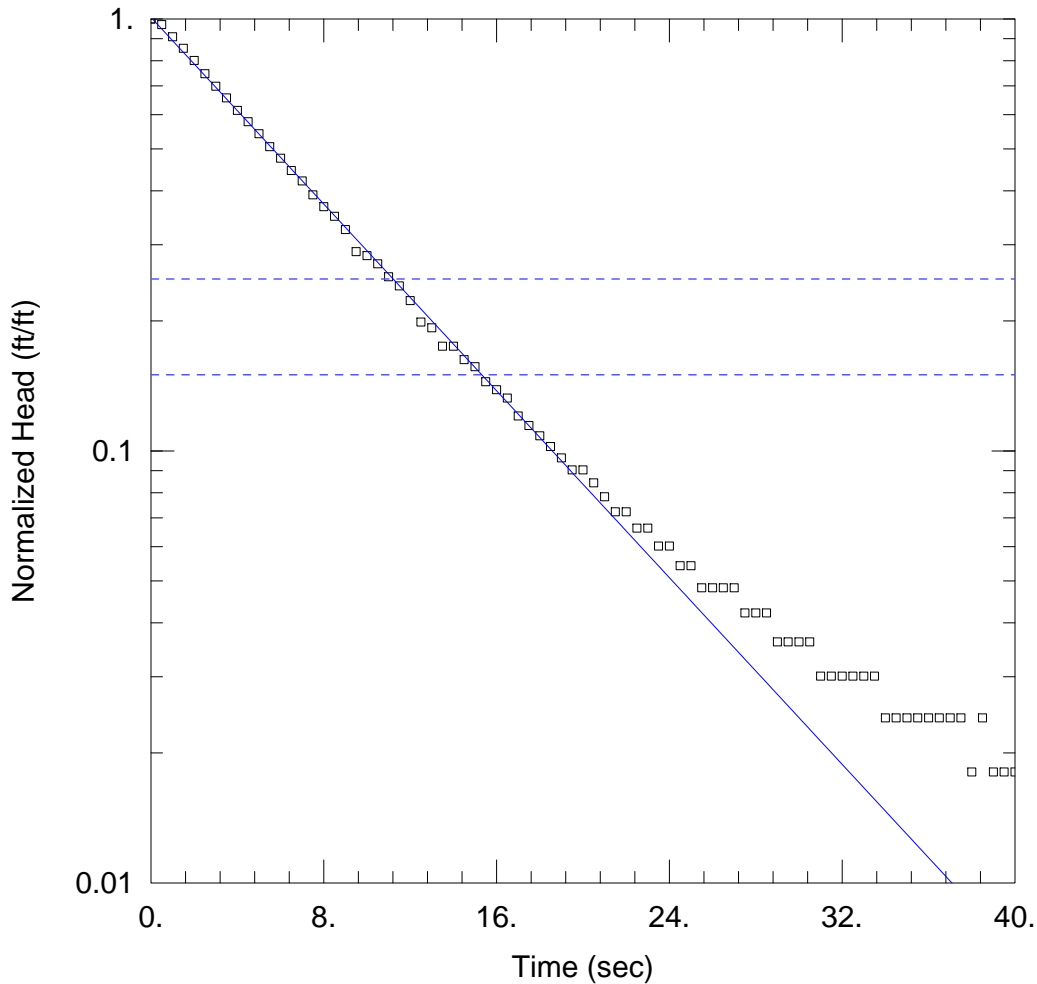
Saturated Thickness: 17.88 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(37-42))

Initial Displacement: 1.16 ft Static Water Column Height: 17.88 ft
 Total Well Penetration Depth: 17.88 ft Screen Length: 5. ft
 Casing Radius: 0.19 ft Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev
 K = 212.2 ft/day y0 = 1.1 ft



TEST 2

Data Set: G:\...\BOX-1(37-42)_Hv_UC_TEST 2.aqt
 Date: 12/14/12 Time: 10:21:56

PROJECT INFORMATION

Company: ARCADIS
 Client: RACER Trust
 Project: OH000294.2012
 Location: Moraine, Ohio
 Test Well: BOX-1 (37-42)
 Test Date: 8/09/2012

AQUIFER DATA

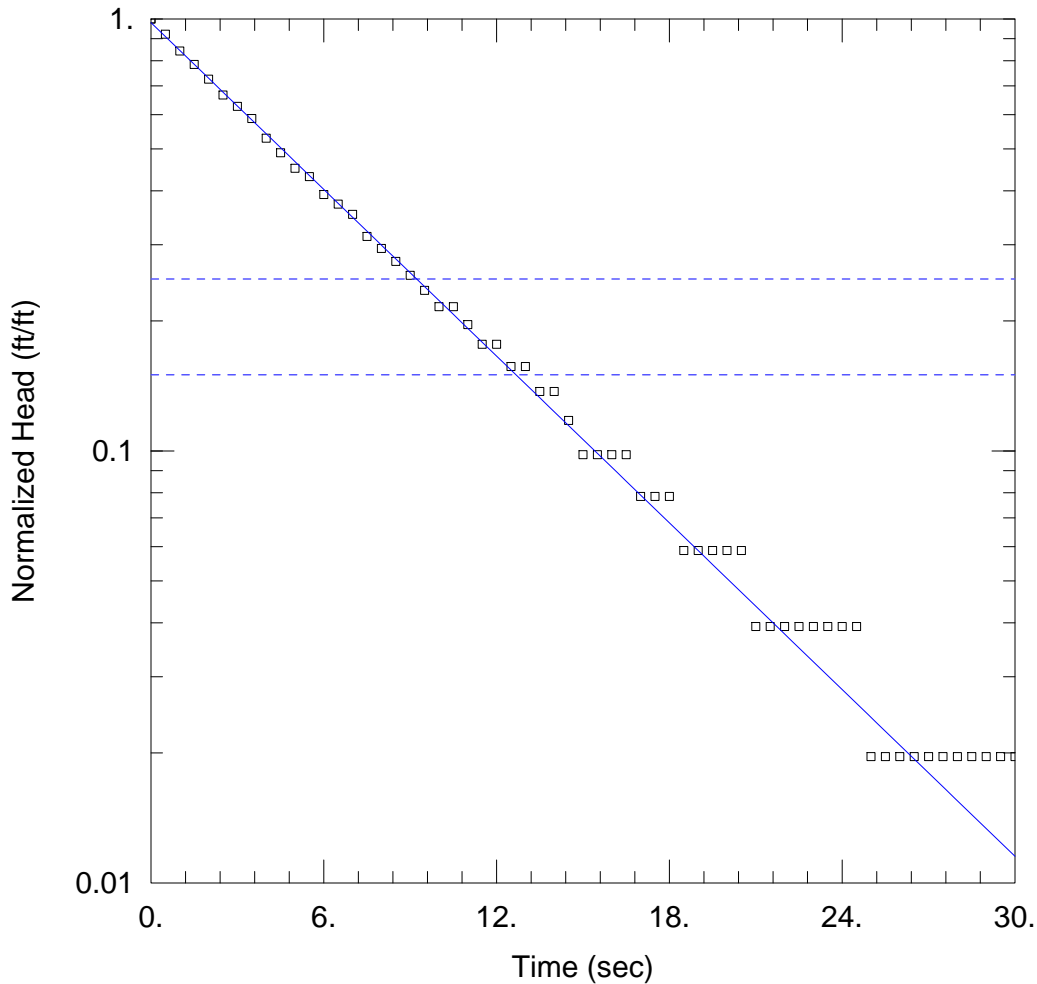
Saturated Thickness: 17.88 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(37-42))

Initial Displacement: 1.66 ft Static Water Column Height: 17.88 ft
 Total Well Penetration Depth: 17.88 ft Screen Length: 5. ft
 Casing Radius: 0.19 ft Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev
 K = 185.8 ft/day y0 = 1.674 ft



TEST 3

Data Set: G:\...\BOX-1(37-42)_Hv_UC_TEST 3.aqt

Date: 12/14/12

Time: 10:22:22

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (37-42)

Test Date: 8/09/2012

AQUIFER DATA

Saturated Thickness: 17.88 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(37-42))

Initial Displacement: 0.51 ft

Static Water Column Height: 17.88 ft

Total Well Penetration Depth: 17.88 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

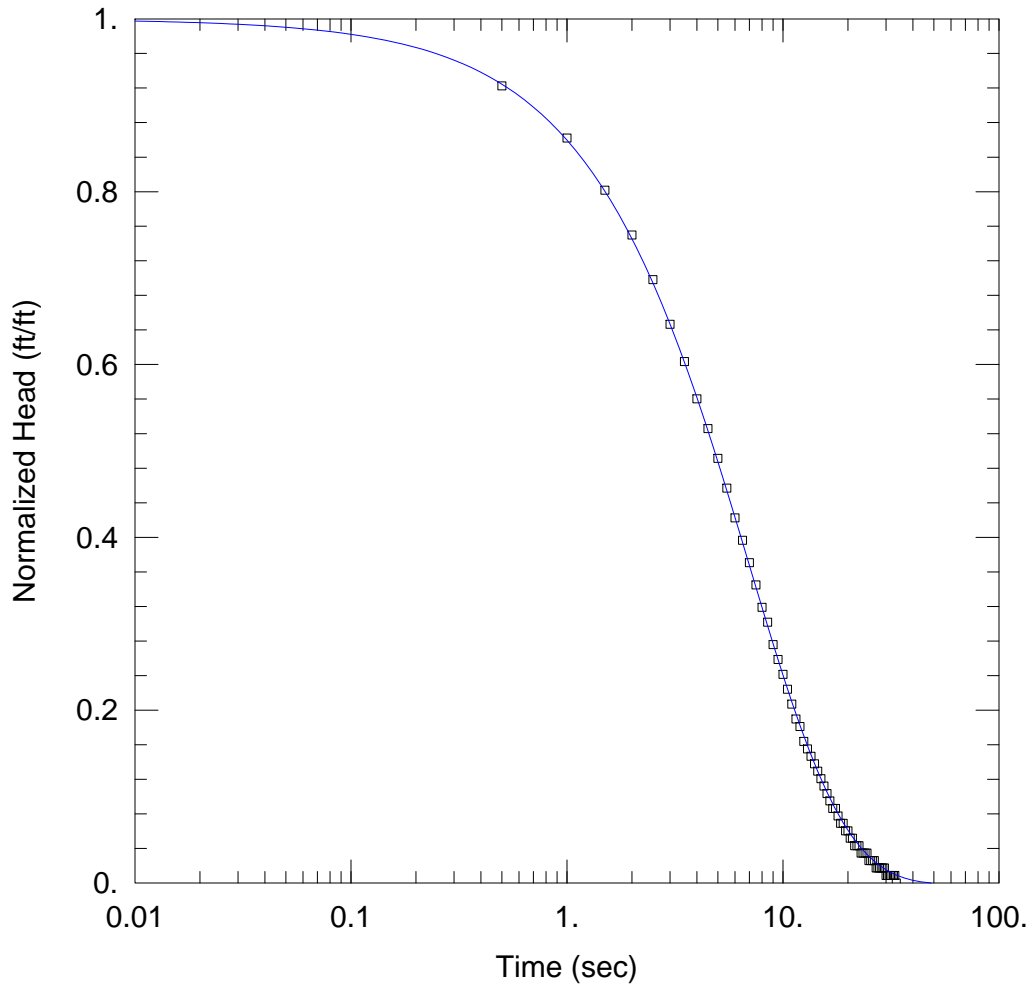
SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

K = 221.2 ft/day

y0 = 0.5 ft



TEST 1

Data Set: G:\...\BOX-1(37-42)_KGS_UC_TEST 1.aqt

Date: 12/14/12

Time: 10:23:00

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (37-42)

Test Date: 8/09/2012

AQUIFER DATA

Saturated Thickness: 17.88 ft

WELL DATA (BOX-1(37-42))

Initial Displacement: 1.16 ft

Static Water Column Height: 17.88 ft

Total Well Penetration Depth: 17.88 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

SOLUTION

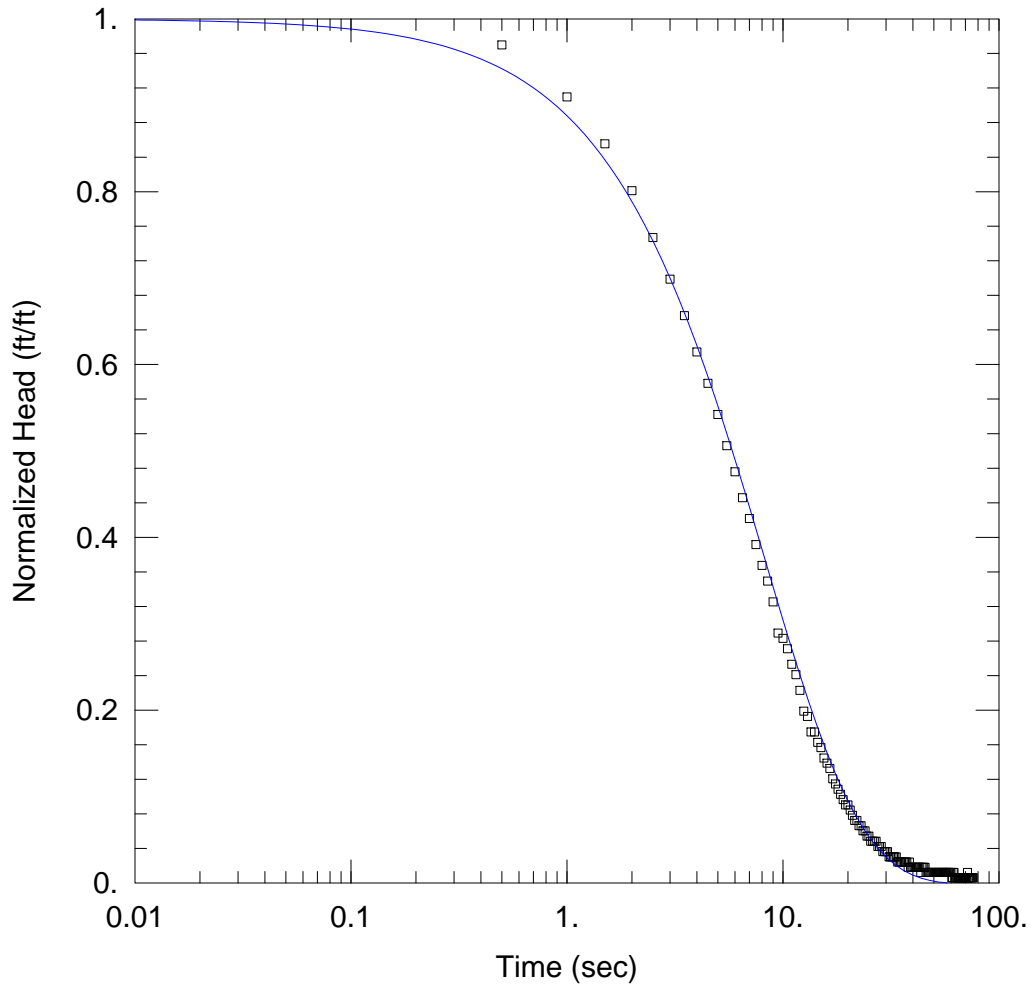
Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 191.5 ft/day

Ss = 1.9E-5 ft⁻¹

Kz/Kr = 1.



TEST 2

Data Set: G:\...\BOX-1(37-42)_KGS_UC_TEST 2.aqt

Date: 12/14/12

Time: 10:23:23

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (37-42)

Test Date: 8/09/2012

AQUIFER DATA

Saturated Thickness: 17.88 ft

WELL DATA (BOX-1(37-42))

Initial Displacement: 1.66 ft

Total Well Penetration Depth: 17.88 ft

Casing Radius: 0.19 ft

Static Water Column Height: 17.88 ft

Screen Length: 5. ft

Well Radius: 0.0833 ft

SOLUTION

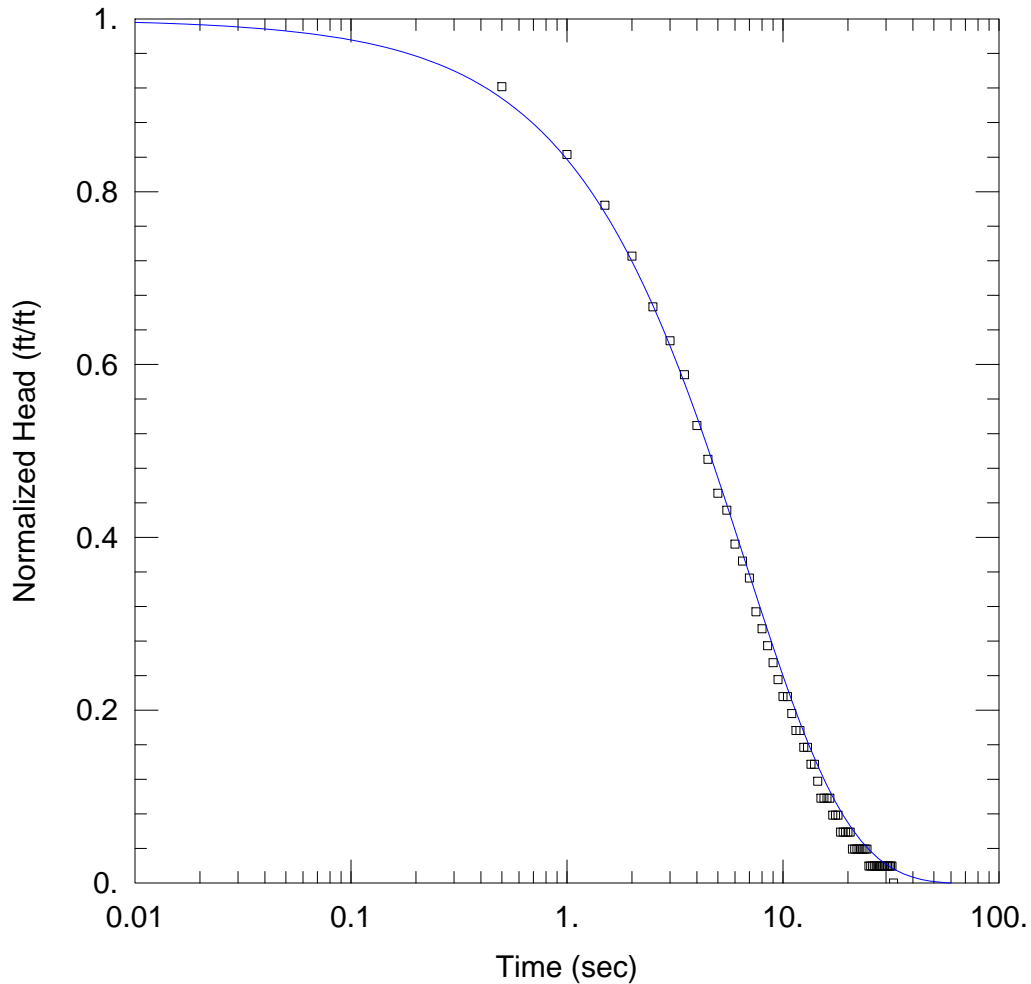
Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 159.3 ft/day

Ss = 5.0E-18 ft⁻¹

Kz/Kr = 1.



TEST 3

Data Set: G:\...\BOX-1(37-42)_KGS_UC_TEST 3.aqt

Date: 12/14/12

Time: 10:23:47

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (37-42)

Test Date: 8/09/2012

AQUIFER DATA

Saturated Thickness: 17.88 ft

WELL DATA (BOX-1(37-42))

Initial Displacement: 0.51 ft

Total Well Penetration Depth: 17.88 ft

Casing Radius: 0.19 ft

Static Water Column Height: 17.88 ft

Screen Length: 5. ft

Well Radius: 0.0833 ft

SOLUTION

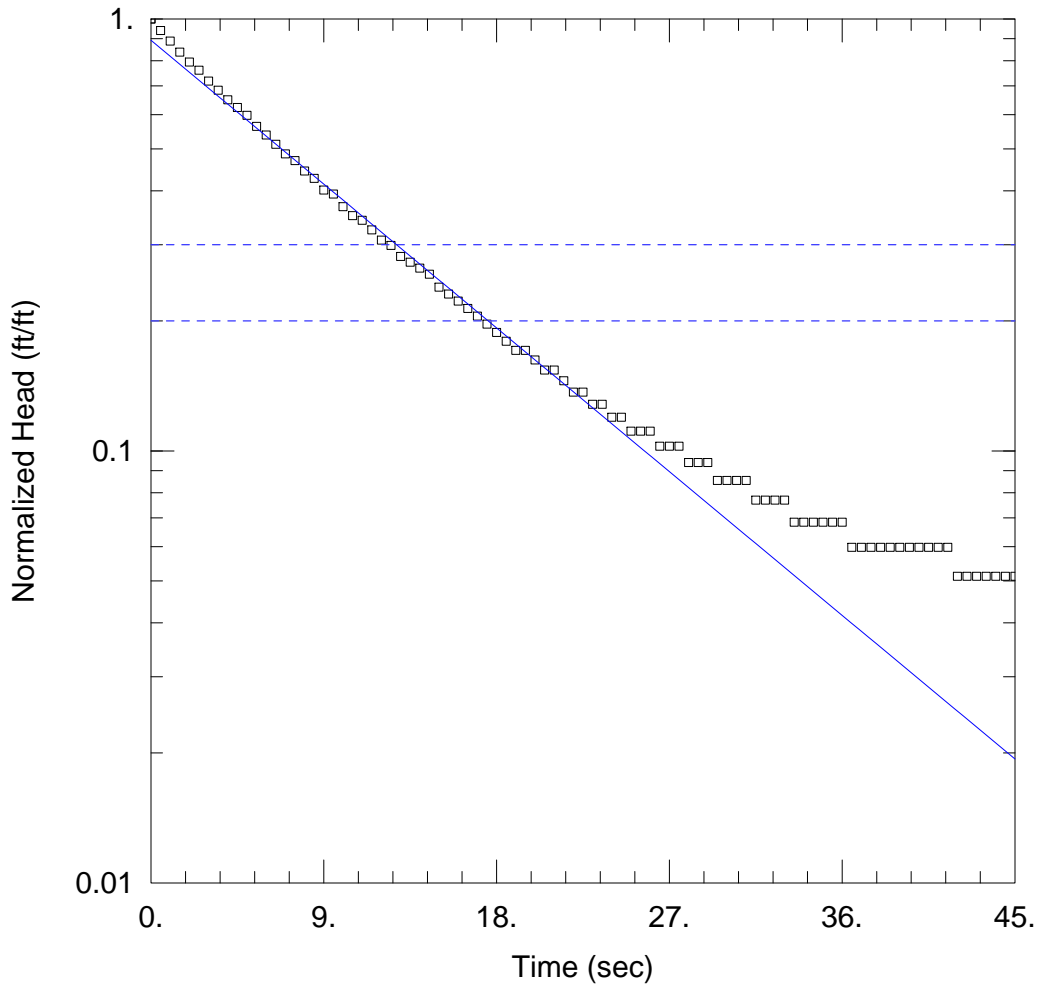
Aquifer Model: Unconfined

Solution Method: KGS Model

Kr = 189.5 ft/day

Ss = 0.0002 ft⁻¹

Kz/Kr = 1.



TEST 1

Data Set: G:\...\BOX-1(49-54)_B&R_C_TEST 1.aqt

Date: 12/14/12

Time: 10:24:10

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(49-54))

Initial Displacement: 1.17 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

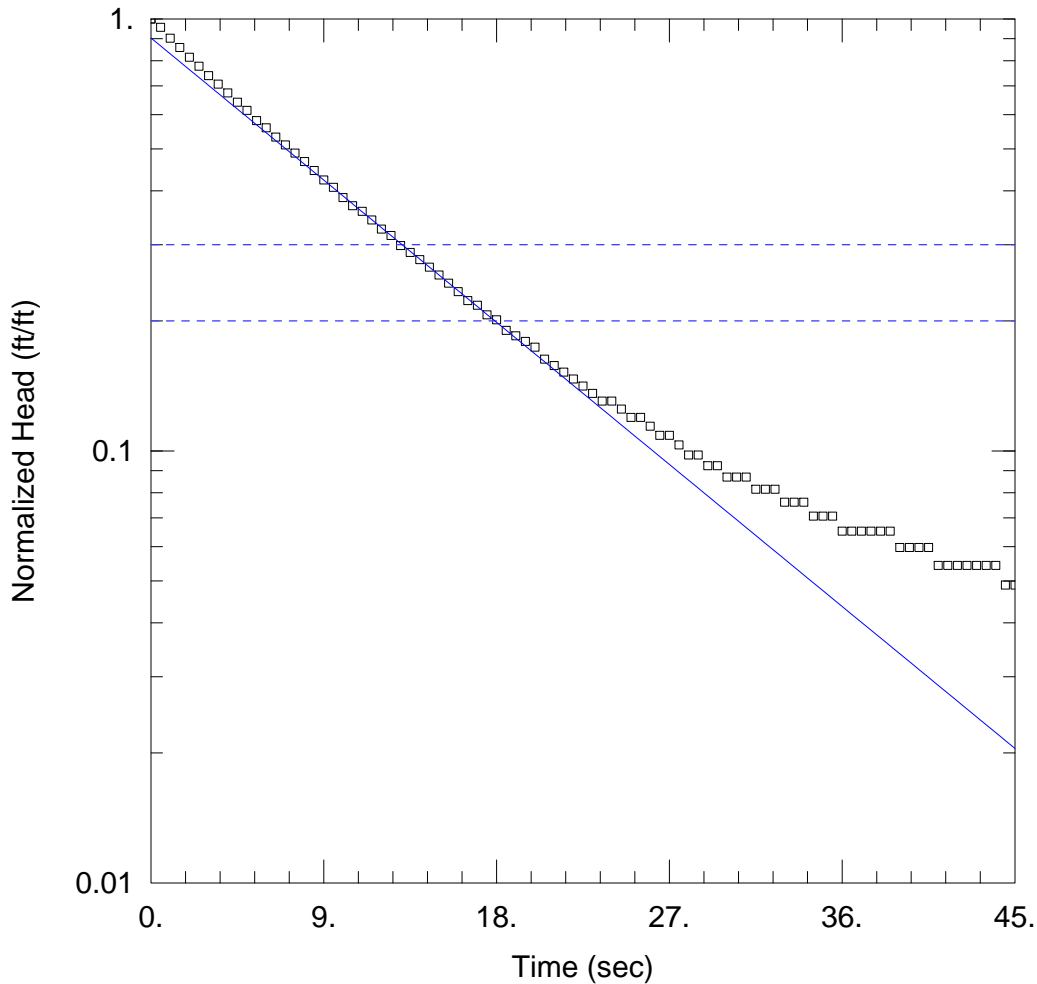
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 87.5 ft/day

y0 = 1.044 ft



TEST 2

Data Set: G:\...\BOX-1(49-54)_B&R_C_TEST 2.aqt

Date: 12/14/12

Time: 10:24:31

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(49-54))

Initial Displacement: 1.84 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

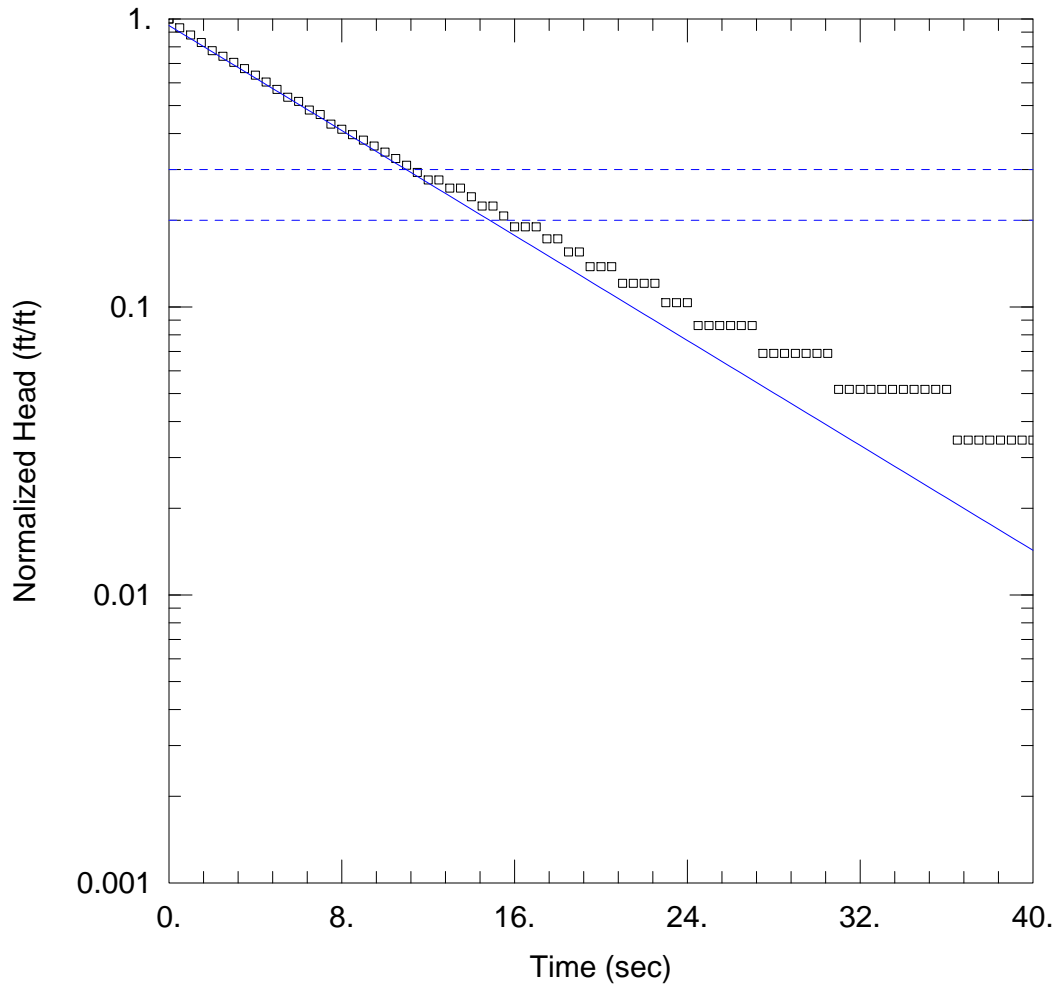
SOLUTION

Aquifer Model: Confined

Solution Method: Bower-Rice

K = 86.5 ft/day

y0 = 1.662 ft



TEST 3

Data Set: G:\...\BOX-1(49-54)_B&R_C_TEST 3.aqt

Date: 12/14/12

Time: 10:24:57

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(49-54))

Initial Displacement: 0.58 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

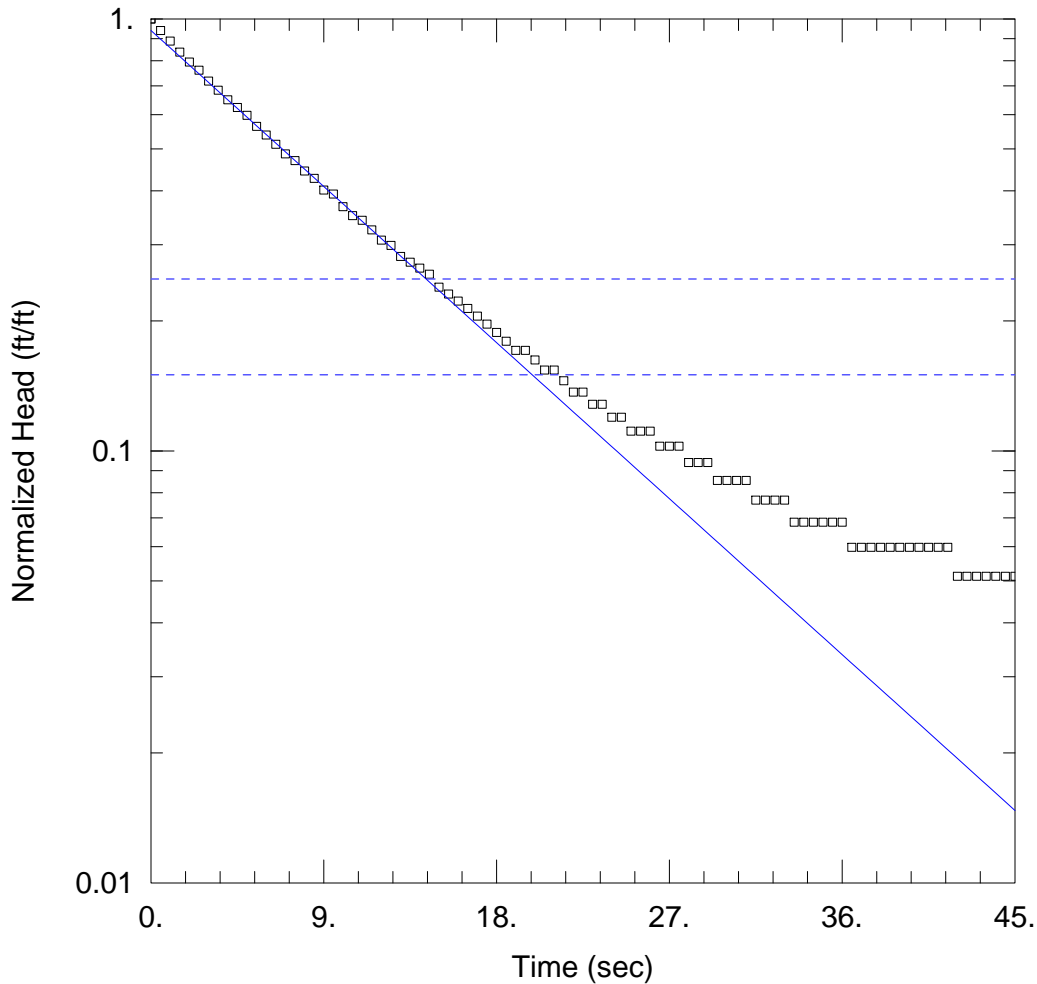
SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 107.8 ft/day

y0 = 0.55 ft



TEST 1

Data Set: G:\...\BOX-1(49-54)_Hv_C_TEST 1.aqt

Date: 12/14/12

Time: 10:25:30

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(49-54))

Initial Displacement: 1.17 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

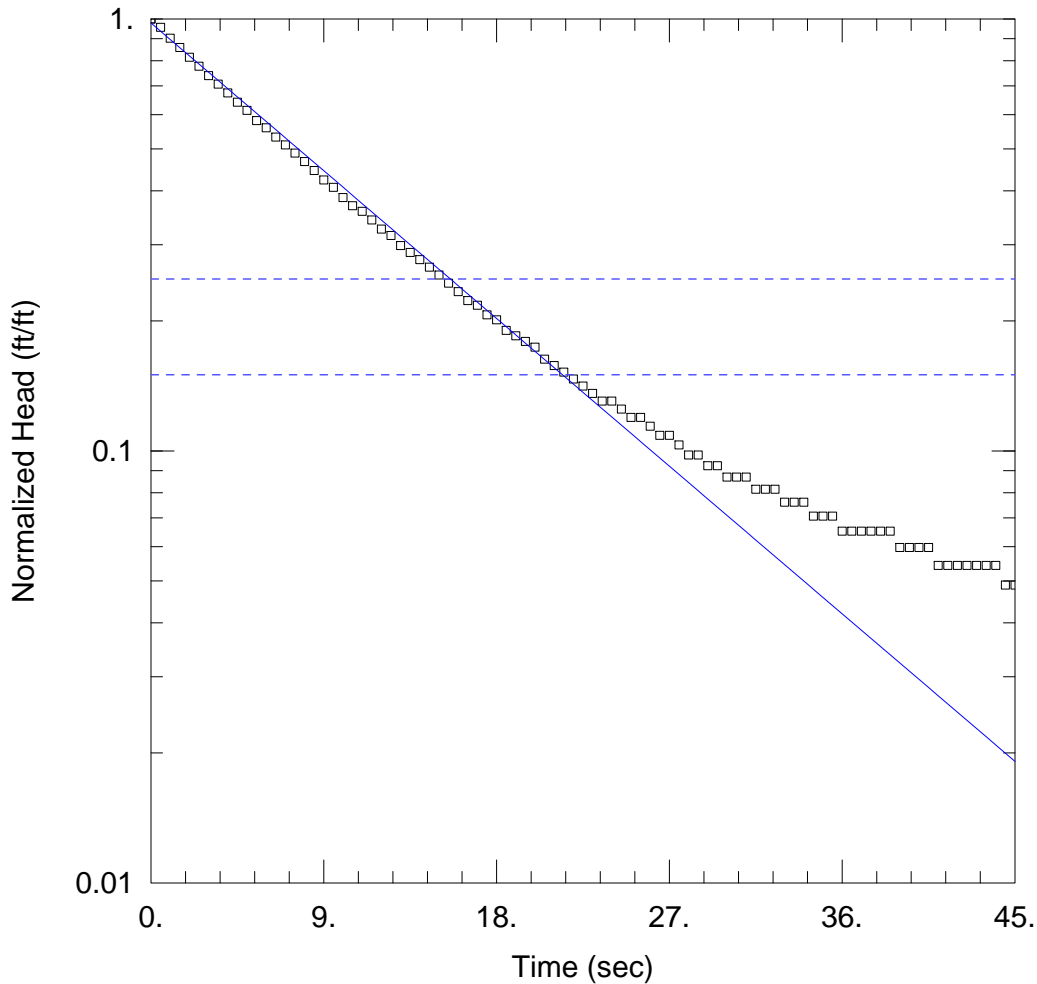
SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 118. ft/day

y0 = 1.1 ft



TEST 2

Data Set: G:\...\BOX-1(49-54)_Hv_C_TEST 2.aqt

Date: 12/14/12

Time: 10:25:54

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(49-54))

Initial Displacement: 1.84 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

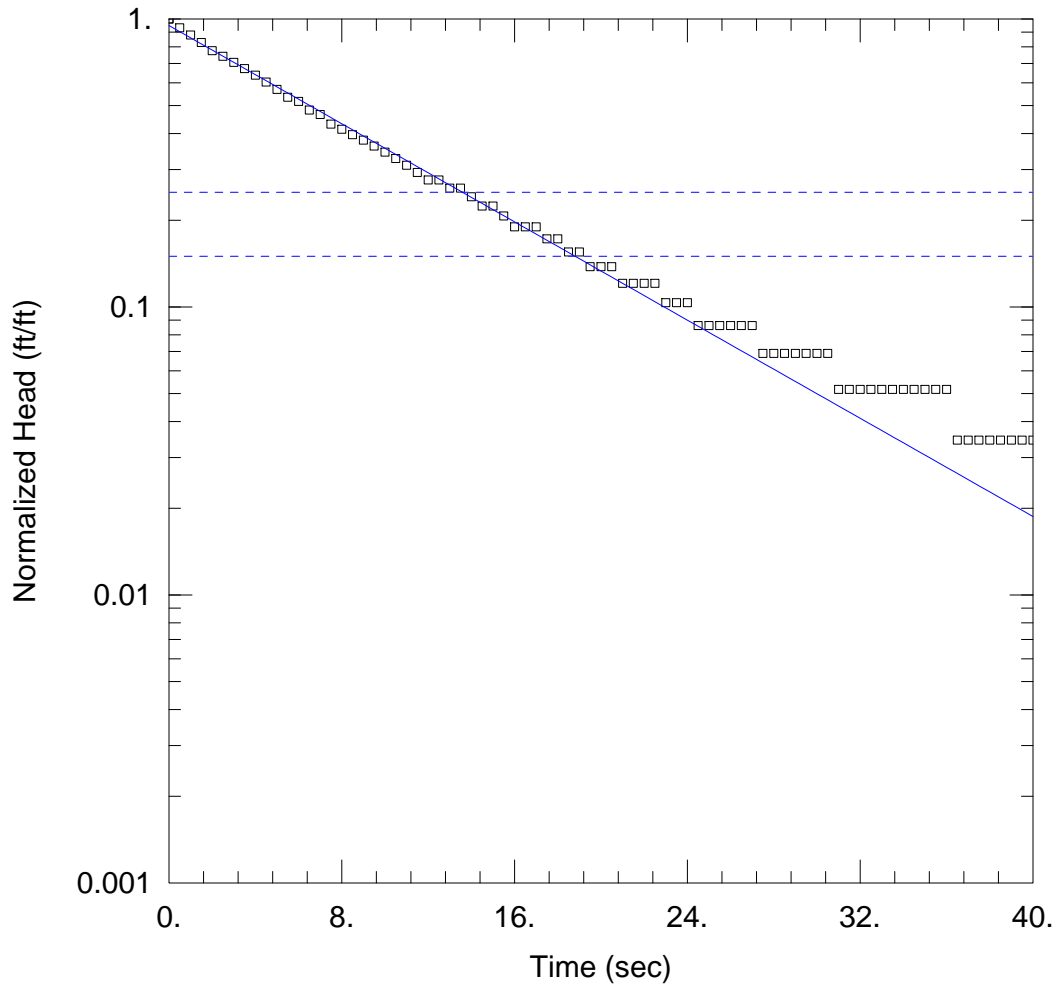
SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 111.7 ft/day

y0 = 1.8 ft



TEST 3

Data Set: G:\...\BOX-1(49-54)_Hv_C_TEST 3.aqt

Date: 12/14/12

Time: 10:26:27

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BOX-1(49-54))

Initial Displacement: 0.58 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

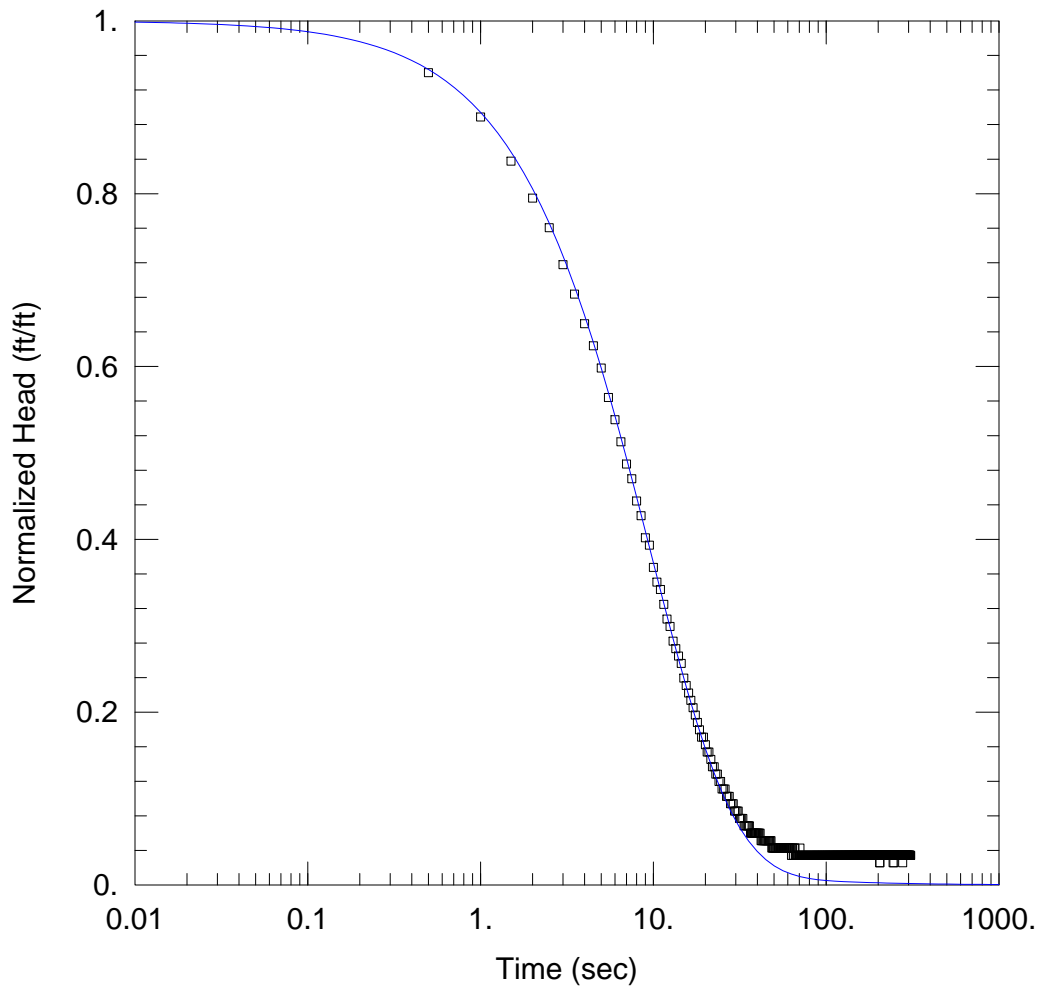
SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 125.3 ft/day

y0 = 0.55 ft



TEST 1

Data Set: G:\...\BOX-1(49-54)_KGS__C_TEST 1.aqt

Date: 12/14/12

Time: 10:27:09

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

WELL DATA (BOX-1(49-54))

Initial Displacement: 1.17 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

SOLUTION

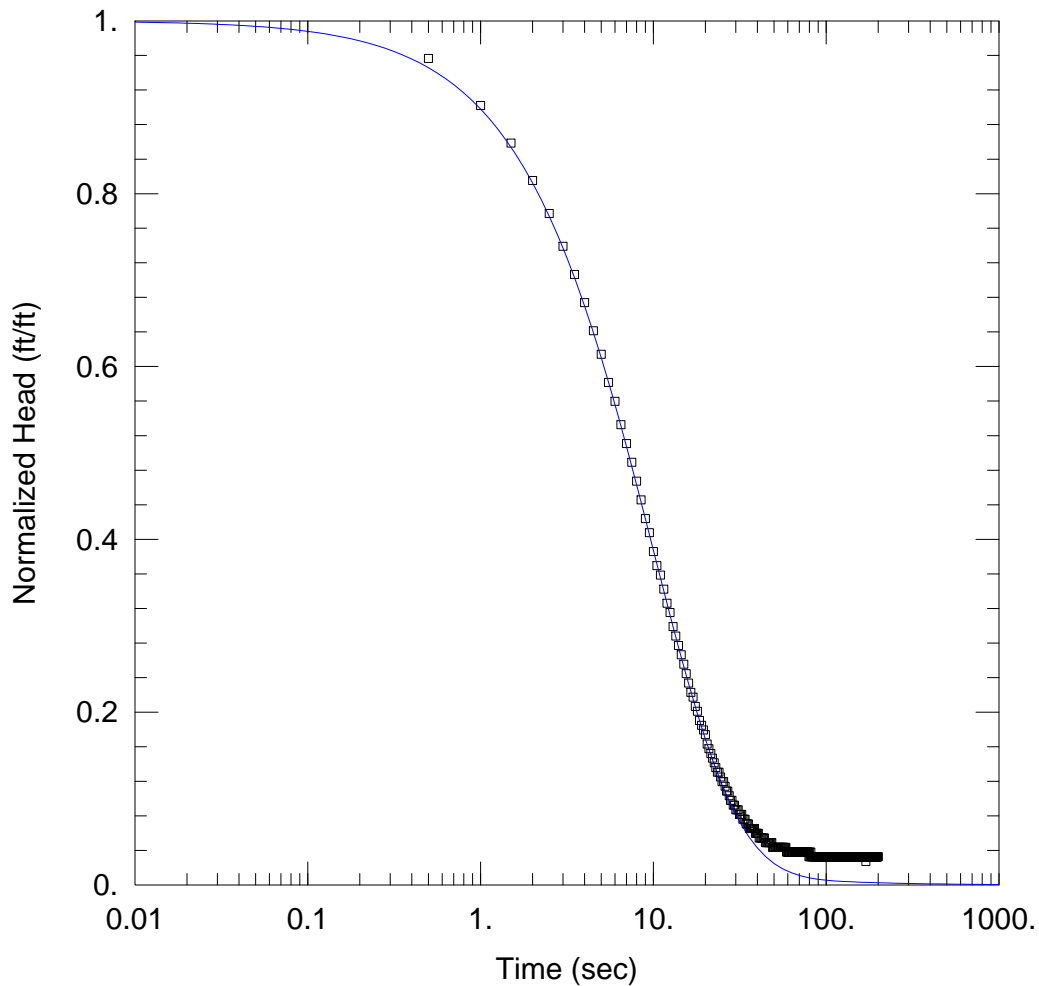
Aquifer Model: Confined

Solution Method: KGS Model

Kr = 174.9 ft/day

Ss = 1.846E-7 ft⁻¹

Kz/Kr = 1.



TEST 2

Data Set: G:\...\BOX-1(49-54)_KGS_C_TEST 2.aqt

Date: 12/14/12

Time: 10:27:41

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

WELL DATA (BOX-1(49-54))

Initial Displacement: 1.84 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

SOLUTION

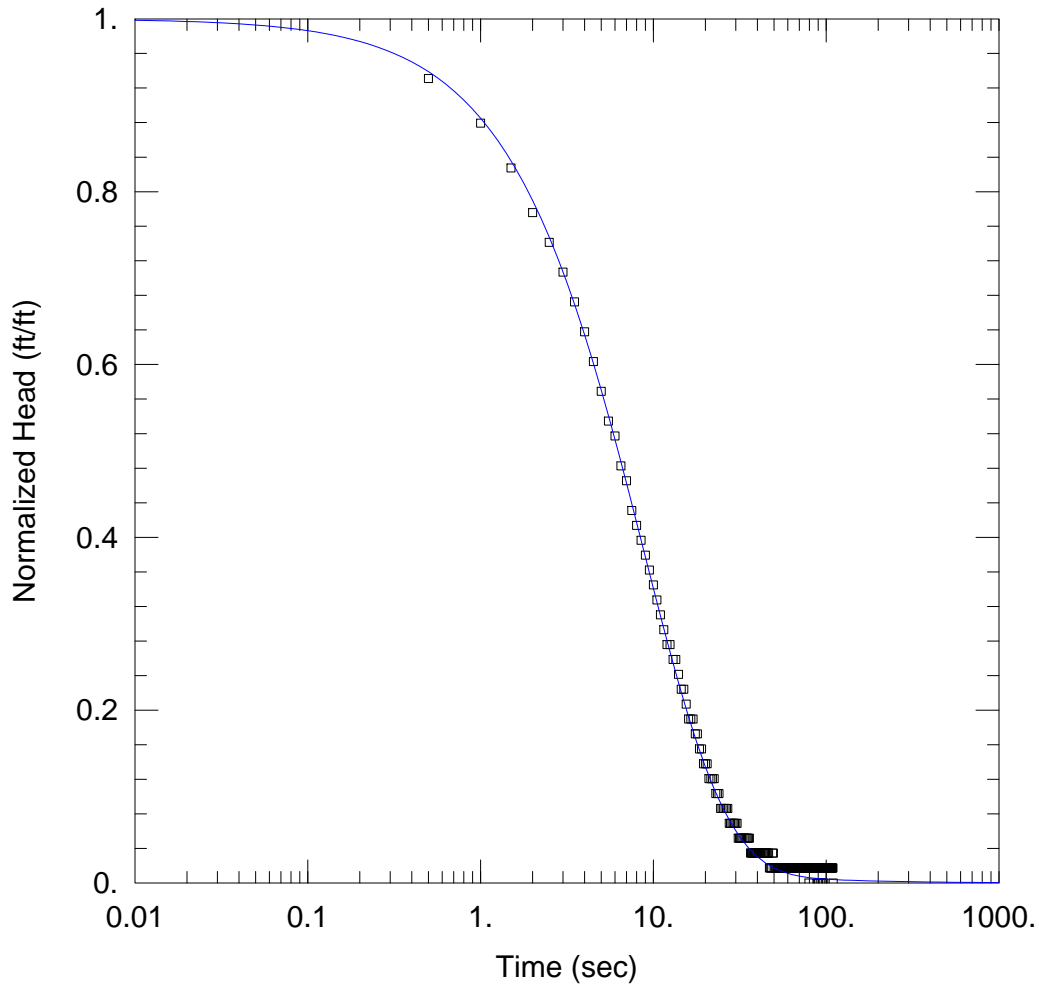
Aquifer Model: Confined

Solution Method: KGS Model

Kr = 166.1 ft/day

Ss = 2.3E-7 ft⁻¹

Kz/Kr = 1.



TEST 3

Data Set: G:\...\BOX-1(49-54)_KGS__C_TEST 3.aqt

Date: 12/14/12

Time: 10:28:05

PROJECT INFORMATION

Company: ARCADIS

Client: RACER Trust

Project: OH000294.2012

Location: Moraine, Ohio

Test Well: BOX-1 (49-54)

Test Date: 8/10/2012

AQUIFER DATA

Saturated Thickness: 10.5 ft

WELL DATA (BOX-1(49-54))

Initial Displacement: 0.58 ft

Static Water Column Height: 29.98 ft

Total Well Penetration Depth: 9.94 ft

Screen Length: 5. ft

Casing Radius: 0.19 ft

Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 196.5 ft/day

Ss = 1.1E-7 ft⁻¹

Kz/Kr = 1.

ARCADIS

Attachment F-2

Soil Boring Logs



SOIL BORING LOG

BORING NO.: **BOX-1**

TOTAL DEPTH: **60** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **8/9/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **731.57 feet AMSL**
 NORTHING: **623061.8209**
 EASTING: **1484899.1967**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION	
0				CONCRETE	(0.0 - 1.0) CONCRETE removed by coring.	
2		NM		FILL	(1.0 - 10.0) SAND, medium to coarse grain, small to large gravel, trace silt, some small cobbles poorly sorted, loose, dry, brown, fill includes: metal.	
4		NM				
6		NM				
8		NM				
10		NM				
12	28	1.3		SM	(10.0 - 14.5) SAND, medium grain with silt, some medium to large round pebbles, few small cobbles, moist (due to rainfall), poorly sorted, loose to moderately stiff, moist, olive brown.	
14		1.2				
16	38	9.0		CL	*Soil sample submitted for laboratory analysis from 14 to 16 feet.	
18				SM	(14.5 - 15.0) SILTY CLAY, some medium round pebbles, trace medium sand, poorly sorted, hard, dry, light gray.	
20	36	1.2			(15.0 - 26.0) SAND, medium grain, some silt, few small round pebbles, poorly sorted, loose, dry.	
22						4.6
24						6.5
26	37	6.0			(26.0 - 33.5) SAND, medium to coarse grain, some small to medium round pebbles, some silt, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 26 to 31 feet.	
28						5.6
30						4.8
		8.2			Note: higher silt content from 29 to 30 feet.	

Notes:
 bls: below land surface NR: No Recovery
 HA: Hand Auger NM: Not Measured
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System
 ppm: parts per million PID: Photo-ionization Detector
 HK: Hydroknife AMSL: Above Mean Sea Level
 Date: 12/11/2012
 Page: 1 of 2



SOIL BORING LOG

BORING NO.: **BOX-1**

TOTAL DEPTH: **60 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **8/9/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **731.57 feet AMSL**
 NORTHING: **623061.8209**
 EASTING: **1484899.1967**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
32	42	9.7			
34		24		ML	(33.5 - 35.0) SILT, moderately stiff, wet, dark gray.
36	40	6.8		ML	(35.0 - 38.0) SANDY SILT, medium grain, reworked silt material, moderately loose to stiff, wet, gray to very dark grayish brown.
38		8.6		SW	(38.0 - 40.0) SAND, medium to coarse grain, some medium round pebbles, few small cobbles, trace silt, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 38 to 43 feet.
40	40	11.2		SM	(40.0 - 42.5) SILTY SAND, medium grain, some clay, some medium round pebbles to small cobbles, poorly sorted, stiff, wet, grayish brown.
42		21.4		CL	(42.5 - 44.0) SILTY CLAY, few small round pebbles, poorly sorted, very hard, dry, very dark gray.
44	44	14.2		SM	(44.0 - 50.0) SILTY SAND, fine grain, loose, wet, olive brown. Note: little clay, soft, moderate plasticity from 45 to 50 feet. *Groundwater sample submitted for laboratory analysis from 49 to 54 feet.
46		41.0			
48		43.0			
50	41	111.3		SM	(50.0 - 54.0) SAND, medium grain, silt, few small to medium round pebbles, wet.
52		151.7			
54		239.2		SW	(54.0 - 54.5) SAND, fine grain, trace silt, poorly sorted, loose, wet.
56	48	11.2		CL	(54.5 - 60.0) SILTY CLAY, few small round pebbles, poorly sorted, hard, dry.
58		6.9			
60					End of boring 60 feet.
62					

Notes:
 bls: below land surface NR: No Recovery
 HA: Hand Auger NM: Not Measured
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System
 ppm: parts per million HK: Hydroknife AMSL: Above Mean Sea Level
 PID: Photo-ionization Detector Date: 12/11/2012
 Page: 2 of 2



SOIL BORING LOG

BORING NO.: **BOX-2**

TOTAL DEPTH: **58** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **8/13/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **731.57 feet AMSL**
 NORTHING: **622256.3639**
 EASTING: **1484709.4647**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 1.0) CONCRETE removed by coring.
2		NM		FILL	(1.0 - 10.0) SAND, medium to coarse grain, small to large pebbles, small cobbles, trace silt, poorly sorted, loose, brown, fill includes metal.
4		NM			
6	HK	NM			
8		NM			
10		NM			
12	68	0.3		SM	(10.0 - 14.0) SAND, medium grain, some small round pebbles, some clay, some silt, trace small cobbles, poorly sorted, moderately stiff to loose, moist, olive brown.
14		0.4			
16		1.1		CL	(14.0 - 16.0) SILTY CLAY, few small round pebbles, poorly sorted, hard, dry, light brownish gray.
18	50	3.0			
20		0.3		SM	(16.0 - 24.0) SAND, medium grain, some silt, few small to medium pebbles, poorly sorted, loose, dry, light olive brown. *Soil sample submitted for laboratory analysis from 16 to 18 feet.
22		1.2			
24		0.1			
26	72	2.1		CL	(24.0 - 35.0) SILTY CLAY, some small to medium round pebbles, poorly sorted, hard, dry, dark gray. Note: during advancement into the clay unit and the borehole began to collect groundwater so a sample was collected. *Groundwater sample submitted for laboratory analysis from 24 to 29 feet.
28		2.6			
30		1.1			

Notes:
 bls: below land surface NR: No Recovery
 HA: Hand Auger NM: Not Measured
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System
 ppm: parts per million PID: Photo-ionization Detector Date: 12/11/2012
 HK: Hydroknife AMSL: Above Mean Sea Level Page: 1 of 2



SOIL BORING LOG

BORING NO.: **BOX-2**

TOTAL DEPTH: **58** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **8/13/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **731.57 feet AMSL**
 NORTHING: **622256.3639**
 EASTING: **1484709.4647**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
30	75	0.0			
32		0.0			
34	68	0.1		SW	(35.0 - 51.0) SAND, medium to coarse grain, some small to medium round pebbles, little silt, poorly sorted, loose, wet.
36		0.0			
38		0.1			
40	52	0.0			Note: trace clay from 40 to 45 feet. *Groundwater sample submitted for laboratory analysis from 40 to 45 feet.
42		0.0			
44	73	4.5			Note: increase in clay and silt from 45 to 51 feet. *Groundwater sample submitted for laboratory analysis from 46 to 51 feet.
46		17.9			
48		19.2			
50		19.4			
52	NM	26.1		CL	(51.0 - 58.0) SILTY CLAY, some small round pebbles, hard, dry, orange brown mottling from 51 to 52 feet, dark gray from 52 to 53 feet.
54		14.1			
56		4.4			
58					End of boring at 58 feet.
60					

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/11/2012
 HA: Hand Auger NM: Not Measured PID: Photo-ionization Detector Page: 2 of 2
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **BOX-4**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **7/6/2012**
 DATE COMPLETED: **8/14/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **731.64 feet AMSL**
 NORTHING: **621398.0590**
 EASTING: **1484496.3252**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 1.0) CONCRETE removed by coring.
2				SW	(1.0 - 10.0) SAND, medium to coarse grain, medium to large pebbles, some small cobbles, poorly sorted, dry, brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
12	41	4.2		SM	(10.0 - 14.0) SAND, fine to medium grain, silt, few small to medium round pebbles, poorly sorted, loose, dry to moist.
14		2.1			
16		6.8		CL	(14.0 - 15.5) SILTY CLAY, few small round pebbles, cobble fragments, moderately stiff, hard, dry.
18	43	7.1		SM	(15.0 - 30.0) SAND, medium grain, silt, few small to medium round pebbles, trace small cobbles, dry.
20		6.6			
22	43	4.5			Note: higher silt content from 20 to 25 feet.
24		3.6			
26		5.1			
28	42	5.7			Note: more small round pebbles from 25 to 30 feet.
30		17.3			*Soil sample submitted for laboratory analysis from 28 to 30 feet.
32	42	14.1		SW	(30.0 - 36.0) SAND, medium to coarse grain, few small round pebbles, little silt, poorly sorted, loose, wet, olive brown.
34		6.5			*Groundwater sample submitted for laboratory analysis from 30 to 35 feet.
		7.1			

Notes:
 bls: below land surface NR: No Recovery
 HA: Hand Auger NM: Not Measured
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System
 ppm: parts per million PID: Photo-ionization Detector
 HK: Hydroknife AMSL: Above Mean Sea Level
 Date: 12/11/2012
 Page: 1 of 2



SOIL BORING LOG

BORING NO.: **BOX-4**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **7/6/2012**
 DATE COMPLETED: **8/14/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **731.64 feet AMSL**
 NORTHING: **621398.0590**
 EASTING: **1484496.3252**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
36	45	6.2		SM	(36.0 - 40.0) SILTY SAND, medium to coarse grain, some small to medium round pebbles, trace clay, loose to moderately stiff, wet, olive brown.
38		3.1			
40	50	0.9		CL	(40.0 - 62.0) SILTY CLAY, some small round pebbles, poorly sorted, hard, dry, dark gray. Note: olive brown from 40 to 40.3 feet. Note: little fine sand from 43 to 44 feet. Note: dark gray from 45 to 50 feet.
42		0.5			
44		1.3			
46		3.3			
48	48	4.7		CL	
50		4.1			
52	48	8.4		CL	Note: becomes slightly sandy from 53 to 54 feet.
54		5.1			
56	124	3.6		CL	Note: more small round pebbles from 55 to 60 feet.
58		2.8			
60		5.0			
62		4.6			
64		3.1		CL	(64.0 - 65.0) SILTY CLAY, some small round pebbles, poorly sorted, hard, dry, dark gray.
66					End of boring at 65 feet.

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/11/2012
 HA: Hand Auger NM: Not Measured PID: Photo-ionization Detector Page: 2 of 2
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **HFA-1**

TOTAL DEPTH: **55** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **7/9/2012**
 DATE COMPLETED: **8/8/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **731.99 feet AMSL**
 NORTHING: **623089.9746**
 EASTING: **1484513.0188**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
30					*Groundwater sample submitted for laboratory analysis from 28 to 32 feet.
30 - 40.0	NR	NM			(30.0 - 40.0) NO RECOVERY. Note: <1 inch silty clay in shoe at 30 feet.
32		NM			
34		NM			
36		NM			
38		NM			
40 - 45.0	24	3.8		CL	(40.0 - 45.0) SILTY CLAY, few small round pebbles, poorly sorted, hard, dry, very dark gray brown. Note: trace silt in bottom 6 inches.
42		2.0			
44		3.0			
45.0 - 52.0	58	7.8		SW	(45.0 - 52.0) SAND, medium to coarse grain with small round pebbles, few medium round pebbles, trace silt, poorly sorted, loose, wet. *Groundwater sample submitted for laboratory analysis from 47 to 52 feet.
46		11.7			
48		5.9			
50		5.4		CL	(52.0 - 55.0) SILTY CLAY, trace medium sand, some small to medium round pebbles, poorly sorted, hard, dry.
52		5.4			
54		5.4			
55					End of boring at 55 feet.

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

MSL: Above Mean Sea Level
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/7/2012
 Page: 2 of 2



SOIL BORING LOG

BORING NO.: **HFA-2**

TOTAL DEPTH: **56** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **7/9/2012**
 DATE COMPLETED: **8/10/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **732.05 feet AMSL**
 NORTHING: **623032.0561**
 EASTING: **1484499.6284**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
30	14	5.2			Note: some fine sand, higher silt content from 30 to 33 feet.
32	48	3.1		CL	(33.0 - 45.0) SILTY CLAY, some small round pebbles, poorly sorted, hard, dry, dark gray brown.
34		3.3			
36	61	2.1			
38		2.7			
40		2.8			Note: softer clay from 40 to 45 feet.
42	63	3.5			
44		8.5			
46	43	10.6		SM	(45.0 - 52.5) SAND, coarse grain with small to medium round pebbles, some silt, trace clay, poorly sorted, loose, dry, olive brown.
48		9.8			*Groundwater sample submitted for laboratory analysis from 45 to 50 feet.
50		5.9			
52	48	4.8		CL	(52.5 - 56.0) SILTY CLAY, few small to medium round pebbles, poorly sorted, hard, dry, dark gray.
54		3.2			
56					End of boring at 56 feet.
58					

Notes:
 bls: below land surface MSL: Above Mean Sea Level
 NR: No Recovery NM: Not Measured
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System

Date: 12/7/2012
Page: 2 of 2

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife



SOIL BORING LOG

BORING NO.: **WTANKF-1**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: RACER Trust
PROJECT: Secondary Source Area Investigation
SITE LOCATION: Moraine, Ohio
PROJECT NUMBER: OH000294.2012.0002B
LOGGED BY: Lauren Baumgartner
DATE STARTED: 6/28/2012
DATE COMPLETED: 9/4/2012

DRILLING INFORMATION AMSL

DRILLING CO.: Boart Longyear
DRILLER: Jason Greer
DRILLING METHOD: Rotasonic

GROUND ELEVATION: 729.29 feet AMSL
NORTHING: 621690.6718
EASTING: 1483354.0145

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 0.5) CONCRETE removed by coring.
2		NM		SW	(0.5 - 10.0) SAND, medium to coarse grain, medium to large pebbles, trace silt, poorly sorted, loose, dry, brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
10		4.0		CL	(10.0 - 12.0) SANDY CLAY with silt, some small to medium round pebbles, poorly sorted, stiff, moist, olive brown.
12	34	5.1		GM	(12.0 - 13.0) PEBBLES, small round with medium to coarse sand, some silt, few medium pebbles, poorly sorted, moist to wet, olive brown.
14		12.5		SM	(13.0 - 20.0) SAND, medium to coarse, some small round pebbles, some silt, poorly sorted, loose, dry, light olive brown. Note: higher silt content from 15 to 20 feet.
16	50	6.2			
18		5.8			
20		9.7		SM	(20.0 - 27.0) SANDY SILT, medium grain, some small to medium round pebbles, poorly sorted, loose, dry, light olive gray.
22	62	10.6			
24		6.8			
26		12.9			*Soil sample submitted for laboratory analysis from 26 to 28 feet.
28	64	8.9		SM	(27.0 - 32.0) SAND, medium grain, silt, some small to medium round pebbles, trace clay, poorly sorted, moderately loose, moist, olive brown.
30		8.0			
32	72	3.5		GM	(32.0 - 36.0) PEBBLES, small round, some silt, few medium to large round pebbles, trace medium sand, loose, poorly sorted, wet, olive brown.
34		4.7			

Notes: MSL: Above Mean Sea Level ppm: parts per million Date: 12/7/2012
 bls: below land surface NM: Not Measured PID: Photo-ionization Detector Page: 1 of 2
 NR: No Recovery USCS: Unified Soil Classification System ft: feet
 *Indicates sample submitted for laboratory analysis. HK: Hydroknife



SOIL BORING LOG

BORING NO.: **WTANKF-1**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **9/4/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **729.29 feet AMSL**
 NORTHING: **621690.6718**
 EASTING: **1483354.0145**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
36	68	10.4		CL	(36.0 - 46.0) SILTY CLAY, trace medium sand, some small round medium pebbles, poorly sorted, hard, wet, dark gray. Note: dry from 40 to 46 feet.
38		7.6			
40	84	5.1			
42		4.2			
44		7.9			
46	71	10.1		SM	(46.0 - 50.0) SAND, medium to coarse grain, some small round pebbles, some silt, trace clay, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 46 to 51 feet.
48		6.1			
50	70	3.2		GW	(50.0 - 60.0) PEBBLES, small round, with medium sand, trace silt, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 55 to 60 feet. Note: well sorted pebbles from 57 to 58 feet.
52		2.2			
54		2.5			
56	64	4.3		CL	(60.0 - 65.0) SILTY CLAY, some small to medium round pebbles, trace sand, dry, gray.
58		1.9			
60	64	1.8		CL	(60.0 - 65.0) SILTY CLAY, some small to medium round pebbles, trace sand, dry, gray.
62		2.1			
64		1.9			
66					End of boring at 65 feet.

Notes:
 bls: below land surface MSL: Above Mean Sea Level ppm: parts per million Date: 12/7/2012
 NR: No Recovery NM: Not Measured PID: Photo-ionization Detector Page: 2 of 2
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System ft: feet HK: Hydroknife



SOIL BORING LOG

BORING NO.: **WTANKF-2**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/29/2012**
 DATE COMPLETED: **9/10/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **728.65 feet AMSL**
 NORTHING: **621772.2486**
 EASTING: **1483325.4789**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION		
36	69	0.6		CL	(35.5 - 50.0) SILTY CLAY, some small to medium round pebbles, poorly sorted, hard, dry, gray.		
38		1.9					
40	49	2.8					
42		4.7					
44		3.1					
46	38	8.9					
48		9.2					
50	51	4.5				SM	Note: some sand and few small cobbles from 49 to 50 feet.
52		2.8				SM	(50.0 - 51.0) SILTY SAND, coarse grain, some small to medium round pebbles, poorly sorted, stiff, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 50 to 55 feet.
54		3.0					(51.0 - 59.0) SAND, medium to coarse grain, some silt, few small to medium round pebbles, poorly sorted, loose, wet, olive brown. Note: larger pebbles from 55 to 59 feet.
56		1.3					
58	71	1.8		CL	(59.0 - 65.0) SILTY CLAY, some small round pebbles, poorly sorted, hard, dry, gray.		
60		0.8					
62		2.1					
64		2.9					
66					End of boring at 65 feet.		

Notes:
 bls: below land surface MSL: Above Mean Sea Level ppm: parts per million Date: 12/7/2012
 NR: No Recovery NM: Not Measured PID: Photo-ionization Detector Page: 2 of 2
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System ft: feet HK: Hydroknife



BORING/WELL CONSTRUCTION LOG

WELL NO.: **RMW-87/WTANKF-3**

TOTAL DEPTH: **100 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **9/06/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **728.01 feet AMSL**
 GROUND ELEVATION: **728.44 feet AMSL**
 NORTHING: **621671.6198**
 EASTING: **1483277.4116**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
0				CONCRETE	(0.0 - 0.3) CONCRETE removed by coring.	2" PVC Sch 40 Casing (0 to 67 ft)
2				SW	(0.3 - 12.0) SAND, medium to coarse grain, small to medium pebbles, round, trace silt, poorly sorted, dry, brown.	
4				HK		Grout (0 to 10 ft)
6						
8						
10						
12						
12	64	0.2		SM	(12.0 - 20.0) SILTY SAND, medium grain, some small to medium round pebbles, trace small cobbles, poorly sorted, loose, dry, light gray. *Soil sample submitted for laboratory analysis from 12 to 14 feet.	Bentonite Slurry (10 to 66 ft)
14		4.2				
16		0.4				
16	54	1.7		SW	(20.0 - 25.0) SAND, medium grain with silt, some small to medium round pebbles, poorly sorted, loose, dry, olive brown.	
18		0.8				
20				72		
22						
24						
24				SW	*Groundwater sample submitted for laboratory analysis from 24 to 29 feet. Note: moist at 24.5 feet.	
26						
28	64	2.5				
30				GW	(25.0 - 30.0) SAND, medium grain, some medium round pebbles, little silt, poorly sorted, loose, wet, olive brown.	
32						
34	62	1.0				
36				CL	(30.0 - 35.0) PEBBLES, small round, some medium round pebbles, little coarse sand, little silt, poorly sorted, loose, wet, olive brown.	
36						
38	65	0.3			(35.0 - 43.0) SILTY CLAY, some small round pebbles, trace medium sand, poorly sorted, hard, dry, gray.	

Notes:

bls: below land surface
 HA: Hand Auger

NR: Not Recorded
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 HK: Hydroknife AMSL: Above Mean Sea Level

Date: 12/28/2012
 Page: 1 of 3



BORING/WELL CONSTRUCTION LOG

WELL NO.: **RMW-87/WTANKF-3**

TOTAL DEPTH: **100 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **9/06/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **728.01 feet AMSL**
 GROUND ELEVATION: **728.44 feet AMSL**
 NORTHING: **621671.6198**
 EASTING: **1483277.4116**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
38	1.1					
40	0.7					
42	2.2					
44	2.1			GW	(43.0 - 56.0) PEBBLES, small round, few medium round pebbles, trace medium to coarse sand, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 45 to 50 feet.	
46	2.2					
48	3.0					
50	2.3					
52	1.2					
54	1.0					
56	0.6			SM	(56.0 - 59.0) SILTY SAND, medium to coarse grain, some clay, few small to medium round pebbles, poorly sorted, moderate stiff, wet to moist, gray.	
58	0.3					
60	0.2			CL	(59.0 - 65.0) SILTY CLAY, some small to medium round pebbles, poorly sorted, hard, dry, gray. Note: trace sand from 60 to 65 feet.	
62	0.3					
64	0.2					
66	0.4			SM	(65.0 - 75.0) SILTY SAND, medium to coarse grain, some small round pebbles, few medium round pebbles, loose to moderate stiff, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 65 to 70 feet. Note: less silt from 70 to 75 feet.	
68	0.3					
70	0.1					
72	0.3					
74	1.4			SM	(75.0 - 78.0) SILTY SAND, medium to coarse grain, few small to	
76						

Bentonite Slurry (10 to 66 ft)

Sand Pack (66 to 77 ft)

2" Screen slot size 0.10 (67 to 77 ft)



SOIL BORING LOG

BORING NO.: **WTANKF-4**

TOTAL DEPTH: **70** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **9/17/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **732.85 feet AMSL**
 NORTHING: **621636.1699**
 EASTING: **1483412.6859**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 1.0) CONCRETE removed by coring.
2		NM		SW	(1.0 - 10.0) SAND, medium to coarse grain, small to large rounded gravel, medium cobbles, trace silt, poorly sorted, loose, brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
12	52	2.4		SM	(10.0 - 14.0) SAND, medium to coarse grain, some small to medium round pebbles, some silt, poorly sorted, loose, moist, olive brown.
14		6.9			
16		6.0		ML	(14.0 - 16.0) SILT, some medium sand, few small to medium round pebbles, poorly sorted, loose, dry, light gray.
18	54	5.7		SM	(16.0 - 30.0) SILTY SAND, medium grain, some small round pebbles, poorly sorted, loose, dry, olive brown.
20		5.9			
22	50	3.8			
24		5.5			
26		3.3			Note: higher silt content from 25 to 30 feet.
28	58	9.4			
30		10.2			*Soil sample submitted for laboratory analysis from 28 to 30 feet.
32	62	5.0		SM	Note: slightly moist from 29.5 to 30 feet.
34		4.2			(30.0 - 35.0) SILTY SAND, medium grain, some small to medium round pebbles, poorly sorted, loose to moderate stiff, wet at 30 feet, olive brown.
36		3.5		GM	*Groundwater sample submitted for laboratory analysis from 30 to 35 feet.
					(35.0 - 40.0) PEBBLES, small round with some medium sand, some silt, poorly sorted, loose, wet,

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

MSL: Above Mean Sea Level
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/7/2012
 Page: 1 of 2



BORING/WELL CONSTRUCTION LOG

WELL NO.: **RMW-86/BLDG21-1**

TOTAL DEPTH: **105 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **8/24/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **729.22 feet AMSL**
 GROUND ELEVATION: **729.60 feet AMSL**
 NORTHING: **620409.7071**
 EASTING: **1483253.2715**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
38	0.1				(35.0 - 36.0) SANDY SILT, some clay, some medium round pebbles, poorly sorted, loose, moist, olive brown.	
40	0.3				(36.0 - 47.0) SAND, medium to coarse grain, silt, some small round pebbles increasing with depth, trace clay, poorly sorted, loose, wet, olive brown. Note: higher clay content from 40 to 45 feet. *Groundwater sample submitted for laboratory analysis from 40 to 45 feet.	Bentonite Slurry (1 to 68 ft)
42	0.3			54		
44	0.4				(47.0 - 48.0) SAND with clay, coarse grain, poorly sorted, dense, wet, olive brown.	
46	0.7			61		
48	2.1			SC	(48.0 - 53.0) SAND, medium to coarse grain, few small round pebbles, poorly sorted, loose, wet, olive brown.	
50	0.1			SW		
52	0.3				*Groundwater sample submitted for laboratory analysis from 51 to 56 feet.	
54	0.5			SM		
56	1.2			SC	(53.0 - 56.0) SILTY SAND, medium to coarse grain, little clay, poorly sorted, moderately stiff, wet, olive brown.	
58	3.2			33		
60	0.1				Note: dry from 60 to 60.5 feet.	
62	0.0			ML		
64	0.1			CL	(60.5 - 61.0) SILT, moderately loose, moist, dark gray.	
66	0.1				(61.0 - 68.0) SILTY CLAY, some small to medium round pebbles, poorly sorted, hard, dry, dark gray.	
68	0.1				(68.0 - 75.0) SAND, medium to coarse grain, some small round pebbles, little silt, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 68 to 73 feet.	Bentonite Chips (68 to 69 ft)
70	0.0			SW		Sand Pack (69 to 80 ft)
72	0.4				(75.0 - 85.0) SAND, fine to medium grain, some silt, few small round	2" Screen slot
74	0.2			SW		
76						

Notes:

bls: below land surface
 HA: Hand Auger

NR: Not Recorded
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 HK: Hydroknife AMSL: Above Mean Sea Level

Date: 12/28/2012
 Page: 2 of 3

WELL NO.: **RMW-86/BLDG21-1**

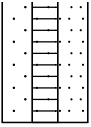
TOTAL DEPTH: **105 feet bls**

PROJECT INFORMATION

DRILLING INFORMATION AMSL

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **8/24/2012**

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **729.22 feet AMSL**
 GROUND ELEVATION: **729.60 feet AMSL**
 NORTHING: **620409.7071**
 EASTING: **1483253.2715**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
76						
78	70	0.1			pebbles, poorly sorted, loose, wet, olive brown.	 size 0.10 (70 to 80 ft)
80		0.2				
82		0.6			Note: more fine sand from 80 to 85 feet.	Formation Collapsed (80 to 105 ft)
84		1.2				
86	103	0.3		SW	(85.0 - 94.0) SAND, medium to coarse grain, some small round pebbles, trace silt, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 85 to 90 feet.	
88		0.1				
90		0.1				
92	48	0.3				
94		0.2			(94.0 - 95.0) SILT with medium sand, some clay, some small round pebbles, poorly sorted, stiff to dense, moist, gray.	
96		0.1		SM		
98	50	0.0		SM	(95.0 - 105.0) SILTY SAND, medium to coarse grain, some small to medium round pebbles, poorly sorted, loose, dry, light gray.	
100		0.0				
102	53	0.2			Note: less silt, wet from 100 to 105 feet. *Groundwater sample submitted for laboratory analysis from 100 to 105 feet.	
104		0.3				
106		0.2			End of boring at 105 feet.	

Notes:

bls: below land surface
 HA: Hand Auger

NR: Not Recorded
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 HK: Hydroknife AMSL: Above Mean Sea Level

Date: 12/28/2012
 Page: 3 of 3



SOIL BORING LOG

BORING NO.: **BLDG21-2**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: RACER Trust
PROJECT: Secondary Source Area Investigation
SITE LOCATION: Moraine, Ohio
PROJECT NUMBER: OH000294.2012.0002B
LOGGED BY: Lauren Baumgartner
DATE STARTED: 6/27/2012
DATE COMPLETED: 8/20/2012

DRILLING INFORMATION AMSL

DRILLING CO.: Boart Longyear
DRILLER: Jason Greer
DRILLING METHOD: Rotasonic

GROUND ELEVATION: 730.01 feet AMSL
NORTHING: 620508.0325
EASTING: 1483367.7447

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0	HK	NM	[Dotted Pattern]	SW	(0.0 - 10.0) SAND, medium to coarse grain, small to large round pebbles, poorly sorted, loose, dry, brown to tan.
2		NM			
4		NM			
6		NM			
8		NM			
10	41	1.3	[Diagonal Lines]	CL	Note: hydroknifed to 10 feet but collapsed at 9.6 feet. (10.0 - 16.0) SANDY CLAY, some silt, medium to coarse grain, few small round pebbles, poorly sorted, soft, medium plasticity, moist, olive brown.
12		2.6			
14		4.8			
16	42	4.0	[Dotted Pattern]	SP	(16.0 - 22.0) SAND, fine grain, trace small round pebbles, loose, dry, olive brown. *Soil sample submitted for laboratory analysis from 18 to 20 feet.
18		10.2			
20	36	5.7	[Vertical Lines]	SM	(22.0 - 25.0) SAND, medium to coarse grain, some small to medium round pebbles, some silt, poorly sorted, loose, dry, olive brown.
22		8.2			
24		7.2			
26	47	4.2	[Dotted Pattern]	SW	Note: moist from 24 to 25 feet. (25.0 - 30.0) SAND, medium to coarse grain with small to medium round pebbles, little silt, poorly sorted, loose, wet. *Groundwater sample submitted for laboratory analysis from 25 to 30 feet.
28		5.8			
30		0.2			
32	125	0.2	[Dotted Pattern]	SW	(30.0 - 34.0) SAND, coarse grain with small round pebbles, trace silt, loose, poorly sorted, wet, olive brown.
34		0.2			
36		0.6	[Dotted Pattern]	SW	(34.0 - 36.0) SAND, medium to coarse grain, few small round pebbles, trace silt, poorly sorted, loose, wet, olive brown.
38		0.2			
40		0.0			
			[Diagonal Lines]	GW	(36.0 - 43.0) PEBBLES, small round, few medium with medium to coarse grain sand, little silt, trace clay, poorly sorted, loose, wet, olive brown.

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/11/2012
 HA: Hand Auger NM: Not Measured PID: Photo-ionization Detector Page: 1 of 2
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **BLDG21-2**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **8/20/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **730.01 feet AMSL**
 NORTHING: **620508.0325**
 EASTING: **1483367.7447**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
40		0.0	□		*Groundwater sample submitted for laboratory analysis from 40 to 45 feet.
42	40	0.0	□		
44		0.0	●	SW	(43.0 - 55.0) SAND, medium to coarse grain, some small to medium round pebbles, trace silt, few small cobbles, poorly sorted, loose, wet, olive brown. Note: higher silt content from 50 to 55 feet. *Groundwater sample submitted for laboratory analysis from 50 to 55 feet.
46		0.1	●		
48	38	3.6	●		
50		0.6	●		
52		0.1	●		
54		0.8	●		
56		0.6		ML	(55.0 - 57.0) SILT, trace fine grain sand, dense, wet, gray.
58		0.2	/	CL	(57.0 - 59.0) SILTY CLAY, few small round pebbles, poorly sorted, hard, dry, gray.
60		0.3		ML	(59.0 - 60.0) SILT, trace clay, trace small round pebbles, poorly sorted, dense, gray.
62	64	0.2	/	SM	(60.0 - 60.5) SAND, fine grain with silt, loose, wet, gray.
64		0.2	/	CL	(60.5 - 65.0) SILTY CLAY, few small to medium round pebbles, poorly sorted, hard, dry, gray.
66					End of boring at 65 feet.

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/11/2012
 HA: Hand Auger NM: Not Measured PID: Photo-ionization Detector Page: 2 of 2
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **BLDG21-3**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **8/21/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **729.86 feet AMSL**
 NORTHING: **620649.9905**
 EASTING: **1483394.8308**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0					
0 - 9.6	HK	NM		FILL	(0.0 - 9.6) SAND, medium to coarse grain with small to large rounded gravel to cobbles, poorly sorted, loose, dry. Fill includes: concrete and wood. Note rebar found at 4 inches, offset to avoid. Note: sheet metal at 5 feet. Note: more fill debris, concrete and wood from 6 to 9.6 feet.
9.6 - 12.5	51	0.1		CL	(9.6 - 12.5) SANDY SILTY CLAY, some small round pebbles, poorly sorted, moderately stiff, moist to dry with depth, black to gray to brown with depth. *Soil sample submitted for laboratory analysis from 10 to 12 feet.
12.5 - 21.0	51	0.1		SM	(12.5 - 21.0) SAND, medium grain with silt, some small to medium round pebbles, poorly sorted, loose, dry, olive brown. Note: few small cobbles from 15 to 20 feet.
21.0 - 22.0	62	0.0		SM	
22.0 - 26.5	62	0.1		SM	
22.0 - 26.5	60	0.1		SM	
22.0 - 26.5	60	0.2		SM	(22.0 - 26.5) SILTY SAND, medium grain, some small to medium round pebbles, poorly sorted, loose, dry, olive brown. *Soil sample submitted for laboratory analysis from 24 to 26 feet.
26.5 - 33.5	60	0.3		SM	
26.5 - 33.5	58	0.0		GM	(26.5 - 33.5) PEBBLES, small and round with silt, some medium grain sand, poorly sorted, moderately loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 27 to 32 feet.
33.5 - 34.0	58	0.4		GM	
34.0 - 34.0	56	0.0		GM	
34.0 - 34.0	56	0.0		GM	

Notes:
 bls: below land surface NR: No Recovery
 HA: Hand Auger NM: Not Measured
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System
 ppm: parts per million Date: 12/11/2012
 PID: Photo-ionization Detector Page: 1 of 2
 HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **BLDG21-3**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: RACER Trust
PROJECT: Secondary Source Area Investigation
SITE LOCATION: Moraine, Ohio
PROJECT NUMBER: OH000294.2012.0002B
LOGGED BY: Lauren Baumgartner
DATE STARTED: 6/27/2012
DATE COMPLETED: 8/21/2012

DRILLING INFORMATION AMSL

DRILLING CO.: Boart Longyear
DRILLER: Jason Greer
DRILLING METHOD: Rotosonic

GROUND ELEVATION: 729.86 feet AMSL
NORTHING: 620649.9905
EASTING: 1483394.8308

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
34				ML	(33.5 - 35.0) SILT, few small round pebbles, trace sand, poorly sorted, dense, wet, olive brown.
36	56	0.1		ML	(35.0 - 41.0) SANDY SILT, interbedded lenses of silt and medium grain sand, trace small round pebbles, well sorted, dense, wet, olive brown.
38		0.4			
40		0.1			
42	56	0.1		CL	(41.0 - 44.0) SILTY CLAY, some small to medium round pebbles, trace sand, poorly sorted, hard, dry, dark gray.
44		0.2			
46	53	0.1		SW	(44.0 - 52.5) SAND with small round pebbles, coarse grain, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 45 to 50 feet.
48		0.3			
50		0.2			
52	60	0.2		ML	(52.5 - 55.0) SILT, dense, wet, gray.
54		0.1			
56	42	0.0		CL	(55.0 - 65.0) SILTY CLAY, small to medium round pebbles, trace sand, medium grain, poorly sorted, hard to moderately hard, dry, dark gray. Note: dry, harder from 60 to 65 feet.
58		0.1			
60		0.1			
62	36	0.0			
64		0.0			
66		0.1			
End of boring at 65 feet.					

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/11/2012
 HA: Hand Auger NM: Not Measured PID: Photo-ionization Detector Page: 2 of 2
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **BLDG21-4**

TOTAL DEPTH: **75** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **7/09/2012**
 DATE COMPLETED: **8/22/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **729.63 feet AMSL**
 NORTHING: **620649.9905**
 EASTING: **1483394.8308**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0	HK	NM		FILL	(0.0 - 9.8) FILL, medium to coarse grain sand, large gravel, some small to medium cobbles, poorly sorted, loose, dry. Fill includes: metal, plastic, wood, pipes, rebar.
2					
4					
6					
8					
10	47	0.0		ML	(9.8 - 15.0) SANDY SILT, medium grain, some small to medium round pebbles, poorly sorted, loose, moist to dry, olive brown. Note: light gray, few small cobbles from 12 to 15 feet. *Soil samples submitted for laboratory analysis from 14 to 15 feet and 15 to 16 feet.
12					
14					
16	51	0.7		CL	(15.0 - 16.5) SILTY CLAY with some medium grain sand, some medium round pebbles, poorly sorted, moderately dense, moist, olive brown.
18		6.3			
20	17.1				
22	58	2.7		ML	(20.0 - 22.0) SILT, some small to medium round pebbles, poorly sorted, loose, dry, pale brown.
24		4.9			
26	2.3		ML	(25.3 - 27.5) SILT with medium grain sand, some small to medium round pebbles, poorly sorted, moderately dense, wet, light gray. *Groundwater sample submitted for laboratory analysis from 27 to 32 feet.	
28	0.7				
30	0.6		SW	(27.5 - 38.0) SAND, medium to coarse grain with small round pebbles, little silt, poorly sorted, loose, wet, olive brown.	

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/11/2012
 HA: Hand Auger NM: Not Measured PID: Photo-ionization Detector Page: 1 of 3
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **BLDG21-4**

TOTAL DEPTH: **75** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **7/09/2012**
 DATE COMPLETED: **8/22/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **729.63 feet AMSL**
 NORTHING: **620649.9905**
 EASTING: **1483394.8308**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
30	28	0.0	•••••		
32		0.0	•••••		Note: more small round pebbles from 32 to 38 feet.
34		0.0	•••••		
36	94	0.0	•••••		
38		0.0	•••••		
40		0.1	•••••	SM	(38.0 - 50.0) SAND with small round pebbles, medium to coarse grain, silt, poorly sorted, loose, wet, olive brown. Note: more silt with depth.
42	42	0.0	•••••		
44		0.0	•••••		
46		0.1	•••••		*Groundwater sample submitted for laboratory analysis from 45 to 50 feet.
48	46	0.0	•••••		
50		0.4	•••••	SM	Note: small amount of clay from 49.5 to 50 feet.
52	44	0.2	•••••		(50.0 - 58.0) SILTY SAND, medium grain, trace small round pebbles, poorly sorted, moderately stiff, moist, olive brown.
54		0.6	•••••		
56		0.6	•••••		Note: cobbles at 55 feet.
58	50	0.6	•••••	ML	(58.0 - 60.0) SILT, moderately stiff, slight black staining at 58 feet, moist, gray. *Saturated soil sample submitted for laboratory analysis from 58 to 60 feet.
60			•••••		

Notes:	NR: No Recovery	ppm: parts per million	Date: 12/11/2012
bls: below land surface	NM: Not Measured	PID: Photo-ionization Detector	Page: 2 of 3
HA: Hand Auger	USCS: Unified Soil Classification System	HK: Hydroknife	AMSL: Above Mean Sea Level
*Indicates sample submitted for laboratory analysis.			



SOIL BORING LOG

BORING NO.: **BLDG21-4**

TOTAL DEPTH: **75** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Secondary Source Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002B**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **7/09/2012**
 DATE COMPLETED: **8/22/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**

 GROUND ELEVATION: **729.63 feet AMSL**
 NORTHING: **620649.9905**
 EASTING: **1483394.8308**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
60	62	0.1		CL	(60.0 - 64.0) SILTY CLAY, some small to medium round pebbles, trace sand, poorly sorted, hard, dry, dark gray.
62		0.2		CL	
64	NM	0.5		SM	(64.0 - 65.0) SILTY SAND with pebbles, clay, medium to coarse grain, small sub-rounded pebbles, poorly sorted, moderate stiff, dry, gray.
66		0.1		CL	(65.0 - 69.0) SILTY CLAY, few small to medium round pebbles, poorly sorted, hard, dry, dark gray.
68	NM	0.1		SW	(69.0 - 75.0) SAND with small round pebbles, coarse grain, trace silt, poorly sorted, loose, wet, olive brown.
70		0.1		SW	
72		0.0		SW	
74		0.0		SW	
76					End of boring at 75 feet.



SOIL BORING LOG

BORING NO.: **NP-1**

TOTAL DEPTH: **100 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Northern Perimeter Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002C**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **9/7/2012**
 DATE COMPLETED: **9/8/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **735.73 feet AMSL**
 NORTHING: **625085.6992**
 EASTING: **1483936.5303**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
40	52	3.8		SP	(40.0 - 45.0) SAND, coarse grain, few small round pebbles, trace silt, well sorted, loose, wet, olive brown.
42		2.9			
44		2.4			
46	54	1.9		SM	(45.0 - 50.0) SILTY SAND, coarse to medium grain, some small to medium round pebbles, trace clay, loose to moderate stiff, wet, olive brown.
48		0.11			
50					
52	59	3.3		SP	(50.0 - 60.0) SAND, coarse grain, few small round pebbles, trace silt, well sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 50 to 55 feet.
54		1.3			
56		1.3			
58	NM	1.4		SP	Note: more silt from 58 to 60 feet.
60		1.2			
62	68	2.6		CL	(60.0 - 65.0) SILTY CLAY, some small to medium round pebbles, poorly sorted, hard, dry, gray.
64		3.2			
66		1.3			
68	59	0.2		SM	(65.0 - 75.0) SILTY SAND with clay, coarse grain, some small to medium round pebbles, poorly sorted, stiff, wet, light gray-brown. *Groundwater sample submitted for laboratory analysis from 65 to 70 feet.
70		0.5			
72		1.1			
74	61	0.6		SM	
76		1.4			
78	59	0.9		SW	(75.0 - 85.0) SAND, medium grain, some small round pebbles, trace silt, poorly sorted, loose, wet, olive brown.
80		1.3			

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/7/2012
 NR: No Recovery NM: Not Measured PID: Photo-ionization Detector Page: 2 of 3
 *Indicates sample submitted for laboratory analysis. USCS: Unified Soil Classification System ft: feet HK: Hydroknife AMSL: Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **NP-1**

TOTAL DEPTH: **100 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Northern Perimeter Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002C**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **9/7/2012**
 DATE COMPLETED: **9/8/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **735.73 feet AMSL**
 NORTHING: **625085.6992**
 EASTING: **1483936.5303**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
80	53	0.3			*Groundwater sample submitted for laboratory analysis from 80 to 85 feet.
82		0.9			
84	54	0.5		GW	(85.0 - 97.0) PEBBLES, small round, some medium to coarse sand, some silt, poorly sorted, loose, wet, olive brown.
86		1.1			
88		1.2			
90	50	0.6			
92		0.2			
94		1.1			
96	56	1.0		SW	*Groundwater sample submitted for laboratory analysis from 95 to 100 feet.
98		0.7			
100					End of boring at 100 feet.
102					



BORING/WELL CONSTRUCTION LOG

WELL NO.: **RMW-88/NP-2**

TOTAL DEPTH: **100 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Northern Perimeter Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0002C**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **9/17/2012**
 DATE COMPLETED: **9/18/2012**

DRILLING INFORMATION

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **739.11 feet AMSL**
 GROUND ELEVATION: **739.32 feet AMSL**
 NORTHING: **625051.9881**
 EASTING: **1484580.6683**

DEPTH (feet)	Soil Symbols	USCS Classification	PID (ppm)	Recovery (inches)	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
76		ML	0.0	59	(76.0 - 78.0) SILT, trace fine to medium sand, well sorted, stiff, wet, gray.	Pellets (75 to 88 ft)
78		SW	0.1		(78.0 - 87.0) SAND, medium grain, little silt, few small round pebbles, poorly sorted, loose, wet, olive brown.	
80			0.1	61	*Groundwater sample submitted for laboratory analysis from 80 to 85 feet.	Sand Pack (88 to 100 ft)
82			0.0			
84			0.0			
86			0.0	65	(87.0 - 92.0) PEBBLES, small to medium round with medium to coarse grain sand, some silt, poorly sorted, loose, wet, olive brown.	2" Screen slot size 0.10 (90 to 100 ft)
88		GW	0.1			
90			0.0	70	Note: trace small cobbles from 90 to 92 feet.	
92		SW	0.3			
94			0.0			
96			0.0	67	*Groundwater sample submitted for laboratory analysis from 95 to 100 feet.	
98			0.0			
100			0.0		End of boring at 100 feet.	

Notes:

bls: below land surface
 HA: Hand Auger

NR: Not Recorded
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 HK: Hydroknife

Date: 12/28/2012
 Page: 3 of 3



SOIL BORING LOG

BORING NO.: **PSA-1**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/13/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **736.52 feet AMSL**
 NORTHING: **622710.4301**
 EASTING: **1485392.9152**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 0.6) CONCRETE removed by coring.
2		NM		SW	(0.6 - 10.0) SAND, medium to coarse grain, small to large rounded gravel, some cobble (6 in.), trace silt, poorly sorted, loose, dry, brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
10		1.0		CL	(10.0 - 11.0) SILTY CLAY, some fine to medium sand, few small pebbles, soft, moist, very dark grayish brown.
12	30	1.8		SW	(11.0 - 20.0) SAND, fine to medium grain, trace silt, few small round pebbles, poorly sorted, loose, dry, light olive brown.
14		2.4			
16	39	2.5			
18		2.6			
20					*Soil sample submitted for laboratory analysis from 18 to 20 feet.
22	41	0.7		SW	(20.0 - 33.5) SAND, fine to medium grain, trace silt, few small round pebbles, poorly sorted, loose, dry, light olive brown.
24		1.6			
26		1.0			
28	58	1.2			Note: some medium cobbles from 24 to 25 feet.
30		1.3			Note: Wet at 27 feet. *Groundwater sample submitted for laboratory analysis from 27 to 32 feet.
32	NM	1.7			
34		0.5		CL	Note: some small angular pebbles from 33 to 33.5 feet.
36		0.6			(33.5 - 42.0) SILTY CLAY, low plasticity, stiff, dry, light olive brown to very dark gray.
38	39	0.5			

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/11/2012
 Page: 1 of 2
 AMSL - Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **PSA-1**
 TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/13/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **736.52 feet AMSL**
 NORTHING: **622710.4301**
 EASTING: **1485392.9152**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
38		1.2			
40		0.2			
42		0.4		CL	*Groundwater sample submitted for laboratory analysis from 42 to 47 feet.
44	102	0.5		SP	(42.0 - 44.0) SILTY CLAY, small angular pebbles, low plasticity, stiff, dry, light olive brown.
46		1.1		CL	(44.0 - 45.0) SAND, medium to coarse grain, some small to medium pebbles, silt, poorly sorted, loose, wet, light olive brown.
48		1.3			(45.0 - 65.0) SILTY CLAY, small angular pebbles, low plasticity, hard, dry, very dark gray.
50		2.2			Note: some large cobbles from 50 to 55 feet.
52	50	2.4			
54		1.1			
56		1.2			
58	60	1.0			
60		1.0			
62	58	1.0			
64		0.9			
66					End of boring at 65 feet.



SOIL BORING LOG

BORING NO.: **PSA-2**

TOTAL DEPTH: **53** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/14/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **737.37 feet AMSL**
 NORTHING: **622748.0730**
 EASTING: **1485231.7515**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0			██████████	CONCRETE	(0.0 - 0.6) CONCRETE removed by coring.
2			██████████	SW	(0.6 - 10.0) SAND, medium to coarse grain, small to large gravel rounded, cobble (7 in.), trace silt, poorly sorted, loose, dry, brown.
4	HK	NM	██████████		
6		NM	██████████		
8		NM	██████████		
10		NM	██████████		
12	40	0.2	██████████	SM	(10.0 - 15.0) SAND, medium to coarse grain, some silt, some small to large round pebbles, poorly sorted, loose, dry, olive brown.
14		0.4	██████████		
16	34	1.1	██████████	SM	(15.0 - 34.5) SAND, medium grain, some silt, few small to medium round pebbles, poorly sorted, loose, dry, light yellowish brown.
18		7.6	██████████		
20		6.2	██████████		
22	68	6.7	██████████		
24		4.5	██████████		
26		10.1	██████████		*Soil sample submitted for laboratory analysis from 24 to 26 feet.
28	50	9.6	██████████		
30		6.6	██████████		
32	50	4.2	██████████		*Groundwater sample submitted for laboratory analysis from 30 to 35 feet.
34		2.4	██████████	∇	Note: wet from 33 to 34.5 feet.
36		1.4	██████████	CL	(34.5 - 40.0) SILTY CLAY, few small angular pebbles, hard, dry, very dark gray.
38	42	1.2	██████████		

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/11/2012
 Page: 1 of 2
 AMSL - Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **PSA-2**

TOTAL DEPTH: **53** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/14/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **737.37 feet AMSL**
 NORTHING: **622748.0730**
 EASTING: **1485231.7515**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
38		1.2	▨		
40	52	0.1	▨	SM	*Groundwater sample submitted for laboratory analysis from 40 to 45 feet. (40.0 - 52.0) SAND, medium to coarse grain, some silt, some small to large pebbles, poorly sorted, loose, wet, dark grayish brown.
42		0.0			
44		0.6			
46		0.5			
48		0.4			
50	80	0.4	▨		
52		0.3			
54				CL	(52.0 - 53.0) SILTY CLAY, small angular pebbles, hard, dry, very dark gray.
					End of boring at 53 feet.

Notes:
 bls: below land surface NR: No Recovery ppm: parts per million Date: 12/11/2012
 NR: No Recovery NM: Not Measured PID: Photo-ionization Detector Page: 2 of 2
 USCS: Unified Soil Classification System ft: feet HK: Hydroknife AMSL - Above Mean Sea Level
 *Indicates sample submitted for laboratory analysis.



SOIL BORING LOG

BORING NO.: **PSA-3**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/16/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **737.83 feet AMSL**
 NORTHING: **622777.1622**
 EASTING: **1485105.5065**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 0.6) CONCRETE, removed by coring.
2		NM		SM	(0.6 - 9.5) SAND medium to coarse grain, some silt, some small to large pebbles, few small cobbles, poorly sorted, loose, dry, dark grayish brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
12	36	0.0		SM	(9.5 - 25.0) SAND medium to coarse grain, some silt, some small to large round pebbles, poorly sorted, loose, dry, very dark grayish brown. Note: few small cobbles from 20 to 25 feet.
14		0.0			
16		0.2			
18	54	0.7			
20		0.7			
22		0.1			
24	50	0.0			
26		0.0		SM	
28	49	0.7		SM	
30		0.9			
32	44	0.9			*Soil sample submitted for laboratory analysis from 32 to 34 feet.
34		1.4			
36		0.4		GW	*Groundwater sample submitted for laboratory analysis from 34 to 39 feet.
38	48	0.3			(35.0 - 56.0) PEBBLES, small to large with medium to coarse sand, silt, poorly sorted, loose, wet,

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/11/2012
 Page: 1 of 2
 AMSL - Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **PSA-3**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/16/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **737.83 feet AMSL**
 NORTHING: **622777.1622**
 EASTING: **1485105.5065**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
38		NM			olive brown.
40		0.2			Note: some large round pebbles from 40 to 45 feet.
42	52	0.3			
44		0.1			
46		0.2			
48	52	0.4			
50		1.0			*Groundwater sample submitted for laboratory analysis from 49 to 54 feet.
52	54	1.2			
54		1.5			Note: light olive brown from 53 to 54 feet.
56		15000			Note: dry from 55 to 56 feet.
58		8599		SM	*Saturated soil sample submitted for laboratory analysis from 56 to 58 feet.
60	84	1906			(56.0 - 63.0) SAND, very fine grain with silt, well sorted, dense, wet, olive brown.
62		1072			
64		82.7		CL	(63.0 - 65.0) SILTY CLAY, few small angular pebbles, hard, dry, very dark gray.
66					End of boring at 65 feet.



SOIL BORING LOG

BORING NO.: **PSA-4**

TOTAL DEPTH: **64** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/26/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **736.79 feet AMSL**
 NORTHING: **622809.6554**
 EASTING: **1484968.8079**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 0.6) CONCRETE removed by coring.
2		NM		SM	(0.6 - 10.0) SAND medium to coarse grain, some silt, some small to medium round pebbles, poorly sorted, loose, dry, olive brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
12		0.1		SM	(10.0 - 32.0) SAND medium to coarse grain, silt, some small to medium round pebbles, poorly sorted, loose, moist, olive brown. Note: more small cobbles from 20 to 25 feet. Note: more fine to medium sand from 26 to 29.5 feet. *Soil sample submitted for laboratory analysis from 30 to 32 feet.
14	34	0.3			
16		0.5			
18	30	2.8			
20		0.5			
22	48	3.9			
24		2.7			
26		3.5			
28	46	1.3			
30		2.0			
32	45	4.0			
34		1.4		SM	(32.0 - 35.0) SAND, fine to medium grain, silt, some medium round pebbles, some coarse sand to small round pebbles, poorly sorted, loose, wet.
36		6.6			(35.0 - 40.0) NO RECOVERY.

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/11/2012
 Page: 1 of 2
 AMSL - Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **PSA-4**

TOTAL DEPTH: **64** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/26/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **736.79 feet AMSL**
 NORTHING: **622809.6554**
 EASTING: **1484968.8079**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
36	NR	NM			
38		NM			
40	89	1.1		SM	(40.0 - 41.0) SAND, fine to medium grain, silt, few small round pebbles, poorly sorted, loose, wet, brown. *Groundwater sample submitted for laboratory analysis from 40 to 45 feet.
42		2.1		SM	(41.0 - 50.0) SAND, medium to coarse grain, small to medium round pebbles, silt, poorly sorted, loose, wet, olive brown.
44		2.2			
46		7.9			
48		31.4			
50	40	45.9		GW	(50.0 - 52.0) PEBBLES, small round, silt, poorly sorted, loose, wet, olive brown.
52		9.4		CL	(52.0 - 57.0) SILTY CLAY, few small round pebbles, poorly sorted, hard, dry, very dark gray (2.5Y 3/1).
54	51	2.2			
56		2.3		ML	(57.0 - 60.0) SILT, very fine to medium sand, medium stiff, wet, dark grayish brown (2.5Y 4/2).
58		5.2			*Saturated soil sample submitted for laboratory analysis from 58 to 60 feet. *Groundwater sample submitted for laboratory analysis from 58 to 63 feet.
60	30	2.3		SM	(60.0 - 63.0) SAND, fine, silt, moderately loose, wet, dark grayish brown.
62		1.8		CL	(63.0 - 64.0) SILTY CLAY, few medium round pebbles, hard, very dark gray.
64					End of boring at 64 feet.
66					

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

AMSL - Above Mean Sea Level

Date: 12/11/2012
 Page: 2 of 2



BORING/WELL CONSTRUCTION LOG

WELL NO.: **RMW-85/PSA-5**

TOTAL DEPTH: **105 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/23/2012**

DRILLING INFORMATION

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **736.65 feet AMSL**
 GROUND ELEVATION: **737.03 feet AMSL**
 NORTHING: **622914.0083**
 EASTING: **1484978.1674**

DEPTH (feet)	Soil Symbols	USCS Classification	PID (ppm)	Recovery (inches)	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
--------------	--------------	---------------------	-----------	-------------------	------------------	---------------------------

0	CONCRETE	NM			(0.0 - 0.5) CONCRETE removed by coring.	2" PVC Sch 40 Casing (0 to 85 ft)
2	SM	NM			(0.5 - 16.0) SAND, medium to coarse grain, some silt, some small to large round pebbles few small cobbles, poorly sorted, loose, light olive brown.	
4		NM		HK		
6		NM				
8		NM				
10		NM				
12			192.6	25		Grout (0 to 15 ft)
14			553.5			
15			226.9	15	Note: large cobble at 13 feet. Note: rock fragments from 13 to 15 feet.	
16	SM		212.7	62	(16.0 - 16.5) SILTY SAND, medium to coarse grain, small round pebbles, poorly sorted, stiff, dry, dark grayish brown.	Bentonite Slurry (15 to 83 ft)
18	SM		136.0		(16.5 - 25.0) SAND, medium to coarse grain, some silt, some small to large round pebbles, poorly sorted, loose, light yellowish brown.	
20			125.4			
22			390.1	51		
24			980.6		Note: more fine to medium sand from 24 to 25 feet.	
26	SM		1242	60	(25.0 - 30.0) SAND, fine to medium grain, some silt, poorly sorted, loose, moist, olive brown. *Soil sample submitted for laboratory analysis from 28 to 30 feet.	
28			2791			
30	SM		142.6	60	(30.0 - 35.0) SAND, medium to coarse grain, some silt, some small round pebbles, poorly sorted, loose, olive brown. *Groundwater sample submitted for laboratory analysis from 30 to 35 feet.	
32			225.1			
34			112.4		(35.0 - 45.0) PEBBLES, small and round with medium to coarse grain sand, some silt, poorly sorted, loose, wet, odor, olive brown.	
36	GW		128.2	60		
38						

Notes:

bls: below land surface
 HA: Hand Auger

NR: Not Recorded
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 HK: Hydroknife

Date: 12/28/2012
 Page: 1 of 3



BORING/WELL CONSTRUCTION LOG

WELL NO.: **RMW-85/PSA-5**

TOTAL DEPTH: **105 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/23/2012**

DRILLING INFORMATION

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **736.65 feet AMSL**
 GROUND ELEVATION: **737.03 feet AMSL**
 NORTHING: **622914.0083**
 EASTING: **1484978.1674**

DEPTH (feet)	Soil Symbols	USCS Classification	PID (ppm)	Recovery (inches)	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
--------------	--------------	---------------------	-----------	-------------------	------------------	---------------------------

38			394.5			
40			1048			
42			>15000	60		
44			>15000			
46		SM	>15000		(45.0 - 50.0) SAND, medium to coarse grain with small round pebbles, few large round pebbles, silt, poorly sorted, loose, wet, olive brown.	
48			>15000	58		
50			>15000		*Groundwater sample submitted for laboratory analysis from 45 to 50 feet.	
52		CL	>15000	8	(50.0 - 58.0) SILTY CLAY, few small pebbles, hard, dry.	
54			221.3			
56			>15000	120		
58			117.2			
60		SM	891.2		(58.0 - 62.0) SAND, very fine with silt, dense, wet, olive brown.	
62			491.2	120		
64		CL	379.2		(62.0 - 69.0) SILTY CLAY, hard, some small round pebbles, dry, very dark gray.	
66			303.5		Note: higher silt content from 65 to 69 feet.	
68			185.5	75		
70		SM	15.2		(69.0 - 74.0) SAND, medium to fine grain, silt, some small to medium round pebbles, poorly sorted, loose, wet, dark grayish brown.	
72			10.1	42		
74			205.5		*Groundwater sample submitted for laboratory analysis from 69 to 74 feet.	
76		ML	245.8		(74.0 - 75.0) SILT, moderately stiff, wet, light olive brown.	

Bentonite Slurry (15 to 83 ft)

Notes:

bls: below land surface
 HA: Hand Auger

NR: Not Recorded
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 HK: Hydroknife

Date: 12/28/2012
 Page: 2 of 3



BORING/WELL CONSTRUCTION LOG

WELL NO.: **RMW-85/PSA-5**

TOTAL DEPTH: **105 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 CITY, STATE: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/23/2012**

DRILLING INFORMATION

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 TOP OF CASING: **736.65 feet AMSL**
 GROUND ELEVATION: **737.03 feet AMSL**
 NORTHING: **622914.0083**
 EASTING: **1484978.1674**

DEPTH (feet)	Soil Symbols	USCS Classification	PID (ppm)	Recovery (inches)	SOIL DESCRIPTION	WELL CONSTRUCTION DETAILS
76	SM		78.1	150	(75.0 - 85.0) SAND, fine to medium grain, silt, few small to medium round pebbles, poorly sorted, loose, wet, light olive brown.	
78			449			
80			13.5	NM		
82			31.2			
84	GW		20.5	NM	(85.0 - 105.0) PEBBLES, small, sand medium to coarse grain, silt, few medium to large pebbles, poorly sorted, loose, wet, dark olive brown. * Groundwater sample submitted for laboratory analysis from 85 to 90 feet. Note: more fine to medium sand from 90 to 100 feet. *Groundwater sample submitted for laboratory analysis from 100 to 105 feet.	Bentonite Slurry (15 to 83 ft) Sand Pack (83 to 95 ft) 2" Screen slot size 0.10 (85 to 95 ft) Formation collapsed from (95 to 105 ft)
86			10.2			
88			7.9			
90			9.9			
92			15.2			
94			3.8			
96			3.4			
98			3.0			
100			2.1			
102			2.1			
104	2.0	160	End of boring at 105 feet.			
106						

Notes:

bls: below land surface
 HA: Hand Auger

NR: Not Recorded
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 HK: Hydroknife

Date: 12/28/2012
 Page: 3 of 3



SOIL BORING LOG

BORING NO.: **PSA-6**

TOTAL DEPTH: **70** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/27/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **736.66 feet AMSL**
 NORTHING: **632011.4770**
 EASTING: **148500.9137**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 0.5) CONCRETE, removed by coring.
2		NM		SM	(0.5 - 10.0) SAND, medium to coarse grain, silt, small to medium pebbles, few small cobbles, poorly sorted, loose, dry. Note: at 0.5 feet 3-inch layer of tar like substance is observed on the east side of the borehole.
4	HK	NM			
6		NM			
8		NM			
10		NM			
12	41	0.0		SW	(10.0 - 20.0) SAND, medium grain, some small round pebbles, trace silt, poorly sorted, loose, dry, light olive brown. Note: cobble (6 inches) at 16 feet.
14		0.7			
16		0.0			
18	43	0.0			
20		0.0			
22	89	0.1		SM	(20.0 - 30.0) SAND, medium grain, some small pebbles, trace small cobbles, silt, poorly sorted, loose, dry, light olive brown. Note: increase in small pebbles from 22 to 24 feet. *Soil sample submitted for laboratory analysis from 22 to 24 feet.
24		1.1			
26		1.0			
28		0.5			
30		2.3			
32	40	5.2		SC	(30.0 - 33.0) SAND with silty clay, some small pebbles, poorly sorted, low plasticity, soft, moist, olive brown.
34		7.8			
36	36	36.2		CL	(33.0 - 38.0) SILTY CLAY, few small rounded pebbles, poorly sorted, hard, dry, very dark, grayish brown.

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/11/2012
 Page: 1 of 2
 AMSL - Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **PSA-6**

TOTAL DEPTH: **70 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/27/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **736.66 feet AMSL**
 NORTHING: **632011.4770**
 EASTING: **148500.9137**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
36		32.4			Note: cobble from 36 to 37 feet.
38	24	38.7		SC	(38.0 - 42.0) SAND with silty clay, medium to coarse grained sand, some small pebbles, poorly sorted, moist, grayish brown.
40		158.2			
42	48	345.8		CL	(42.0 - 46.0) SILTY CLAY, few to some small to medium angular pebbles, hard, low plasticity, dry, grayish brown. Note: negative result for NAPL test from 42 to 44 feet.
44		18.8			
46					*Groundwater sample submitted for laboratory analysis from 42 to 47 feet.
48	54	55.3		CL-ML	(46.0 - 50.0) CLAYEY SILT with sand, medium grained sand, some small to large pebbles, low plasticity, dry, light gray. Note: cobble at 48 feet.
50		1.2			
52		1487		CL	(50.0 - 54.0) SILTY CLAY, few to some small angular pebbles, hard, low plasticity, dry, dark grayish brown. *Saturated soil sample submitted for laboratory analysis from 50 to 52 feet. *Groundwater sample submitted for laboratory analysis from 52 to 57 feet. Note: negative result for NAPL test from 50 to 54 feet.
54	84	229.7			
56		89.1		SW	(54.0 - 56.0) SILTY SAND, medium grained sand, few to some medium to large rounded pebbles, poorly sorted, moist, olive brown.
58		178.4			
60	36	11,094		SM	(56.0 - 58.0) SILT, some fine to medium grained sand, some small rounded pebbles, poorly sorted, moist, olive brown.
62		9,882		CL	(58.0 - 60.0) SAND with gravel, some silt, some small to medium rounded pebbles, poorly sorted, wet, strong odor, olive-brown. Note: positive result for NAPL test from 58 to 60. *Saturated soil sample submitted for laboratory analysis from 58 to 60 feet.
64	56	2,782			
66		378.5			(60.0 - 68.0) SILTY CLAY, few to small angular pebbles, hard, low plasticity, dry, dark grayish brown. Note: Negative result for NAPL test from 60 to 66 feet. *Saturated soil sample submitted for laboratory analysis from 66 to 68 feet.
68	54	49.1			
70		13.8		SM	Note: increasing silt content, brown at 67 feet. (68.0 - 70.0) SAND with gravel, some silt, some rounded small pebbles, poorly sorted, loose, wet, olive brown.

End of boring at 70 feet.



SOIL BORING LOG

BORING NO.: **PSA-7**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **7/29/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **737.04 feet AMSL**
 NORTHING: **623107.7413**
 EASTING: **1485023.3387**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0			██████████	CONCRETE	(0.0 - 0.6) CONCRETE removed by coring.
2			██████████	SM	(0.6 - 10.0) SAND, medium to coarse grain, silt, small to medium, pebbles, few small cobbles, poorly sorted, loose, dry.
4	HK	NM	██████████		
6		NM	██████████		
8		NM	██████████		
10		NM	██████████		
12	57	4.9	██████████	SW	(10.0 - 20.0) SAND, medium grained, some small round pebbles, trace silt, poorly sorted, loose, dry, light olive brown. *Soil sample submitted for laboratory analysis from 12 to 14 feet. Note: cobble at 14 feet.
14		34.6	██████████		
16		4.2	██████████		
18	42	3.9	██████████		
20		4.4	██████████		
22	50	1.0	██████████	SM	(20.0 - 32.0) SAND, medium grained, some small to medium pebbles, trace small cobbles, silt, poorly sorted, loose, dry, light olive brown. Note: decrease in pebbles from 25 to 30 feet. Note: moist from 26 to 30 feet.
24		2.3	██████████		
26		4.9	██████████		
28	44	7.8	██████████		
30		8.3	██████████		
32	60	7.7	██████████		*Grounwater sample submitted for laboratory analysis from 29 to 34 feet. Note: increase in small to medium rounded pebbles at 30 feet.
34		18.2	██████████	SC	(32.0 - 34.0) SAND with silty clay, some small rounded pebbles, poorly sorted, loose, moist, olive brown.
36		21.7	██████████	CL	(34.0 - 38.0) SILTY CLAY, few small round pebbles, hard, low plasticity, dry, very dark grayish brown.

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife
 AMSL - Above Mean Sea Level

Date: 12/11/2012
 Page: 1 of 2



SOIL BORING LOG

BORING NO.: **PSA-7**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/28/2012**
 DATE COMPLETED: **7/29/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **737.04 feet AMSL**
 NORTHING: **623107.7413**
 EASTING: **1485023.3387**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
36	56	213.8			Note: negative result for NAPL test from 36 to 38 feet.
38		141.2			SC
40	54	5.2		SM	(40.0 - 48.0) SAND with gravel, medium to coarse sand, some silt, some small rounded pebbles, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 40 to 45 feet.
42		5.5			
44		6.8			
46	40	30.7		CL	(48.0 - 52.0) SILTY CLAY, few to some small angular pebbles, hard, low plasticity, dry, dark grayish brown. *Saturated soil sample submitted for laboratory analysis from 50 to 52 feet. Note: negative result for NAPL test from 48 to 50 feet. Note: negative result for NAPL test from 50 to 52 feet. *Saturated soil sample submitted for laboratory analysis from 52 to 54 feet.
48		989.9			
50	42	2204		SM	(52.0 - 64.0) SILTY SAND, medium grained sand, trace small angular pebbles, trace silt, well sorted, loose, wet, light olive brown. *Groundwater sample submitted for laboratory analysis from 59 to 64 feet. Note: grades to medium grained sand, increasing silt content from 60 to 64 feet.
52		244.6			
54	48	190.1			(64.0 - 65.0) SILTY CLAY, few small rounded pebbles, hard, low plasticity, dry, dark grayish brown.
56		73.1			
58		31.9			
60	54	36.1		CL	End of boring at 65 feet.
62		7.4			
64		2.2			
66					



SOIL BORING LOG

BORING NO.: **PSA-8**

TOTAL DEPTH: **66.5 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/31/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **738.73 feet AMSL**
 NORTHING: **623024.1416**
 EASTING: **1485082.2288**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 0.5) CONCRETE removed by coring.
2		NM		SM	(0.5 - 10.0) SAND, medium to coarse grain, some silt, some small to large round pebbles, few small cobbles, poorly sorted, loose, dry, olive brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
12	53	2.1		SW	(10.0 - 20.0) SAND, medium grained, some small to large pebbles, poorly sorted, loose, dry, light yellowish brown. Note: cobble from 17 to 20 feet.
14		2.2			
16		2.4			
18	48	2.2			
20		1.9			
22	47	2.1		SW	(20.0 - 34.0) SAND, medium grained, some small to large rounded pebbles, trace silt, poorly sorted, loose, dry, light olive brown (2.5Y 5/3). Note: olive brown at 25 feet. Note: moist at 30 feet. *Soil sample submitted for laboratory analysis from 32 to 34 feet. *Groundwater sample submitted for laboratory analysis from 31 to 36 feet.
24		4.2			
26		6.6			
28	50	8.3			
30		4.4			
32	45	12.9			(34.0 - 36.0) SAND with silty clay, medium grained sand, few rounded pebbles, poorly sorted, wet, olive brown. Note: negative result for NAPL test from 34 to 36 feet.
34		85.0			
36	24	180.9		SC	

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife
 AMSL - Above Mean Sea Level

Date: 12/11/2012
 Page: 1 of 2



SOIL BORING LOG

BORING NO.: **PSA-8**

TOTAL DEPTH: **66.5 feet bls**

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **7/31/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **738.73 feet AMSL**
 NORTHING: **623024.1416**
 EASTING: **1485082.2288**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
36	81	183.3		CL	Note: negative result for NAPL test from 36 to 38 feet. (36.0 - 43.0) SILTY CLAY, few small round pebbles, poorly sorted, hard, dry, very dark grayish brown. Note: negative result for NAPL test from 38 to 40 feet.
38		181.1			
40		575.4			
42	71	180.4		SM	Note: very hard material is fractured from 40 to 43 feet. Note: negative result for NAPL test from 40 to 42 feet. *Groundwater sample submitted for laboratory analysis from 43 to 48 feet.
44		165.8			
46		115.8			
48		83.2			
50	24	392		CL	(50.0 - 52.0) SILTY CLAY, some small pebbles, poorly sorted, hard, dry, very dark grayish brown. Note: negative result for NAPL test from 50 to 52 feet.
52	NM	233.4		ML	(52.0 - 56.0) SANDY SILT with clay, medium to coarse grain sand, few small to medium pebbles, poorly sorted, loose, moist to wet, odor, olive brown.
54		10,887			
56		11,901			
58	24	9,029		ML	(56.0 - 58.0) SILTY SAND, medium to coarse grain with some small to medium pebbles, poorly sorted, loose, moist to wet, odor, olive brown. *Saturated soil sample submitted for laboratory analysis from 56 to 58 feet.
60		298.2			
62	36	268.1		ML	(60.0 - 62.0) SAND, medium to coarse grain, few small pebbles, trace silt, poorly sorted, loose, wet. Note: negative result for NAPL test from 60 to 62 feet.
64		255.4			
66		38.1			
66				CL	*Groundwater sample submitted for laboratory analysis from 61 to 66 feet. Note: more silt at 61.5 feet.
66				CL	(62.0 - 66.0) SILT with very fine sand, stiff, wet, odor, olive brown. Note: negative result for NAPL test from 62 to 64 feet.
68				CL	Note: negative result for NAPL test from 64 to 66 feet.
				CL	(66.0 - 66.5) SILTY CLAY, trace small round pebbles, hard. Note: negative result for NAPL test from 66 to 66.5 feet.

End of boring at 66.5 feet.



SOIL BORING LOG

BORING NO.: **PSA-9**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **8/7/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **738.81 feet AMSL**
 NORTHING: **622912.6158**
 EASTING: **1485207.1184**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0			██████████	CONCRETE	(0.0 - 0.5) CONCRETE removed by coring.
2			██████████	SM	(0.5 - 10.0) SAND, medium to coarse grain, some silt, some small to medium round pebbles, few small cobbles, poorly sorted, loose, dry.
4	HK	NM	██████████		
6		NM	██████████		
8		NM	██████████		
10		NM	██████████		
12	35	3.2	██████████	SM	(10.0 - 20.0) SAND, fine to medium grain, silt, some small to medium pebbles, poorly sorted, loose, dry, olive brown. Note: higher silt content, olive brown from 15 to 20 feet.
14		3.6	██████████		
16		3.4	██████████		
18	34	1.1	██████████		
20		3.9	██████████		(20.0 - 21.0) PEBBLES, small to medium, trace coarse sand, poorly sorted, loose, dry, olive brown.
22	45	2.1	██████████	GW	(21.0 - 30.0) SILT with fine to medium sand, few medium round pebbles, poorly sorted, loose, dry, olive brown (2.5Y 4/3). Note: more medium round pebbles with depth from 26 to 30 feet. *Soil sample submitted for laboratory analysis from 26 to 28 feet.
24		3.3	██████████	ML	
26		2.2	██████████		
28	38	6.3	██████████		
30		6.1	██████████		
32	NR	NM	██████████		(30.0 - 32.0) NO RECOVERY.
34		2.1	██████████	SW	(32.0 - 40.0) SAND with small pebbles, medium to coarse sand, few medium pebbles, little silt, poorly sorted, loose, wet, olive brown. *Groundwater sample submitted for laboratory analysis from 32 to 37 feet.
36		2.6	██████████		

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/11/2012
 Page: 1 of 2
 AMSL - Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **PSA-9**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **8/7/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **738.81 feet AMSL**
 NORTHING: **622912.6158**
 EASTING: **1485207.1184**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
36	48	5.2			Note: higher silt content, some clay, wet from 36 to 40 feet.
38		2.2			
40		2.4		ML	(40.0 - 42.0) SILT, little fine grain sand, loose, wet, olive brown.
42	33	4.2			SM
44		8.4			
46	34	9.3			*Groundwater sample submitted for laboratory analysis from 47 to 52 feet.
48		8.2			
50	18	11.3		SM	(50.0 - 54.0) SILTY SAND, medium to coarse grain, few medium pebbles to small cobbles, trace clay, poorly sorted, loose to moderately stiff, wet, olive brown. Note: more consolidated with depth from 52 to 54 feet.
52	34	5.7			
54	33	17.8		CL	(54.0 - 59.0) SILTY CLAY, few medium round pebbles, poorly sorted, hard, dry, dark gray brown. Note: dry, slight odor from 55 to 59 feet.
56		13.8			
58		73.9		SM	(59.0 - 60.0) SILTY SAND, fine to medium grain, few small to medium pebbles, moderately stiff, wet, very dark gray. *Groundwater sample submitted for laboratory analysis from 59 to 64 feet.
60	41	46.9			
62		108.7			
64		73.8		ML	(64.0 - 64.5) SILT, few small round pebbles, trace sand, poorly sorted, moderately stiff, slight odor, moist.
66					

End of boring at 65 feet.



SOIL BORING LOG

BORING NO.: **PSA-10**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **8/28/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **738.77 feet AMSL**
 NORTHING: **622869.8232**
 EASTING: **1485368.4397**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
0				CONCRETE	(0.0 - 0.8) CONCRETE removed by coring.
2		NM		SM	(0.8 - 10.0) SAND, medium to coarse grain, silt, some small to medium round pebbles, few small cobbles, poorly sorted, loose, dry, olive brown.
4	HK	NM			
6		NM			
8		NM			
10		NM			
12	36	1.4		SM	(10.0 - 15.0) SAND, medium grain, some silt, some small to large round pebbles, poorly sorted, loose, dry, olive brown.
14		1.2			(15.0 - 16.0) SAND, medium grain, few small round pebbles, trace silt, poorly sorted, loose, dry, olive brown.
16		0.5		SW	
18	34	1.9		SW	(16.0 - 32.0) SAND, medium grain, some small to large round pebbles, poorly sorted, loose, dry, light olive brown.
20		2.0			
22	42	1.4			
24		1.4			
26		2.4			Note: cobbles at 23 feet.
28	40	2.1			Note: higher silt content, more medium round pebbles from 25 to 30 feet.
30		2.8			*Soil sample submitted for laboratory analysis from 30 to 32 feet.
32	29	3.0			
34	30	2.9		CL	
36		2.6			(32.0 - 45.0) SILTY CLAY, some small round pebbles, poorly sorted, loose, dry, gray.
38	48	0.8			

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife

Date: 12/11/2012
 Page: 1 of 2
 AMSL - Above Mean Sea Level



SOIL BORING LOG

BORING NO.: **PSA-10**

TOTAL DEPTH: **65** feet bls

PROJECT INFORMATION

CLIENT: **RACER Trust**
 PROJECT: **Process Sump Area Investigation**
 SITE LOCATION: **Moraine, Ohio**
 PROJECT NUMBER: **OH000294.2012.0006A**
 LOGGED BY: **Lauren Baumgartner**
 DATE STARTED: **6/27/2012**
 DATE COMPLETED: **8/28/2012**

DRILLING INFORMATION AMSL

DRILLING CO.: **Boart Longyear**
 DRILLER: **Jason Greer**
 DRILLING METHOD: **Rotosonic**
 GROUND ELEVATION: **738.77 feet AMSL**
 NORTHING: **622869.8232**
 EASTING: **1485368.4397**

DEPTH (feet)	Recovery (inches)	PID (ppm)	Soil Symbols	USCS Classification	SOIL DESCRIPTION
38		1.4			
40	52	2.1			Note: more small round pebbles, higher silt content from 40 to 45 feet.
42		2.0			
44		1.8			(45.0 - 45.5) SILTY CLAY, some small to medium round pebbles, little medium sand, poorly sorted, soft, moist to wet, olive brown.
46				CL	(45.5 - 46.5) SAND, coarse grain with silt, some small to medium round pebbles, little clay, loose to moderate stiff, wet, olive brown.
48		2.0		SM	
50		4.5		CL	(46.5 - 65.0) SILTY CLAY, some small to medium round pebbles, trace sand, poorly sorted, hard, dry, gray. *Groundwater sample submitted for laboratory analysis from 45 to 50 feet.
52	120	7.0			
54		8.3			
56		8.5			Note: seams of medium sand, well sorted from 55 to 56 feet.
58		9.3			Note: more medium round pebbles from 58 to 60 feet.
60		12.2			
62	78	7.2			
64		5.3			
66		3.4			Note: higher silt content from 64.5 to 65 feet. End of boring at 65 feet.

Notes:
 bls: below land surface
 NR: No Recovery
 *Indicates sample submitted for laboratory analysis.

NR: No Recovery
 NM: Not Measured
 USCS: Unified Soil Classification System

ppm: parts per million
 PID: Photo-ionization Detector
 ft: feet
 HK: Hydroknife AMSL - Above Mean Sea Level

Date: 12/11/2012
 Page: 2 of 2

ARCADIS

Attachment F-3

Groundwater Sampling Logs

ARCADIS

Water Sampling Log

Project RACER Trust Project No. OH000294.2012.0002B Page 1 of 1
 Site Location Moraine, OH Date 9/26/2012
 Site/Well No. RMW-85 Replicate No. N/A Code No. N/A
 Weather Cloudy 65° Sampling Time: Begin 16:22 End 16:54

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 735.90
 Land Surface Elevation (ft) 736.28
 Sounded Well Depth (ft bmp) 94.40
 Depth to Water (ft bmp) 28.63
 Water-Level Elevation (ft) 707.27
 Water Column in Well (ft) 65.77
 Casing Diameter/Type 2" PVC
 Gallons in Well 10.52
 Gallons Pumped/Bailed Prior to Sampling 4.2 pumped
 Sample Pump Intake Setting (ft bmp) 87.4
 Purge Time begin 16:36 end 16:54
 Pumping Rate (ml/min) 300
 Evacuation Method Submersible Pump

Field Parameters

Color NR
 Odor NR
 Appearance NR
 pH (s.u.) See low flow log
 Conductivity (mS/cm) See low flow log
 (µmhos/cm) N/A
 Turbidity (NTU) See low flow log
 Temperature (°C) See low flow log
 Dissolved Oxygen (mg/L) See low flow log
 Salinity (%) See low flow log
 Sampling Method Low flow
 Remarks Sampled @ 16:54

Constituents Sampled	Container Description	Number	Preservative
Site Specific VOCs 8260	40 mL VOA	3	HCl

Sampling Personnel P. Houle, R.Schindler

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	Below measuring point	ml	Milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
ml/min	Milliliter per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

**LOW FLOW SAMPLING
GROUNDWATER FIELD PARAMETER LOG**

Project Number OH000294.2012.0002B

Site Location Moraine, OH

Monitoring Well No. RMW-85

Time Pump Started 16:36

Depth of Sampling 87.4 feet bmp

Date 9/26/2012

Parameters

Time

	1636	1642	1645	1648	1651	1654					
Redox Potential (millivolts)	-18.4	-22.3	-23.1	-23.6	-23.3	-26.8					
Dissolved Oxygen (mg/L)	3.47	0.78	0.56	0.55	0.45	0.43					
pH (s.u.)	7.31	7.05	7.00	6.99	6.98	6.97					
Specific Conductance (mS/cm)	1.073	1.081	1.082	1.083	1.084	1.080					
Temperature °C	18.4	18.9	19.0	19.1	19.1	19.2					

Flow Rate 300 ml/min

Total Depth 94.4 Feet

Time Sampled 16:54

Depth to Water Before 28.63 Feet

Total Water Pumped 4.2 gallons

Depth to Water After 28.65 Feet

Comments Initially water was flourent green in color from dyed drilling fluid. Purged until color was gone.
Field blank collected - 17:07, Equipment blank collected - 17:05

ARCADIS

Water Sampling Log

Project RACER Trust Project No. OH000294.2012.0002B Page 1 of 1
 Site Location Moraine, OH Date 9/26/2012
 Site/Well No. RMW-86 Replicate No. N/A Code No. N/A
 Weather Partly cloudy 60° Sampling Time: Begin 08:18 End 10:12

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 728.47
 Land Surface Elevation (ft) 728.85
 Sounded Well Depth (ft bmp) 80.00
 Depth to Water (ft bmp) 23.21
 Water-Level Elevation (ft) 705.26
 Water Column in Well (ft) 56.79
 Casing Diameter/Type 2" PVC
 Gallons in Well 9.09
 Gallons Pumped/Bailed Prior to Sampling 18.5 pumped
 Sample Pump Intake Setting (ft bmp) 73.0
 Purge Time begin 08:21 end 10:12
 Pumping Rate (ml/min) 400
 Evacuation Method Submersible Pump

Field Parameters

Color NR
 Odor NR
 Appearance NR
 pH (s.u.) See low flow log
 Conductivity (mS/cm) See low flow log
 (µmhos/cm) N/A
 Turbidity (NTU) N/A
 Temperature (°C) See low flow log
 Dissolved Oxygen (mg/L) See low flow log
 Salinity (%) See low flow log
 Sampling Method Low flow
 Remarks Sampled @ 10:12

Constituents Sampled	Container Description	Number	Preservative
Site Specific VOCs 8260	40 mL VOA	3	HCl

Sampling Personnel P. Houle, R. Schindler

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	Below measuring point	ml	Milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
ml/min	Milliliter per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

**LOW FLOW SAMPLING
GROUNDWATER FIELD PARAMETER LOG**

Project Number OH000294.2012.0002B

Site Location Moraine, OH

Monitoring Well No. RMW-86

Time Pump Started 8:21

Depth of Sampling 73.0 feet bmp

Date 9/26/2012

Parameters

Time

	0835	0839	0843	0847	0859	0904	0910	0923	1004	1008	1012
Redox Potential (millivolts)	-120.5	-118.0	-113.5	-108.30	-125.20	-119.70	-111.2	-90.1	15.1	13.1	11.0
Dissolved Oxygen (mg/L)	0.48	0.45	0.44	0.44	0.33	0.26	0.24	0.21	2.87	0.74	0.52
pH (s.u.)	8.05	8.06	8.06	8.06	8.12	8.11	8.02	7.81	7.82	7.48	7.38
Specific Conductance (mS/cm)	1.282	1.290	1.305	1.303	1.342	1.353	1.320	1.299	1.222	1.186	1.178
Temperature °C	17.7	17.7	17.7	17.8	17.8	17.6	17.7	17.6	17.8	17.7	17.7

Flow Rate 400 ml/min

Total Depth 80.00 Feet

Time Sampled 10:12

Depth to Water Before 23.21 Feet

Total Water Pumped 18.5 gallons

Depth to Water After 23.23 Feet

Comments Initially water was flourent green in color from dyed drilling fluid. Purged until color was gone.

ARCADIS

Water Sampling Log

Project RACER Trust Project No. OH 000294.2012.0002B Page 1 of 1
 Site Location Moraine, OH Date 9/26/2012
 Site/Well No. RMW-87 Replicate No. N/A Code No. N/A
 Weather Partly Cloudy, 66° Sampling Time: Begin 13:11 End 13:41

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 727.26
 Land Surface Elevation (ft) 727.69
 Sounded Well Depth (ft bmp) 76.10
 Depth to Water (ft bmp) 21.45
 Water-Level Elevation (ft) 705.81
 Water Column in Well (ft) 54.65
 Casing Diameter/Type 2" PVC
 Gallons in Well 8.74
 Gallons Pumped/Bailed Prior to Sampling 2.4 pumped
 Sample Pump Intake Setting (ft bmp) 69.1
 Purge Time begin 13:20 end 13:41
 Pumping Rate (ml/min) 300
 Evacuation Method Submersible Pump

Field Parameters

Color NR
 Odor NR
 Appearance NR
 pH (s.u.) See low flow log
 Conductivity (mS/cm) See low flow log
 (umhos/cm) N/A
 Turbidity (NTU) See low flow log
 Temperature (°C) See low flow log
 Dissolved Oxygen (mg/L) See low flow log
 Salinity (%) See low flow log
 Sampling Method Low flow
 Remarks Sampled @ 13:41

Constituents Sampled	Container Description	Number	Preservative
Site Specific VOCs 8260	40 mL VOA	3	HCl

Sampling Personnel P. Houle, R. Schindler

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp Below measuring point ml Milliliter NTU Nephelometric Turbidity Units
 °C Degrees Celsius mS/cm Milisiemens per centimeter PVC Polyvinyl chloride
 ft feet msl mean sea-level s.u. Standard units
 ml/min Milliliter per minute N/A Not Applicable umhos/cm Micromhos per centimeter
 mg/L Miligrams per liter NR Not Recorded VOC Volatile Organic Compounds

ARCADIS

**LOW FLOW SAMPLING
GROUNDWATER FIELD PARAMETER LOG**

Project Number OH000294.2012.0002B

Site Location Moraine, OH

Monitoring Well No. RMW-87

Time Pump Started 13:20

Depth of Sampling 69.1 feet bmp

Date 9/26/2012

Parameters

Time

	1320	1326	1329	1332	1335	1338	1341				
Redox Potential (millivolts)	19.3	15.1	14.3	13.1	10.8	8.6	8.3				
Dissolved Oxygen (mg/L)	2.20	0.70	0.63	0.53	0.42	0.41	0.40				
pH (s.u.)	7.38	7.18	7.16	7.15	7.12	7.12	7.10				
Specific Conductance (mS/cm)	1.301	1.308	1.302	1.290	1.285	1.290	1.300				
Temperature °C	19.5	20.0	20.0	19.4	19.0	18.9	19.0				

Flow Rate 300 mil/min

Total Depth 76.10 Feet

Time Sampled 13:41

Depth to Water Before 21.45 Feet

Total Water Pumped 2.4 gallons

Depth to Water After 21.48 Feet

Comments Initially water was flourent green in color from dyed drilling fluid. Purged until color was gone.

ARCADIS

Water Sampling Log

Project RACER Trust Project No. OH000294.2012.0002B Page 1 of 1
 Site Location Moraine, OH Date 9/26/2012
 Site/Well No. RMW-88 Replicate No. N/A Code No. N/A
 Weather Partly Cloudy 64° Sampling Time: Begin 11:48 End 12:44

Evacuation Data

Measuring Point TOC
 MP Elevation (ft) 738.36
 Land Surface Elevation (ft) 738.57
 Sounded Well Depth (ft bmp) 102.7
 Depth to Water (ft bmp) 30.48
 Water-Level Elevation (ft) 707.88
 Water Column in Well (ft) 72.22
 Casing Diameter/Type 2" PVC
 Gallons in Well 11.56
 Gallons Pumped/Bailed Prior to Sampling 10.1 pumped
 Sample Pump Intake Setting (ft bmp) 95.70
 Purge Time begin 12:11 end 12:44
 Pumping Rate (ml/min) 300
 Evacuation Method Submersible Pump

Field Parameters

Color NR
 Odor NR
 Appearance NR
 pH (s.u.) See low flow log
 Conductivity (mS/cm) See low flow log
 (µmhos/cm) N/A
 Turbidity (NTU) See low flow log
 Temperature (°C) See low flow log
 Dissolved Oxygen (mg/L) See low flow log
 Salinity (%) See low flow log
 Sampling Method Low flow
 Remarks Sampled @ 12:44

MS/MSD collected

Constituents Sampled	Container Description	Number	Preservative
Site Specific VOCs 8260	40 mL VOA	9	HCl

Sampling Personnel P. Houle, R.Schindler

Well Casing Volumes

Gal./Ft. 1-¼" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
 1-½" = 0.09 2-½" = 0.26 3-½" = 0.50 6" = 1.47

bmp Below measuring point ml Milliliter NTU Nephelometric Turbidity Units
 °C Degrees Celsius mS/cm Milisiemens per centimeter PVC Polyvinyl chloride
 ft feet msl mean sea-level s.u. Standard units
 ml/min Milliliter per minute N/A Not Applicable umhos/cm Micromhos per centimeter
 mg/L Miligrams per liter NR Not Recorded VOC Volatile Organic Compounds

ARCADIS

**LOW FLOW SAMPLING
GROUNDWATER FIELD PARAMETER LOG**

Project Number OH000294.2012.0002B

Site Location Moraine, OH

Monitoring Well No. RMW-88

Time Pump Started 12:11

Depth of Sampling 95.7 feet bmp

Date 9/26/2012

Parameters

Time

	1211	1218	1227	1230	1235	1238	1241	1244			
Redox Potential (millivolts)	3.8	-5.6	-11.7	-12.8	-15.7	-15.8	-17.0	-17.2			
Dissolved Oxygen (mg/L)	6.00	0.63	0.40	0.36	0.31	0.30	0.30	0.30			
pH (s.u.)	7.81	7.24	7.16	7.15	7.14	7.13	7.13	7.13			
Specific Conductance (mS/cm)	0.891	0.908	0.896	0.900	0.887	0.884	0.887	0.885			
Temperature °C	20.0	17.3	18.2	18.2	18.2	18.2	18.1	18.1			

Flow Rate 300 ml/min

Total Depth 102.7 feet

Time Sampled 12:44

Depth to Water Before 30.48 feet

Total Water Pumped 10.1 gallons

Depth to Water After 30.49 feet

Comments Initially water was flourent green in color from dyed drilling fluid. Purged until color was gone.